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Kholmurod Egamberdiev

$$2n+m, 5n+m$$

## THEORETICAL BASES OF CHEMICAL ALGORITHMS

Xolmurod Egamberdiev

$$n = 2 ; m = -3$$

## KIMYOVIIY ALGORITMLARNING NAZARIY ASOSLARI

$$[3m + (m + 7)]$$

$$[n + (m + 3)]$$

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**THE MINISTRY OF NATIONAL EDUCATION OF REPUBLIC OF  
UZBEKISTAN**

**THE SURKHAN-DARYA REGIONAL INSTITUTE OF IMPROVEMENT OF  
PROFESSIONAL SKILL AND RETRAINING OF PEDAGOGICAL PERSONNELS**

**Kholmurod Egamberdiev**

**THEORETICAL BASES OF  
CHEMICAL ALGORITHMS**

**(Scientific - methodical handbook)**

**TASHKENT - 2012**

In the given handbook, the author seeks to introduce the concepts of “chemical algorithm”, “index expressions”, “sequence coefficient”, “expressions of value coefficient” for the first time in organic chemistry. On the basis of these concepts some variants of the method of “chemical algorithms” are developed and the equations of combustion reaction of representatives of homologues of organic substances which enter into one of their classes are presented and expressed by the general formulas of equalizing by So of coefficients.

The law that “in chemical reactions the quantity of weights of substances increases or decreases for one of consecutive changes” has been proved. It draws attention of those who are interested in chemical science, a rule about «chemical algorithms» offered by the author. The book is intended for pupils of schools, students, teachers, and researchers of chemistry.

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## PROSPECTS OF ALGORITHMIZATION OF CHEMICAL REACTIONS

After establishment of independence in our country considerable successes are reached in the field of development of chemical science and industry: Bukhara oil refining plant is placed in operation, the Fergana oil refining plant is reconstructed, the chemical complex «Shurtangazhimiya» is constructed, metallurgical combines in the cities of Zarafshan and Almalik are converted on the basis of new technologies, the Kungradsky plant (Karakalpakstan) which makes soda is constructed and placed in operation. Exportable production which answers completely to the world standards and is issued at the given enterprises, brings the considerable contribution to development of the industry of our country. Development of the chemical industry is closely connected with development of a chemical science. Preparation of leading personnel among rising generation, for the given branch is one of urgent problems.

According to the State national program of development of school education in 2004 - 2009 modern conditions are created for studying natural sciences at schools, academic lyceums and professional colleges. By today, almost all educational institutions of republic, educational institutions, and laboratories in chemistry, biology, and physics are equipped with necessary educational equipment, laboratory devices, and reactants corresponding to the world standards.

It proves once again that much attention is paid to this branch of science. The life proves necessity of advanced stage-by-stage chemical training for schools, academic lyceums, professional colleges, and higher educational institutions. Modern person regardless his/her work widely uses thousand kinds of natural, artificial and synthetic food, medicines, clothes and industrial goods.

The knowledge of a chemical compound and properties of these products for proper, expedient, economical use is necessary for every person. For this reason, it is important to train pupils from school more deeply with primary knowledge in chemistry. In this connection, «chemical algorithms» is worth for attention.

As the President of Uzbekistan Islam Abduganiyevich Karimov confirms, «All of us know well, what is the value of great openings of our compatriot Mohammed Muse Al Horezmi which were included in the branch of a science of concept algorithm, algebra, ten-character system of the account in universal algebra. Thus, he began the development of all exact sciences, as astronomy, a geodesy, geography, mathematics»<sup>1</sup>.

The author in the given handbook tries to use concept "algorithm" as a concept «chemical algorithm». The first scientific works by the author devoted to "Chemical algorithms" as an article included into the collection of materials of the international conference on a theme «Actual problems of school chemical education » which passed from 28 April till 4 May 2008, in Tashkent in

<sup>1</sup> Karimov I s l a m . «The higher spirituality - invincible force». Tashkent: Manaviyat, 2008.

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connection with the 42nd Mendeleev Olympiad. The added and reviewed data of scientific and methodical elaboration have been published on pages of newspapers: «The Teacher of Uzbekistan» (№ 41, on 10 October, 2008) on a theme: "The chemical phenomena and the equations", "Surkhan ziyosi" (№ 10-11, 2008) on a theme: "Use" of chemical algorithms" and generation of the equations of reaction of combustion of organic substances".

The primary goal of "modern" chemistry is to get above noted substance properties, acceleration of industrial production and creation of technology without waste. Use of energy of chemical changes is also the main task of modern chemistry. It is possible to name chemistry the unique industry of changes. It gives possibility to synthesize nonexistent materials in the nature of which details of various cars and devices are made; houses are built; national economic consumer goods are produced.

The synthetic rubber, plastic, artificial fibers, artificial fuel, paints, medical products and the biopolymers used in medicine successfully, and the important set for humanity of other "substances" are basic products of the chemical industry. Only from oil 20 thousand various organic substances are received, and from coal it is possible to receive even more. Now about 500 thousand (basically organic) substances are applied in the industry. In general, 97 % products used by mankind is process of the processed chemical manufactures.

All these testify that a modern science, i.e. the chemistry and industrial chemistry occupy all spheres of life and human activity.

According to data of science and scientific - popular literature, more than 100 organic substances are received in the artificial and synthetic way in laboratories of scientific - research institutes of the different countries of the world every day. According to some information their number has reached 38 million.

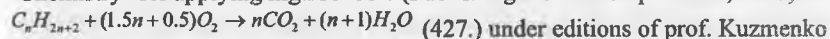
It is known that the first representative in the world - the Nobel Prize winner the Dutch physicist-chemist J. Van-Gogh is the founder of three basic areas of modern chemistry: kinetics, study of solutions and stereochemistry. In June, 1869 J. Van-Gogh sustained the first on a province of Southern Holland to the entrance examination in the higher polytechnic school Delfte. Already at that time, he represented well potential possibilities of chemistry. To the question of the examiner «Where can go an organic synthesis? », the 17-year-old graduate of high school answered: « To a cell ». Indeed, according to a prediction of the great scientist, now the big achievements in the field of modern organic chemistry give possibilities to study thoroughly the chemical processes occurring in a cell of live organisms. In unique laboratories of studying of a structure of a code of DNA at the end of the 20<sup>th</sup> century and the beginning of the 21<sup>st</sup> century and attainments in the field of cloning of living organisms are achievements of organic chemistry of last years, indeed. One of the important knowledge and concepts of organic chemistry is a generation of the equations of combustion of organic substances. Despite of from what stage the organic chemistry is studied, it is clear to learners



that organic substances differ from inorganic substances with the property of burning.

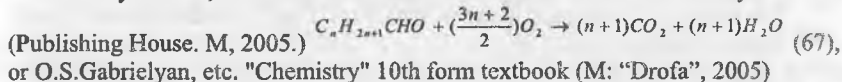
In textbooks of schools, professional colleges, the academic lyceums, and higher educational institutions in organic chemistry data of physical and chemical properties of representatives of one of certain classes of organic connections are given. But data on the equations of burning reaction of organic substances in the published textbooks in chemistry for last years is resulted insufficiently. The general equations of burning reaction of representatives of homologues, organic substances entering into certain classes are given in these textbooks, and also the general equations of reaction of burning given in some magazines on chemistry and manuals complicate definition of coefficients a little.

For example, «Chemistry at school» (2008, № 11), the manual (G.P.Khomchenko), "Chemistry" for applying high schools (Publishing House «O'qituvchi», 2007)

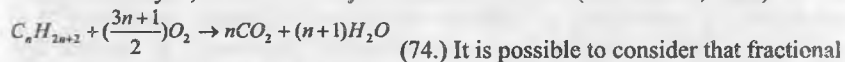


under editions of prof. Kuzmenko N.E. and Professor Terenina V. I.

«Chemistry -2005», «Entrance examinations of Moscow State University»



or O.S.Gabrielyan, etc. "Chemistry" 10th form textbook (M: "Drofa", 2005)



It is possible to consider that fractional numbers in these equations of burning reaction are difficult for defining in specification of coefficients. In scientific elaboration of the author «Chemical algorithms» reaction of combustion of the organic substances which entered into different classes, completely corresponds to mathematical laws.

It is proved in elaboration that generation of the equations of burning reactions of organic substances and equalizing them with the help of coefficients is based on exact mathematical laws.

In such way, there is not only «mathematical algorithms» in science, but also «chemical algorithms». The author introduces for the first time the concept of «chemical algorithm», "index-expressions", «sequence of coefficient» and «expressions of coefficient value» in organic chemistry.

The author names quantity of atoms of hydrogen of organic substances as «index - expression». The value of "index-expression" specifies number of hydrogen atoms as a part of any organic substance. Although it concerns any class of organic connections, it will be equal  $2n$ ,  $2n+m$ ,  $2n-m$ . Then it is possible to consider, the equation of burning reaction of a molecule of organic substances in chemical algorithms in which structure quantity of atoms of hydrogen is expressed by "index-expression" repetitions. And for a product of burning reaction the coefficient value of carbonic gas  $CO_2$  and water  $H_2O$  is obtained. Introducing the concepts of «sequence coefficient» the author specifies that weights of the substances are one of consecutive changes, which have entered reaction in a number of the equations with weights of substances which were formed, increase



in reaction. It is also defined that in the ranks of the equations of burning reaction of organic substances which the structure of molecule includes atoms C, H or C, H, O, «the sequence coefficient» is equal  $(2n/n)$  or  $n5$  (2). Despite the fact that, what class includes organic substance among the equations of reaction of burning of representatives of organic substances, with the same structure the coefficient value of oxygen  $O_2$  increases or decreases on (3) units, and carbonic gas  $CO_2$  and water  $H_2O$  on (2) units. The author also manages to find out that among representatives of homologue of organic substances in the equations of reaction of combustion if

the sequence coefficient is equal  $\frac{4n}{n}$  or (4) coefficient value with change of radical  $(C H_2)$ . The coefficient value of oxygen proportionally increases on (6) units, including coefficient value  $CO_2$  and  $H_2O$ , considered as the basic products of reactions, increases or decreases on (4) units. The author on the basis of value (n) and (m) has developed «chemical algorithms» in different variants and has applied thus an algebraic method of positive and negative numerals.

For example, at saturated hydrocarbons if  $n=1$ ,  $m=2$ , at aldehydes  $n=1$ ,  $m=0$ , at the one-core carbon acids if  $n=1$ ,  $m=-1$  or at aldehydes and ketone acids if,  $n=2$ ,  $m=-2$ . Such laws are proved on an example of other "chemical algorithms». As a conclusion, in elaboration of different variants of "chemical algorithms» it is possible to use the algebraic concepts effectively concerning to positive and negative numerals.

It is known, that at formic aldehyde  $H-CHO$  and acetic acid  $H-COOH$  value  $(C H_2)$  of a radical is equal to zero<sup>(0)</sup>. In the given organic substances functional groups  $-CHO$  and  $-COOH$  are connected only with atoms of hydrogen. The author's elaborations of "chemical algorithms» confirm that the radical  $(C H_2)$  is equal to zero<sup>(0)</sup>.

The author of scientific elaboration of "Chemical algorithms» continues the researches due to the classical law invented by the well-known Russian scientist M.V.Lomonosov «the weight of the substances entering into chemical reaction, as a result of reaction is equal to the formed weights of substances». He specifies the relation of this law with law numbers of the equations of burning reaction by change and increase or reduction in certain sequence of quantity of weights of the given substances. That is, the author of the manual makes comments on his conclusions to a theme: « The mathematical analysis of chemical algorithms » as follows. In the ranks of the equations of burning reaction into which molecules of atoms of carbon enter, hydrogen or atoms of carbon, hydrogen and oxygen, the sequence coefficient is equal  $2n/n$ , and the value of weight of initial organic substance proportionally raises or decreases on  $28 \text{ a.w.u.}^2$ , the basic participant of

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a.w.u.<sup>2</sup> – atom weight unit.

reaction of oxygen  $O_2$  - on 96 a.w.u , and the basic products of reaction of carbonic gas  $CO_2$  - on 88 a.w.u, and water  $H_2O$  - on 36 a.w.u. in the equations of burning reaction , the structure includes molecules of atoms of carbon, hydrogen, nitrogen or carbon, hydrogen, nitrogen and oxygen, sequence coefficient -  $4n/n$ , the value of weight of initial organic substance proportionally raises or decreases on 56 a.w.u, weights of the basic participant of reaction of oxygen  $O_2$  to the 192 a.w.u and weights of the basic products of reaction of carbonic gas  $CO_2$  - on 176 a.w.u and water  $H_2O$  on 72 a.w.u. In the appendix 1 table of expressions of coefficient value for oxygen  $O_2$ , carbonic gas  $CO_2$  and water  $H_2O$  also will help to understand that relation between values (n) and (m) changes in certain sequence. The presented tables of the value (n) and (m) of the first representative of "chemical algorithm" of homologues of the basic class of organic connections in the appendix 2, choosing coefficients on the basis of variants 11, 111 and 1V promotes composition of the equations of reaction and equalizing.

At present time the rapid development of the chemical industry in the country included in textbooks and concept manuals concerning «chemical algorithm», raises its role in development of a chemical science and in its training. In connection with applying concepts concerning «chemical algorithms» in textbooks of schools, the academic lyceums, the professional colleges or higher educational institutions, it becomes clear for those who study chemistry that chemical processes are based on exact mathematical laws.

«Chemical algorithms» are considered only as initial scientific elaborations in this direction of the author and therefore due to our assumptions they afford new possibilities for different directions of science (thermo-chemistry, biochemistry, chemistry of polymers, molecular biology and others) algorithmizations of chemical reactions. Besides that, the laws and rules concerning «chemical algorithms» developed by the author draw youth attention who studies chemical science with interest. We hope for it.

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## THE BASIC CONCEPTS AND THE RULES OF «THE CHEMICAL ALGORITHMS »

It is well known that the role of mathematics as bases of fundamental natural scientific formation is very great. All fundamental disciplines use mathematical models and abstraction for the description of laws of the nature. In addition, with computer facilities development the increasing quantity of pure chemical disciplines gets applied important value for natural sciences.

The modern chemist should know about principles of construction of mathematical model and be able to use mathematical abstraction. It assumes high level of chemical culture, the strong knowledge based on the mathematical facts, and possibilities of independent perfection of the knowledge studying of new sections of mathematics. The knowledge can be required for the expert-chemist in the course of scientific researches or in its practical work. Profound studying of bases of natural-chemical sciences should be based on consideration of interrelation of the chemical phenomena and laws with others natural and applied sciences. Leading theoretical and world outlook ideas of chemistry from a school course to high school should be based on elaboration of special abilities of practical character. In practice, it is possible to apply the algorithmic approach widely at training of organic chemistry, at studying of the equations of reaction of burning of organic substances in oxygen.

The algorithm is sequence of precisely described operations which are carried out in a certain order. Thus it is necessary to change concept «mathematical algorithm» to concept «chemical algorithm».

**«The chemical algorithm» is a performance in certain sequence of the ordinal mathematical decisions applied in formation of the equations of chemical reactions and putting down of equalizing coefficients.**

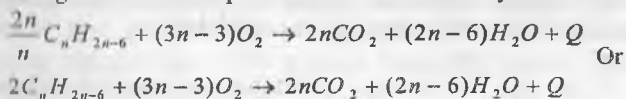
At all performed operations by defining number of the hydrogen atoms which are a part of organic substances, «index - expression»

( $2n$ ,  $2n+1$ ,  $2n+2$ ,  $2n-4$ ,  $2n-6$ ,  $2n+3$ ,  $2n+1$ ,  $2n+2$ ,  $2n-1$ , etc.), are considered as the basic product of the equations of reaction of burning of carbonic gas  $CO_2$  and water  $H_2O$ , also repeated for definition of coefficient value. Including organic connections which include atoms C, H or C, H, O in structure of molecules, if the number of hydrogen equals index-expression  $2n$  in all reactions of the equations coefficient value of carbonic gas  $CO_2$  and water  $H_2O$  will be equal  $2n$  as well. Connections, in which the number of changed index - hydrogen expressions was ( $2n+2$ ,  $2n-2$ ,  $2n-4$ ,  $2n-6$ ,  $2n-8$  etc.), carbonic gas  $CO_2$  will be equal  $2n$ , and the coefficient value of water  $H_2O$  will be proportional an index - expression, that is ( $2n+2$ ,  $2n-2$ ,  $2n-4$ ,  $2n-6$ ,  $2n-8$  etc.).

Number of atoms of hydrogen of "index-expression" which ( $2n+3$ ) in primary, secondary, tertiary amines, including containing atoms C, H, N, O of

organic substances, is equal  $2n+1$  for nitroalkanes and amino acids  $C_nH_{2n+1}NO_2$ , amides acids  $C_nH_{2n+1}NO$ , hydroxy-amino acid  $C_nH_{2n+1}NO_3$  and number of atoms of hydrogen of index-expression, which  $2n+2$ , for diaminocarboxylic acids  $C_nH_{2n+1}N_2O_3$ , number of hydrogen of «index-expression» in which  $2n-1$  for aminodicarboxylic acids -  $C_nH_{2n-1}NO_4$ , the product of the equation of burning for carbonic gas  $CO_2$  of coefficient value will be equal to quantity of carbon atoms of initial organic substance and multiplication of quantity of coefficient sequence, and coefficient value of water  $H_2O$  also are defined by a double parity. For example,  $4n+6$  (amines),  $4n+2$  (nitroalkanes, amino acids, amides acids, hydroxy-amino acids),  $4n+4$  (diaminocarboxylic acids),  $4n-2$  (aminodicarboxylic acids).

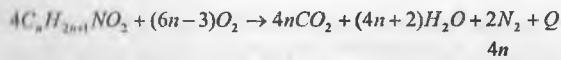
As a part of the molecules containing atoms C, H or C, H, O, it is possible to express any organic substances of reaction of burning of the equation of chemical algorithms in two ways. We will result the equations of reaction of burning of chemical algorithm where representatives of aromatic hydrocarbons enter:



$\frac{2n}{n}$

Here, the meaning coefficient value  $n$  and (2), entering reactions, initial organic substance provides consecutive performance of algorithmic operations. If the representative of homologues, entering into one of certain organic substances, changes on radical ( $C H_2$ ) then the meaning value of coefficient of oxygen proportionally changes on (3) units. For example, in reaction of the equation of burning of benzene  $C_6H_6$  the value of coefficient of oxygen is equal  $3n-3=3*3-3=18-3=15$ , and in toluene  $C_7H_8$   $3n-3=3*7-3=21-3=18$ .

The equation of burning of organic substances in which structure of molecules includes atoms C, H, N or C, H, N, O, it is possible to show algorithm on an example nitroalkanes:



And in it, the meaning coefficient value  $n$  and (4), entering into a reaction initial organic substance provides consecutive performance of algorithmic operation. The representative entering into a certain class of organic substances of homologues, changes on radical ( $C H_2$ ), and the meaning value of coefficient of oxygen proportionally changes on (6) units. For example, in the equation of

\*3 The multiplying sign is expressed by asterisk.

burning of nitromethane  $CH_3NO_2$ , the oxygen coefficient is equal in reaction  $6n-3=6*1-3=6-3=3$ , and in nitroethane  $C_2H_5NO_2$  will be  $-6n-3=6*2-3=12-3=9$ .

In general, indicating quality and quantity of organic substances expressed by the general formula which belongs to the class of organic connections of representatives of homologues of the equation of burning reaction in chemical algorithms of a molecule of organic substances in which structure quantity of atoms of hydrogen expressing repetition of «index - expression» for a product of reaction of burning of carbonic gas  $CO_2$  and water  $H_2O$  the value coefficient is obtained. So, chemical algorithms are a monolithic system of knowledge in which structure includes following concepts and rules:

1. The magnitude, which shows number of atoms of the hydrogen, a part of any organic substance, is called as "index-expression".

2. The value of "index-expression" specifying number of hydrogen atoms as a part of any organic substance, despite the fact that, to what class of organic connections it concerns, will be  $2n$ ,  $2n+m$ ,  $2n-m$ .

3. Value  $\frac{2n}{n}$  or (2),  $\frac{4n}{n}$  or (4), providing sequence of algorithmic operations, are coefficient value of initial organic substances and are called as consecutive coefficients of chemical algorithms.

4. If in the ranks of the equations of reaction of burning the sequence coefficient is equal  $\frac{2n}{n}$  or (2), the value of the representative of homologues of organic substances will change on radical  $(C H_2)$ . The coefficient value of the basic participant of reaction of oxygen proportionally increases or decreases for (3) units, and coefficient value of carbonic gas  $CO_2$  and water  $H_2O$ , considered as the basic products of reactions, increases or decreases for (2) units.

5. In the ranks of the equations of reaction of burning if the sequence coefficient is equal  $\frac{4n}{n}$  or (4), the value of representatives of homologues of organic substances will change on radical  $(C H_2)$ . The coefficient value of the basic participant of reaction of oxygen proportionally increases or decreases for (6) units, and coefficient value of carbonic gas  $CO_2$  and water  $H_2O$ , considered, the basic products of reactions, increases or decreases for (4) units.

6. In the ranks of the equations of reaction of burning if the coefficient of sequence of chemical algorithms is equal  $\frac{2n}{n}$  or (2) value at the carbonic gas  $CO_2$  considered as the basic product of reaction of burning, the value coefficient will be equal to quantity of carbon atoms of initial organic substance and multiplication of quantity of coefficient sequence. The coefficient value of water  $H_2O$  will be equal "index-expression » of initial organic substance.

7. In the ranks of the equations of reaction of burning if the coefficient sequence of chemical algorithms is equal  $\frac{4n}{n}$  or (4) value at the carbonic gas  $CO_2$  considered as the basic product of reaction of combustion, the value coefficient will be equal to quantity of carbon atoms of initial organic substance and multiplication of quantity of coefficient sequence. The coefficient value of water  $H_2O$  is equal "index-expression » of initial organic substance in a double parity.

Researches show that there are various forms of "chemical algorithm» and following general rules are expedient for them.

Among the equations of reaction of burning, one of the basic products of burning which is considered carbonic gas  $CO_2$ , the value coefficient will be equal quantity of carbon atoms of initial organic substance of the coefficient sequence increased by numbers. The coefficient value of water  $H_2O$  will be equal «index - expression» of initial organic substance, at nitric connections "index-expression » of initial organic substance in a double parity.

Firstly, chemical algorithms of the equation of burning reaction of representatives of homologues of saturated hydrocarbons are given in the handbook

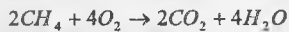
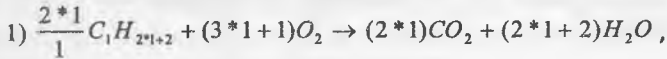
## SATURATED HYDROCARBONS

Saturated hydrocarbons are widespread in the nature. They are found not only in the pure state but also in the form of compound connections. Oil and gas are considered as a basic source. Many connections of representatives of these classes are found in plants. For example, normal heptane  $C_7H_{16}$  allocate from pine wood, eicosane  $C_{20}H_{42}$  is found in parsley leaves, nonacosane  $C_{29}H_{60}$  - in cabbage leaves. Knowing, that the general formula of representatives of homologues of saturated hydrocarbons is  $C_nH_{2n+2}$ , it is possible to express their chemical algorithm as the equation of reaction of burning in following way:

$$\frac{2n}{n} C_n H_{2n+2} + (3n+1) O_2 \rightarrow 2n CO_2 + (2n+2) H_2 O + Q$$

It is possible to activate reactions of burning of methane using this algorithm.

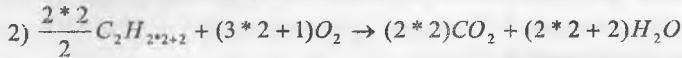
Burning of methane  $C H_4$  in oxygen:



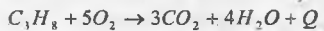
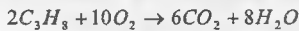
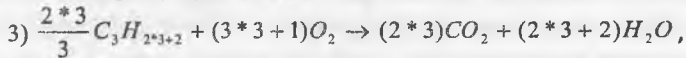
We define small coefficients reducing left and right parts of the equation:



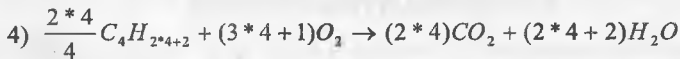
Burning of ethane  $C_2 H_6$  in oxygen:



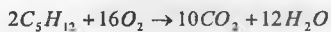
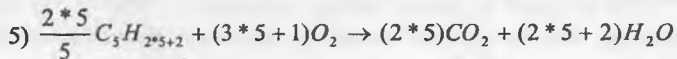
Burning of propane  $C_3 H_8$  in oxygen:



Burning of butane  $C_4 H_{10}$  in oxygen:

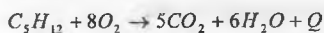


Burning of pentane  $C_5 H_{12}$  in oxygen:

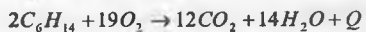
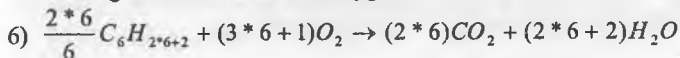




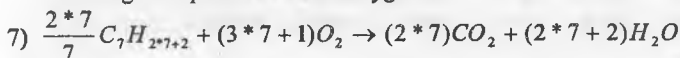
Small coefficients are defined reducing left and right parts of the equation to identical number:



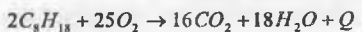
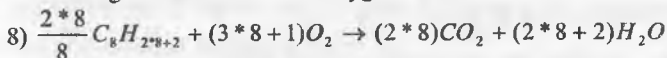
Burning of hexane  $C_6H_{14}$  in oxygen:



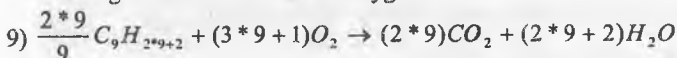
Burning of heptane  $C_7H_{16}$  in oxygen:



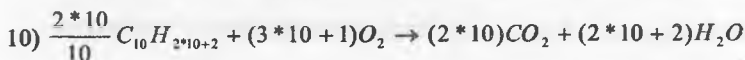
Burning of octane  $C_8H_{18}$  in oxygen:



Burning of nonane  $C_9H_{20}$  in oxygen:



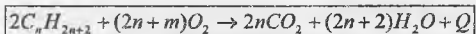
Burning of decane  $C_{10}H_{22}$  in oxygen:



In variant II of chemical algorithm of the representative for substance of oxygen  $O_2$  - expressions of the value of coefficients  $(2n+m)$ , the basic participant of the equations of reaction of burning, the choice of coefficient use from (n) and (m) numbers is made and consecutive relation between them is shown. In this

value (n) and (m) distinguishes on one unit or, if n=1, m=2 or, if n=5, m=6. So, proportional change of values (n) and (m) on unit (1) is observed.

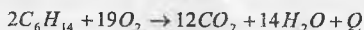
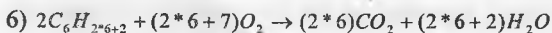
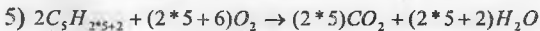
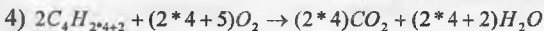
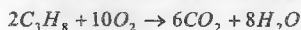
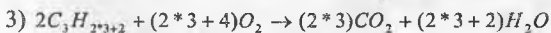
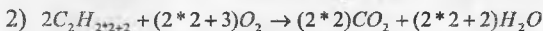
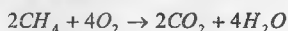
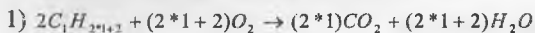
The given chemical algorithm is expressed as followed:

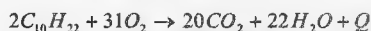
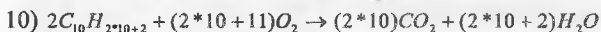
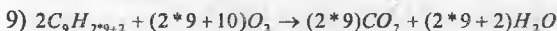
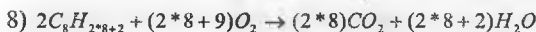
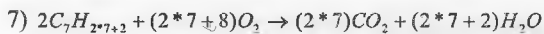


Relation between values (n) and (m):

n=1;	m=2;	n=4;	m=5;	n=7;	m=8;
n=2;	m=3;	n=5;	m=6;	n=8;	m=9;
n=3;	m=4;	n=6;	m=7;	n=9;	m=10.

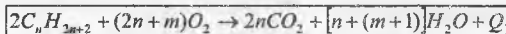
Examples of algorithmic tasks:





In variant III of chemical algorithms consecutive relation between values (n) and (m) definitions of coefficients for water  $H_2O$ , one of the basic products of the equation of reaction of burning is shown.

In this expression the defining coefficient value of water  $H_2O$  is shown in the form of  $[n+(m+1)]$ :



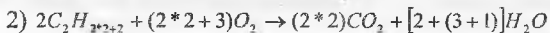
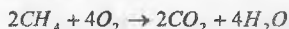
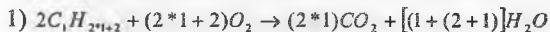
Relation between values (n) and (m):

$$n=1; \quad m=2; \quad n=4; \quad m=5; \quad n=7; \quad m=8;$$

$$n=2; \quad m=3; \quad n=5; \quad m=6; \quad n=8; \quad m=9;$$

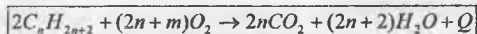
$$n=3; \quad m=4; \quad n=6; \quad m=7; \quad n=9; \quad m=10.$$

Examples of algorithmic tasks:



value (n) and (m) distinguishes on one unit or, if n=1, m=2 or, if n=5, m=6. So proportional change of values (n) and (m) on unit (1) is observed.

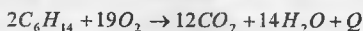
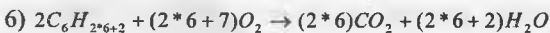
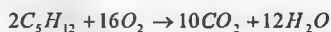
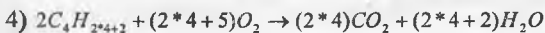
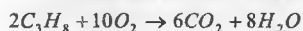
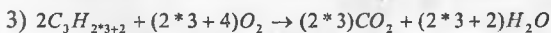
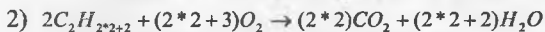
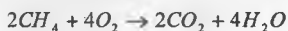
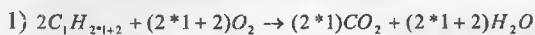
The given chemical algorithm is expressed as followed:

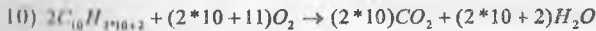
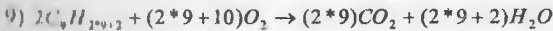
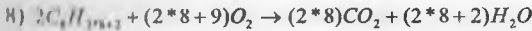


Relation between values (n) and (m):

$$\begin{array}{llllll} n=1; & m=2; & n=4; & m=5; & n=7; & m=8; \\ n=2; & m=3; & n=5; & m=6; & n=8; & m=9; \\ n=3; & m=4; & n=6; & m=7; & n=9; & m=10. \end{array}$$

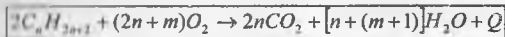
Examples of algorithmic tasks:





In variant III of chemical algorithms consecutive relation between values (n) and (m) definitions of coefficients for water  $H_2O$ , one of the basic products of the equation of reaction of burning is shown.

In this expression the defining coefficient value of water  $H_2O$  is shown in the form of  $[n + (m+1)]$ :



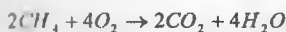
Relation between values (n) and (m):

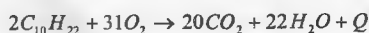
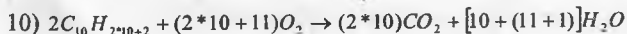
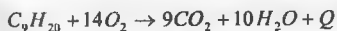
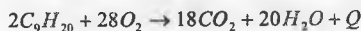
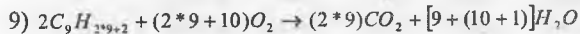
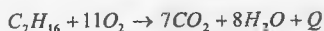
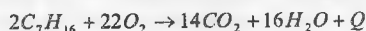
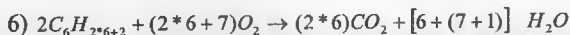
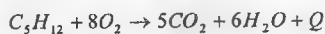
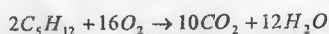
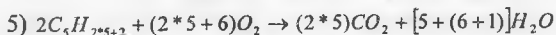
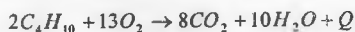
$$n=1; \quad m=2; \quad n=4; \quad m=5; \quad n=7; \quad m=8;$$

$$n=2; \quad m=3; \quad n=5; \quad m=6; \quad n=8; \quad m=9;$$

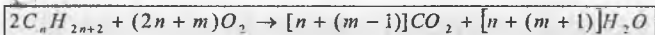
$$n=3; \quad m=4; \quad n=6; \quad m=7; \quad n=9; \quad m=10.$$

Examples of algorithmic tasks:





Let's write down variant IV of chemical algorithms in a kind of the following formula:

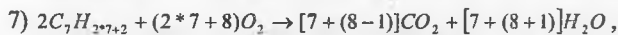
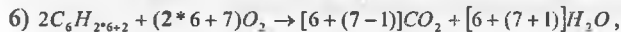
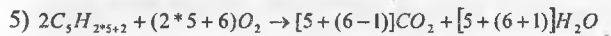
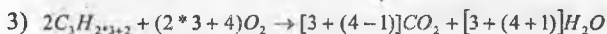
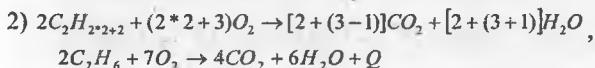
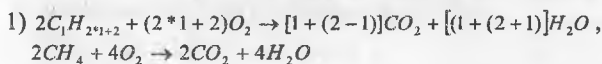


We express coefficient value for carbonic gas  $CO_2$  - in one of the basic products of the equations of burning reaction  $[n+(m-1)]$ .

Relation between values (n) and (m):

$$\begin{array}{llllll} n=1; & m=2; & n=4; & m=5; & n=7; & m=8; \\ n=2; & m=3; & n=5; & m=6; & n=8; & m=9; \\ n=3; & m=4; & n=6; & m=7; & n=9; & m=10. \end{array}$$

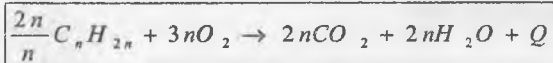
Examples of algorithmic tasks:



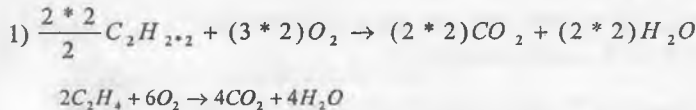


## CYCLOPARAFFINS AND HYDROCARBONS OF ETHYLENE SERIES

Hydrocarbons of ethylene series or unsaturated hydrocarbons are the hydrocarbons which easily undergo reactions of connection. The general formula of hydrocarbons of ethylene series and cyclic molecules is  $C_nH_{2n}$ . The equation of reaction of combustion of chemical algorithms of representatives of cycloparaffins and hydrocarbons of ethylene series should have the following appearance:



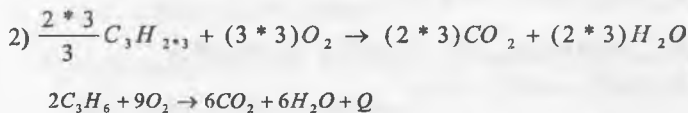
The equations of combustion reaction of ethane in oxygen:  $C_2H_6$



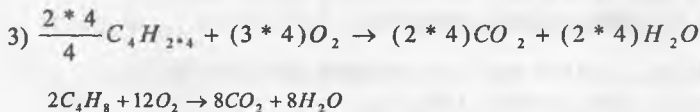
Reducing left and right parts of equation to the same number, we define small coefficients:



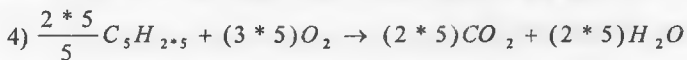
The equation of burning reaction of propene in oxygen:  $C_3H_6$



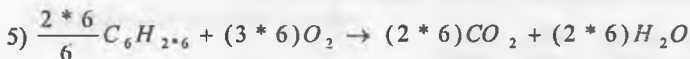
The equation of reaction of combustion of butene:  $C_4H_8$



The equation of reaction of burning of pentene:  $C_5H_{10}$



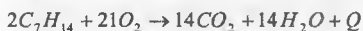
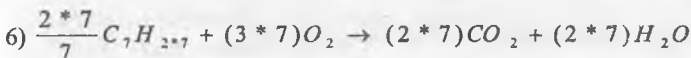
The equation of reaction of burning of hexene:  $C_6H_{12}$



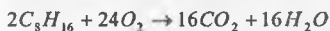
In this reaction small coefficients are defined.



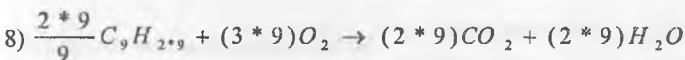
The equation of reaction of burning of heptene;



The equation of reaction of burning of octene:  $C_8H_{16}$

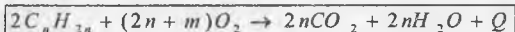


The equation of reaction of burning of nonene:  $C_9H_{18}$



In variant II of chemical algorithms for substance of oxygen  $O_2$  - one of basic participants of the equations of reaction of burning from (n) and (m) values consecutive relation between participants of the equations of reaction of burning is shown by defining their coefficients. Variant II of chemical algorithm in the

equation of burning reaction of representatives of homologues of the given class is expressed in a following kind:



Consecutive relation between values (n) and (m):

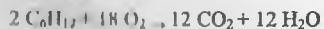
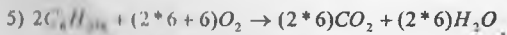
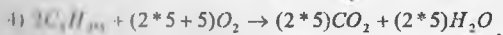
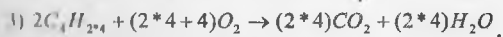
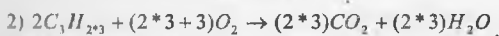
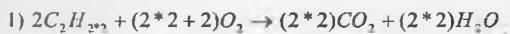
$$n=2; m=2; n=5; m=5;$$

$$n=3; m=3; n=6; m=6;$$

$$n=4; m=4; n=7; m=7;$$

In this expression the coefficient value of oxygen  $O_2$  is expressed as  $(2n + m)$ , (n) and (m) values do not differ in any way or when  $n=2, m=2$  or  $n=5$  and  $m=5$ , i.e. the value between (n) and (m) do not change.

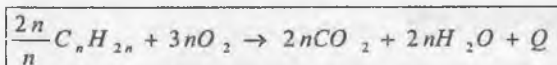
Examples of algorithmic tasks:



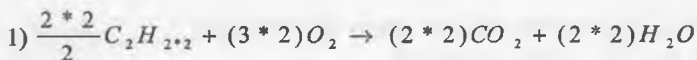
Expression of coefficient value of water  $H_2O$   $(n + m)$  is one of the basic products of the equations of reaction of combustion and variant III of chemical algorithms.

## CYCLOPARAFFINS AND HYDROCARBONS OF ETHYLENE SERIES

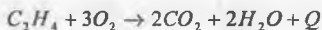
Hydrocarbons of ethylene series or unsaturated hydrocarbons are the hydrocarbons which easily undergo reactions of connection. The general formula of hydrocarbons of ethylene series and cyclic molecules is  $C_nH_{2n}$ . The equation of reaction of combustion of chemical algorithms of representatives of cycloparaffins and hydrocarbons of ethylene series should have the following appearance:



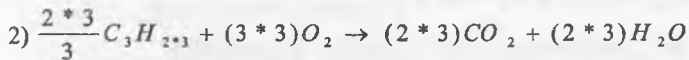
The equations of combustion reaction of ethane in oxygen:  $C_2H_4$



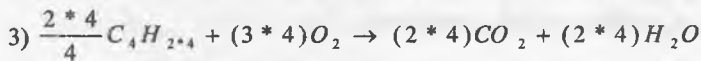
Reducing left and right parts of equation to the same number, we define small coefficients:

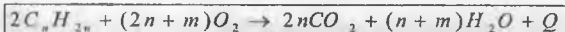


The equation of burning reaction of propene in oxygen:  $C_3H_6$



The equation of reaction of combustion of butene:  $C_4H_8$





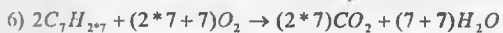
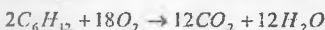
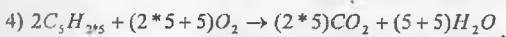
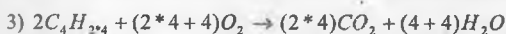
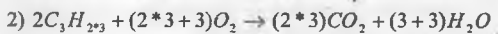
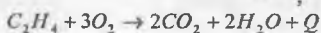
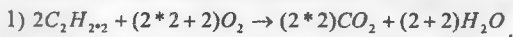
The relation table between (n) and (m) values;

$$n=2; \quad m=2; \quad n=5; \quad m=5;$$

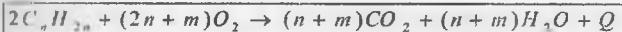
$$n=3; \quad m=3; \quad n=6; \quad m=6;$$

$$n=4; \quad m=4; \quad n=7; \quad m=7;$$

Examples for algorithmic tasks:



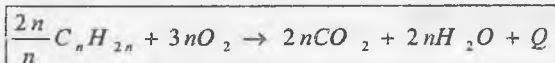
Variant IV of chemical algorithms:



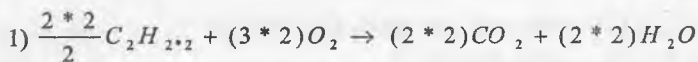
and expression of coefficient value at the carbonic gas  $CO_2 (n+m)$ , one of the products of the equations of reaction of burning.

## CYCLOPARAFFINS AND HYDROCARBONS OF ETHYLENE SERIES

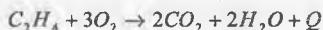
Hydrocarbons of ethylene series or unsaturated hydrocarbons are the hydrocarbons which easily undergo reactions of connection. The general formula of hydrocarbons of ethylene series and cyclic molecules is  $C_nH_{2n}$ . The equation of reaction of combustion of chemical algorithms of representatives of cycloparaffins and hydrocarbons of ethylene series should have the following appearance:



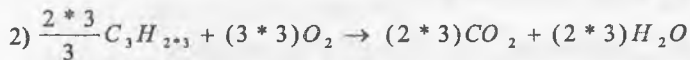
The equations of combustion reaction of ethane in oxygen:  $C_2H_6$



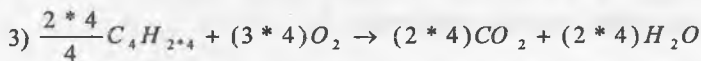
Reducing left and right parts of equation to the same number, we define small coefficients:

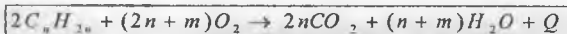


The equation of burning reaction of propene in oxygen:  $C_3H_6$



The equation of reaction of combustion of butene:  $C_4H_8$

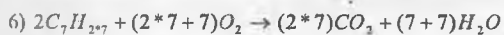
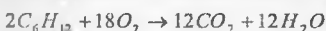
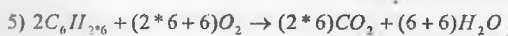
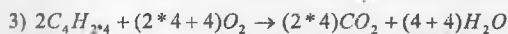
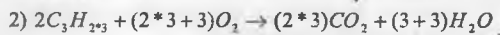
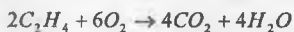
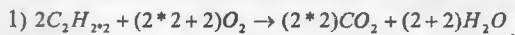




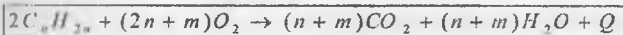
The relation table between (n) and (m) values;

$$\begin{array}{llll} n=2; & m=2; & n=5; & m=5; \\ n=3; & m=3; & n=6; & m=6; \\ n=4; & m=4; & n=7; & m=7; \end{array}$$

Examples for algorithmic tasks:



Variant IV of chemical algorithms:



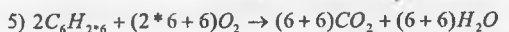
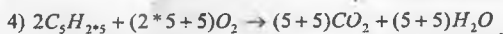
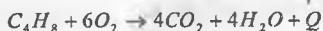
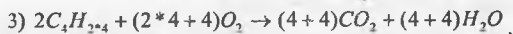
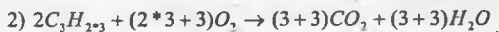
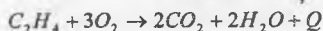
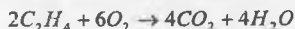
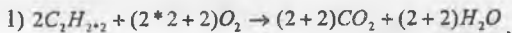
and expression of coefficient value at the carbonic gas  $CO_2$  ( $n+m$ ), one of the products of the equations of reaction of burning.



The relation table between values (n) and (m):

n=2;	m=2;	n=5;	m=5;
n=3;	m=3;	n=6;	m=6;
n=4;	m=4;	n=7;	m=7;

Examples for algorithmic tasks:

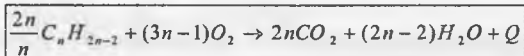


## DIETHENOID AND ACETYLENE HYDROCARBONS

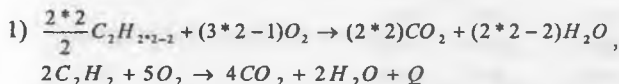
Diethenoid hydrocarbons are unsaturated hydrocarbon series which contain molecule double bonds and molecules of representatives of acetylene series contain triple bonds. But present general formula  $C_nH_{2n-2}$  is used for two classes of representatives of homologues.

Properties of typical representatives of diene and acetylene hydrocarbon series, such as ethyne, propyne, butyn, pentyne or butadien-1.3, pentadien-1.4, are widely studied in organic chemistry and used in the industry for the various purposes. For example, gas of an acetylene(ethyne)-oxygen mix is used for cutting and welding metals, and butadien-1.3 is considered the basic material for reception of synthetic

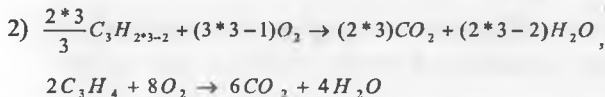
rubber. We express the equation of combustion reaction of chemical algorithms, representatives of homologues of the given class in a following kind:



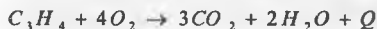
We set up the reaction equation of ethyne:  $C_2H_2$



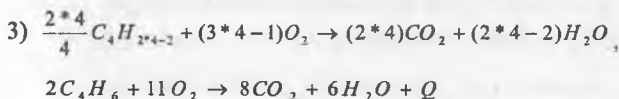
We set up the reaction equation of propyne:  $C_3H_4$



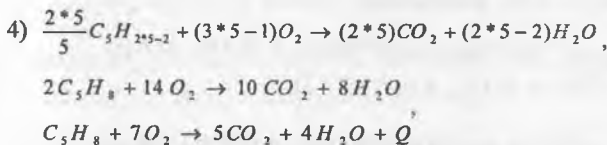
In this reaction small coefficients are defined:



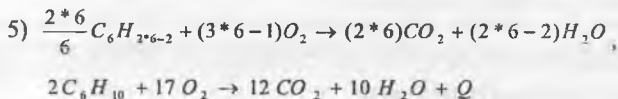
We set up the reaction equation of butyn:  $C_4H_6$



We set up the reaction equation of pentyne:  $C_5H_8$



So the equation of reaction of burning of hexyne is defined:  $C_6H_{10}$



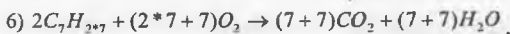
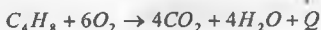
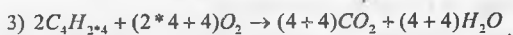
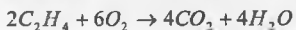
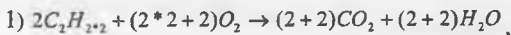
The relation table between values (n) and (m):

$$n=2; \quad m=2; \quad n=5; \quad m=5;$$

$$n=3; \quad m=3; \quad n=6; \quad m=6;$$

$$n=4; \quad m=4; \quad n=7; \quad m=7;$$

Examples for algorithmic tasks:

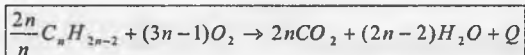


## DIETHENOID AND ACETYLENE HYDROCARBONS

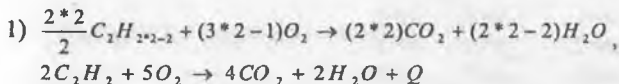
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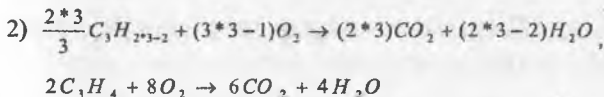
rubber. We express the equation of combustion reaction of chemical algorithms, representatives of homologues of the given class in a following kind:



We set up the reaction equation of ethyne:  $C_2H_2$



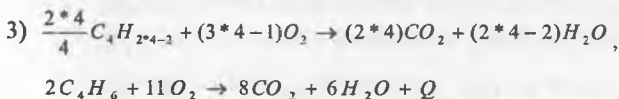
We set up the reaction equation of propyne:  $C_3H_4$



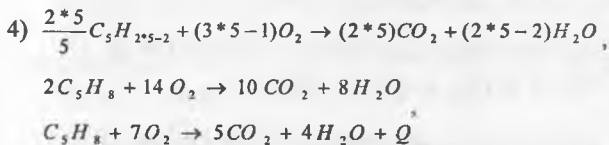
In this reaction small coefficients are defined:



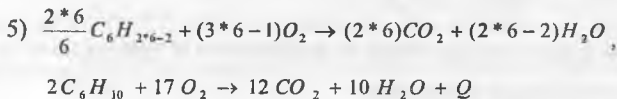
We set up the reaction equation of butyn:  $C_4H_6$



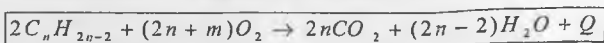
We set up the reaction equation of pentyne:  $C_5H_8$



So the equation of reaction of burning of hexyne is defined:  $C_6H_{10}$



Variant II of chemical algorithms of the equation of burning reaction of representatives of homologues of the given classes looks so:

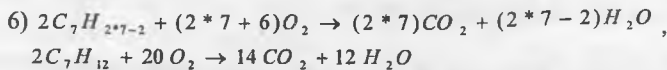
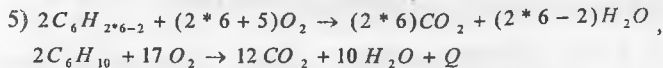
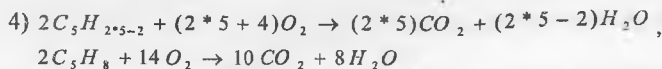
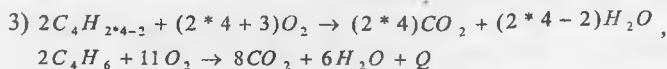
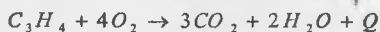
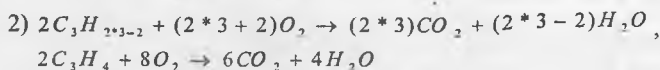
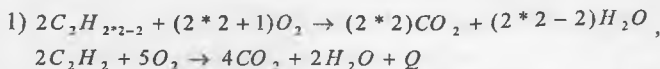


Consecutive relation between values (n) and (m) changes proportionally on unit(1), and expression value of coefficients of oxygen  $O_2$  will be  $(2n+m)$ .

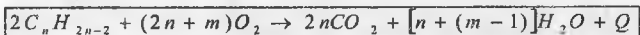
Relation between values (n) and (m) is resulted in the table:

n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

Examples for algorithmic tasks:



Variant III of chemical algorithms of the equations of burning reaction of the representative of the classes is expressed



Expression of coefficient value of water  $H_2O$  is equal to  $[n + (m - 1)]$ .

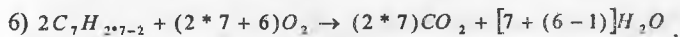
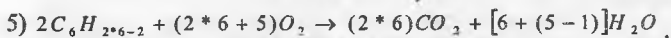
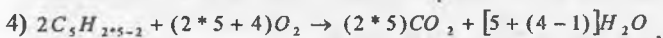
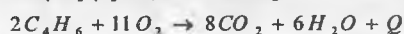
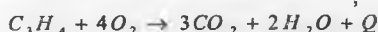
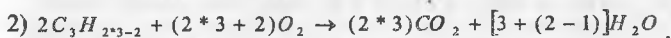
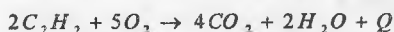
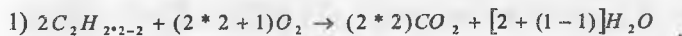
The table values (n) and (m):

$$n=2; \quad m=1; \quad n=5; \quad m=4;$$

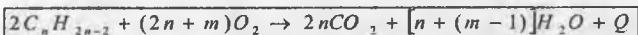
$$n=3; \quad m=2; \quad n=6; \quad m=5;$$

$$n=4; \quad m=3; \quad n=7; \quad m=6;$$

Examples for algorithmic tasks:



Expressing the coefficient value of carbonic gas  $CO_2$  for variant IV in the form of  $[n + (m + 1)]$ , we will represent the equation of burning reaction of representatives of homologues of diene and an acetylene hydrocarbon series as:

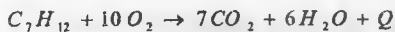
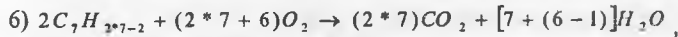
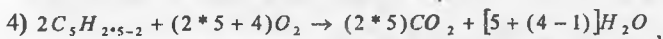
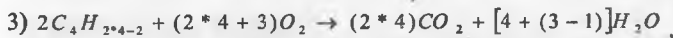
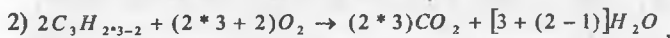
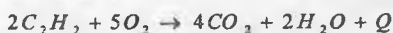
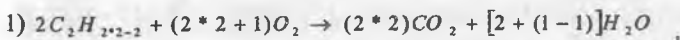


Expression of coefficient value of water  $H_2O$  is equal to  $[n + (m - 1)]$ .

The table values (n) and (m):

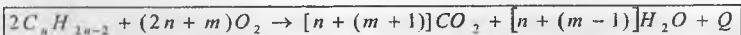
n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

Examples for algorithmic tasks:



Expressing the coefficient value of carbonic gas  $CO_2$  for variant IV in the form of  $[n + (m + 1)]$ , we will represent the equation of burning reaction of representatives of homologues of diene and an acetylene hydrocarbon series as:

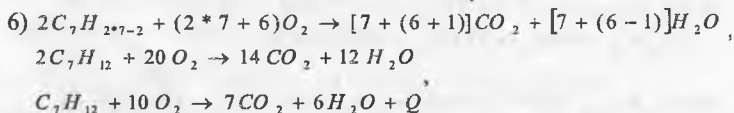
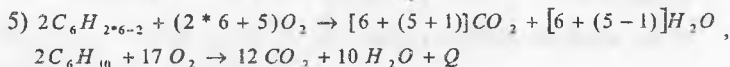
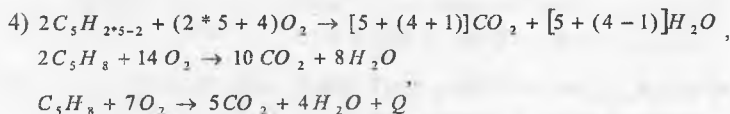
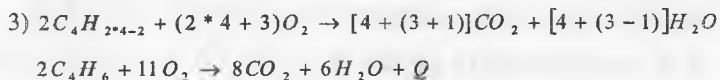
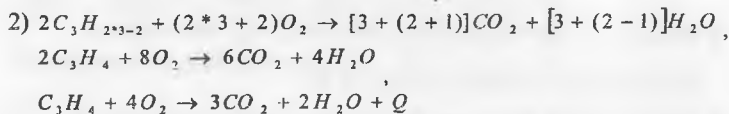
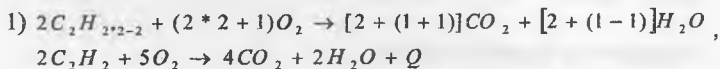




The table of values (n) and (m):

n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

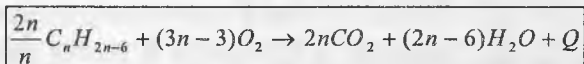
Examples for algorithmic tasks:



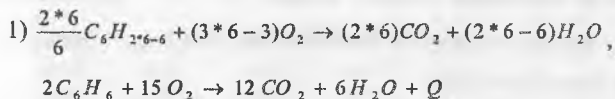
## AROMATIC HYDROCARBONS

The general formula of representatives of homologues of aromatic hydrocarbons can be written in the form of  $C_nH_{2n-6}$ . Benzene is the simplest representative of aromatic hydrocarbons and its first homologue methyl benzene or toluene  $C_7H_8$ . Toluene doesn't contain isomers like other derivatives. The chemical

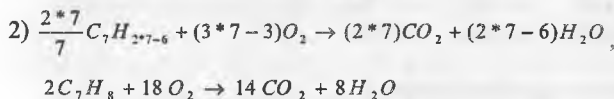
algorithm of the equation of burning reaction of benzene and its derivatives are expressed so:



The equation of burning reaction of benzene  $C_6H_6$  is formulated as following:



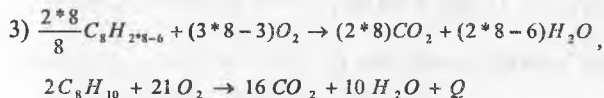
Toluene burning in oxygen:  $C_7H_8$



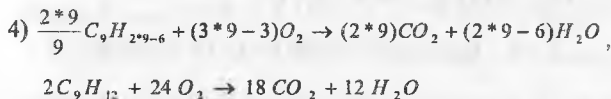
Small coefficients are defined:



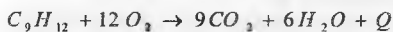
The equation of burning reactions of xylene (dimethylbenzene)  $C_8H_{10}$  is generated so:



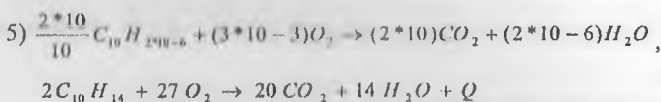
Burning of trimethyl benzene  $C_9H_{12}$  in oxygen:



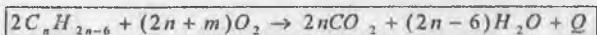
Small coefficients are defined:



We cite one more example:



Variant II of chemical algorithms of the equation of burning reaction for aromatic hydrocarbons and its derivatives is expressed as followed:

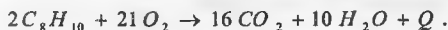
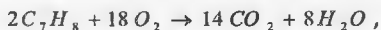
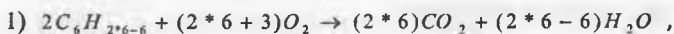


Expression of coefficient value of oxygen  $O_2$  ( $2n+m$ ) and consecutive relation values (n) and (m) is resulted in the following table.

The table values (n) and (m):

n=6;	m=3;	n=10;	m=7;
n=7;	m=4;	n=11;	m=8;
n=8;	m=5;	n=12;	m=9;
n=9;	m=6;	n=13;	m=10;

Examples for algorithmic tasks:





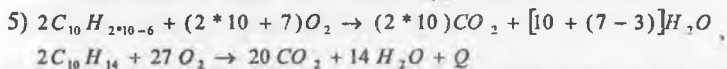
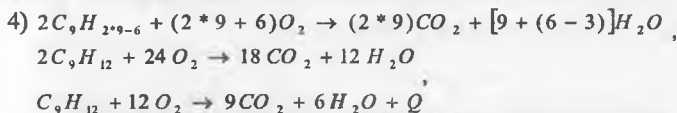
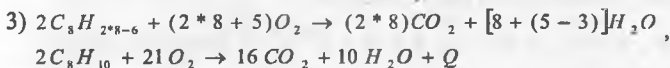
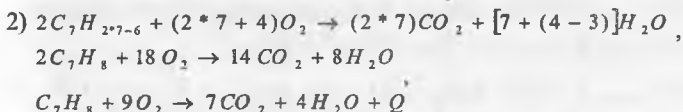
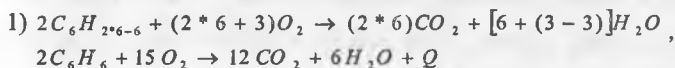
Variant III of chemical algorithms of the equations of burning reaction of representatives of homologues of the given class is expressed so:



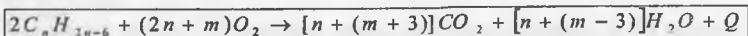
The coefficient value of water  $H_2O$  is defined by expression:  $[n + (m - 3)]$   
 The table values (n) and (m):

n=6;	m=3;	n=10;	m=7;
n=7;	m=4;	n=11;	m=8;
n=8;	m=5;	n=12;	m=9;
n=9;	m=6;	n=13;	m=10;

Examples for algorithmic tasks:



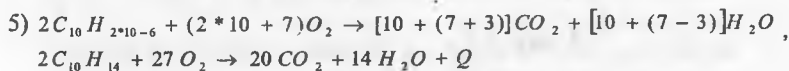
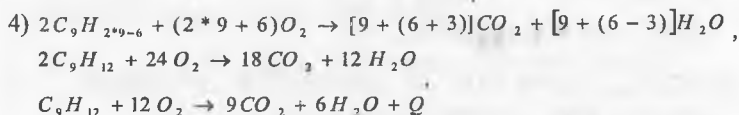
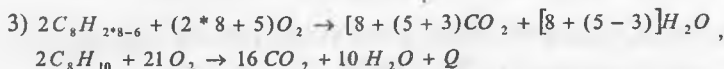
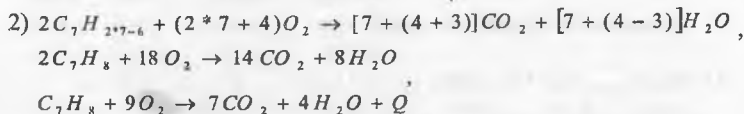
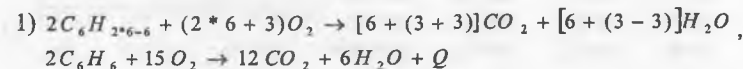
If expression of coefficient value for carbonic gas  $CO_2$  is written in this kind  $[n + (m + 3)]$  the equation of burning reaction and chemical algorithms for a variant IV of representatives of homologues of benzene and its derivatives looks as following:



The table values (n) and (m):

n=6;	m=3;	n=10;	m = 7;
n=7;	m=4;	n=11;	m = 8;
n=8;	m=5;	n=12;	m = 9;
n=9;	m=6;	n=13;	m=10;

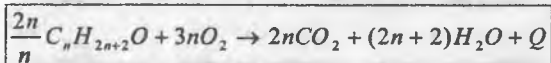
Examples for algorithmic tasks:



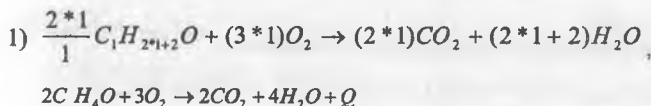
## MONOHYDRIC ALCOHOLS AND SIMPLE ETHERS

Alcohols are hydrocarbonic derivatives, in which composition one or several atoms of the hydrogen replaced functional hydroxyl group - (OH). Depending on the number of groups of hydroxyls in their molecule composition they can be monohydric and polyhydric. Representatives of homologues of ethers and monohydric alcohols can be expressed as the following general formula:  $C_nH_{2n+2}O$ .

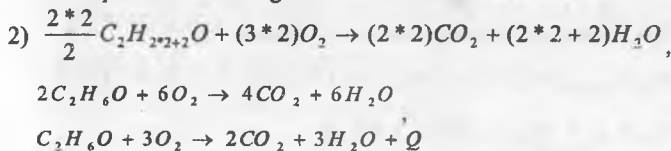
Chemical algorithms of the equations of burning reaction of representatives of homologues, ethers and monohydric alcohols are resulted below:



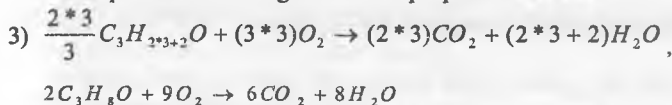
The equation of burning reaction of methanol:  $CH_3OH$



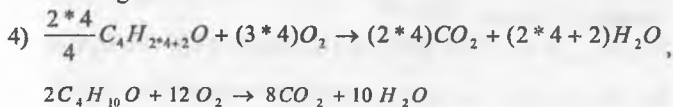
The equation of burning reaction of ethanol:  $C_2H_5OH$



The equation of burning reaction of propanol:  $C_3H_7OH$



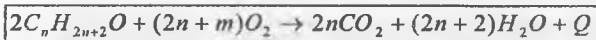
Burning of butanol:  $C_4H_9OH$



Small coefficients are defined:



Variant II of chemical algorithms of representatives of the present classes looks so:



Consecutive relation of values (n) and (m):

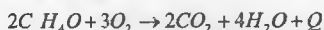
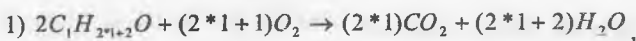
$$n=1; \quad m=1; \quad n=4; \quad m=4;$$

$$n=2; \quad m=2; \quad n=5; \quad m=5;$$

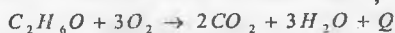
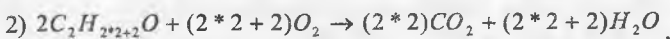
$$n=3; \quad m=3; \quad n=6; \quad m=6:$$

Expression of coefficient value for oxygen  $O_2$  will be equal  $(2n+m)$  and the value (n) also is equal (m). The values (n) and (m) or,  $n=1, m=1$ , or,  $n=5, m=5$  do not differ in it.

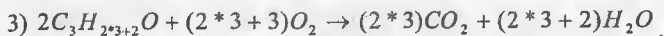
The equation of burning reaction of methanol:  $CH_3OH$



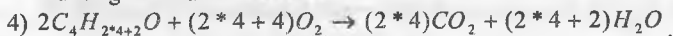
The equation of burning reaction of ethanol:  $C_2H_5OH$



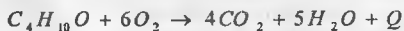
The equation of burning reaction of propanol:  $C_3H_7OH$



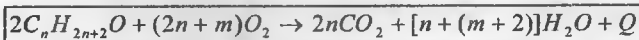
Burning of butanol:  $C_4H_9OH$



Small coefficients are defined:



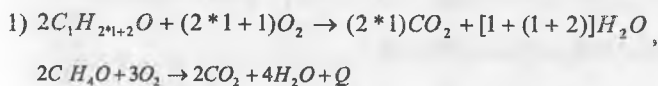
Variant III of chemical algorithm of representatives of the given classes and expression of coefficient value of water  $H_2O$  looks so:  $[n+(m+2)]$



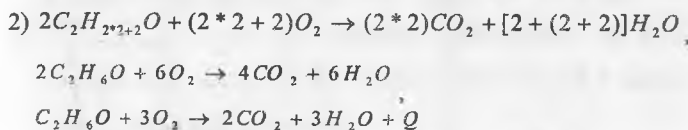
Consecutive relation of values (n) and (m):

$$\begin{array}{llll} n=1; & m=1; & n=4; & m=4; \\ n=2; & m=2; & n=5; & m=5; \\ n=3; & m=3; & n=6; & m=6; \end{array}$$

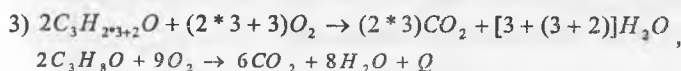
The equation of burning reaction of methanol:  $CH_3OH$



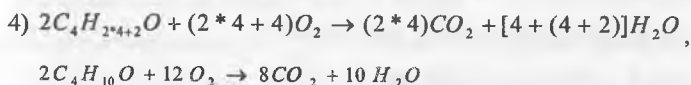
The equation of burning reaction of ethanol:  $C_2H_5OH$



The equation of burning reaction of propanol:  $C_3H_7OH$



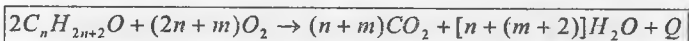
Combustion of butanol:  $C_4H_9OH$



Small coefficients are defined:



If in variant IV expression of coefficient value of one the basic products of reaction of carbonic gas  $CO_2$  is given by  $(n+m)$  expression of the equation of chemical algorithm looks so:

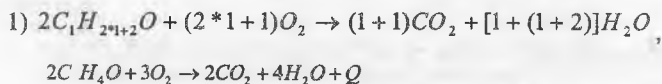




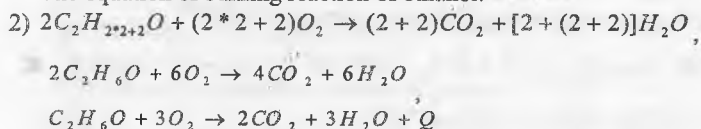
Consecutive relation of values (n) and (m):

$$\begin{array}{llll} n=1; & m=1; & n=4; & m=4; \\ n=2; & m=2; & n=5; & m=5; \\ n=3; & m=3; & n=6; & m=6; \end{array}$$

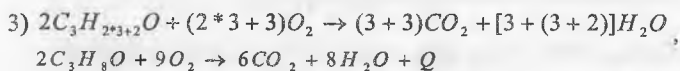
The equation of burning reaction of methanol:  $CH_3OH$



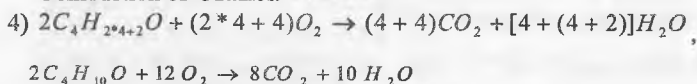
The equation of burning reaction of ethanol:  $C_2H_5OH$



The equation of burning reaction of propanol:  $C_3H_7OH$



Combustion of butanol:  $C_4H_9OH$



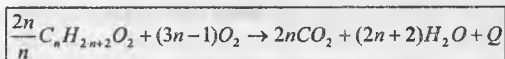
Small coefficients are defined:



## DIHYDRIC ALCOHOLS

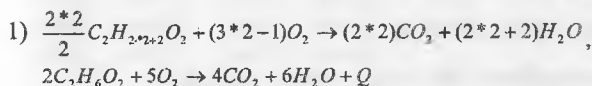
Dihydric alcohols are called as glycols. The word "glycol" originates from Greek «glycos» - "sweet". Indeed, dihydric alcohols have sweet taste - the representative of organic connections which is widely used in different industries. It lowers temperature of freezing of water in combination with water; therefore it is used at manufacturing antifreezes freezing at low temperature. The general formula of

representatives of homologues of this class looks so:  $C_nH_{2n+2}O_2$ , and the equation of burning reaction of chemical algorithm is expressed as:

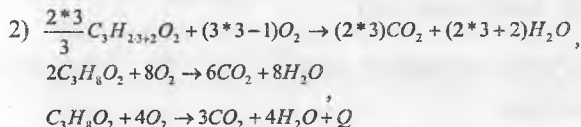


Examples are presented:

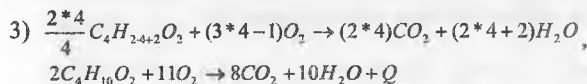
Ethyleneglycol:  $HO-CH_2-CH_2-OH$  or  $C_2H_6O_2$



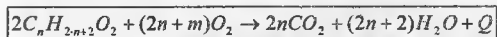
Trimethyleneglycol:  $HO-CH_2-CH_2-CH_2-OH$  or  $C_3H_8O_2$



Tetramethyleneglycol:  $HO-(CH_2)_4-OH$  or  $C_4H_{10}O_2$



If expression of coefficient value of oxygen  $O_2$ , the basic participant of the equations of burning reaction is  $(2n+m)$ , variant II of chemical algorithm looks so:



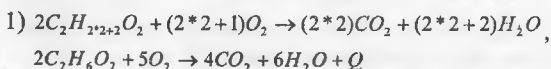
Consecutive relation between values (n) and (m):

n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

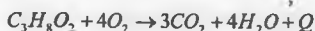
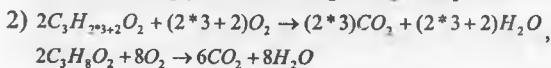
It is obvious in the table, that the values (n) and (m) differ on unit (1), if n=2, m=1 or if n=5, m=4. In such order the relation between values (n) and (m) changes.

Examples are resulted:

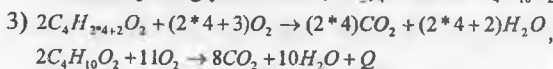
Ethyleneglycol:  $HO-CH_2-CH_2-OH$  or  $C_2H_6O_2$



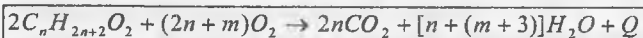
Trimethyleneglycol:  $HO-CH_2-CH_2-CH_2-OH$  or  $C_3H_8O_2$



Tetramethyleneglycol:  $HO-(CH_2)_4-OH$  or  $C_4H_{10}O_2$



If expression of coefficient value of water  $H_2O$  is  $[n+(m+3)]$  their variant III of chemical algorithm looks:

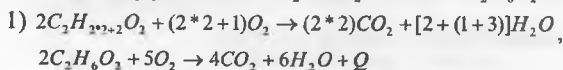


Consecutive relation between values (n) and (m):

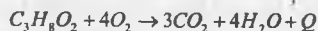
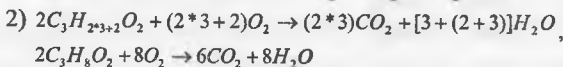
n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

Examples are resulted:

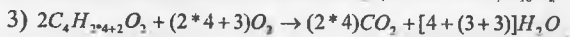
Ethyleneglycol:  $HO-CH_2-CH_2-OH$  or  $C_2H_6O_2$

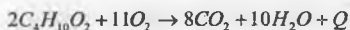


Trimethyleneglycol:  $HO-CH_2-CH_2-CH_2-OH$  or  $C_3H_8O_2$

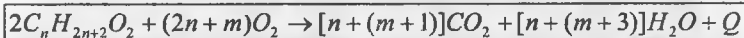


Tetramethyleneglycol;  $HO-(CH_2)_4-OH$  or  $C_4H_{10}O_2$





If expression coefficient value of carbonic gas  $CO_2$  [ $n+(m+1)$ ] the equation of burning reaction of chemical algorithm is made in a variant IV so:



Consecutive communication between values (n) and (m):

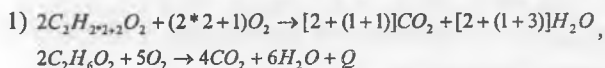
$$n=2; \quad m=1; \quad n=5; \quad m=4;$$

$$n=3; \quad m=2; \quad n=6; \quad m=5;$$

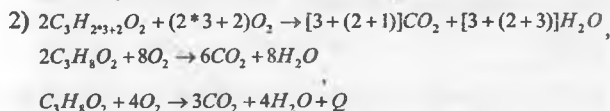
$$n=4; \quad m=3; \quad n=7; \quad m=6;$$

Examples are resulted:

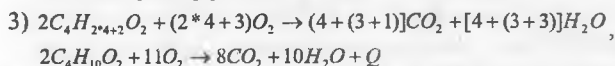
Ethyleneglycol:  $HO-CH_2-CH_2-OH$  or  $C_2H_6O_2$



Trimethyleneglycol:  $HO-CH_2-CH_2-CH_2-OH$  or  $C_3H_8O_2$

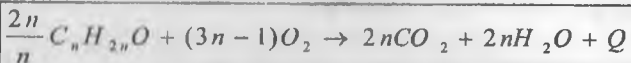


Tetramethyleneglycol;  $HO-(CH_2)_4-OH$  or  $C_4H_{10}O_2$

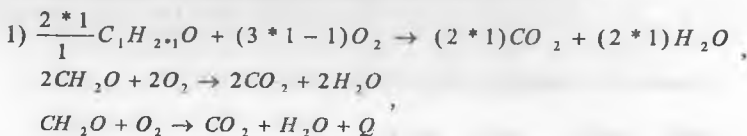


## ALDEHYDES, KETONES AND UNSATURATED ALCOHOLS

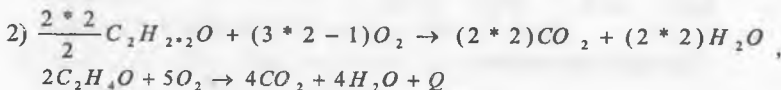
Aldehydes, ketones, and unsaturated alcohols are also considered as the important classes of organic compounds. The general formula of representatives of homologues is  $C_nH_{2n}O$ . Concepts about physical and chemical properties of the form of aldehydes and acetaldehydes (ethyl aldehydes), representatives of the basic class of aldehydes are widely used in textbooks and manuals. Under the international nomenclature the name "aldehydes" is formed by suffix addition - «al» to the name of corresponding hydrocarbon. If the general formula of aldehydes is expressed  $C_nH_{2n+1}CHO$ , and if used general formula  $C_nH_{2n}O$  for representatives of homologues of this class, then their chemical algorithm of the equations of burning reaction looks so:



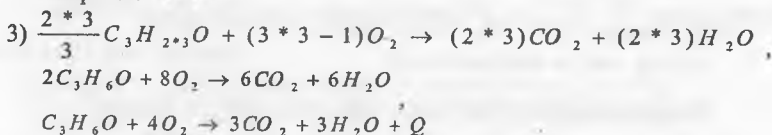
The equation of reaction of combustion of methanal:  $C H_2 O$



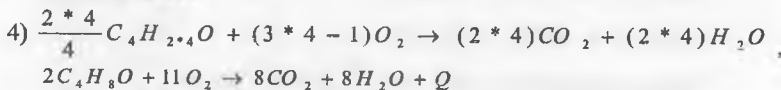
Ethanal:  $C_2 H_4 O$



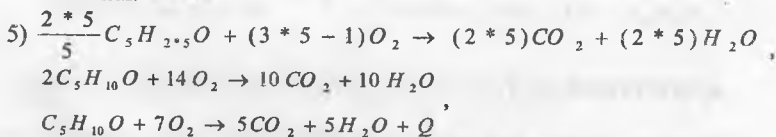
Propanal:  $C_3 H_6 O$



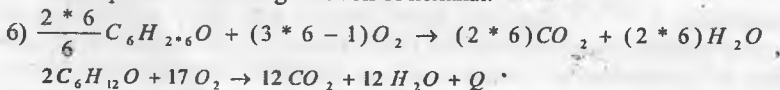
Butanal:  $C_4 H_8 O$



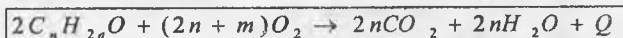
Pentanal:  $C_5 H_{10} O$



The equation of burning reaction of hexanal:  $C_6 H_{12} O$



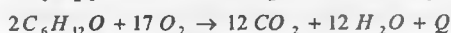
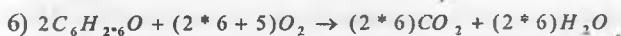
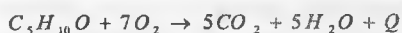
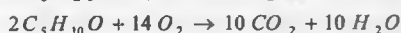
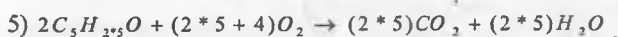
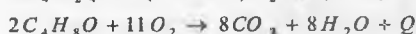
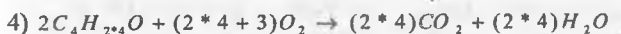
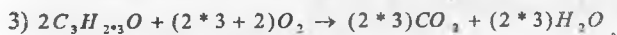
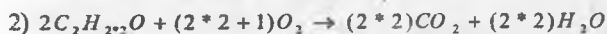
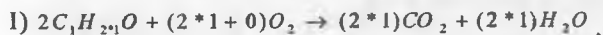
If the general formula of homologues of the given class is  $C_n H_{2n} O$ , and expression of coefficient value of oxygen  $O_2 (2n+m)$ , for variant-II of the equation of burning reaction is expediently used as the following chemical algorithm:



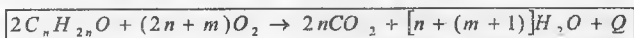
Consecutive relation between values (n) and (m):

n=1;	m=0;	n=5;	m=4;
n=2;	m=1;	n=6;	m=5;
n=3;	m=2;	n=7;	m=6;
n=4;	m=3;	n=8;	m=7;

Examples are resulted:



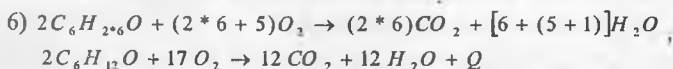
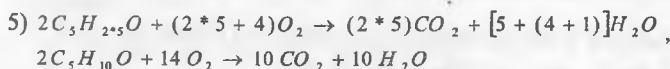
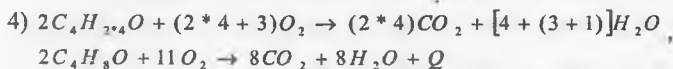
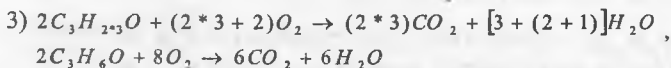
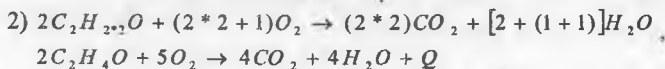
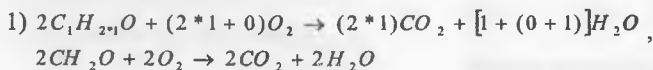
If expression of coefficient value of water  $H_2O$  is  $[n + (m + 1)]$  their variant III of chemical algorithm looks so:



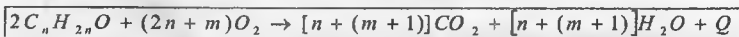
Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=1; & m=0; & n=5; & m=4; \\ n=2; & m=1; & n=6; & m=5; \\ n=3; & m=2; & n=7; & m=6; \\ n=4; & m=3; & n=8; & m=7; \end{array}$$

Examples are resulted:



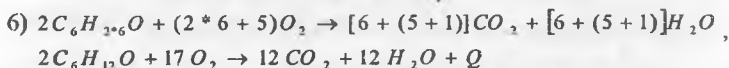
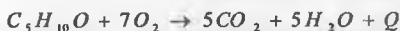
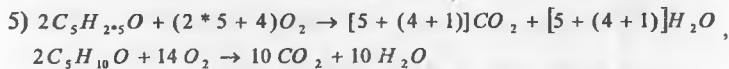
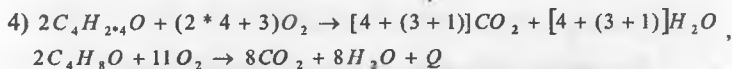
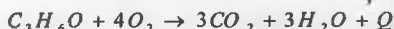
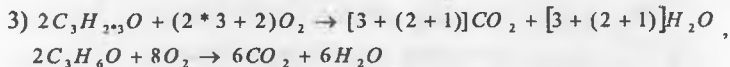
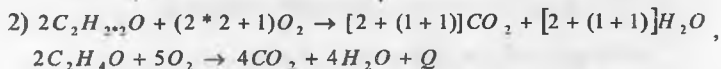
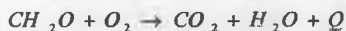
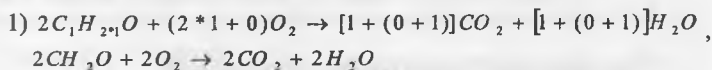
If expression of coefficient value of the carbonic gas  $CO_2$   $[n + (m + 1)]$ , their variant IV contains:



Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=1; & m=0; & n=5; & m=4; \\ n=2; & m=1; & n=6; & m=5; \\ n=3; & m=2; & n=7; & m=6; \\ n=4; & m=3; & n=8; & m=7; \end{array}$$

Examples are resulted:

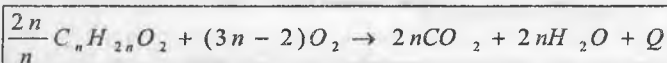


## THE MONOBASIC CARBOXYLIC ACIDS AND ESTERS

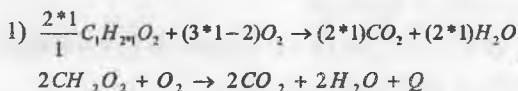
Carboxylic acids are called the complex organic compounds in which molecules contain one or several carboxyl groups -  $COOH$ , they are combined with a hydrocarbonic radical or an atom of hydrogen. They are also named butyric acids, as representatives of some carboxylic acids are received from the composition of oil at first. Its first representative - formic acid  $H-COOH$  also is named so because it is received from a waste of formics. The second representative - the acetic acid  $CH_3-COOH$  is one of the first acids known to mankind. Since ancient times they are received from seasoned wine - from vinegar.

Formic, acetic, propionic, butyric, valeric, caproic, enanthic, palmitic and stearic acids are considered as the basic representatives of the monobasic carboxylic acids. Carboxylic acids are widespread in the nature; they are used in the industry and in life for various purposes. The general formula of representatives of esters and monobasic carboxylic acids can be expressed as  $C_nH_{2n}O_2$ . Then their initial variant of chemical algorithms of the equation of burning reaction looks as follows:

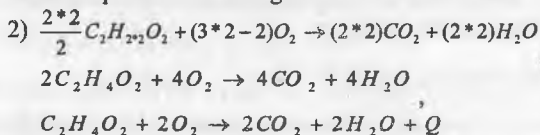




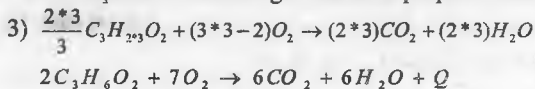
The equation of burning reaction of formic acid:



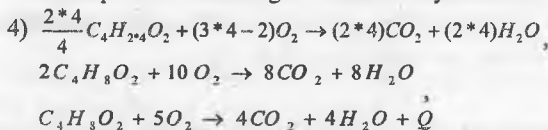
The equation of burning reaction of acetic acid:



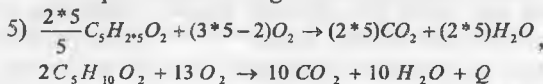
The equation of burning reaction of propionic acids:



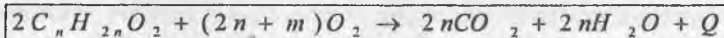
The equation of burning reaction of butyric acid:



The equation of burning reaction of valeric acids:



Expression of coefficient value of oxygen  $O_2$ , the basic participant of the equations, burning reaction of representatives of the given class looks  $(2n+m)$ , where variant II of their chemical algorithms:

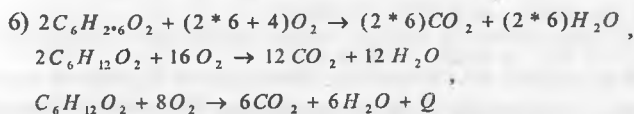
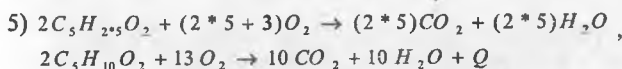
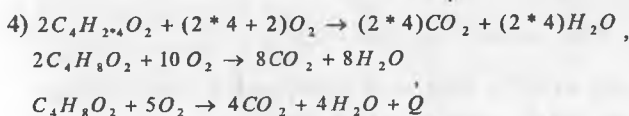
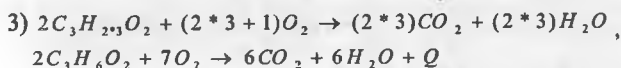
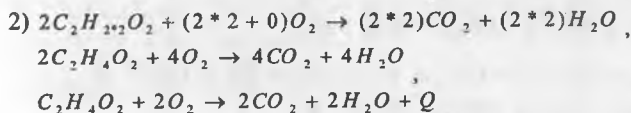
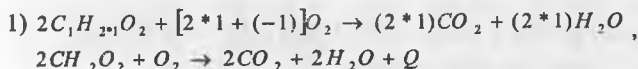


Consecutive relation between values (n) and (m):

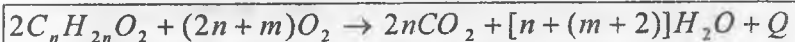
n=1;	m=-1;	n=5;	m=3;
n=2;	m=0;	n=6;	m=4;
n=3;	m=1;	n=7;	m=5;
n=4;	m=2;	n=8;	m=6;

It is clear here that if  $n=1, m=-1$  if  $n=2, m=0$  or if  $n=4, m=2$ . In such order the difference changes between values (n) and (m).

Examples are resulted:



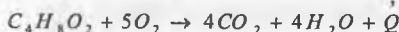
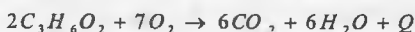
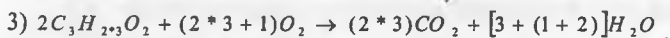
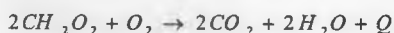
If expression of coefficient value of water  $H_2O$  in the form of  $[n+(m+2)]$  variant III of their chemical algorithms looks so:



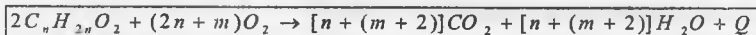
Consecutive relation between values (n) and (m):

n=1;	m=-1;	n=5;	m=3;
n=2;	m=0;	n=6;	m=4;
n=3;	m=1;	n=7;	m=5;
n=4;	m=2;	n=8;	m=6;

Examples are resulted:



If expression of coefficient value of carbonic gas  $CO_2$   $[n + (m + 2)]$  variant IV of chemical algorithms of representatives of the given class looks so:



Consecutive relation between values (n) and (m):

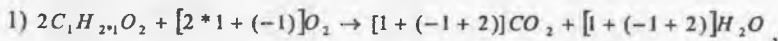
$$n=1; \quad m=-1; \quad n=5; \quad m=3;$$

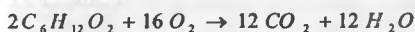
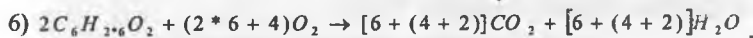
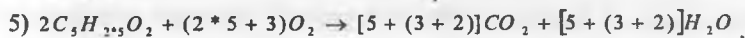
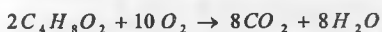
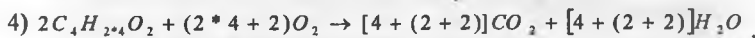
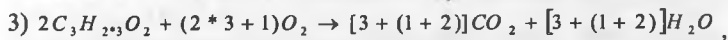
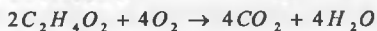
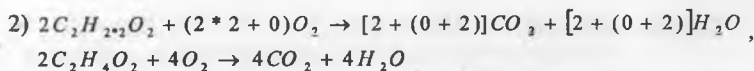
$$n=2; \quad m=0; \quad n=6; \quad m=4;$$

$$n=3; \quad m=1; \quad n=7; \quad m=5;$$

$$n=4; \quad m=2; \quad n=8; \quad m=6$$

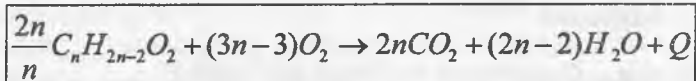
Examples are resulted:





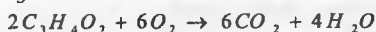
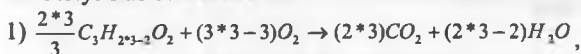
### THE UNSATURATED MONOBASIC CARBOXYLIC ACIDS, DIALDEHYDES AND DIKETONES

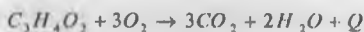
The organic compounds formed because of replacement of one atom of hydrogen in a radical of unsaturated hydrocarbons on carboxyl group  $-COOH$  are called as the unsaturated monobasic carboxylic acids. Acrylic and meta-acrylic acids are typical representatives of classes of these organic substances. The general formula of representatives of the unsaturated monobasic carboxylic acids, dialdehydes and diketones are possible to express as  $C_nH_{2n-2}O_2$  and the equations of burning reaction look so:



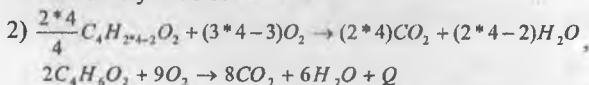
Examples are resulted:

Acrylic acid:  $C_3H_4O_2$

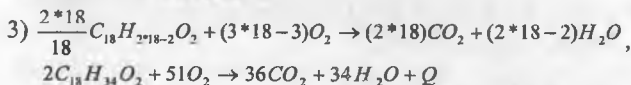




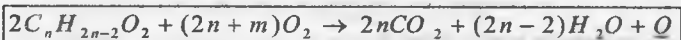
Meta-acrylic acid:  $C_4H_6O_2$



Oleic acid:  $C_{18}H_{34}O_2$



Expression of coefficient value of oxygen  $O_2$ , the basic participant of the equations of burning reaction of representatives of the given class looks  $(2n + m)$  variant II of their chemical algorithms will be:



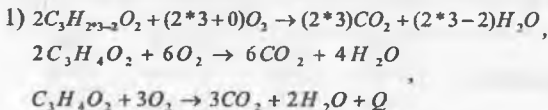
Consecutive relation between values (n) and (m):

n=3;	m=0;	n=7;	m=4;	-----
n=4;	m=1;	n=8;	m=5;	n=16; m=13;
n=5;	m=2;	n=9;	m=6;	n=17; m=14;
n=6;	m=3;	n=10;	m=7;	n=18; m=15;

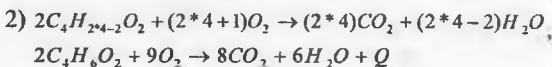
It is visible here that if  $n=3$ ,  $m=0$  if  $n=4$ ,  $m=1$ . The difference changes between values (n) and (m).

Examples are resulted:

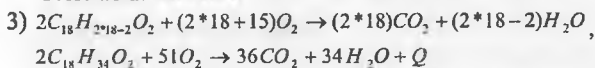
Acrylic acid:  $C_3H_4O_2$



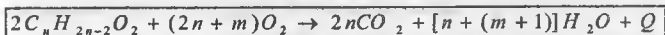
Meta-acrylic acid:  $C_4H_6O_2$



Oleic acid:  $C_{18}H_{34}O_2$



If we will write expression of coefficient value of water  $H_2O$  in the form of  $[n + (m+1)]$  their variant III of chemical algorithms looks so:

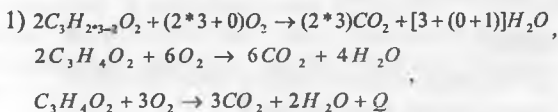


Consecutive relation between values (n) and (m):

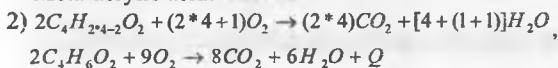
n=3;	m=0;	n = 7;	m=4;	-----	
n=4;	m=1;	n = 8;	m=5;	n=16;	m=13;
n=5;	m=2;	n = 9;	m=6;	n=17;	m=14;
n=6;	m=3;	n=10;	m=7;	n=18;	m=15;

Examples are resulted:

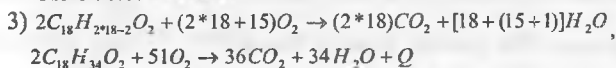
Acrylic acids:  $C_3H_4O_2$



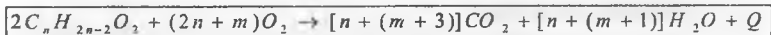
Meta-acrylic acid:  $C_4H_6O_2$



Oleic acid:  $C_{18}H_{34}O_2$



If expression of coefficient value of carbonic gas  $CO_2$  in this kind  $[n + (m + 3)]$  variant IV of chemical algorithms of representatives of the given class looks so:

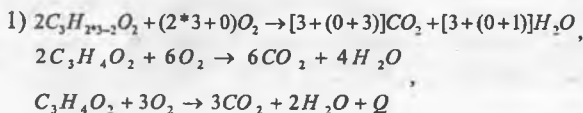


Consecutive relation between values (n) and (m):

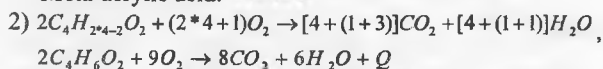
n=3;	m=0;	n = 7;	m=4;	-----	
n=4;	m=1;	n = 8;	m=5;	n=16;	m=13;
n=5;	m=2;	n = 9;	m=6;	n=17;	m=14;
n=6;	m=3;	n=10;	m=7;	n=18;	m=15;

Examples are resulted:

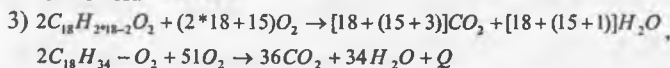
Acrylic acid:  $C_3H_4O_2$



Meta-acrylic acid:  $C_4H_6O_2$

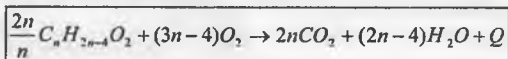


Oleic acid:  $C_{18}H_{34}O_2$



## MORE UNSATURATED CARBOXYLIC ACIDS

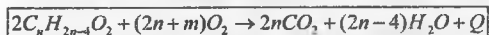
Representatives of homologues of this class are found in organism of animals and cells of plants. The general formula looks  $C_nH_{2n-4}O_2$ , and the chemical algorithm of the equations of burning reaction is expressed by the equation:



Examples are resulted:

- 1)  $\frac{2*4}{4} C_4H_{2*4-4}O_2 + (3*4-4)O_2 \rightarrow (2*4)CO_2 + (2*4-4)H_2O$   
 $2C_4H_4O_2 + 8O_2 \rightarrow 8CO_2 + 4H_2O$   
 $C_4H_4O_2 + 4O_2 \rightarrow 4CO_2 + 2H_2O + Q$
- 2)  $\frac{2*5}{5} C_5H_{2*5-4}O_2 + (3*5-4)O_2 \rightarrow (2*5)CO_2 + (2*5-4)H_2O$   
 $2C_5H_6O_2 + 11O_2 \rightarrow 10CO_2 + 6H_2O + Q$
- 3)  $\frac{2*6}{6} C_6H_{2*6-4}O_2 + (3*6-4)O_2 \rightarrow (2*6)CO_2 + (2*6-4)H_2O$   
 $2C_6H_8O_2 + 14O_2 \rightarrow 12CO_2 + 8H_2O$   
 $C_6H_8O_2 + 7O_2 \rightarrow 6CO_2 + 4H_2O + Q$
- 4)  $\frac{2*7}{7} C_7H_{2*7-4}O_2 + (3*7-4)O_2 \rightarrow (2*7)CO_2 + (2*7-4)H_2O$   
 $2C_7H_{10}O_2 + 17O_2 \rightarrow 14CO_2 + 10H_2O + Q$
- 5)  $\frac{2*18}{18} C_{18}H_{2*18-4}O_2 + (3*18-4)O_2 \rightarrow (2*18)CO_2 + (2*18-4)H_2O$   
 $2C_{18}H_{32}O_2 + 50O_2 \rightarrow 36CO_2 + 32H_2O$   
 $C_{18}H_{32}O_2 + 25O_2 \rightarrow 18CO_2 + 16H_2O + Q$

Expression of coefficient value of oxygen  $O_2$  - the basic participant of the equations, we will write  $(2n + m)$  to reaction of burning of representatives of homologues of the given class, and the equation of chemical algorithm of variant II looks:

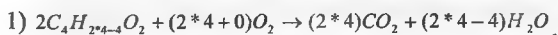


Consecutive relation between values (n) and (m):

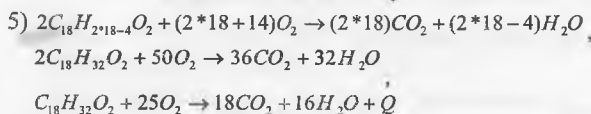
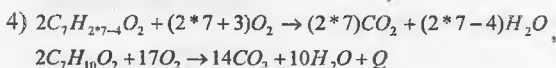
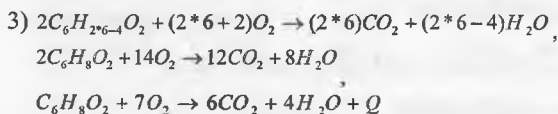
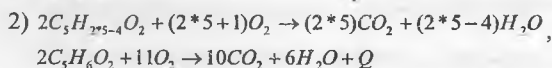
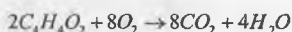
n=4;	m=0;	n=7;	m=3;	n=10;	m=6;
n=5;	m=1;	n=8;	m=4;	n=---	m=--;
n=6;	m=2;	n=9;	m=5;	n=18;	m=14;

It is shown in the table, if  $n=4$ ,  $m=0$  or if  $n=18$ ,  $m=14$ . Thus, the values (n) and (m) in representatives of homologues of the given class proportionally distinguish on unit (4).

Examples are resulted:







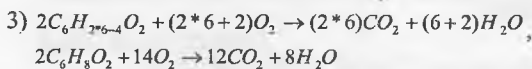
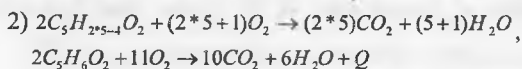
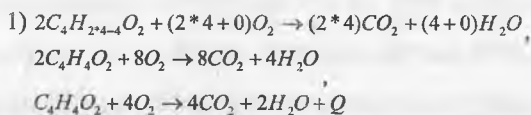
Expression of coefficient value of water  $H_2O$  ( $n+m$ ) and variant III of chemical algorithm.

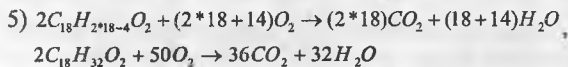
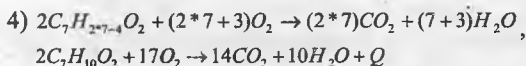


Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=4; & m=0; & n=7; & m=3; & n=10; & m=6; \\ n=5; & m=1; & n=8; & m=4; & n=-; & m=-; \\ n=6; & m=2; & n=9; & m=5; & n=18; & m=14; \end{array}$$

Examples are resulted:





Expression of coefficient value of the carbonic gas  $CO_2$ , one of the basic products of reaction  $[n + (m + 4)]$  in variant IV of chemical algorithm.



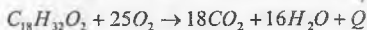
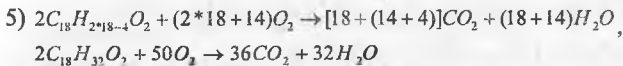
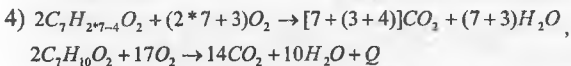
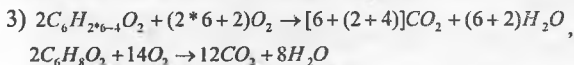
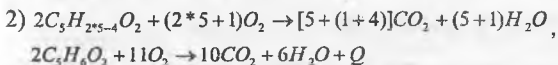
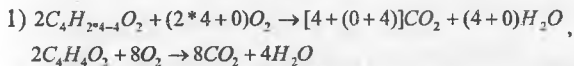
Consecutive relation between values (n) and (m):

$$n=4; m=0; \quad n=7; m=3; \quad n=10; m=6;$$

$$n=5; m=1; \quad n=8; m=4; \quad n=-; m=-;$$

$$n=6; m=2; \quad n=9; m=5; \quad n=18; m=14;$$

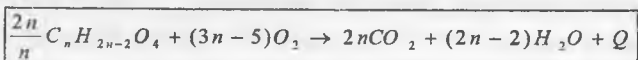
Examples are resulted:



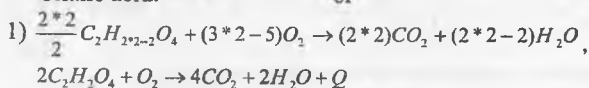
## BIBASIC CARBOXYLIC ACIDS

The basic representative of the bibasic carboxylic acids is oxalic acid  $HOOC - COOH$ , is found in plants in the form of salt. Malonic acid  $HOOC - CH_2 - COOH$  is segregated from turnip juice. At first it is received from acetic acid with a synthesis method.

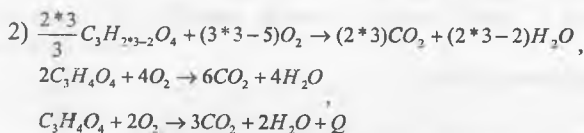
The general formula of the bibasic carboxylic acids looks  $C_n H_{2n-2} O_4$ , and we will express chemical algorithm of the equations of reaction of burning as:



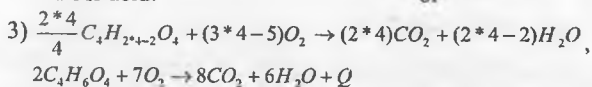
Oxalic acid:  $HOOC - COOH$  or  $C_2 H_2 O_4$



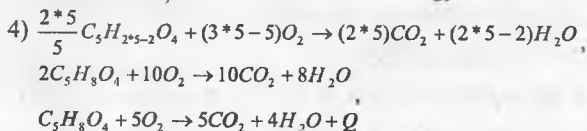
Malonic acid:  $HOOC - CH_2 - COOH$  or  $C_3 H_4 O_4$



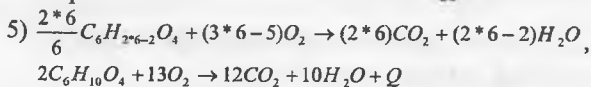
Amber acid:  $HOOC - (CH_2)_2 - COOH$  or  $C_4 H_6 O_4$



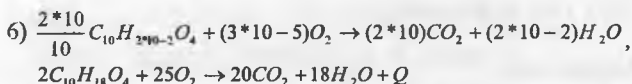
Glutaric acid:  $HOOC - (CH_2)_3 - COOH$  or  $C_5 H_8 O_4$



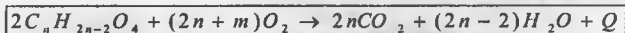
Adipinic acid:  $HOOC - (CH_2)_4 - COOH$  or  $C_6 H_{10} O_4$



Sebacic acid:  $HOOC - (CH_2)_8 - COOH$  or  $C_{10} H_{18} O_4$



Expression of coefficient value of oxygen  $O_2$ , - the basic participant of the equations of burning reaction of representatives of homologues of the given class will be presented as  $(2n + m)$ , and the equation of chemical algorithm of variant II is expressed as followed:



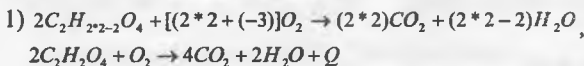
Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=2; & m=-3; & n=5; & m=0; & n=8; & m=3; \\ n=3; & m=-2; & n=6; & m=1; & n=9; & m=4; \\ n=4; & m=-1; & n=7; & m=2; & n=10; & m=5; \end{array}$$

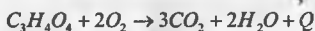
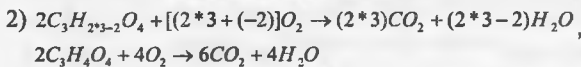
It is visible in the table, that if  $n=2$ ,  $m=-3$  or if,  $n=5$ ,  $m=0$ . So, the values (n) and (m) in representatives of homologues of this class change proportionally on unit (5).

Examples are resulted:

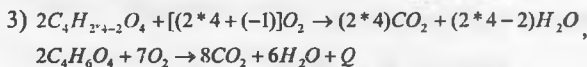
Oxalic acid:  $HOOC - COOH$  or  $C_2H_2O_4$



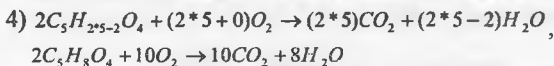
Malonic acid:  $HOOC - CH_2 - COOH$  or  $C_3H_4O_4$

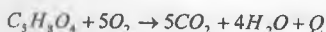


Amber acid:  $HOOC - (CH_2)_2 - COOH$  or  $C_4H_6O_4$

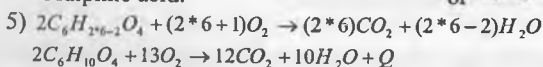


Glutaric acid:  $HOOC - (CH_2)_3 - COOH$  or  $C_5H_8O_4$

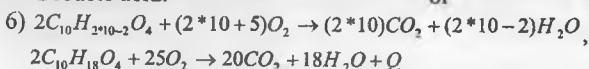




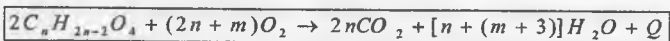
Adipinic acid:  $HOOC-(CH_2)_4-COOH$  or  $C_6H_{10}O_4$



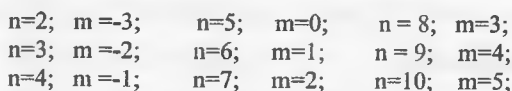
Sebacic acid:  $HOOC-(CH_2)_8-COOH$  or  $C_{10}H_{18}O_4$



Expression of coefficient value of water  $H_2O$ , one of the basic product of the equation of burning reaction of representatives of homologues of the given class is replaced as  $[n + (m + 3)]$ , and we will express variant III of chemical algorithm by equation:

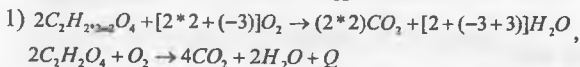


Consecutive relation between values (n) and (m):

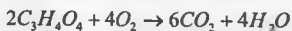
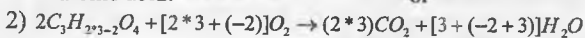


Examples are resulted:

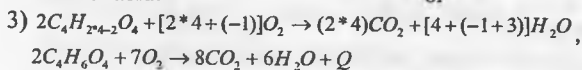
Oxalic acid:  $HOOC-COOH$  or  $C_2H_2O_4$



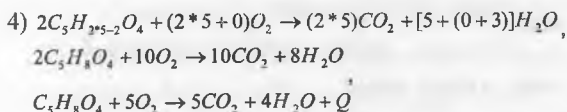
Malonic acid:  $HOOC-CH_2-COOH$  or  $C_3H_4O_4$



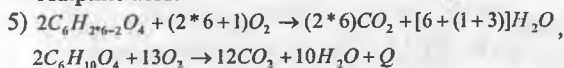
Amber acid:  $HOOC-(CH_2)_2-COOH$  or  $C_4H_6O_4$



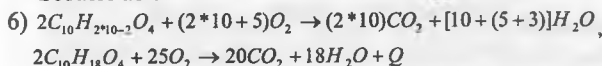
Glutaric acid:  $HOOC-(CH_2)_3-COOH$  or  $C_5H_8O_4$



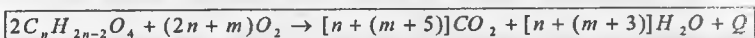
Adipinic acid:  $HOOC-(CH_2)_4-COOH$  or  $C_6H_{10}O_4$



Sebacic acid:  $HOOC-(CH_2)_8-COOH$  or  $C_{10}H_{18}O_4$



If expression of coefficient value of carbonic gas  $CO_2$  in this kind  $[n + (m + 5)]$  IV variant of chemical algorithms of representatives of the given class looks as followed:

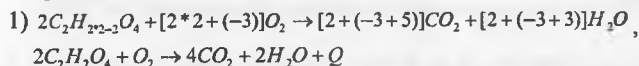


Consecutive relation between values (n) and (m):

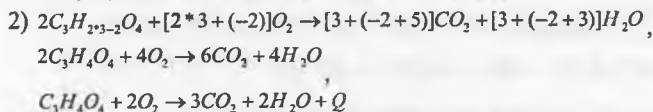
n=2;	m=-3;	n=5;	m=0;	n=8;	m=3;
n=3;	m=-2;	n=6;	m=1;	n=9;	m=4;
n=4;	m=-1;	n=7;	m=2;	n=10;	m=5;

Examples are resulted:

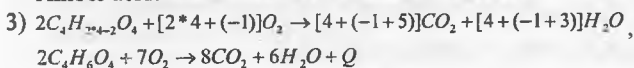
Oxalic acid:  $HOOC-COOH$  or  $C_2H_2O_4$



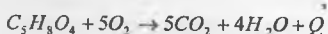
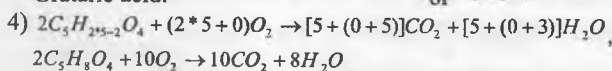
Malonic acid:  $HOOC-CH_2-COOH$  or  $C_3H_4O_4$



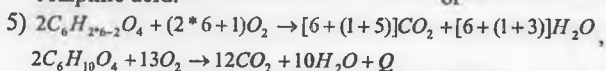
Amber acid:  $HOOC-(CH_2)_2-COOH$  or  $C_4H_6O_4$



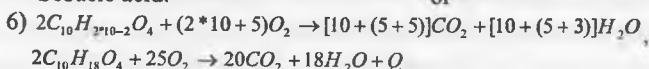
Glutaric acid:  $HOOC-(C H_2)_3-COOH$  or  $C_5H_8O_4$



Adipinic acid:  $HOOC-(C H_2)_4-COOH$  or  $C_6H_{10}O_4$



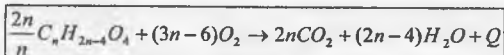
Sebacic acid:  $HOOC-(C H_2)_8-COOH$  or  $C_{10}H_{18}O_4$



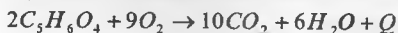
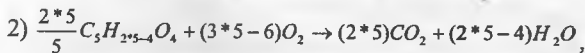
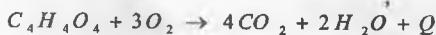
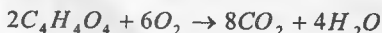
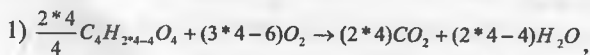
### UNSATURATED BIBASIC ACIDS

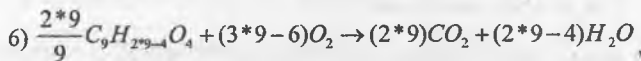
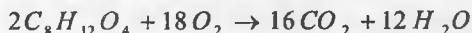
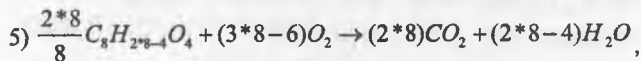
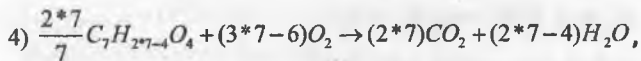
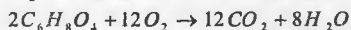
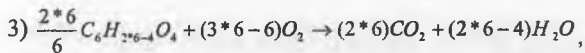
The compounds formed replacing two hydrogen atoms of unsaturated hydrocarbons in two groups of carboxyl- $COOH$ , are called as the bibasic unsaturated (dicarboxylic) acids.

(R) Radicals in dicarboxylic acids can be the residua of hydrocarbons of ethylene and acetylene bonds. The general formula of representatives homologues of bibasic unsaturated carboxylic acids  $C_nH_{2n-4}O_4$ , chemical algorithm of the equations of reaction of burning is expressed:



Examples are resulted:





Expression of coefficient value of oxygen  $O_2$  - the basic participant of the equation of burning reaction of representatives of the given class  $(2n+m)$ , and the equation of chemical algorithm of variant II is expressed:



Consecutive relation between values (n) and (m);

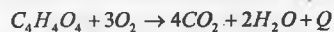
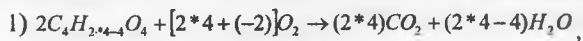
$$n=4; m=-2; \quad n=7; m=1;$$

$$n=5; m=-1; \quad n=8; m=2;$$

$$n=6; m=0; \quad n=9; m=3;$$

It is evident in the table, that if  $n=4, m=-2$  or if  $n=6, m=0$ . So, the values (n) and (m) in representatives of homologues of this class change proportionally on unit (6).

Examples are resulted.

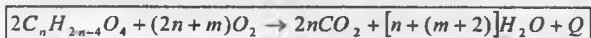




- 2)  $2C_3H_{2*5-4}O_4 + [2*5 + (-1)]O_2 \rightarrow (2*5)CO_2 + (2*5-4)H_2O$   
 $2C_3H_6O_4 + 9O_2 \rightarrow 10CO_2 + 6H_2O + Q$
- 3)  $2C_5H_{2*6-4}O_4 + (2*6 + 0)O_2 \rightarrow (2*6)CO_2 + (2*6-4)H_2O$   
 $2C_5H_8O_4 + 12O_2 \rightarrow 12CO_2 + 8H_2O$   
 $C_6H_8O_4 + 6O_2 \rightarrow 6CO_2 + 4H_2O + Q$
- 4)  $2C_7H_{2*7-4}O_4 + (2*7 + 1)O_2 \rightarrow (2*7)CO_2 + (2*7-4)H_2O$   
 $2C_7H_{10}O_4 + 15O_2 \rightarrow 14CO_2 + 10H_2O + Q$
- 5)  $2C_8H_{2*8-4}O_4 + (2*8 + 2)O_2 \rightarrow (2*8)CO_2 + (2*8-4)H_2O$   
 $2C_8H_{12}O_4 + 18O_2 \rightarrow 16CO_2 + 12H_2O$   
 $C_8H_{12}O_4 + 9O_2 \rightarrow 8CO_2 + 6H_2O + Q$
- 6)  $2C_9H_{2*9-4}O_4 + (2*9 + 3)O_2 \rightarrow (2*9)CO_2 + (2*9-4)H_2O$   
 $2C_9H_{14}O_4 + 21O_2 \rightarrow 18CO_2 + 14H_2O + Q$

Expression of coefficient value of water  $H_2O$  - one of the basic products of the equations of burning reaction of representatives of homologues of the given class

will be written in the form of  $[n + (m + 2)]$ , and variant III of chemical algorithm we will express as:

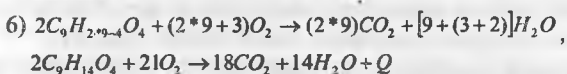
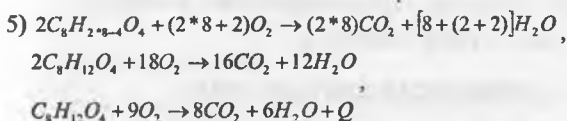
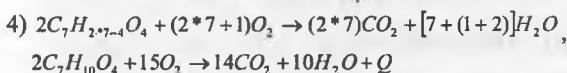
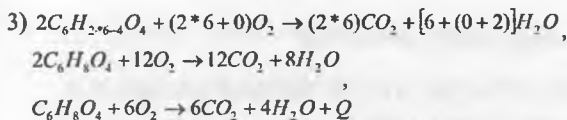


Consecutive relation between values (n) and (m):

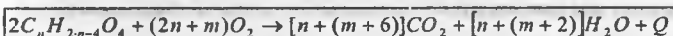
$$\begin{array}{llll} n=4; & m=-2; & n=7; & m=1; \\ n=5; & m=-1; & n=8; & m=2; \\ n=6; & m=0; & n=9; & m=3; \end{array}$$

Examples are resulted.

- 1)  $2C_4H_{2*4-4}O_4 + [2*4 + (-2)]O_2 \rightarrow (2*4)CO_2 + [4 + (-2 + 2)]H_2O$   
 $2C_4H_4O_4 + 6O_2 \rightarrow 8CO_2 + 4H_2O$   
 $C_4H_4O_4 + 3O_2 \rightarrow 4CO_2 + 2H_2O + Q$
- 2)  $2C_5H_{2*5-4}O_4 + [2*5 + (-1)]O_2 \rightarrow (2*5)CO_2 + [5 + (-1 + 2)]H_2O$   
 $2C_5H_6O_4 + 9O_2 \rightarrow 10CO_2 + 6H_2O + Q$



If expression of coefficient value of carbonic gas  $CO_2$  looks  $[n + (m + 6)]$  variant IV of chemical algorithms of representatives of the given class looks so:



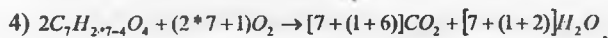
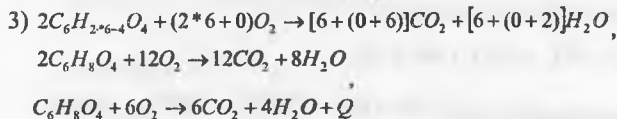
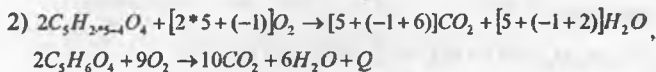
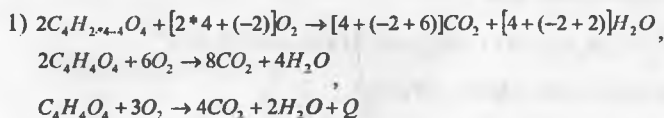
Consecutive relation between values (n) and (m):

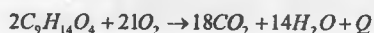
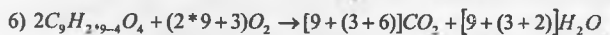
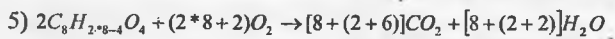
$$n=4; \quad m=-2; \quad n=7; \quad m=1;$$

$$n=5; \quad m=-1; \quad n=8; \quad m=2;$$

$$n=6; \quad m=0; \quad n=9; \quad m=3;$$

Examples are resulted:

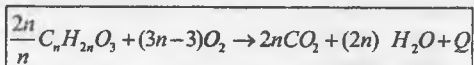




### MONOXICARBOXYLIC ACIDS

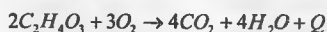
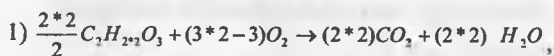
Monoxycarboxylic acids or oxyacids are considered as one of representatives of the important class of organic compounds which include hydroxyl  $-OH$  and carboxyl  $-COOH$  groups in structure. So the representatives of homologues of this class are compounds which contain two different functional groups - hydroxyl  $-OH$  and carboxyl  $-COOH$  in structure of molecules.

Monoxycarboxylic acids are widespread in the nature, especially hydroxiacetic acid and lactic acids. We express the general formula of their representatives  $C_nH_{2n}O_3$ , the chemical algorithm of the equations of reaction of burning looks as following:

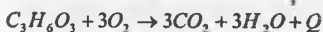
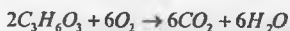
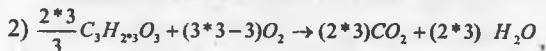


Examples are resulted:

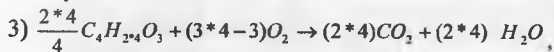
Hydroxiacetic acid:  $C_2H_4O_3$

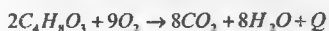


Lactic acid:  $C_3H_6O_3$

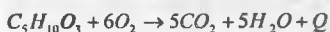
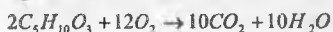
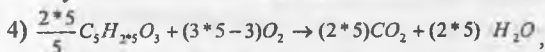


Hydroxibutanoic acid:  $CH_3 - CH_2 - CHOH - COOH$  or  $C_4H_8O_3$

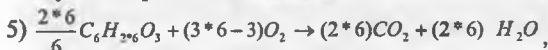




Hydroxivaleric acid:  $C_5H_{10}O_3$



Hydroxicaproic acid:  $C_6H_{12}O_3$



We will write  $(2n+m)$  to expression of coefficient value of oxygen  $O_2$ , the basic participant of the equation of burning reaction of representatives of the given class, and chemical algorithm of II variant is expressed so;



Consecutive relation between values (n) and (m):

$$n=2; \quad m=-1; \quad n=5; \quad m=2;$$

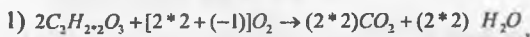
$$n=3; \quad m=0; \quad n=6; \quad m=3;$$

$$n=4; \quad m=1; \quad n=7; \quad m=4;$$

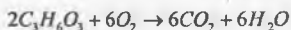
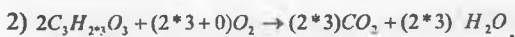
It is visible in the table, that if  $n=2$ ,  $m=-1$  or if  $n=5$ ,  $m=2$ . So, the values (n) and (m) in representatives of homologues of this class change proportionally on unit (3).

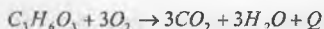
Examples are resulted.

Hydroxiacetic acid:  $C_2H_4O_3$

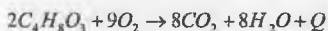
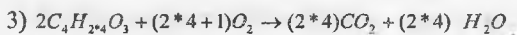


Lactic acid:  $C_3H_6O_3$

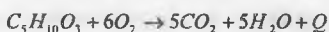
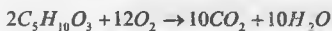
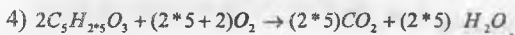




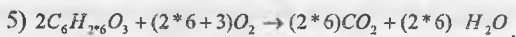
Hydroxibutanoic acid:  $CH_3 - CH_2 - CHOH - COOH$  or  $C_4H_8O_3$



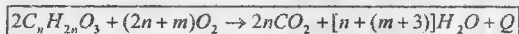
Hydroxivaleric acid:  $C_5H_{10}O_3$



Hydroxicaproic acid:  $C_6H_{12}O_3$



Expression of coefficient value of water  $H_2O$  - one of the basic products of the equation of burning reaction of representatives of homologues of the given class we will write in this kind  $[n+(m+3)]$ , and variant III of chemical algorithm we will express so:



Consecutive relation between values (n) and (m):

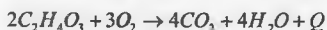
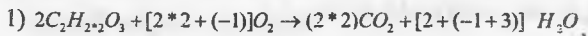
$$n=2; \quad m=-1; \quad n=5; \quad m=2;$$

$$n=3; \quad m=0; \quad n=6; \quad m=3;$$

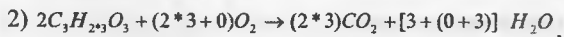
$$n=4; \quad m=1; \quad n=7; \quad m=4;$$

Examples are resulted:

Hydroxiacetic acid:  $C_2H_4O_3$

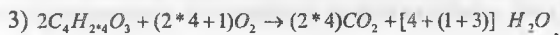


Lactic acid:  $C_3H_6O_3$

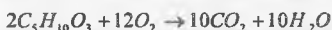
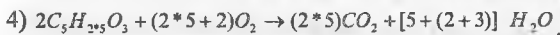




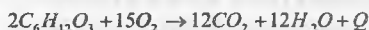
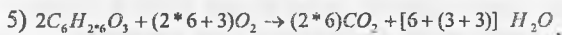
Hydroxybutanoic acid:  $CH_3 - CH_2 - CHOH - COOH$  or  $C_4H_8O_3$



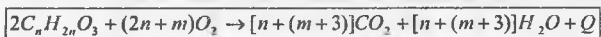
Hydroxivaleric acid:  $C_5H_{10}O_3$



Hydroxicaproic acid:  $C_6H_{12}O_3$



If expression of coefficient value of carbonic gas  $CO_2$  looks  $[n + (m + 3)]$  variant IV of chemical algorithms of representatives of the given class looks so:



Consecutive relation between values (n) and (m):

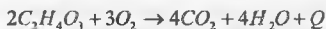
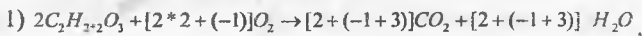
$$n=2; \quad m=-1; \quad n=5; \quad m=2;$$

$$n=3; \quad m=0; \quad n=6; \quad m=3;$$

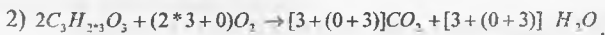
$$n=4; \quad m=1; \quad n=7; \quad m=4;$$

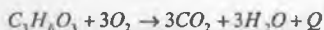
Examples are resulted:

Hydroxiacetic acid:  $C_2H_4O_3$

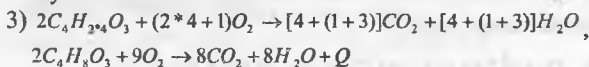


Lactic acid:  $C_3H_6O_3$

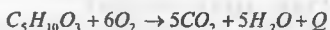
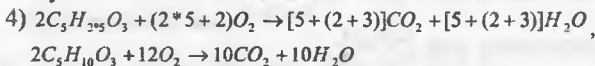




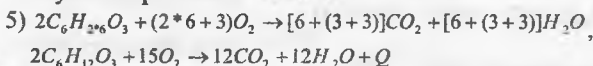
Hydroxibutanoic acid:  $CH_3 - CH_2 - CHOH - COOH$  or  $C_4H_8O_3$



Hydroxivaleric acid:  $C_5H_{10}O_3$

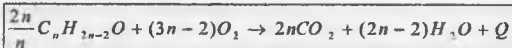


Hydroxicaproic acid:  $C_6H_{12}O_3$

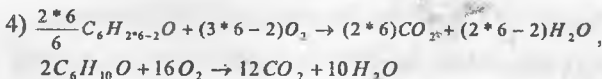
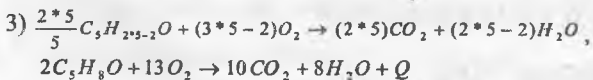
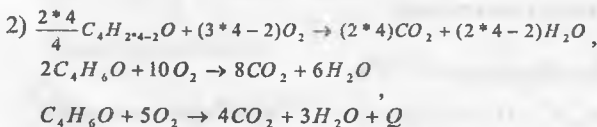
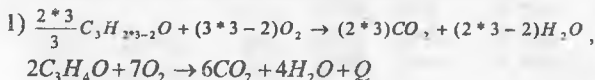


## UNSATURATED ALDEHYDES AND KETONES

The general formula of unsaturated aldehydes and ketones looks  $C_nH_{2n-2}O$ , we will express chemical algorithm of the equations of reaction of burning in such kind:

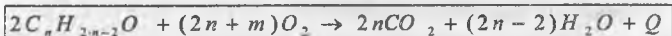


Examples of chemical algorithms:





Expression of coefficient value of oxygen  $O_2$ , the basic participant of the equations of burning reaction of representatives of the given class,  $(2n+m)$ , and variant II of chemical algorithm will be:

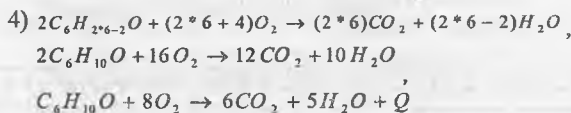
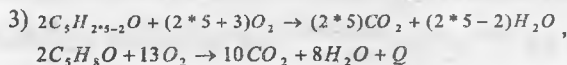
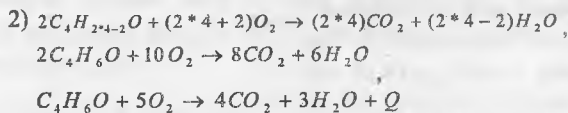
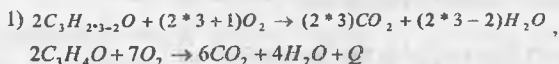


The table of values (n) and (m):

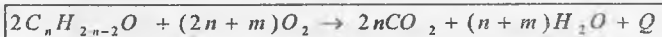
n=3;	m=1;	n=6;	m=4;
n=4;	m=2;	n=7;	m=5;
n=5;	m=3;	n=8;	m=6;

It is evident in the table, that difference between values (n) and (m) changes on unit (2).

Examples of algorithmic problems:



Expression of coefficient value of water  $H_2O$ , one of the basic products of the equation of burning reaction of representatives of homologues of organic substances of the given class is expressed so:  $(n+m)$ , and variant III of chemical algorithm has the following appearance:

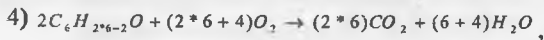
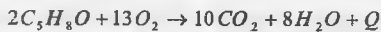
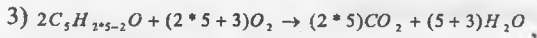
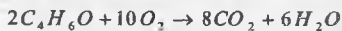
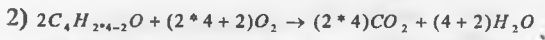
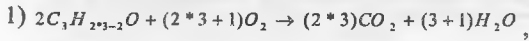




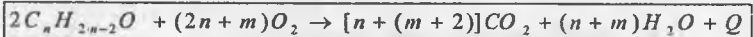
The table of values (n) and (m):

n=3;	m=1;	n=6;	m=4;
n=4;	m=2;	n=7;	m=5;
n=5;	m=3;	n=8;	m=6;

Examples of algorithmic problems:



In variant IV expression of coefficient value of one of the basic product of reaction of carbonic gas  $CO_2$  will be  $[n+(m+2)]$ , and the chemical algorithm looks so:



The table of values (n) and (m):

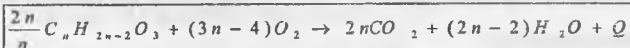
n=3;	m=1;	n=6;	m=4;
n=4;	m=2;	n=7;	m=5;
n=5;	m=3;	n=8;	m=6;

Examples of algorithmic problems:

- 1)  $2C_3H_{2n-2}O + (2 \cdot 3 + 1)O_2 \rightarrow [3 + (1 + 2)]CO_2 + (3 + 1)H_2O$ ,  
 $2C_3H_4O + 7O_2 \rightarrow 6CO_2 + 4H_2O + Q$
- 2)  $2C_4H_{2n-2}O + (2 \cdot 4 + 2)O_2 \rightarrow [4 + (2 + 2)]CO_2 + (4 + 2)H_2O$ ,  
 $2C_4H_6O + 10O_2 \rightarrow 8CO_2 + 6H_2O$   
 $C_4H_6O + 5O_2 \rightarrow 4CO_2 + 3H_2O + Q$
- 3)  $2C_5H_{2n-2}O + (2 \cdot 5 + 3)O_2 \rightarrow [5 + (3 + 2)]CO_2 + (5 + 3)H_2O$ ,  
 $2C_5H_8O + 13O_2 \rightarrow 10CO_2 + 8H_2O + Q$
- 4)  $2C_6H_{2n-2}O + (2 \cdot 6 + 4)O_2 \rightarrow [6 + (4 + 2)]CO_2 + (6 + 4)H_2O$ ,  
 $2C_6H_{10}O + 16O_2 \rightarrow 12CO_2 + 10H_2O$   
 $C_6H_{10}O + 8O_2 \rightarrow 6CO_2 + 5H_2O + Q$

### ALDEHYDE AND KETONE ACIDS

Organic substances which contain a group of aldehyde, ketone or the group carboxyl in molecules, is called aldehyde and ketone acids. Their first representative glyoxylic acid is found in green fruit. The general formula of aldehyde and ketone acids  $C_nH_{2n-2}O_3$ , and chemical algorithm of the equations of reaction of burning:



Examples of algorithmic problems:

Glyoxylic acid:  $CHO - COOH$  or  $C_2H_2O_3$

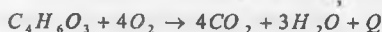
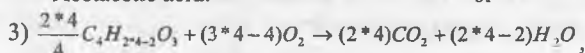
- 1)  $\frac{2 \cdot 2}{2} C_2H_{2 \cdot 2 - 2}O_3 + (3 \cdot 2 - 4)O_2 \rightarrow (2 \cdot 2)CO_2 + (2 \cdot 2 - 2)H_2O$ ,  
 $2C_2H_2O_3 + 2O_2 \rightarrow 4CO_2 + 2H_2O$   
 $C_2H_2O_3 + O_2 \rightarrow 2CO_2 + H_2O + Q$

Propane acid:  $C_3H_4O_3$

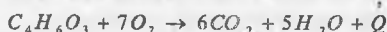
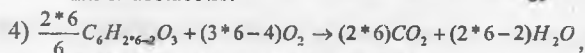
- 2)  $\frac{2 \cdot 3}{3} C_3H_{2 \cdot 3 - 2}O_3 + (3 \cdot 3 - 4)O_2 \rightarrow (2 \cdot 3)CO_2 + (2 \cdot 3 - 2)H_2O$ ,



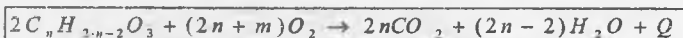
Acetacetic acid:  $CH_3 - CO - CH_2 - COOH$  or  $C_4H_6O_3$



Ether acetacetic:  $CH_3 - CO - CH_2 - COOC_2H_5$  or  $C_6H_{10}O_3$



Noting the expression of coefficient value of oxygen  $O_2$  in the form of  $(2n + m)$ , we will express variant II of chemical algorithm:



The table of relations between values (n) and (m);

$$n=2; \quad m=-2; \quad n=5; \quad m=1;$$

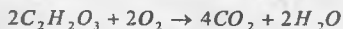
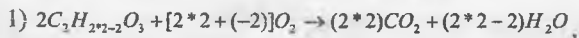
$$n=3; \quad m=-1; \quad n=6; \quad m=2;$$

$$n=4; \quad m=0; \quad n=7; \quad m=3;$$

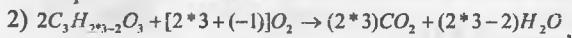
It is visible in the table, that if  $n=2$   $m=-2$ , the values (n) and (m) change with a difference on unit (4).

Examples of algorithmic problems:

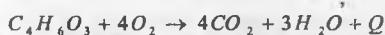
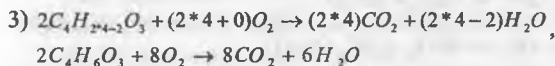
Glyoxylic acid:  $CHO - COOH$  or  $C_2H_2O_3$



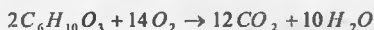
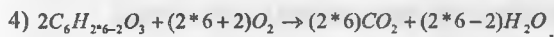
Propane acid:  $C_3H_4O_3$



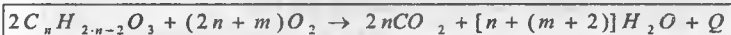
Acetacetic acid:  $CH_3 - CO - CH_2 - COOH$  or  $C_4H_6O_3$



Ether acetacetic:  $CH_3 - CO - CH_2 - COOC_2H_5$  or  $C_6H_{10}O_3$



The coefficient value of water  $H_2O$  - one of the basic products, the equation of reaction of burning of representatives of organic compounds of the given class is expressed  $[n + (m + 2)]$ , and the chemical algorithm of variant III looks as follows:



The table of values (n) and (m):

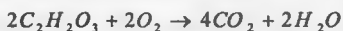
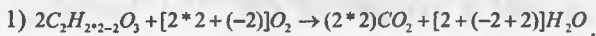
$$n=2; \quad m=-2; \quad n=5; \quad m=1;$$

$$n=3; \quad m=-1; \quad n=6; \quad m=2;$$

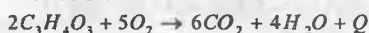
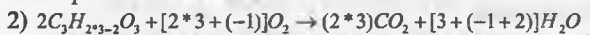
$$n=4; \quad m=0; \quad n=7; \quad m=3;$$

Examples of algorithmic problems:

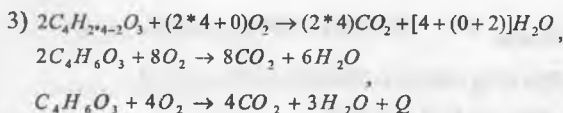
Glyoxylic acid:  $CHO - COOH$  or  $C_2H_2O_3$



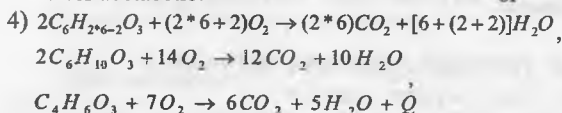
Propane acid:  $C_3H_4O_3$



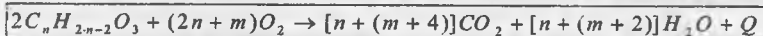
Acetacetic acid:  $CH_3 - CO - CH_2 - COOH$  or  $C_4H_6O_3$



Ether acetacetic:  $CH_3 - CO - CH_2 - COOC_2H_5$  or  $C_6H_{10}O_3$



In variant IV expression of coefficient value of one the basic products of reaction of carbonic gas  $CO_2$  looks  $[n + (m + 4)]$ , and the chemical algorithm looks so:

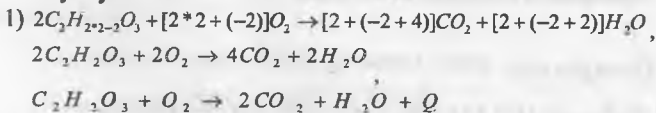


The table of relation between values (n) and (m):

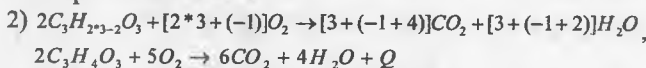
n=2;	m=-2;	n=5;	m=1;
n=3;	m=-1;	n=6;	m=2;
n=4;	m=0;	n=7;	m=3;

Examples of algorithmic problems:

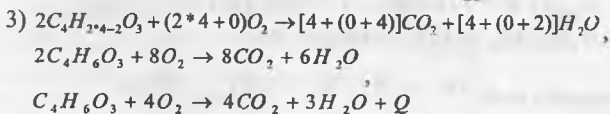
Glyoxylic acid:  $CHO - COOH$  or  $C_2H_2O_3$



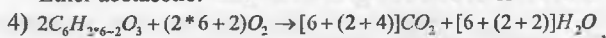
Propane acid:  $C_3H_4O_3$



Acetacetic acid:  $CH_3 - CO - CH_2 - COOH$  or  $C_4H_6O_3$



Ether acetacetic:  $CH_3 - CO - CH_2 - COOC_2H_5$  or  $C_6H_{10}O_3$

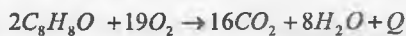
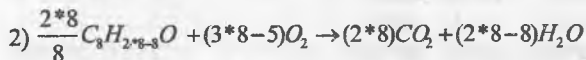
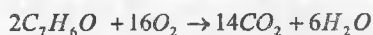
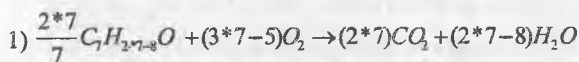


## AROMATIC ALDEHYDES AND KETONES

Aromatic aldehydes and ketones are considered as one of the major classes of organic compounds. The general formula of representatives of some homologues is expressed by formula  $C_nH_{2n-8}O$ , and the chemical algorithm of the equations of reaction of burning looks as follows:



Examples of algorithmic problems



Expression of coefficient value of oxygen  $O_2^{(2n+m)}$ , and chemical algorithm of variant II is

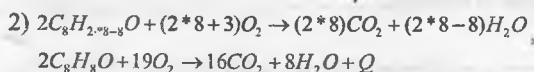
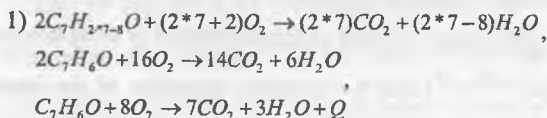


The table of relation between values (n) and (m):

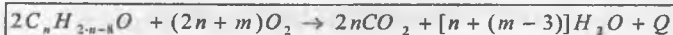
n=7;	m=2;	n=10;	m=5;
n=8;	m=3;	n=11;	m=6;
n=9;	m=4;	n=12;	m=7;

It is possible to see in the table, that the difference between values (n) and (m) changes on unit (5).

Examples of algorithmic problems:



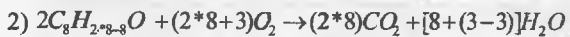
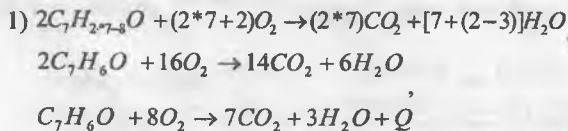
Expression of coefficient value of water  $H_2O$  [ $n + (m - 3)$ ], and chemical algorithm of variant III:

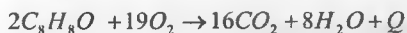


The table of relation between values (n) and (m):

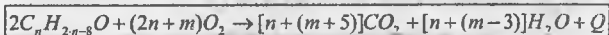
n=7;	m=2;	n=10;	m=5;
n=8;	m=3;	n=11;	m=6;
n=9;	m=4;	n=12;	m=7;

Examples of algorithmic problems;





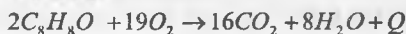
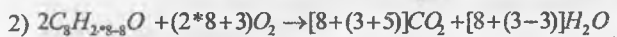
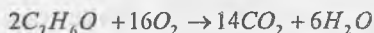
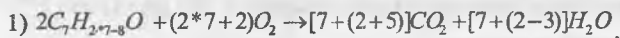
Expression of coefficient value of carbonic gas  $CO_2$  [ $n+(m+5)$ ] and chemical algorithm of variant IV is



The table of relation between values (n) and (m):

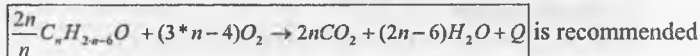
n=7;	m=2;	n=10;	m=5;
n=8;	m=3;	n=11;	m=6;
n=9;	m=4;	n=12;	m=7;

Examples of algorithmic problems:



## AROMATIC ALCOHOLS

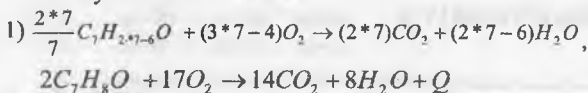
General formula  $C_nH_{2n-6}O$  is used for some representatives of aromatic alcohols and for the equations of burning reaction of chemical algorithm



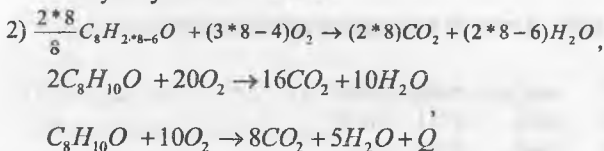


Examples of algorithmic problems:

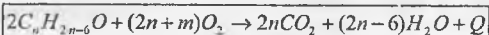
Benzyl alcohol:  $C_7H_8O$



Phenylethyl alcohol:  $C_8H_{10}O$



Expression of coefficient value of oxygen  $O_2$ , the basic participant of the equation of reaction of burning of representatives of the given class  $(2n + m)$ , and chemical algorithm of variant II:



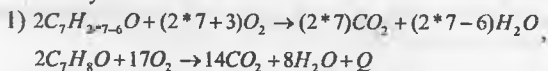
The table of values (n) and (m):

n=7;	m=3;	n=10;	m=6;
n=8;	m=4;	n=11;	m=7;
n=9;	m=5;	n=12;	m=8;

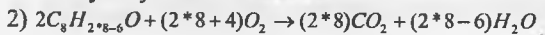
It is visible in the table that the difference between values (n) and (m) changes on unit (4).

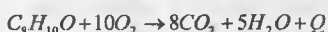
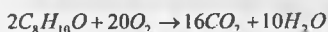
Examples of algorithmic problems:

Benzyl alcohol:  $C_7H_8O$

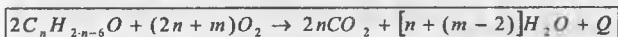


Phenylethyl alcohol:  $C_8H_{10}O$





Expression of coefficient value of water  $H_2O$   $[n+(m-2)]$ , and chemical algorithm of variant III:



The table of values (n) and (m):

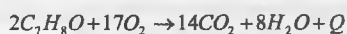
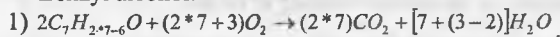
$$n=7; \quad m=3; \quad n=10; \quad m=6;$$

$$n=8; \quad m=4; \quad n=11; \quad m=7;$$

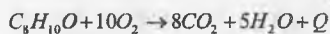
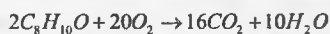
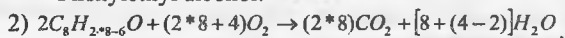
$$n=9; \quad m=5; \quad n=12; \quad m=8;$$

Examples of algorithmic problems:

Benzyl alcohol:  $C_7H_8O$



Phenylethyl alcohol:  $C_8H_{10}O$



In variant IV expression of coefficient value of one of the basic products of reaction of carbonic gas  $CO_2$  will be  $[n+(m+4)]$ , and the chemical algorithm looks so:



The table of values (n) and (m):

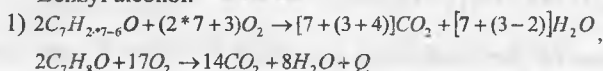
$$n=7; \quad m=3; \quad n=10; \quad m=6;$$

$$n=8; \quad m=4; \quad n=11; \quad m=7;$$

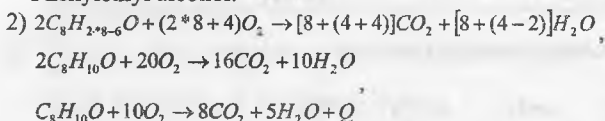
$$n=9; \quad m=5; \quad n=12; \quad m=8;$$

Examples of algorithmic problems:

Benzyl alcohol:  $C_7H_8O$

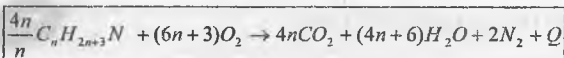


Phenylethyl alcohol:  $C_8H_{10}O$

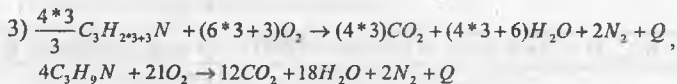
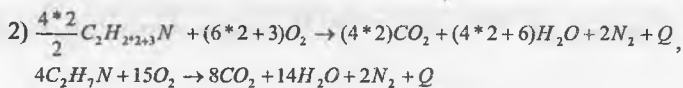
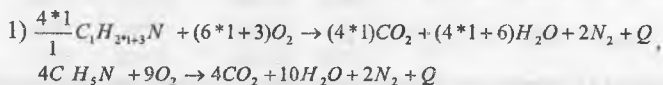


### PRIMARY, SECONDARY AND TERTIARY AMINES

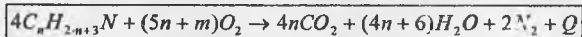
Representatives of these classes are widespread in the nature and divided into primary, secondary and tertiary amines. The general formula of representatives of homologues of amine class is expressed  $C_nH_{2n+3}N$ , and we will write chemical algorithm of the equations of reaction of burning in a kind:



Examples are resulted:



If expression of coefficient value of oxygen  $O_2$  - the basic participant of the equations of burning reaction of representatives of the given class,  $(5n+m)$  that chemical algorithm of variant II:



Consecutive relation between values (n) and (m):

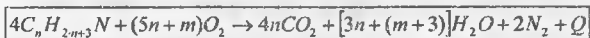
$$\begin{array}{llll} n=1; & m=4; & n=4; & m=7; \\ n=2; & m=5; & n=5; & m=8; \\ n=3; & m=6; & n=6; & m=9 \end{array}$$

It is visible in the table, that if  $n=1$ ,  $m=4$  or, if  $n=3$ ,  $m=6$ . So, the values (n) and (m) in representatives of homologues of this class change proportionally on unit (3).

Examples are resulted:

- 1)  $4C_1H_{2*1+3}N + (5*1+4)O_2 \rightarrow (4*1)CO_2 + (4*1+6)H_2O + 2N_2$ ,  
 $4CH_3N + 9O_2 \rightarrow 4CO_2 + 10H_2O + 2N_2 + Q$
- 2)  $4C_2H_{2*2+3}N + (5*2+5)O_2 \rightarrow (4*2)CO_2 + (4*2+6)H_2O + 2N_2$ ,  
 $4C_2H_7N + 15O_2 \rightarrow 8CO_2 + 14H_2O + 2N_2 + Q$
- 3)  $4C_3H_{2*3+3}N + (5*3+6)O_2 \rightarrow (4*3)CO_2 + (4*3+6)H_2O + 2N_2$ ,  
 $4C_3H_9N + 21O_2 \rightarrow 12CO_2 + 18H_2O + 2N_2 + Q$

Expression of coefficient value of water  $H_2O$  - one of the basic products of the equation of burning reaction of representatives of homologues of the given class  $[3n+(m+3)]$ , and variant III of chemical algorithm has the following appearance:

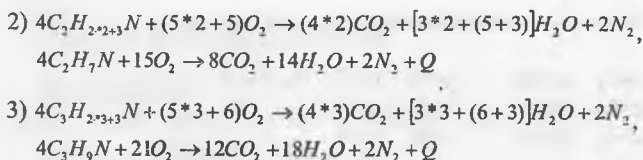


Consecutive relation between values (n) and (m):

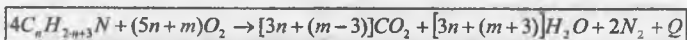
$$\begin{array}{llll} n=1; & m=4; & n=4; & m=7; \\ n=2; & m=5; & n=5; & m=8; \\ n=3; & m=6; & n=6; & m=9 \end{array}$$

Examples are resulted:

- 1)  $4C_1H_{2*1+3}N + (5*1+4)O_2 \rightarrow (4*1)CO_2 + [3*1+(4+3)]H_2O + 2N_2$ ,  
 $4CH_3N + 9O_2 \rightarrow 4CO_2 + 10H_2O + 2N_2 + Q$



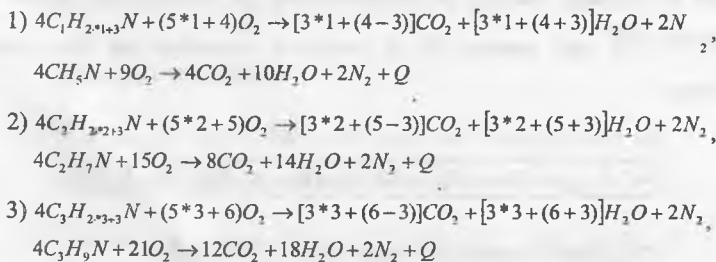
Expression of coefficient of value of carbonic gas  $CO_2$  - one of the basic products of the equation of burning reaction of representatives of homologues of the given class  $[3n + (m + 3)]$ , and variant IV of chemical algorithm has the following appearance:



Consecutive relation between values (n) and (m):

n=1;	m=4;	n=4;	m=7;
n=2;	m=5;	n=5;	m=8;
n=3;	m=6;	n=6;	m=9;

Examples are resulted:

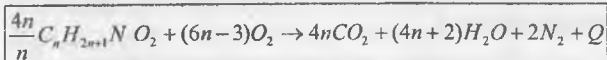


## AMINO ACIDS AND NITROALKANES

Amino acids are heterofunctional bonds in which atoms of hydrogen at hydrocarbon radicals are replaced by amino group  $-NH_2$  and carboxyl group  $-COOH$ .

Depending on the number of amino and carboxyl groups in molecules they are divided into monocarboxylic, diaminocarboxylic acids and into aromatic heterocyclic chemical bond. The general formula of the majority monoaminocarboxylic acids

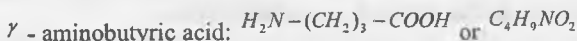
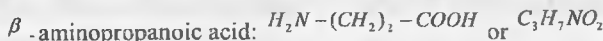
and nitroalkanes is expressed  $C_nH_{2n+1}NO_2$ , and chemical algorithm of the equations of burning reaction of representatives of these classes will be written in a kind:



Examples of algorithms:

- 1)  $\frac{4 \cdot 1}{1} C_1H_{2 \cdot 1 + 1}NO_2 + (6 \cdot 1 - 3)O_2 \rightarrow (4 \cdot 1)CO_2 + (4 \cdot 1 + 2)H_2O + 2N_2 + Q$ ,  
 $4C_1H_3NO_2 + 3O_2 \rightarrow 4CO_2 + 6H_2O + 2N_2 + Q$
- 2)  $\frac{4 \cdot 2}{2} C_2H_{2 \cdot 2 + 1}NO_2 + (6 \cdot 2 - 3)O_2 \rightarrow (4 \cdot 2)CO_2 + (4 \cdot 2 + 2)H_2O + 2N_2 + Q$ ,  
 $4C_2H_5NO_2 + 9O_2 \rightarrow 8CO_2 + 10H_2O + 2N_2 + Q$
- 3)  $\frac{4 \cdot 3}{3} C_3H_{2 \cdot 3 + 1}NO_2 + (6 \cdot 3 - 3)O_2 \rightarrow (4 \cdot 3)CO_2 + (4 \cdot 3 + 2)H_2O + 2N_2 + Q$ ,  
 $4C_3H_7NO_2 + 15O_2 \rightarrow 12CO_2 + 14H_2O + 2N_2 + Q$

The formula of representatives of homologues of amino acids are written in terms of



So, for a number of representatives of amino acids it is possible to use the chemical algorithms resulted for the equations of burning reaction of nitroalkanes. Expression of coefficient value of oxygen  $O_2$ , the basic participant of the equation of burning reaction of representatives of the given class  $(5n+m)$ , and chemical algorithm of variant II is expressed by the equation:

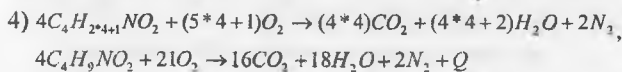
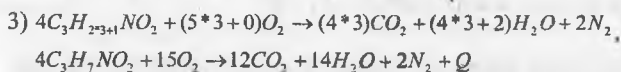
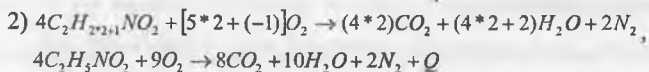
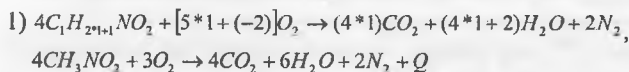


Consecutive relation between values (n) and (m):

n=1;	m=-2;	n=5;	m=2;
n=2;	m=-1;	n=6;	m=3;
n=3;	m=0;	n=7;	m=4;
n=4;	m=1;	n=8;	m=5.

It is visible in the table, that if  $n=1$ ,  $m=-2$  or, if  $n=4$ ,  $m=1$ . So, the values (n) and (m) in representatives of homologues of this class change proportionally on unit (3).

Examples are resulted:



Expression of coefficient value of water  $H_2O$ , - one of the basic products of the

equation of burning reaction of representatives of the given class  $[3n+(m+5)]$ , and

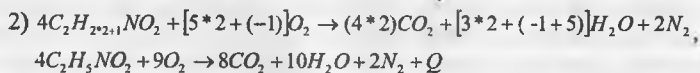
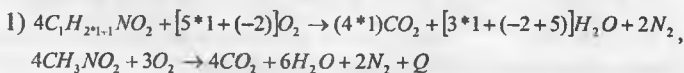
variant III of chemical algorithm is expressed by the equation:

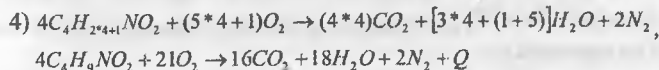
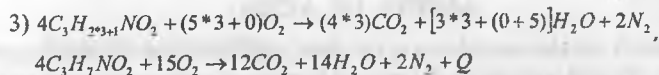


Consecutive relation between (n) and (m) values:

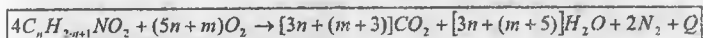
$n=1;$	$m=-2;$	$n=5;$	$m=2;$
$n=2;$	$m=-1;$	$n=6;$	$m=3;$
$n=3;$	$m=0;$	$n=7;$	$m=4;$
$n=4;$	$m=1;$	$n=8;$	$m=5.$

Examples are resulted:





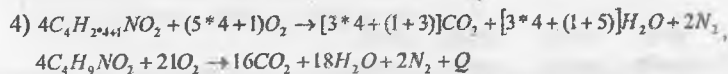
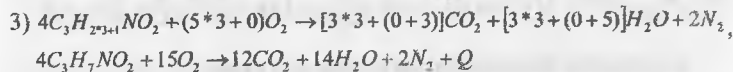
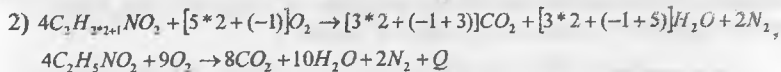
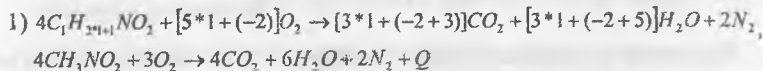
If expression of coefficient value of carbonic gas  $CO_2$  in the form of  $[3n + (m+3)]$  variant IV of chemical algorithms of representatives of the given class looks as:



Consecutive relation between values (n) and (m):

n=1;	m=-2;	n=5;	m=2;
n=2;	m=-1;	n=6;	m=3;
n=3;	m=0;	n=7;	m=4;
n=4;	m=1;	n=8;	m=5.

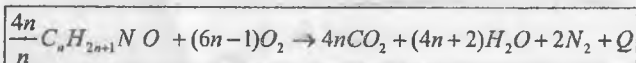
Examples are resulted:





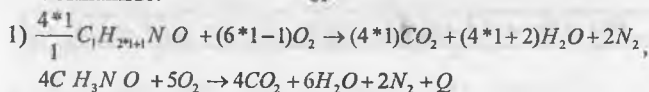
## AMIDES OF ACIDS

Amides of acids are also considered as the most important class of nitric organic compounds. We will write down the general formula of representatives of this class in the form of  $C_n H_{2n+1} NO$ , and chemical algorithm of the equations of burning reaction will be expressed as:

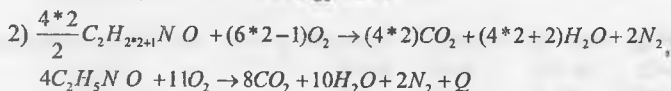


Examples are resulted:

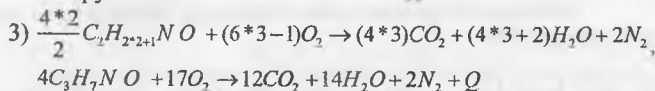
Formamide:  $H-CO-NH_2$  or  $CH_3NO$



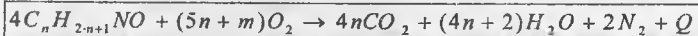
Acetamid:  $CH_3-CO-NH_2$  or  $C_2H_5NO$



Propyoamid:  $CH_3-CH_2-CO-NH_2$  or  $C_3H_7NO$



Expression of coefficient value of oxygen  $O_2$  - the basic participant of the equation of burning reaction of representatives of the given class looks,  $(5n+m)$ , and the equation of chemical algorithm of variant II:



Consecutive relation between (n) and (m) values;

n=1;	m=0;	n=4;	m=3;
n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;

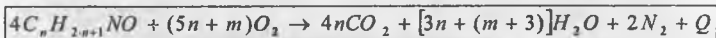
It is possible to see, that the values (n) and (m) proportionally change with a difference on unit (1).

Examples are resulted:

- 1)  $4C_1H_{2 \cdot 1+1}NO + (5 \cdot 1 + 0)O_2 \rightarrow (4 \cdot 1)CO_2 + (4 \cdot 1 + 2)H_2O + 2N_2$ ,  
 $4CH_3NO + 5O_2 \rightarrow 4CO_2 + 6H_2O + 2N_2 + Q$
- 2)  $4C_2H_{2 \cdot 2+1}NO + (5 \cdot 2 + 1)O_2 \rightarrow (4 \cdot 2)CO_2 + (4 \cdot 2 + 2)H_2O + 2N_2$ ,  
 $4C_2H_5NO + 11O_2 \rightarrow 8CO_2 + 10H_2O + 2N_2 + Q$
- 3)  $4C_3H_{2 \cdot 3+1}NO + (5 \cdot 3 + 2)O_2 \rightarrow (4 \cdot 3)CO_2 + (4 \cdot 3 + 2)H_2O + 2N_2$ ,  
 $4C_3H_7NO + 17O_2 \rightarrow 12CO_2 + 14H_2O + 2N_2 + Q$

Expression of coefficient value of water  $H_2O$   $[3n + (m + 3)]$  and variant

III of chemical algorithm:



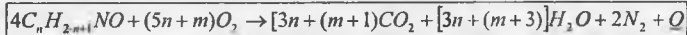
Consecutive relation between values (n) and (m):

n=1;	m=0;	n=4;	m=3;
n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;

Examples are resulted:

- 1)  $4C_1H_{2 \cdot 1+1}NO + (5 \cdot 1 + 0)O_2 \rightarrow (4 \cdot 1)CO_2 + [3 \cdot 1 + (0 + 3)]H_2O + 2N_2$ ,  
 $4CH_3NO + 5O_2 \rightarrow 4CO_2 + 6H_2O + 2N_2 + Q$
- 2)  $4C_2H_{2 \cdot 2+1}NO + (5 \cdot 2 + 1)O_2 \rightarrow (4 \cdot 2)CO_2 + [3 \cdot 2 + (1 + 3)]H_2O + 2N_2$ ,  
 $4C_2H_5NO + 11O_2 \rightarrow 8CO_2 + 10H_2O + 2N_2 + Q$
- 3)  $4C_3H_{2 \cdot 3+1}NO + (5 \cdot 3 + 2)O_2 \rightarrow (4 \cdot 3)CO_2 + [3 \cdot 3 + (2 + 3)]H_2O + 2N_2$ ,  
 $4C_3H_7NO + 17O_2 \rightarrow 12CO_2 + 14H_2O + 2N_2 + Q$

If expression of coefficient value of carbonic gas  $CO_2$  is in this kind  $[3n + (m + 1)]$  variant IV of chemical algorithms of representatives of the given class looks so:



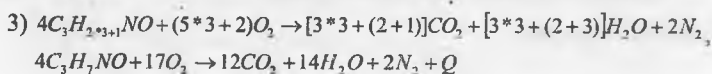
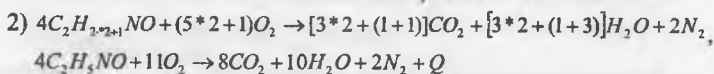
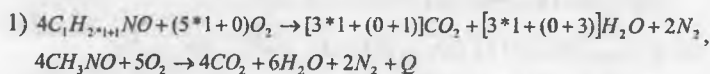
Consecutive relation between values (n) and (m):

$$n=1; \quad m=0; \quad n=4; \quad m=3;$$

$$n=2; \quad m=1; \quad n=5; \quad m=4;$$

$$n=3; \quad m=2; \quad n=6; \quad m=5;$$

Examples are resulted:

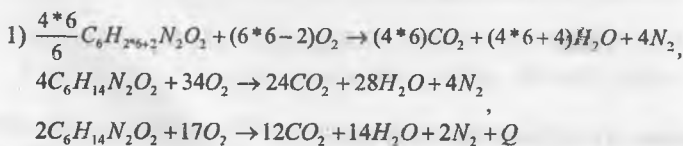


## DIAMINOCARBON ACIDS

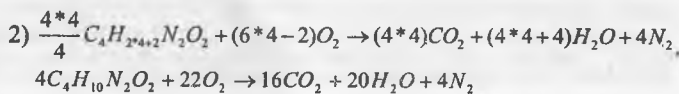
Diaminocarbon acids are representatives of the major class of organic compounds found in protein. The general formula of representatives of homologues of diaminocarboxylic acids  $C_nH_{2n+2}N_2O_2$ , equation of burning reactions of chemical algorithm:

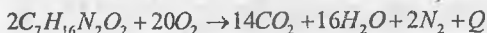
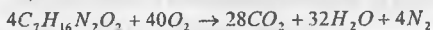
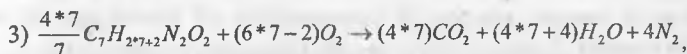
$$\frac{4n}{n} C_nH_{2n+2}N_2O_2 + (6n-2)O_2 \rightarrow 4nCO_2 + (4n+4)H_2O + 4N_2 + Q$$

The equation of burning reaction of lysine:  $C_6H_{14}N_2O_2$



Other examples are resulted:





Expression of coefficient value of oxygen  $O_2$  - the basic participant of the equation of burning reaction  $(5n+m)$  and chemical algorithm of variant II:



Consecutive relation between values (n) and (m):

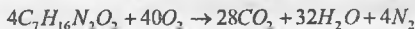
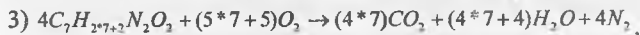
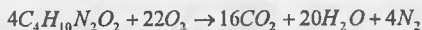
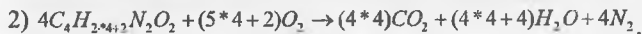
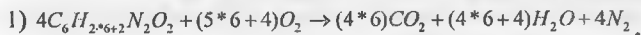
$$n=2; \quad m=0; \quad n=5; \quad m=3;$$

$$n=3; \quad m=1; \quad n=6; \quad m=4;$$

$$n=4; \quad m=2; \quad n=7; \quad m=5.$$

It is evident in the table, that if  $n=2, m=0$  or if  $n=4, m=2$ . So, the values (n) and (m) in representatives of homologues of this class change proportionally on unit (2).

Examples are resulted:



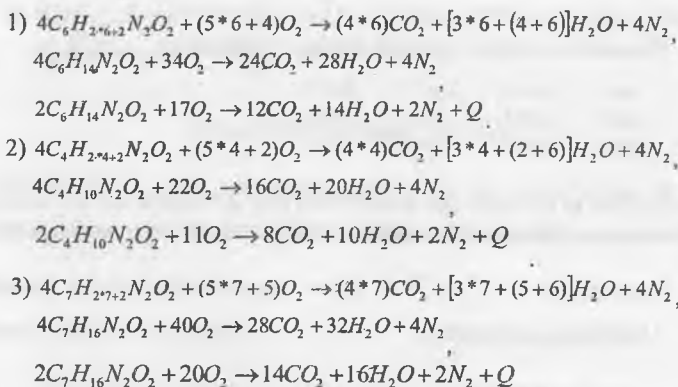
Expression of coefficient value of water  $H_2O$ , one of the basic products of the equation of burning reaction of representatives of homologues of the given class  $[3n + (m + 6)]$ , and variant III of chemical algorithm is expressed so:



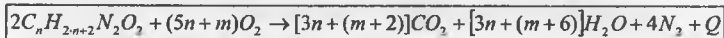
Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=2; & m=0; & n=5; & m=3; \\ n=3; & m=1; & n=6; & m=4; \\ n=4; & m=2; & n=7; & m=5. \end{array}$$

Examples are resulted:



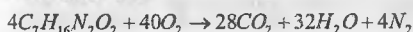
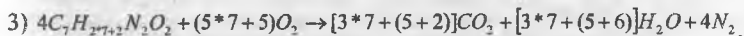
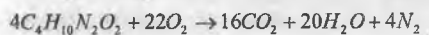
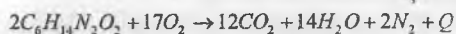
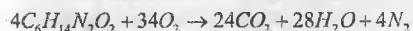
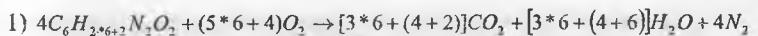
Expression of coefficient value of carbonic gas  $CO_2$   $[3n + (m + 2)]$  and variant IV of chemical algorithm:



Consecutive relation between values (n) and (m):

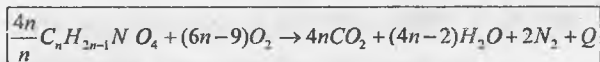
$$\begin{array}{llll} n=2; & m=0; & n=5; & m=3; \\ n=3; & m=1; & n=6; & m=4; \\ n=4; & m=2; & n=7; & m=5. \end{array}$$

Examples are resulted:

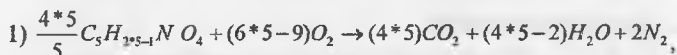


### AMINODICARBON ACIDS

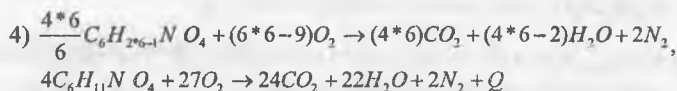
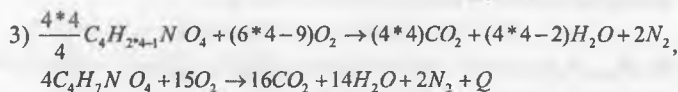
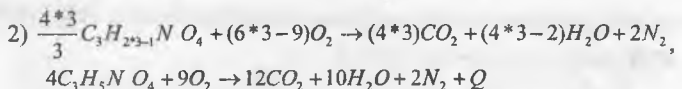
Aminodicarbon acids are also a part of some protein and are considered as the basic class of organic compounds. The general formula of representatives of homologues of aminodicarbon acids can be expressed in the form of  $C_nH_{2n-1}NO_4$ , and the chemical algorithm of the equation of burning reaction looks as:



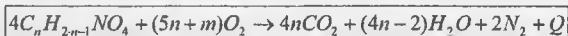
The equation of burning reaction of glutaminic acids:  $C_5H_9NO_4$



Other examples are resulted:



We will write  $(5n+m)$  to the expression of coefficient value of oxygen  $O_2$  - the basic participant of the equations of reaction of burning of representatives of the given class, and chemical algorithm of variant II as:

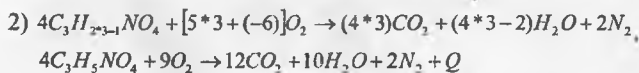
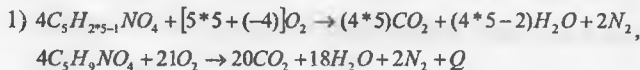


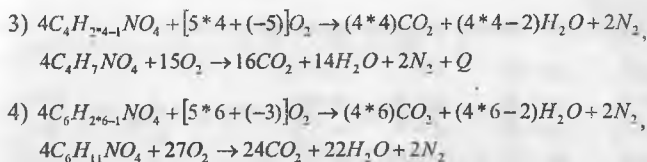
Consecutive relation between values (n) and (m):

n=3;	m=-6;	n=7;	m=-2;
n=4;	m=-5;	n=8;	m=-1;
n=5;	m=-4;	n=9;	m=0;
n=6;	m=-3;	n=10;	m=1.

It is clear in the table, that if n=3, m = - 6; if n=7, m =-2 or if n=9, m=0. So, the values (n) and (m) in representatives of homologues of the given class proportionally change on (9) units.

Examples are resulted:





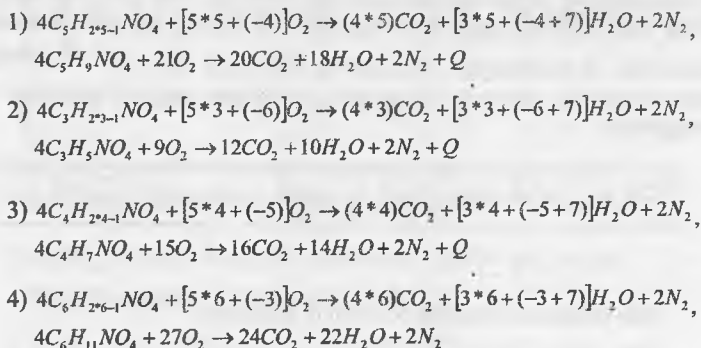
Expression of coefficient value of water  $H_2O$  - one of the basic products of the equation of burning reaction of representatives of homologues of the given class we will write in the form  $[3n + (m + 7)]$ , and variant III of chemical algorithm as:



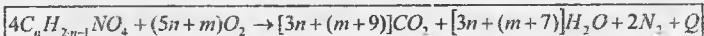
Consecutive relation between values (n) and (m):

n=3;	m=-6;	n=7;	m=-2;
n=4;	m=-5;	n=8;	m=-1;
n=5;	m=-4;	n=9;	m=0;
n=6;	m=-3;	n=10;	m=1.

Examples are resulted:



Expression of coefficient value of carbonic gas  $CO_2$   $[3n + (m + 9)]$  and variant IV of chemical algorithm:





Consecutive relation between values (n) and (m):

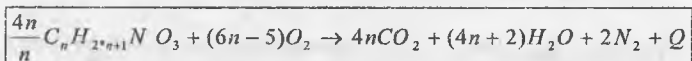
$$\begin{array}{llll} n=3; & m=-6; & n=7; & m=-2; \\ n=4; & m=-5; & n=8; & m=-1; \\ n=5; & m=-4; & n=9; & m=0; \\ n=6; & m=-3; & n=10; & m=1. \end{array}$$

Examples are resulted:

- 1)  $4C_5H_{2*5-4}NO_4 + [5*5 + (-4)]O_2 \rightarrow [3*5 + (-4+9)]CO_2 + [3*5 + (-4+7)]H_2O + 2N_2$ ,  
 $4C_5H_5NO_4 + 21O_2 \rightarrow 20CO_2 + 18H_2O + 2N_2 + Q$
- 2)  $4C_3H_{2*3-1}NO_4 + [5*3 + (-6)]O_2 \rightarrow [3*3 + (-6+9)]CO_2 + [3*3 + (-6+7)]H_2O + 2N_2$ ,  
 $4C_3H_5NO_4 + 9O_2 \rightarrow 12CO_2 + 10H_2O + 2N_2 + Q$
- 3)  $4C_4H_{2*4-1}NO_4 + [5*4 + (-5)]O_2 \rightarrow [3*4 + (-5+9)]CO_2 + [3*4 + (-5+7)]H_2O + 2N_2$ ,  
 $4C_4H_7NO_4 + 15O_2 \rightarrow 16CO_2 + 14H_2O + 2N_2 + Q$
- 4)  $4C_6H_{2*6-1}NO_4 + [5*6 + (-3)]O_2 \rightarrow [3*6 + (-3+9)]CO_2 + [3*6 + (-3+7)]H_2O + 2N_2$ ,  
 $4C_6H_{11}NO_4 + 27O_2 \rightarrow 24CO_2 + 22H_2O + 2N_2 + Q$

### HYDROXYAMINO ACIDS

Representatives of homologues of hydroxiamino acids are considered as an important class of nitric organic compounds. Expressing the general formula of representatives of homologues, included in the given class as  $C_nH_{2n+1}NO_3$ , the equation of burning reaction of chemical algorithms we will represent in the following form:

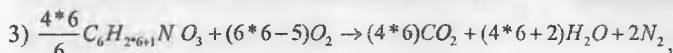


The equation of burning reaction of threonine:  $C_4H_9NO_3$

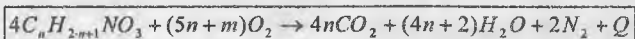
- 1)  $\frac{4*4}{4} C_4H_{2*4+1}NO_3 + (6*4-5)O_2 \rightarrow (4*4)CO_2 + (4*4+2)H_2O + 2N_2$ ,  
 $4C_4H_9NO_3 + 19O_2 \rightarrow 16CO_2 + 18H_2O + 2N_2 + Q$

Other examples are resulted.

- 2)  $\frac{4*3}{3} C_3H_{2*3+1}NO_3 + (6*3-5)O_2 \rightarrow (4*3)CO_2 + (4*3+2)H_2O + 2N_2$ ,



Expression of coefficient value of oxygen  $O_2$ , the basic participant of the equation of burning reaction of representatives of the given class we will write as  $(5n+m)$ , and the equation of chemical algorithm of variant II as:



Consecutive relation between (n) and (m) values:

$$n=3; \quad m=-2; \quad n=7; \quad m=2;$$

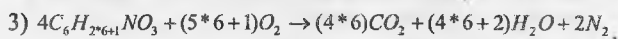
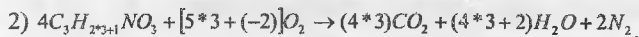
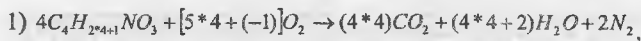
$$n=4; \quad m=-1; \quad n=8; \quad m=3;$$

$$n=5; \quad m=0; \quad n=9; \quad m=4;$$

$$n=6; \quad m=1; \quad n=10; \quad m=5;$$

It is shown in the table, that if  $n=3$ ,  $m=-2$ ; if,  $n=6$ ,  $m=1$ . So, the values(n) and (m) in representatives of homologues of the given class proportionally change in such order:

Examples are resulted:



Expression of coefficient value of water  $H_2O$ , one of the basic products of the equation of burning reaction of representatives of homologues of the given

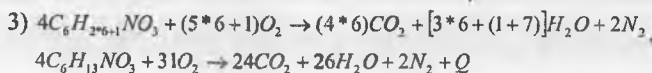
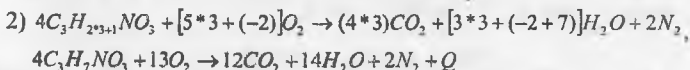
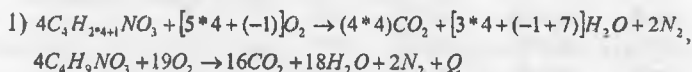
class in following  $[3n+(m+7)]$ , and variant III of chemical algorithm we will express so:



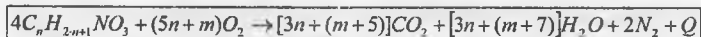
Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=3; & m=-2; & n=7; & m=2; \\ n=4; & m=-1; & n=8; & m=3; \\ n=5; & m=0; & n=9; & m=4; \\ n=6; & m=1; & n=10; & m=5; \end{array}$$

Examples are resulted:



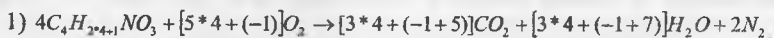
Expression of coefficient value of carbonic gas  $CO_2 [3n+(m+5)]$  and variant IV of chemical algorithm:

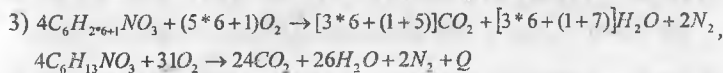
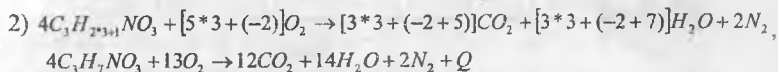


Consecutive relation between values (n) and (m):

$$\begin{array}{llll} n=3; & m=-2; & n=7; & m=2; \\ n=4; & m=-1; & n=8; & m=3; \\ n=5; & m=0; & n=9; & m=4; \\ n=6; & m=1; & n=10; & m=5; \end{array}$$

Examples are resulted:



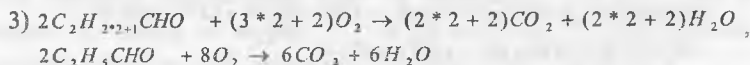
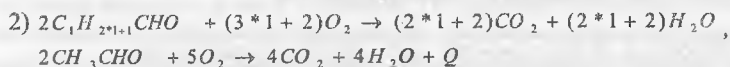
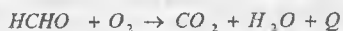
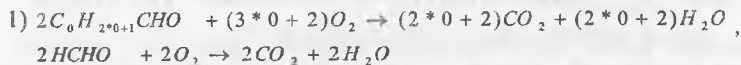


## «CHEMICAL ALGORITHMS» OF ORGANIC CONNECTIONS WITH FUNCTIONAL GROUP

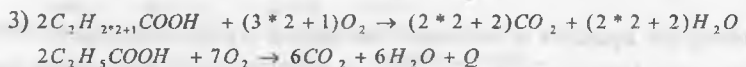
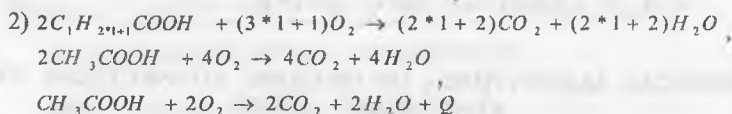
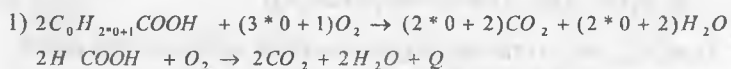
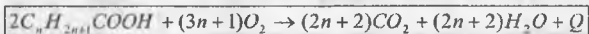
Among the equations of reaction of burning of organic compounds combined with functional group  $-CHO$ ,  $-COOH$  or other functional groups, some laws of chemical algorithms are defined. For example, at formic aldehydes  $H-CHO$  and acetic acids  $H-COOH$  the value  $(C H_2)$  of radicals is equal to zero  $(0)$ . In these organic substances functional groups  $-CHO$  and  $-COOH$  are combined only with atoms of hydrogen. Such kinds of chemical algorithms especially confirm that  $(C H_2)$  the radical is equal to zero  $(0)$ . Examples on these algorithms are given more below. If the general formula of aldehydes  $C_nH_{2n+1}CHO$  chemical algorithm of the equations of reaction of burning will have the following appearance:



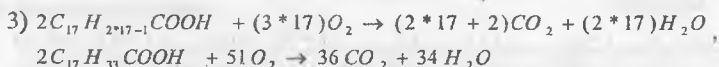
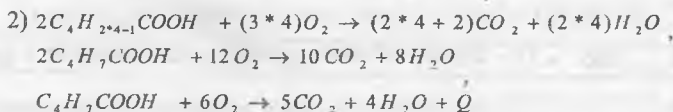
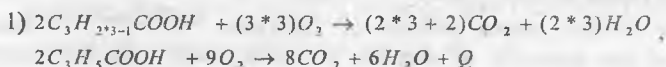
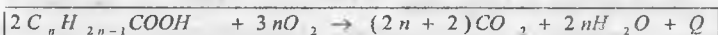
Examples:



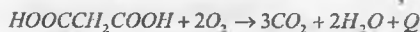
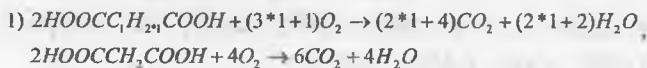
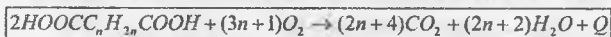
The general formula of the one-basic carboniferous acids  $C_nH_{2n+1}COOH$  and the equation of reaction of burning of chemical algorithm

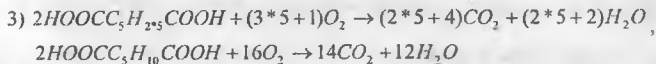


The general formula of the one-basic unsaturated carboniferous acids  $C_n H_{2n-1} COOH$  and the equation of reaction of burning of chemical algorithm

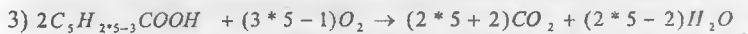
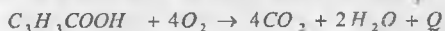
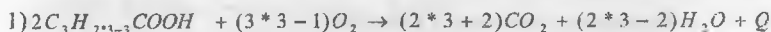
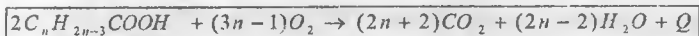


The general formula of the bibasic carboniferous acids  $HOOC C_n H_{2n} COOH$  and the equation of burning reaction of chemical algorithm:





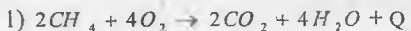
The general formula of more unsaturated monobasic carboniferous acids  $\text{C}_n\text{H}_{2n-3}\text{COOH}$  and the equation of burning reaction of chemical algorithm:



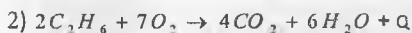
### THE MATHEMATICAL ANALYSIS «THE CHEMICAL ALGORITHMS»

Analyses once again confirm a conclusion about certain consecutive repetition among the equations of reaction of burning, the classical law of chemistry, equality of weights of the substances which have reacted with weights of substances, formed as a result of reaction. The equations of reaction of burning include molecules, atoms of carbon, hydrogen or atoms of carbon, hydrogen and oxygen, the sequence coefficient is equal  $2n/n$ , and the value of weight of initial organic substance proportionally raises or decreases on 28 a.w.u, the basic participant of reaction of oxygen  $\text{O}_2$  - on 96 a.w.u and the basic products of reaction of carbonic gas  $\text{CO}_2$  - on 88 a.w.u and water  $\text{H}_2\text{O}$  - on 36 a.w.u.

Examples are resulted:



$$2 \cdot 16 = 32 + 4 \cdot 32 = 128 = 2 \cdot 44 = 88 + 4 \cdot 18 = 72$$



$$2 \cdot 30 = 60 + 7 \cdot 32 = 224 = 4 \cdot 44 = 176 + 6 \cdot 18 = 108$$

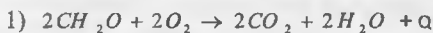


$$2 \cdot 44 = 88 + 10 \cdot 32 = 320 = 6 \cdot 44 = 264 + 8 \cdot 18 = 144$$



$$2 \cdot 58 = 116 + 13 \cdot 32 = 416 = 8 \cdot 44 = 352 + 10 \cdot 18 = 180$$

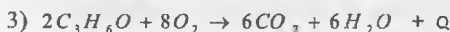
Examples of the class of aldehydes:



$$2 \cdot 30 = 60 + 2 \cdot 32 = 64 = 2 \cdot 44 = 88 + 2 \cdot 18 = 36$$



$$2 \cdot 44 = 88 + 5 \cdot 32 = 160 = 4 \cdot 44 = 176 + 4 \cdot 18 = 72$$



$$2 \cdot 58 = 116 + 8 \cdot 32 = 256 = 6 \cdot 44 = 264 + 6 \cdot 18 = 108$$



$$2 \cdot 72 = 144 + 11 \cdot 32 = 352 = 8 \cdot 44 = 352 + 8 \cdot 18 = 144$$

Among the equations of reaction of burning of the organic substances consisting of atoms of carbon, hydrogen, nitrogen or carbon, hydrogen, nitrogen and oxygen, sequence coefficient  $4n/n$ , the value of weight of initial organic substance proportionally raises or decreases on 56 a.w.u, weights of the basic participant of reaction of oxygen  $O_2$  - on 192 a.w.u and weights of the basic products of reaction of carbonic gas  $CO_2$  on 176 a.w.u and water  $H_2O$  - on 72 a.w.u.

Examples are resulted:



$$4 \cdot 31 = 124 + 9 \cdot 32 = 288 = 4 \cdot 44 = 176 + 10 \cdot 18 = 180 + 2 \cdot 28 = 56$$

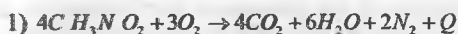


$$4 \cdot 45 = 180 + 15 \cdot 32 = 480 = 8 \cdot 44 = 352 + 14 \cdot 18 = 252 + 2 \cdot 28 = 56$$



$$4 \cdot 59 = 236 + 21 \cdot 32 = 672 = 12 \cdot 44 = 528 + 18 \cdot 18 = 324 + 2 \cdot 28 = 56$$

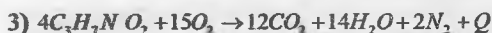
Examples of the class of nitroalkanes:



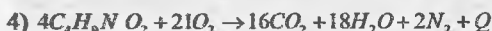
$$4 \cdot 61 = 244 + 3 \cdot 32 = 96 = 4 \cdot 44 = 176 + 6 \cdot 18 = 108 + 2 \cdot 28 = 56$$



$$4 \cdot 75 = 300 + 9 \cdot 32 = 288 = 8 \cdot 44 = 352 + 10 \cdot 18 = 180 + 2 \cdot 28 = 56$$



$$4 \cdot 89 = 356 + 15 \cdot 32 = 480 = 12 \cdot 44 = 528 + 14 \cdot 18 = 252 + 2 \cdot 28 = 56$$



$$4 \cdot 103 = 412 + 21 \cdot 32 = 672 = 16 \cdot 44 = 704 + 18 \cdot 18 = 324 + 2 \cdot 28 = 56$$

Comparing weights of the substances which have entered reaction of a number of equations with weights of substances, formed in reaction, it is possible to see consecutive change of quantity of substances. This consecutive change of quantity of substances submits to the same law in change of high-molecular compounds (protein, oils, carbohydrates, etc.) in low-molecular compounds (amino acids, glycerin, high-molecular carboxylic acids, glucose, carbonic gas, water, etc.).

Results confirm the classical law that «the weight of the substances entered reaction is equal to weight of the substances formed as a result of reaction» is expedient to express as a logic continuation of the law. «In chemical reactions the quantity of weight of substance increases or decreases, and one of consecutive changes» can be characterized as followed: «Among the equations of reaction of burning the quantity of weight of the substances entered reaction, and



quantity of weight of the substances formed as a result of reaction, increase or decrease on one of the consecutive changes».

These results once again confirm the possibility of algorithmization and modeling of chemical reactions by mathematical ways.

It is possible to assert that the chemical processes occurring in the animate and inanimate nature, quantity of weights of the substances participating in given chemical processes, occur on the basis of the certain and consecutive increase and reduction. So, each chemical process submits to any mathematical laws.

**The table of "chemical algorithms» expressions coefficient the value for oxygen (O<sub>2</sub>), carbonic gas (CO<sub>2</sub>) and waters (H<sub>2</sub>O)**

The basic classes of organic connections	Expression of coefficient of the value of oxygen O <sub>2</sub>	Expression of coefficient of the value of carbon dioxide (CO <sub>2</sub> )	Expression of coefficient of the value of water (H <sub>2</sub> O)
1. Limiting hydrocarbons	$2n + m$	$[n + (m - 1)]$	$[n + (m + 1)]$
2. Cycloparaffins and numbers ethylene hydrocarbons	$2n + m$	$(n + m)$	$n + m$
3. Numbers diene and acetylene hydrocarbons	$2n + m$	$[n + (m + 1)]$	$[n + (m - 1)]$
4. Aromatic hydrocarbons	$2n + m$	$[n + (m + 3)]$	$[n + (m - 3)]$
5. One-nuclear alcohols and simple aethers	$2n + m$	$n + m$	$[n + (m + 2)]$
6. Two-nuclear alcohols	$2n + m$	$[n + (m + 1)]$	$[n + (m + 3)]$
7. Aldehydes, ketones and unsaturated alcohols	$2n + m$	$[n + (m + 1)]$	$[n + (m + 1)]$
8 The one-basic carboxylic acids and difficult aethers	$2n + m$	$[n + (m + 2)]$	$[n + (m + 2)]$
9. The one-basic unsaturated carboxylic acids, dialdehydes and diketones	$2n + m$	$[n + (m + 3)]$	$[n + (m + 1)]$
10. More unsaturated carboxylic acids	$2n + m$	$[n + (m + 4)]$	$n + m$
11. The bibasic carboxylic acids	$2n + m$	$[n + (m + 5)]$	$[n + (m + 3)]$
12. The bibasic unsaturated carboxylic acids	$2n + m$	$[n + (m + 6)]$	$[n + (m + 2)]$
13. Monoxycarboxylic acids	$2n + m$	$[n + (m + 3)]$	$[n + (m + 3)]$
14. Unsaturated aldehydes and ketones	$2n + m$	$[n + (m + 2)]$	$n + m$
15. Aldehyde ketone acids	$2n + m$	$[n + (m + 4)]$	$[n + (m + 2)]$
16. Aromatic aldehydes and ketones	$2n + m$	$[n + (m + 5)]$	$[n + (m - 3)]$
17. Aromatic alcohols	$2n + m$	$[n + (m + 4)]$	$[n + (m - 2)]$
18. Amines	$5n + m$	$[3n + (m - 3)]$	$[3n + (m + 3)]$
19. Amino acids and nitroalkanes	$5n + m$	$[3n + (m + 3)]$	$[3n + (m + 5)]$
20. Amides acids	$5n + m$	$[3n + (m + 1)]$	$[3n + (m + 3)]$
21. Diaminocarbon acids	$5n + m$	$[3n + (m + 2)]$	$[3n + (m + 6)]$
22. Aminodicarbon acids	$5n + m$	$[3n + (m + 9)]$	$[3n + (m + 7)]$
23 Hydroxy-amino acids	$5n + m$	$[3n + (m + 5)]$	$[3n + (m + 7)]$

The value table (n) and (m) the first representative of "chemical algorithm" homologues the basic class of organic connections

The basic classes of organic connections	The general formula of main classes of organic connections	The formula homologues the first representative	The value of numbers (n) And (m)
1. . . Limiting hydrocarbons	$C_n H_{2n+2}$	$C H_4$	n = 1 m = 2
2. Cycloparaffins and numbers ethylene hydrocarbons	$C_n H_{2n}$	$C_2 H_4$	n = 2 m = 2
3. . Numbers diene and acetylene hydrocarbons	$C_n H_{2n-2}$	$C_2 H_2$	n = 2 m = 1
4. Aromatic hydrocarbons	$C_n H_{2n-6}$	$C_6 H_6$	n = 6 m = 3
5. One-nuclear alcohols and simple aethers	$C_n H_{2n+2} O$	$C H_4 O$	n = 1 m = 1
6 Two-nuclear alcohols	$C_n H_{2n+2} O_2$	$C_2 H_6 O_2$	n = 2 m = 1
7. . Aldehydes, ketones and unsaturated alcohols	$C_n H_{2n} O$	$C H_2 O$	n = 1 m = 0
8. The one-basic carboxylic carboxylic acids and difficult aethers	$C_n H_{2n} O_2$	$C H_2 O_2$	n = 1 m = -1
9. The one-basic unsaturated carboxylic acids, dialdehydes and diketones	$C_n H_{2n-2} O_2$	$C_3 H_4 O_2$	n = 3 m = 0
10 More unsaturated carboxylic acids	$C_n H_{2n-4} O_2$	$C_4 H_4 O_2$	n = 4 m = 0
11. The bitasic carboxylic acids	$C_n H_{2n-2} O_4$	$C_2 H_2 O_4$	n = 2 m = -3
12. The bibasic unsaturated carboxylic acids	$C_n H_{2n-4} O_4$	$C_4 H_4 O_4$	n = 4 m = -2
13. . Monoxicarboxylic acids	$C_n H_{2n} O_3$	$C_3 H_4 O_3$	n = 2 m = -1
14. Unsaturated aldehydes and ketones	$C_n H_{2n-2} O$	$C_3 H_4 O$	n = 3 m = 1
15. Aldehyde ketone acids	$C_n H_{2n-2} O_3$	$C_2 H_2 O_3$	n = 2 m = -2
16. Aromatic aldehydes and ketones	$C_n H_{2n-8} O$	$C_7 H_6 O$	n = 7 m = 2
17. Aromatic alcohols	$C_n H_{2n-6} O$	$C_7 H_8 O$	n = 7 m = 3
18. Amines	$C_n H_{2n+3} N$	$C H_3 N$	n = 1 m = 4
19. Amino acids and nitroalkanes	$C_n H_{2n+1} N O_2$	$C H_3 N O_2$	n = 1 m = -2
20. Ампы acids	$C_n H_{2n+1} N O$	$C H_3 N O$	n = 1 m = 0
21. Diaminocarbon acids	$C_n H_{2n+2} N_2 O_2$	$C_2 H_6 N_2 O_2$	n = 2 m = 0
22. Aminodicarbon acids	$C_n H_{2n-1} N O_4$	$C_3 H_5 N O_4$	n = 3 m = -6
23. . Hydroxy-amino acids	$C_n H_{2n+1} N O_3$	$C_3 H_7 N O_3$	n = 3 m = -2

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## Contents

Prospects of algorithmization of chemical reactions .....	3
The basic concepts and rules of "chemical algorithms» .....	9
Saturated hydrocarbons .....	13
Cycloparaffins and a number ethylene hydrocarbons .....	19
A number diene and acetylene hydrocarbons .....	23
Aromatic hydrocarbons .....	27
Monohydric alcohols and simple aethers .....	32
Dihydric alcohols .....	36
Aldehydes, ketones and unsaturated alcohols .....	39
The monobasic carboxylic acids and difficult aethers .....	43
The nonsaturated monobasic carboxylic acids, dialdehydes and diketones .....	47
More unsaturated carboxylic acids .....	50
The bibasic carboxylic acids .....	53
The unsaturated bibasic carboxylic acids .....	57
Monoxycarboxylic acids .....	61
Unsaturated aldehydes and ketones .....	65
Aldehyde and ketone acids .....	68
Aromatic aldehydes and ketones .....	72
Aromatic alcohols .....	74
Primary, secondary and tertiary amines .....	77
Amino acids and nitroalkanes .....	79
Amides of acids .....	82
Diaminocarbon acids .....	85
Aminodicarbon acids .....	88
Hydroxy-amino acids .....	91
«Chemical algorithms» organic connections with functional group .....	94
The mathematical analysis of "chemical algorithms" .....	96
Bibliography .....	101

O'ZBEKISTON RESPUBLIKASI XALQ TA'LIMI VAZIRLIGI

SURXONDARYO VILOYAT PEDAGOG KADRLARNI QAYTA  
TAYYORLASH VA MALAKASINI OSHIRISH INSTITUTI

Xolmurod Egamberdiev

# KIMYOVIY ALGORITMLARNING NAZARIY ASOSLARI

(Ilmiy metodik qo'llanma)

TOSHKENT-2011

Ushbu ilmiy- uslubiy qo'llanmada organik kimyo fanida birinchi marta "kimyoviy algoritm", "indeks-ifoda", "izchillik koeffisienti" va "koeffisient qiymati ifodasi" kabi tushunchalarni tatbiq etishga harakat qilingan.

Mazkur tushunchalar asosida ma'lum bir sinfga kiradigan umumiy formula bilan ifodalanadigan organik moddalar gomologlari vakillarining yonish reaksiya tenglamalarini tuzish va koeffisientlar qo'yib tenglashtirishning bir necha variantlari keltirilgan. Shuningdek, qo'llanmada "Kimyoviy reaksiyalarda moddalar massalari miqdorlarining ma'lum bir izchillikda o'zgarib, ortib yoki kamayib borishi" qonuni asoslab berilgan.

Muallif tomonidan ishlab chiqilgan "kimyoviy algoritm"larga oid qoidalar ham kimyo fanini qiziqib o'rganuvchi o'quvchilarni befarq qoldirmaydi. Qo'llanma maktab o'quvchilari, talabalar, o'qituvchilar va tadqiqotchi-kimyogarlarga mo'ljallab yozilgan.

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## KIMYOVIY REAKSIYALARNI ALGORITMLASHNING ISTIQBOLLARI

Mustaqillikning dastlabki yillaridanoq amaliy ishlarga keng yo'l ochib berildi hamda bu borada mamlakatimizda kimyo fani va sanoatini rivojlantirishda ulkan yutuqlar qo'lga kiritila boshladi. Buxoro neftni qayta ishlash zavodining ishga tushirilishi, Farg'onadagi neftni qayta ishlash zavodining rekonstruksiya qilinishi, Sho'rtangaz kimyo majmuasining qurib foydalanishga topshirilishi, shuningdek, bugungi kunda zamonaviy texnologiyalar bilan jihozlangan Zarafshon va Olmaliqdagi kon metallurgiya zavodlari yoki yaqin yillarda qurib foydalanishga topshirilgan Qoraqalpog'iston Respublikasidagi Qo'ng'iro't soda zavodida ishlab chiqarilayotgan jahon standartlariga to'la javob bera oladigan eksportbop kimyoviy mahsulotlar mamlakatimiz iqtisodiyotini yuksaltirishda o'zining munosib hissasini qo'shmoqda.

Mamlakatimizda kimyo sanoatining rivojlanishi kimyoviy ta'limni rivojlantirish bilan chambarchas va uzviy bog'liq. Negaki, o'sib kelayotgan yoshlarimiz orasidan shu sohaning yetuk mutaxassislarini tayyorlash ham ustuvor vazifalardan biri sifatida belgilangan.

Xususan, 2004-2009-yillarga mo'ljallangan maktab ta'limini rivojlantirishning Davlat umummilliy dasturiga muvofiq bugungi kunga kelib akademik litseylar, kasb-hunar kollejlari tabiiy fanlarning o'qitilishi uchun yaratilayotgan beqiyos imkoniyatlar yoki Respublikamizdagi deyarli barcha umunta'lim maktablarining kimyo - biologiya, fizika o'quv xonalarining xalqaro talablar darajasida qayta qurilishi va laboratoriya xonalarining zamonaviy asboblari, uskunalari va reaktivlari bilan ta'minlanishi ham bu sohaga alohida e'tibor berilayotganligiga dalolatdir.

XXI asrga kelib ta'limning turli bo'g'inlarida (maktablar, akademik litseylar, kasb - hunar kollejlari va oliy o'quv yurtlari) kimyoviy ta'limni takomillashtirishni hayotning o'zi taqozo etmoqda.

Chunonchi, hozirgi zamon odami qanday kasbni egallamasin, minglab turdagi tabiiy, sun'iy va sintetik usullarda olingan oziq - ovqat, dori - darmon, kiyim - kechak va sanoat mahsulotlaridan keng foydalanadi. Bundan tashqari qishloq xo'jaligi, qurilish yoki xalq xo'jaligining kerakli zaruriy, ehtiyojbop mahsulotlari ham bugungi kun zamonaviy kimyoviy ishlab chiqarishning mahsulidir. Mazkur mahsulotlarning kimyoviy tarkibi va xossalari har bir kishining bilishi, ulardan to'g'ri, oqilona va tejab foydalana olishlari uchun ham juda zarurdir.

Shu sababli bugungi yosh avlodga maktab partasidayoq dastlabki kimyoviy bilim va tushunchalar puxtaroq o'rgatilishi lozim. Shuningdek, zamonaviy yosh kimyogarning kimyoviy jarayonlarni teranroq anglashlari uchun ham fizik, ham matematik bilimlar, qonunlar va qonuniyatlarni chuqurroq bilishlari hamda amalda tatbiq eta olishlari ayni muddaodir.

Prezidentimiz Islom Abdug'aniyevich Karimov ta'kidlaganlaridek: «Muhammad Muso Xorazmiyning o'nlik sanoq s'istemasini, algoritm va algebra tushunchalarini dunyoda birinchi bo'lib ilm-fan sohasida joriy etgani va shu asosda



aniq fanlar rivoji uchun o'z vaqtida mustahkam asos yaratgan umuminsoniy taraqqiyot rivojida qanday katta ahamiyatga ega bo'lganini barchamiz yaxshi bilamiz»<sup>4</sup>. Mazkur ilmiy-uslubiy qo'llanmada "algoritm" tushunchasini "kimyoviy algoritim" tushunchasi sifatida talqin etishga harakat qilingan. Muallifning "kimyoviy algoritim"larga oid dastlabki ilmiy ishlanmalari Toshkentda 2008 yil 28-aprel- 4-may kunlari 42-Mendelev olimpiadasi munosabati bilan o'tkazilgan "Maktab kimyo ta'limining dolzarb muammolari" mavzusidagi xalqaro konferensiya materiallari to'plamiga maqola sifatida kiritilgan. Shuningdek, mazkur ilmiy va metodik ishlanmaning to'ldirilgan va qayta ishlangan mukammalroq variantlari "Uchitel Uzbekist'ana" (№41, 10.10.2008- yil) "Surxon Ziyosi" (№ 10-11, 2008 yil) sahifalarida e'lon qilingan.

Kimyoning hozirgi zamondagi eng muhim vazifasi - oldindan belgilangan xossalni moddalar olish va sanoat ishlab chiqarishini jadallashtirishdan, chiqindisiz texnologiyalarni yaratishdan iborat. Uning yana bir muhim vazifasi - kimyoviy o'zgarishlar energiyasidan foydalanishdir. Bugungi kunda nanotexnologiyalar sohasida erishilayotgan yutuqlar fikrimizga yorqin misoldir. Kimyoni ajoyib o'zgarishlar industriyasi deyish mumkin. U tabiatda bo'lmaydigan materiallarni sintez qilishga, ulardan turli-tuman mashina va asboblarni yaratish uchun, turar-joy binolari qurish va xalq iste'moli mollari ishlab chiqarish uchun foydalanishga imkon berdi. Sintetik kauchuklar, plastmassalar, sun'iy tolalar, sun'iy yoqilg'ilar, bo'yoqlar, dori-darmonlar, tibbiyotda muvaffaqiyat bilan qo'llanilayotgan biopolimerlar va insoniyat uchun zarur bo'lgan boshqa juda ko'plab moddalar kimyo sanoatining asosiy mahsulotlaridir. Kimyoning imkoniyatlari bitmas-tuganmasdir. Faqat neftning o'zidan 20 mingdan ortiq, toshko'mirdan esa bundan ham ko'poq organik moddalarni olish mumkin. Sanoatda hozirgi vaqtda 500 mingga yaqin (asosan organik) moddalar ishlatilmoqda. Umuman olganda, odamzod foydalanayotgan mahsulotlarning 97 % i kimyoviy ishlab chiqarish jarayoni mahsulidir.

Demak, zamonaviy kimyo fani va sanoati insoniyat hayoti va faoliyatining hamma sohalarini qamrab oldi, desak to'g'riroq bo'ladi. Organik kimyo faniga oid o'quv qo'llanmalari, ilmiy va ilmiy-ommabop adabiyotlarda keltirilishicha, har kuni jahondagi turli mamlakatlarning ilmiy - tadqiqot institutlari laboratoriyalarida yuzlab turdagi organik moddalar hosil qilinmoqda.

Ayrim ma'lumotlarga qaraganda, ularning soni 38 millionga yetgan. Zamonaviy kimyoning uch sohasi-kinetika, stereokimyo va kritmalar to'g'risidagi ta'limotning asoschisi, dunyoda birinchi Nobel mukofotining sohibi gollandiyalik mashhur kimyogar Yakob Genrix Vant- Goff Janubiy Gollandiya provinsiyasining Delfte oliy politexnika maktabiga 1869 yilda kirish imtihonlarini topshiradi. Shunda imtihon oluvchi professorning "Organik sintez qaergacha borib qolishi mumkin" degan savoliga o'n etti yashar maktab bitiruvchisi "Hujayragacha" deb javob beradi.

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<sup>4</sup> Islom Karimov «Yuksak ma'naviyat –yengilmas kuch» T.: « Ma'naviyat », 2008. 41-bet.

Darhaqiqat, ulug' olim bashorat qilganidek bugungi kunga kelib, zamonaviy organik kimyo fani sohasida erishilgan yutuqlar tufayli, tirik organizmlar hujayrasida kechayotgan kimyoviy jarayonlarni yanada chuqurroq o'rganish imkoniyatlari paydo bo'ldi.

XX asrning oxiri, XXI asrning boshlariga kelib DNK kodi tuzilishining kashf qilinishi, tirik organizmlarni "klonlash" borasida amalga oshirilgan ishlar, haqiqatan ham so'nggi yillarda organik kimyo fani sohasida erishilgan yutuqlar tufaylidir.

Organik kimyodagi muhim bilim va tushunchalardan biri yonish reaksiya tenglamalaridir. Organik kimyo kimyoviy ta'limning qaysi bo'g'inida o'qitilishidan qat'i - nazar kimyoni o'rganuvchilar har qanday organik modda yonish xususiyati bilan noorganik moddalardan farqlanishini yaxshi anglaydilar. Maktab, kasb-hunar kollejlari, akademik litseylar yoki oliy o'quv yurtlari uchun mo'ljallab yozilgan organik kimyo darsliklarida organik birikmalarning ma'lum bir sinfi gomologlari vakillarining fizikaviy va kimyoviy xossalari to'g'risidagi bilimlar batafsil yoritilgan bo'lsada, ularning yonish reaksiya tenglamalarini tuzish va tenglashtirishga oid tushunchalar deyarli o'z aksini topmagan.

Tahlillar shuni ko'rsatadiki, keyingi yillarda nashr qilingan darslik va o'quv qo'llanmalarida turli sinflarga mansub organik moddalar gomologlari vakillarining umumiy yonish reaksiya tenglamalari keltirilgan. Yoki ayrim kimyoviy ta'limga oid jurnallarda jumladan, "Ximiya v shkole" 2008 (№ 11), yoki G.P. Xomchenkoning; ("Kimyo" oliy o'quv yurtlariga kiruvchilar uchun (T.: "O'qituvchi", 2007, 427-bet) o'quv qo'llanmasida:  $C_nH_{2n+2} + (1.5n + 0.5)O_2 \rightarrow nCO_2 + (n+1)H_2O$  professorlar N.E.Kuzmenko va V.I.Tereninlarda (Ximiya-2005 "Vstupitelniye ekzameni v MGU", M., .2005.67-bet),  $C_nH_{2n+1}CHO + (\frac{3n+2}{2})O_2 \rightarrow (n+1)CO_2 + (n+1)H_2O$

hamda O.S.Gabrielyan va boshqalarning ( Ximiya. 10 klass. "Drofa", M., 2005. 74-bet)  $C_nH_{2n+2} + (\frac{3n+1}{2})O_2 \rightarrow nCO_2 + (n+1)H_2O$  o'quv qo'llanmalarida keltirilgan umumiy tenglamalar va mazkur tenglamalardagi kasr sonlar yonish reaksiya tenglamalari uchun koeffitsientlar tanlash va aniqlashni ancha murakkablashtiradi.

Muallif tomonidan ishlab chiqilgan ushbu ilmiy-uslubiy ishlanmada esa, turli sinflarga mansub organik moddalarning yonish reaksiya tenglamalari "kimyoviy algoritmlari" matematik qonuniatlarga batamom mos keladi.

Ilmiy ishlanmada organik moddalarning yonish reaksiya tenglamalarini tuzish va koeffitsientlar qo'yib tenglashtirish qandaydir mavhumlikka emas, balki aniq matematik qonuniatlarga bo'ysunishi asoslab berilgan. Faqat "matematik algoritmlar" emas, balki "kimyoviy algoritmlar" ham kimyo fanida mavjud ekanligi o'z tasdig'ini topgan.

Avvalo, muallif tomonidan organik kimyo fanida birinchi marta "kimyoviy algoritmlar", "indeks-ifoda", "ketma-ketlik" yoki "izchillik koeffitsienti", hamda "koeffitsient qiymati ifodasi" kabi tushunchalarni tatbiq etishga harakat qilingan.

Ya'ni muallif organik moddalardagi vodorod ( $H$ ) atomlari sonini ko'rsatuvchi kattalikni "indeks-ifoda" deb nomlagan. Ushbu "indeks-ifoda"larning qiymatlari  $2n$ ,  $2n + m$ ,  $2n - m$  bo'lishi mumkinligini tasdiqlagan holda, ana shu kattaliklarning qisman yoki aynan takrorlanishi orqali, yonish reaksiyalari tenglamalari qatorida asosiy reaksiya mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suv  $H_2O$  uchun koefitsientlar qiymatlarini aniqlovchi sonlar hosil bo'ladi, deb hisoblaydi. Muallif "izchillik koefitsienti" iborasini tatbiq qilish orqali esa organik moddalarning ma'lum bir sinfiga kiruvchi kiruvchi gomologlari vakillarining yonish reaksiyalari tenglamalari qatorida reaksiyaga kirishgan va hosil bo'lgan moddalar koefitsient qiymatlarining yoki massalari miqdorlarining ma'lum bir izchillikda o'zgarib, ortib borishini aniqlagan. Ushbu qonuniyatlardan kelib chiqib, algoritm-bu ma'lum bir izchillikda bajariladigan matematik amallar tartibidir deb izohlar ekan, "kimyoviy algoritm" tushunchasiga alohida ta'rif berishga harakat qilgan.

Shuningdek, qo'llanmada molekulasi tarkibi faqat uglerod, vodorod yoki uglerod, vodorod va kisloroddan iborat bo'lgan organik moddalarning yonish reaksiya tenglamalari qatorida "izchillik koefitsienti" ( $2n/n$ ) yoki (2) qiymatlariga ega ekanligi aniqlangan. Organik moddalarning qaysi sinfiga kirishidan qat'i-nazar, molekulasi shunday tarkibli organik moddalar gomologlari vakillari yonish reaksiya tenglamalari qatorida kislorodning koefitsient qiymati (3) birlikka, asosiy yonish reaksiya mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suvning  $H_2O$  koefitsient qiymatlari esa (2) birlikka ortib yoki kamayib borishi asoslab berilgan.

Molekulasi tarkibida uglerod, vodorod, azot yoki uglerod, vodorod, azot va kislorod tutgan organik moddalarning yonish reaksiya tenglamalari qatorida "izchillik koefitsienti" ( $4n/n$ ) yoki (4) qiymatlarga teng bo'lganda reaksiyaning asosiy ishtirokchisi kislorodning koefitsient qiymati (6) birlikka, asosiy reaksiya mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suvning  $H_2O$  koefitsient qiymatlari esa (4) birlikka ortib yoki kamayib borishi misollar asosida izohlangan.

Muallif musbat va manfiy sonlarga oid algebraik tushunchalardan foydalanib, "kimyoviy algoritmlar"ning turli variantlarini ishlab chiqishga harakat qilgan. Jumladan, to'yingan uglevodorodlarda  $n = 1$  bo'lganda  $m = 2$  ga, aldegidlarda  $n = 1$  bo'lganda  $m = 0$  ga, bir asosli karbon kislotalarda  $n = 1$  bo'lganda  $m = -1$  ga yoki aldegido va ketoni kislotalarda  $n = 2$  bo'lganda,  $m = -2$  ga tengligi va shu kabi qonuniyatlar boshqa "kimyoviy algoritmlar" misolida ham asoslangan.

Demak, "kimyoviy algoritmlar"ning turli variantlarini ishlab chiqishda musbat va manfiy sonlarga oid algebraik tushunchalardan samarali foydalanish mumkinligi ham ko'rsatib berilgan.

Ma'lumki, organik moddalardan chumoli aldegidi  $H-CHO$  va ushbu formula  $H-COOH$  bilan ifodalanadigan chumoli kislotasida  $-CHO$  yoki  $-COOH$  funksional guruhlar faqat vodorod ( $H$ ) atomlari bilan bog'langan, ya'ni mazkur moddalarda ( $CH_2$ ) radikalining qiymati (0) ga teng. Muallif tomonidan ishlab chiqilgan "kimyoviy algoritmlar" ham mazkur moddalarda ( $CH_2$ ) radikalining aynan (0) ga tengligini yana bir bor tasdiqlaydi.

Muallif izlanish va tadqiqotlarini davom ettirar ekan, mashhur rus olimi M. V. Lomonosov tomonidan kashf etilgan “Kimyoviy reaksiyaga kirishgan moddalarning massasi reaksiya natijasida hosil bo’lgan moddalarning massasiga tengligiga” doir klassik qonunining yonish reaksiyalari tenglamalari qatorida mazkur moddalar massalari miqdorlarining ma’lum bir izchillikda o’zgarib, ortib yoki kamayib borishi bilan bog’liq tahlillari ham e’tiborga loyiqdir. Ya’ni muallif qo’llanmaning “Kimyoviy algoritmlarning matematik tahlillari” mavzusida o’z xulosalarini shunday izohlaydi.

Yonish reaksiyalari tenglamalari qatorida molekulasi tarkibida uglerod, vodorod yoki uglerod, vodorod va kislorod tutgan hamda izchillik koeffisienti  $2n/n$  bo’lgan birikmalarda dastlabki organik moddaning massasi 28 a.m.b.<sup>5</sup> ga, reaksiyaning asosiy ishtirokchisi kislorod  $O_2$  massasi 96 a.m.b. ga va asosiy reaksiya mahsulotlari karbonat anhidridning  $CO_2$  massasi 88 a.m.b. ga hamda suvning  $H_2O$  massasi esa 36 a.m.b. qiymatiga proporsional ravishda ortib yoki kamayib boradi.

Shuningdek, yonish reaksiyalari tenglamalari qatorida molekulasi tarkibida uglerod, vodorod, azot yoki uglerod, vodorod, azot va kislorod tutgan hamda izchillik koeffisienti  $4n/n$  bo’lgan birikmalarda dastlabki organik moddaning massasi 56 a.m.b ga reaksiyaning asosiy ishtirokchisi kislorodning  $O_2$  massasi 192 a.m.b ga, va reaksiyaning asosiy mahsulotlari karbonat anhidridning  $CO_2$  massasi 176 a.m.b ga hamda suvning  $H_2O$  massasi esa 72 a.m.b. gi qiymatiga proporsional ravishda ortib yoki kamayib boradi. Muallif ushbu natijalar asosida “reaksiyaga kirishgan moddalarning massasi reaksiya natijasida hosil bo’lgan moddalarning massasiga tengligiga” doir kimyo fani klassik qonunining mantiqiy davomi sifatida “Yonish reaksiyalari tenglamalari qatorida reaksiyaga kirishgan va hosil bo’lgan moddalar massalarining miqdorlari ma’lum bir izchillikda o’zgarib, ortib yoki kamayib borish” qonunini “Kimyoviy reaksiyalarda moddalar massalari miqdorlarining ma’lum bir izchillikda o’zgarib, ortib yoki kamayib borish” qonuni deb ta’riflashni maqsadga muvofiq deb hisoblaydi.

Qo’llanmaga ilova qilingan (1- ilova) kislorod  $O_2$ , karbonat anhidrid  $CO_2$  va suvning  $H_2O$  koeffisient qiymati ifodalari jadvali ham kimyoviy algoritmlarni o’rganuvchilarning (n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog’liqlik ma’lum bir izchillikda o’zgarib borishini yaxshiroq tushunib olishlariga yaqindan yordam beradi. 2-ilovada “kimyoviy algoritmlar”ning organik moddalar gomologlarining dastlabki vakili uchun keltirilgan (n) va (m) qiymatlari jadvali II, III, IV variantlari uchun reaksiya tenglamalarini tuzish va koeffisientlar tanlab, tenglashtirishni osonlashtiradi.

Mamlakatimizda kimyo sanoati jadal rivojlanayotgan bir paytda “kimyoviy algoritmlar”larga oid tushunchalarning o’quv qo’llanmalari yoki darsliklarga kiritilishi uning kimyo fani va ta’limini rivojlantirishdagi nufuzini yanada

<sup>5</sup> a.m.b – atom massa birligi.

oshirishga xizmat qiladi.

“Kimyoviy algoritmlar”ga oid tushunchalarning maktab, akademik lisey, kasb-hunar kollejlari va oliy o’quv yurtlari darsliklariga kiritilishi tufayli kimyoni o’rganuvchilar kimyoviy jarayonlar qandaydir mavhumlikka emas, balki aniq matematik qonuniyatlarga asoslanishini teranroq anglaydilar. Bizning fikrimizcha, “kimyoviy algoritmlar” organik kimyo fanida shu yo’nalishdagi dastlabki ilmiy ishlanmalar bo’lib hisoblanadi va mazkur ilmiy ishlanmalar fanlarning turli sohalarida (termokimyo, biokimyo, polimerlar kimyosi, molekulyar biologiya va boshqalar) kimyoviy reaksiyalarni algoritmizatsion yangi-yangi ufqlarini ochadi. Bundan tashqari, muallif tomonidan ishlab chiqilgan “kimyoviy algoritmlar”ga oid qoidalari organik kimyo fanining nafaqat ilmiy-uslubiy, balki nazariy masalalarini hal qilishda ham muhim rol o’ynaydi, desak haqiqatga yaqinroq bo’ladi.

Bugungi kunda organik kimyo fani shiddat bilan rivojlanayotgan bir paytda zamonaviy matematik bilimlarni puxta o’zlashtirgan mamlakatimizning iqtidorli yosh kimyogarlari “kimyoviy algoritmlar”larni chuqurroq o’rganishga kirishadilar va uning yangi-yangi qirralarini topishga harakat qiladilar deb ishonch bildiramiz.

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Isroil Ismoilov – kimyo fanlari doktori, Nizomiy nomidagi Toshkent davlat pedagogika universiteti professori

## KIMYOVIY ALGORITMLARNING ASOSIY TUSHUNCHALARI VA QOIDALARI

Barcha fundamental fanlarda tabiat qonunlarini yozish uchun matematik abstraksiya va modellardan doimo samarali foydalanib kelingan. Bizning asrimizga kelib, kompyuter va hisoblash texnikasi insoniyat hayotining hamma qirralariga tobora shiddat bilan kirib kelayotganligi ham matematik qonuniyatlar tabiiy fanlar, xususan, kimyo fani uchun muhim ahamiyat kasb etmoqda. Shuning uchun bugungi zamonaviy kimyogar matematik modellar va qonuniyatlarni mukammal bilishi, uni kimyoviy jarayonlarni chuqurroq va kengroq tasavvur qilishlari uchun amalda tathiq qila olish ko’nikmalariga ega bo’lishi lozim. Ayniqsa, yonish reaksiya tenglamalari uchun koefitsientlar tanlab, tenglashtirishda matematik algoritmning qulay imkoniyatlari mavjud.

**Algoritmlar** – bu ma’lum bir izchillikda bajariladigan matematik amallar tartibidir. Ma’lumki, organik moddalarni kislorodda yonishining asosiy mahsulotlari karbonat anhidrid va suv ekanligini yaxshi bilamiz.

Yonish reaksiya tenglamalaridagi dastlabki organik moddalar molekulasini

tarkibidagi asosiy elementlardan biri vodorod atomlari sonini bildiruvchi "indeks-ifoda"lar ( $2n+2$ ,  $2n-2$ ,  $2n$ ,  $2n-6$  va hokazo) yonish reaksiya tenglamalarining asosiy mahsulotlari bo'lgan karbonat angidrid va suv  $H_2O$  uchun koeffitsientlar qiymatlarini aniqlovchi sonlar bo'lib hisoblanadi.

Demak, "matematik algoritim" tushunchasini "kimyoviy algoritim" tushunchasiga almashtirib, organik moddalarning yonish reaksiya tenglamalarini tuzish va koeffitsientlar qo'yib tenglashtirish uchun qo'llaniladigan algoritimlarni "kimyoviy algoritim"lar tushunchasi sifatida qabul qilish maqsadga muvofiqdir.

**Kimyoviy algoritim** – bu kimyoviy reaksiya tenglamalarini tuzish va koeffitsientlar qo'yib tenglashtirish uchun qo'llaniladigan va ma'lum bir izchillikda bajariladigan matematik amallar tartibidir.

Molekulasi tarkibi faqat uglerod va vodorod yoki uglerod, vodorod va kisloroddan iborat bo'lgan organik birikmalarda vodorod atomlari sonini ko'rsatuvchi "indeks-ifoda"ning qiymati  $2n$  bo'lganda barcha yonish reaksiya tenglamalarining asosiy mahsulotlari karbonat angidrid  $CO_2$  va suv  $H_2O$  uchun ham koeffitsientlar qiymati ( $2n$ ) "indeks-ifoda"ning qiymatiga teng bo'ladi.

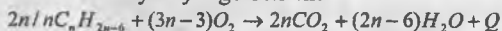
Molekulasi tarkibidagi vodorod atomlari sonini ko'rsatuvchi "indeks-ifoda"lari o'zgaruvchan bo'lgan organik moddalarda, shuningdek, alkanlar  $C_nH_{2n+2}$ , asetilen va dien  $C_nH_{2n-2}$ , aromatik  $C_nH_{2n-6}$ , to'yinmagan bir asosli karbon kislotalar va aldegidlar  $C_nH_{2n-2}O_2$ ,  $C_nH_{2n-2}O$ , ikki asosli karbon kislotalar  $C_nH_{2n-2}O_4$  va boshqalarda, asosiy yonish reaksiya mahsulotlaridan biri bo'lgan karbonat angidridning  $CO_2$  koeffitsient qiymati dastlabki organik modda tarkibidagi uglerod atomlari soni bilan izchillik koeffitsienti qiymati ko'paytmasiga teng bo'lgan holda, suvning  $H_2O$  koeffitsient qiymatlari esa, dastlabki organik modda indeks-ifodalarning qiymatlariga, ya'ni  $2n+2$  (alkanlarda),  $2n-2$  (asetilen va dien),  $2n-6$  (aromatik),  $2n-2$  ga (to'yinmagan karbon kislota va aldegidlar) teng bo'ladi.

Organik moddalarning boshqa sinf vakillarining yonish reaksiya tenglamalarida ham ana shunday qonuniyat kuzatiladi.

Tarkibida azot saqlovchi hamda vodorodning "indeks-ifodasi" ( $2n+3$ ) bo'lgan aminlarda  $-C_nH_{2n+3}N$ , shuningdek, molekulasi tarkibida C, H, O, N tutgan organik moddalarda vodorodlar sonini bildiruvchi, ya'ni "indeks-ifodasi" ( $2n+1$ ) ga teng bo'lgan nitroalkanlar va aminokislotalar  $-C_nH_{2n+1}NO_2$ , kislota amidlari  $-C_nH_{2n+1}NO$ , oksiaminokislotalar  $-C_nH_{2n+1}NO_3$ , "indeks-ifoda"si ( $2n+2$ ) bo'lgan diaminokarbon kislotalar  $-C_nH_{2n+2}N_2O_2$  va "indeks-ifoda"si ( $2n-1$ ) bo'lgan aminodikarbon kislotalarda  $-C_nH_{2n-1}NO$ , yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri bo'lgan karbonat angidridning  $CO_2$  koeffitsient qiymati dastlabki organik modda tarkibidagi uglerod atomlari soni bilan izchillik koeffitsienti qiymati ko'paytmasiga teng bo'lgan holda, suvning  $H_2O$  koeffitsient qiymati esa, organik modda indeks-ifodasining ikki karra nisbati qiymatiga, ya'ni

$4n+6$  (aminlarda),  $4n+2$  (nitroalkanlar, aminokislotalar, kislota amidlari, oksiaminokislotalar),  $4n+4$  (diaminokarbon kislotalar),  $4n-2$  (aminodikarbon kislotalarda) qiymatlariga teng bo'ladi.

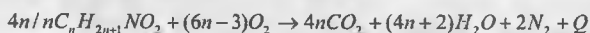
Molekulasi tarkibida C, H yoki C, H, O atomlaridan iborat bo'lgan har qanday organik moddalarning yonish reaksiya tenglamalari "kimyoviy algoritmi"ni ikki xil ko'rinishda, masalan, aromatik uglevodorodlar vakillarining reaksiya tenglamalari "kimyoviy algoritmi"ni:



yoki  $2C_nH_{2n-6} + (3n-3)O_2 \rightarrow 2nCO_2 + (2n-6)H_2O + Q$  ko'rinishda ifodalash mumkin. Bunda dastlabki organik moddaning koeffitsient qiymatini bildiruvchi ( $2n/n$ ) yoki (2) kattaligi algoritmik amallarning ketma-ketlik va izchillikda bajarilishini ta'minlaydi va bu kattalikni "kimyoviy algoritmi"larning "izchillik koeffitsienti" deb ham qabul qilish maqsadga muvofiqdir.

Shuningdek, yonish reaksiya tenglamalari "kimyoviy algoritmi"larida kislorodning koeffitsient qiymati ham ma'lum bir qonuniyat asosida ortib boradi. Ya'ni, ma'lum bir sinfga kiruvchi organik moddalar vakillari gomologlarining yonish reaksiyalari tenglamalari qatorida ( $C H_2$ ) radikalga o'zgarib borishi bilan, unga proporsional ravishda kislorodning koeffitsient qiymatini bildiruvchi sonlar ham (3) birlikka, yonish reaksiya tenglamalarining asosiy mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suvning  $H_2O$  koeffitsientlar qiymatlari esa (2) birlikka ortib boradi.

Masalan, benzolning  $C_6H_6$  yonish reaksiya tenglamasida kislorodning koeffitsient qiymati  $3n-3=3*6-3=18-3=15$  ga teng bo'lsa, u holda, toluol  $C_7H_8$  da  $3n-3=3*7-3=18$  ga teng bo'ladi. Molekulasi tarkibida C, H, N yoki C, H, N, O atomlarini tutgan organik moddalarning yonish reaksiya tenglamalari "kimyoviy algoritmi"ni ham nitroalkanlar misolida:



yoki  $4C_nH_{2n+1}NO_2 + (6n-3)O_2 \rightarrow 4nCO_2 + (4n+2)H_2O + 2N_2 + Q$  bilan ifodalash mumkin. Bunda ham dastlabki organik modda koeffitsient qiymatini bildiruvchi ( $4n/n$ ) yoki (4) kattaligi dastlabki organik moddaning koeffitsient qiymati bo'lib hisoblanadi va yonish reaksiya tenglamalari qatorida algoritmik amallar bajarilishining ketma-ketligini ta'minlaydi. Mazkur toifaga kiruvchi organik moddalar vakillarining gomologlari yonish reaksiya tenglamalari qatorida ( $C H_2$ ) radikalga o'zgarib borishi bilan unga proporsional ravishda kislorodning koeffitsient qiymati ham (6) birlikka, yonish reaksiya tenglamalarinig asosiy mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suv  $H_2O$  uchun koeffitsientlar qiymati esa (4) birlikka ortib boradi. Masalan, nitrometanning  $CH_3NO_2$  yonish reaksiya tenglamasida kislorodning koeffitsient qiymati  $6n-3=6*1-3=3$  ga teng bo'lsa, nitroetanda  $C_2H_5NO_2$  kislorodning koeffitsient qiymati  $6n-3=6*2-3=9$  teng

\*6 Yulduzcha bilan kopaytiruv belgisi ifodalangan.

bo'lgan holda, nitropropanda  $C_3H_7NO_2$ :  $6n-3=6*3-3=15$  ga teng bo'ladi.

Umuman, aksariyat organik moddalarning sifat va miqdoriy tarkibini ko'rsatuvchi umumiy formula bilan ifodalanadigan ma'lum bir sinfga kiruvchi organik moddalar gomologlari vakillari yonish reaksiya tenglamalari kimyoviy algoritmlarida organik modda molekulasida tarkibidagi vodorod atomlari sonini bildiruvchi "indeks-ifoda"larning qisman yoki aynan takrorlanishidan yonish reaksiya tenglamalarining asosiy mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suv  $H_2O$  uchun koeffitsient qiymatlari hosil bo'ladi. Demak, "kimyoviy algoritmlar" yaxlit bilimlar tizimi bo'lib, uning tarkibiga quyidagi tushuncha va qoidalarni kiritish mumkin:

1. Har qanday organik modda tarkibidagi vodorod atomlari sonini ko'rsatuvchi kattalik "indeks-ifoda" deb ataladi.

2. Organik moddalarning qaysi sinfga kirishidan qat'i nazar, har qanday organik modda tarkibidagi vodorod atomlari sonini ko'rsatuvchi "indeks-ifoda"ning qiymati ( $2n$ ,  $2n+m$ ,  $2n-m$ ) bo'lishi mumkin.

3. Algoritmik amallarning ketma-ketlik yoki izchilligini ta'minlovchi ( $2n/n$ ) (2), ( $4n/n$ ) yoki (4) qiymatlari dastlabki organik moddaning koeffitsient qiymati bo'lib hisoblanadi va "kimyoviy algoritmlar"ning ketma-ketlik yoki izchillik koeffitsienti deb ataladi.

4. Yonish reaksiyalari tenglamalari qatorida ketma-ketlik yoki izchillik koeffitsienti ( $2n/n$ ) yoki (2) qiymatga teng bo'lganda, organik moddalar gomologlari vakillari ( $CH_2$ ) radikalga o'zgarib borishi bilan, unga proporsional ravishda reaksiyaning asosiy ishtirokchisi kislorodning ( $O_2$ ) koeffitsienti qiymati (3) birlikka, reaksiyaning asosiy mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suvning  $H_2O$  koeffitsient qiymatlari esa (2) birlikka ortib yoki kamayib boradi.

5. Yonish reaksiyalari tenglamalari qatorida ketma-ketlik, yoki izchillik koeffitsienti ( $4n/n$ ) yoki (4) qiymatga teng bo'lganda, organik moddalar gomologlari vakillari ( $CH_2$ ) radikalga o'zgarib borishi bilan, unga proporsional ravishda reaksiyaning asosiy ishtirokchisi kislorodning koeffitsient qiymati (6) birlikka, reaksiyaning asosiy mahsulotlari bo'lgan karbonat anhidrid  $CO_2$  va suvning  $H_2O$  koeffitsient qiymatlari esa (4) birlikka ortib yoki kamayib boradi.

6. Yonish reaksiyalari tenglamalari qatorida "kimyoviy algoritmlar"ning ketma-ketlik yoki izchillik koeffitsienti ( $2n/n$ ) yoki (2) qiymatga teng bo'lganda, yonish reaksiya tenglamalarining asosiy mahsulotlari bo'lgan karbonat anhidridning  $CO_2$  koeffitsient qiymati dastlabki organik modda



tarkibidagi uglerod atomlari soni bilan izchillik koeffisienti qiymati ko'paytmasiga, suvning  $H_2O$  koeffisient qiymati esa dastlabki organik modda "indeks-ifodasi"ning qiymatiga teng bo'ladi.

7. Yonish reaksiyalari tenglamalari qatorida "kimyoviy algoritmlar"ning ketma-ketlik yoki izchillik koeffisienti  $(4n/n)$  yoki  $(4)$  qiymatga teng bo'lganda, yonish reaksiya tenglamalarining asosiy mahsulotlari bo'lgan karbonat anhidridning  $CO_2$  koeffisient qiymati dastlabki organik modda tarkibidagi uglerod atomlari soni bilan izchillik koeffisienti qiymati ko'paytmasiga, suvning  $H_2O$  koeffisient qiymati esa, dastlabki organik modda "indeks- ifodasi"ning ikki baravar qiymatiga teng bo'ladi.

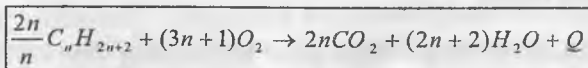
Tadqiqotlar shuni ko'rsatadiki, kimyoviy algoritmlarning turli shakllari mavjud bo'lib, ular uchun umumiy bo'lgan quydagi qoidani ham tatbiq etish maqsadga muvofiqdir.

Yonish reaksiyalari tenglamalari qatorida yonish reaksiya tenglamalarining asosiy mahsulotlari bo'lgan karbonat anhidridning  $CO_2$  koeffisient qiymati dastlabki organik modda tarkibidagi uglerod atomlari soni bilan "izchillik koeffisienti" qiymati ko'paytmasiga, suvning  $H_2O$  koeffisient qiymati ham dastlabki organik modda indeks ifodasi qiymatiga azotli organik birikmalarda esa, dastlabki organik modda "indeks - ifodasi" qiymatining ikki baravariga teng bo'ladi.

Qo'llanmada dastlab to'yingan uglevodorodlar gomologlari vakillarining yonish reaksiya tenglamalariga doir kimyoviy algoritmlar keltirilgan

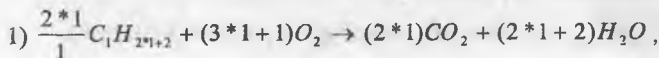
## TO'YINGAN UGLEVODORODLAR

To'yingan uglevodorodlar tabiatda keng tarqalgan bo'lib, ular odatda, sof holda emas, balki murakkab aralashmalar holda uchraydi. Ularning eng asosiy manbalari neft va tabiiy gaz bo'lib hisoblanadi. Bu sinf vakillarining ko'pgina aralashmalari o'simliklarda ham topilgan. Masalan, normal heptan  $C_7H_{16}$  qarag'ay daraxtidan ajratib olingan. Eykozan  $C_{20}H_{42}$  petrushka bargida, nonakozan  $C_{29}H_{60}$  karam bargida topilgan. To'yingan uglevodorodlar gomologlari vakillarining umumiy formulasi  $C_nH_{2n+2}$  ekanligini bilgan holda, ularning yonish reaksiya tenglamalari kimyoviy algoritmini ushbu ko'rinishda ifodalash mumkin:

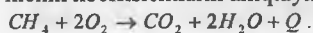


Yuqorida keltirilgan algoritmdan foydalanib, metanning yonish reaksiya tenglamasi quydagicha tuziladi.

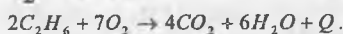
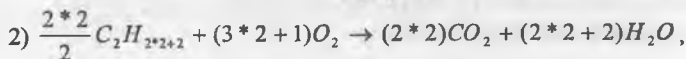
Metanning kislorodda yonishi:  $C_1H_4$



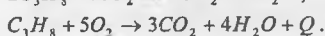
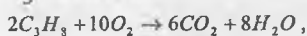
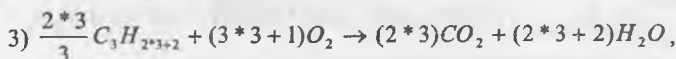
Tenglamani chap va o'ng tomonini bir xil songa qisqartirib, kichik koeffitsientlarni aniqlaymiz.



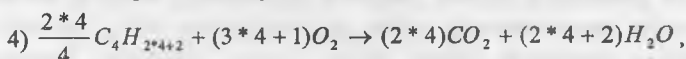
Etanning kislorodda yonishi:  $C_2H_6$



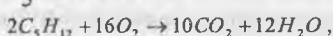
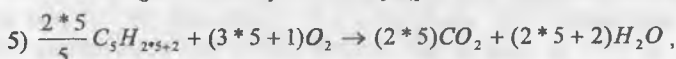
Propanning kislorodda yonishi:  $C_3H_8$



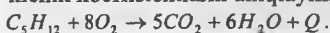
Butanning kislorodda yonishi:  $C_4H_{10}$



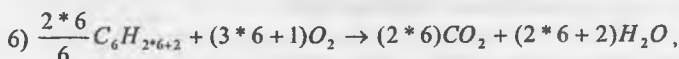
Pentanning kislorodda yonishi:  $C_5H_{12}$



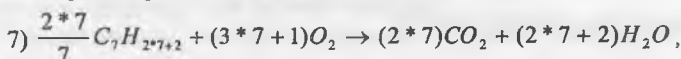
Tenglamani chap va o'ng tomonini bir xil songa qisqartirib, kichik koeffitsientlarni aniqlaymiz.



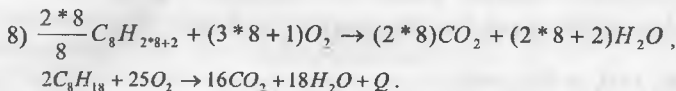
Geksanning kislorodda yonishi:  $C_6H_{14}$



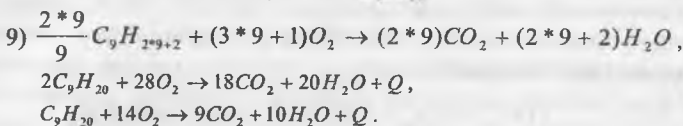
Geptanning kislorodda yonishi:  $C_7H_{16}$



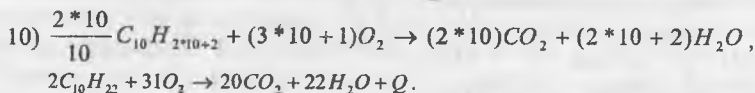
Oktanning kislorodda yonishi:  $C_8H_{18}$



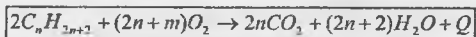
Nonanning kislorodda yonishi:  $C_9H_{20}$



Dekanning kislorodda yonishi:  $C_{10}H_{22}$



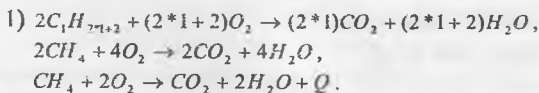
Bu sinf gomologlari vakillari kimyoviy algoritmining ushbu II variantida yonish reaksiya tenglamalarining asosiy ishtirokchilaridan biri - kislorod  $O_2$  moddasi uchun koeffisient qiymati ifodasi  $(2n+m)$  keltirilgan. Shuningdek koeffisientlar tanlab tenglashtirishda  $(n)$  va  $(m)$  sonlaridan foydalanilgan va ular orasidagi ketma-ketlikdagi bog'liqlik ko'rsatib berilgan. Bunda  $(n)$  va  $(m)$  qiymatlari bitta birlikka farq qiladi, ya'ni  $n = 1$  bo'lganda,  $m = 2$  yoki  $n = 5$  bo'lganda,  $m = 6$  ga teng bo'ladi. Demak,  $(n)$  va  $(m)$  qiymatlarning o'zaro nisbatlari proporsional ravishda  $(1)$  birlikka farq qilib, o'zgarib borishi kuzatiladi. Mazkur kimyoviy algoritm quydagicha ifodalanadi:

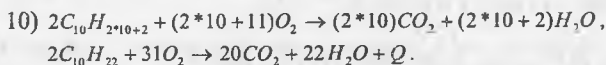
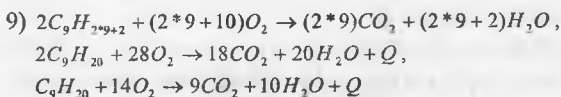
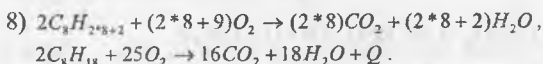
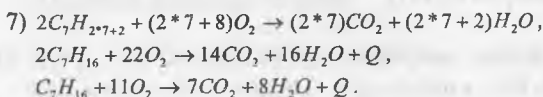
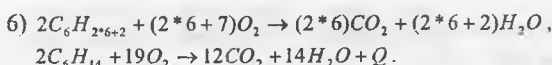
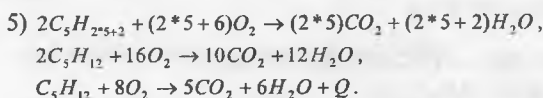
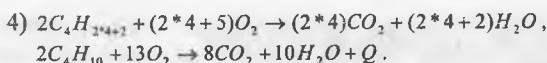
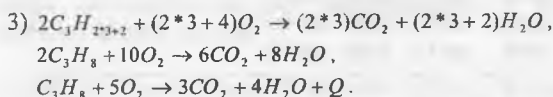
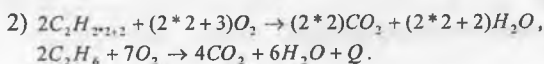


$(n)$  va  $(m)$  qiymatlari orasidagi bog'liqlik:

$$\begin{array}{llll} n=1; & m=2; & n=4; & m=5; & n=7; & m=8; \\ n=2; & m=3; & n=5; & m=6; & n=8; & m=9; \\ n=3; & m=4; & n=6; & m=7; & n=9; & m=10; \end{array}$$

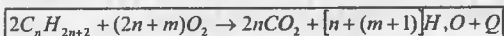
Algoritmik amallarga misollar:





Kimyoviy algoritmlarning III variantida yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri - suv  $H_2O$  uchun (n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik ko'rsatib berilgan.

Bunda suvning koeffitsient qiymatini aniqlovchi ifoda ushbu ko'rinishda bo'ladi:  $[n+(m+1)]$

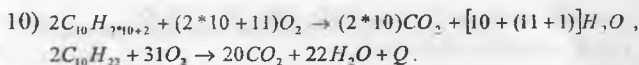


(n) va (m) qiymatlari orasidagi bog'liqlik:

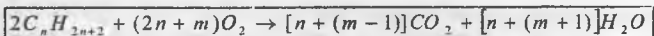
$$\begin{aligned} n=1; m=2; & n=4; m=5; & n=7; m=8; \\ n=2; m=3; & n=5; m=6; & n=8; m=9; \\ n=3; m=4; & n=6; m=7; & n=9; m=10; \end{aligned}$$

Algoritmik amallarga misollar:

- 1)  $2C_1H_{2*1+2} + (2*1+2)O_2 \rightarrow (2*1)CO_2 + [1+(2+1)]H_2O$ ,  
 $2CH_4 + 4O_2 \rightarrow 2CO_2 + 4H_2O$ ,  
 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Q$ .
- 2)  $2C_2H_{2*2+2} + (2*2+3)O_2 \rightarrow (2*2)CO_2 + [2+(3+1)]H_2O$ ,  
 $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O + Q$ .
- 3)  $2C_3H_{2*3+2} + (2*3+4)O_2 \rightarrow (2*3)CO_2 + [3+(4+1)]H_2O$ ,  
 $2C_3H_8 + 10O_2 \rightarrow 6CO_2 + 8H_2O$ ,  
 $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O + Q$ .
- 4)  $2C_4H_{2*4+2} + (2*4+5)O_2 \rightarrow (2*4)CO_2 + [4+(5+1)]H_2O$ ,  
 $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O + Q$ .
- 5)  $2C_5H_{2*5+2} + (2*5+6)O_2 \rightarrow (2*5)CO_2 + [5+(6+1)]H_2O$ ,  
 $2C_5H_{12} + 16O_2 \rightarrow 10CO_2 + 12H_2O$ ,  
 $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O + Q$ .
- 6)  $2C_6H_{2*6+2} + (2*6+7)O_2 \rightarrow (2*6)CO_2 + [6+(7+1)]H_2O$ ,  
 $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O + Q$ .
- 7)  $2C_7H_{2*7+2} + (2*7+8)O_2 \rightarrow (2*7)CO_2 + [7+(8+1)]H_2O$ ,  
 $2C_7H_{16} + 22O_2 \rightarrow 14CO_2 + 16H_2O + Q$ ,  
 $C_7H_{16} + 11O_2 \rightarrow 7CO_2 + 8H_2O + Q$ .
- 8)  $2C_8H_{2*8+2} + (2*8+9)O_2 \rightarrow (2*8)CO_2 + [8+(9+1)]H_2O$ ,  
 $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O + Q$ .
- 9)  $2C_9H_{2*9+2} + (2*9+10)O_2 \rightarrow (2*9)CO_2 + [9+(10+1)]H_2O$ ,  
 $2C_9H_{20} + 28O_2 \rightarrow 18CO_2 + 20H_2O + Q$ ,  
 $C_9H_{20} + 14O_2 \rightarrow 9CO_2 + 10H_2O + Q$ .



Ushbu sinf vakillari kimyoviy algoritmlarining IV variantini ushbu ko'rinishda bo'ladi:



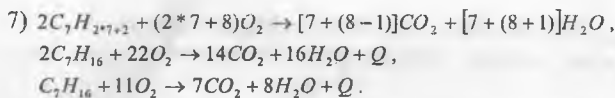
Yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri - karbonat anhidrid  $CO_2$  uchun koeffitsientlar qiymati ifodasini quydagicha ifodalaymiz:  
 $[n + (m - 1)]$

(n) va (m) qiymatlari orasidagi bog'liqlik:

$$\begin{aligned} n=1; m=2; & \quad n=4; m=5; & \quad n=7; m=8; \\ n=2; m=3; & \quad n=5; m=6; & \quad n=8; m=9; \\ n=3; m=4; & \quad n=6; m=7; & \quad n=9; m=10; \end{aligned}$$

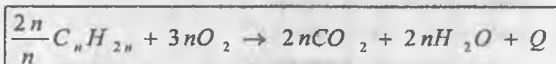
Algoritmik amallarga misollar:

- 1)  $2C_1H_{2 \cdot 1 + 2} + (2 \cdot 1 + 2)O_2 \rightarrow [1 + (2 - 1)]CO_2 + [1 + (2 + 1)]H_2O,$   
 $2CH_4 + 4O_2 \rightarrow 2CO_2 + 4H_2O,$   
 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Q.$
- 2)  $2C_2H_{2 \cdot 2 + 2} + (2 \cdot 2 + 3)O_2 \rightarrow [2 + (3 - 1)]CO_2 + [2 + (3 + 1)]H_2O$   
 $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O + Q$
- 3)  $2C_3H_{2 \cdot 3 + 2} + (2 \cdot 3 + 4)O_2 \rightarrow [3 + (4 - 1)]CO_2 + [3 + (4 + 1)]H_2O$   
 $2C_3H_8 + 10O_2 \rightarrow 6CO_2 + 8H_2O,$   
 $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O + Q.$
- 4)  $2C_4H_{2 \cdot 4 + 2} + (2 \cdot 4 + 5)O_2 \rightarrow [4 + (5 - 1)]CO_2 + [4 + (5 + 1)]H_2O,$   
 $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O.$
- 5)  $2C_5H_{2 \cdot 5 + 2} + (2 \cdot 5 + 6)O_2 \rightarrow [5 + (6 - 1)]CO_2 + [5 + (6 + 1)]H_2O,$   
 $2C_5H_{12} + 16O_2 \rightarrow 10CO_2 + 12H_2O,$   
 $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O + Q.$
- 6)  $2C_6H_{2 \cdot 6 + 2} + (2 \cdot 6 + 7)O_2 \rightarrow [6 + (7 - 1)]CO_2 + [6 + (7 + 1)]H_2O,$   
 $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O + Q.$

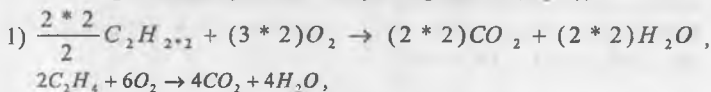


## SIKLOPARAFINLAR VA ETILEN QATORI UGLEVDORODLAR

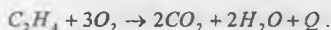
Molekulasida uglerod atomlari soni tegishli to'yingan uglevodorodlardagi kabi, ammo vodorod atomlarining soni kam va turli birikish reaksiyalariga to'yingan birikmalarga nisbatan oson kirishadigan uglevodorodlar etilen qatori yoki to'yingan uglevodorodlardir. Etilen qatori hamda molekulasining tuzilishi halqadan yoki boshqacha qilib aytganda, sikldan iborat bo'lgan, ya'ni sikloparafinlar gomologlari vakillarining umumiy formulasi ham ushbu ko'rinishda  $C_nH_{2n}$  ifodalanadi. Demak, sikloparafinlar va etilen qatori uglevodorodlar gomologlari vakillarining yonish reaksiya tenglamalarini kimyoviy algoritmi quydagicha bo'ladi:



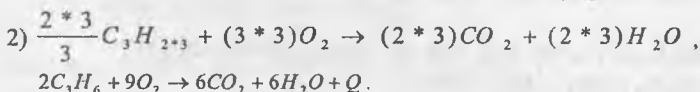
Etenning kisloroda yonish reaksiya tenglamasi:  $(C_2H_4)$



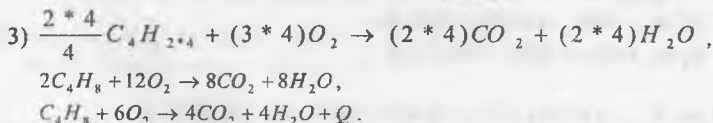
Tenglamaning chap va o'ng tomonini bir xil songa qisqartirib, kichik koeffitsientlarni aniqlaymiz:



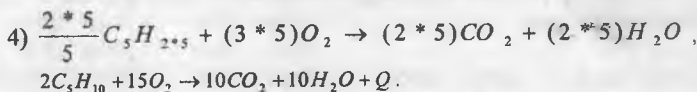
Propenning kisloroda yonish reaksiya tenglamasi:  $C_3H_6$



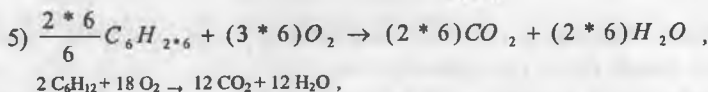
Butenning yonish reaksiya tenglamasi:  $C_4H_8$



Pentening yonish reaksiya tenglamasi:  $C_5H_{10}$



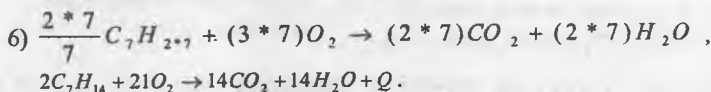
Geksening yonish reaksiya tenglamasi:  $C_6H_{12}$



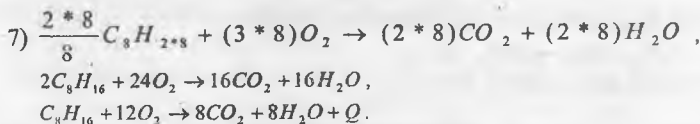
Kichik koeffisientlar aniqlanadi:



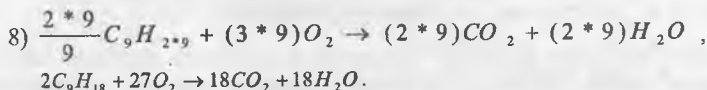
Geptening yonish reaksiya tenglamasi:  $C_7H_{14}$



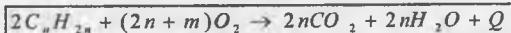
Oktenning yonish reaksiya tenglamasi:  $C_8H_{16}$



Nonening yonish reaksiya tenglamasi:  $C_9H_{18}$



Kimyoviy algoritmlarning ushbu II variantida yonish reaksiya tenglamalarining asosiy ishtirokchilaridan biri kislorod  $O_2$  maddasi uchun koeffisientlar tanlab tenglashtirishda (n) va (m) qiymatlaridan foydalanilgan hamda ular orasidagi ketma-ketlikdagi bog'liqlik ko'rsatib berilgan. Mazkur sinflar gomologlari vakillarining yonish reaksiya tenglamalari kimyoviy algoritmining II varianti ushbu ko'rinishda ifodalanadi:



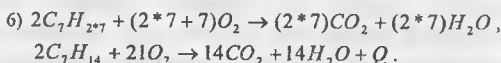
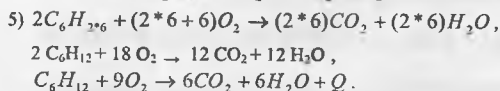
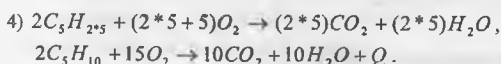
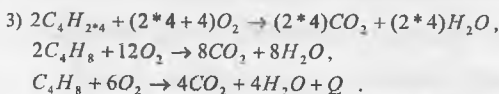
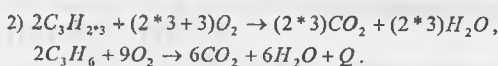
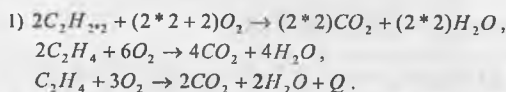


(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik quydagi jadvalda keltirilgan:

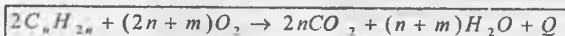
n=2;	m=2;	n=5;	m=5;
n=3;	m=3;	n=6;	m=6;
n=4;	m=4;	n=7;	m=7;

Bunda kislorodning  $O_2$  - koeffitsient qiymati ifodasi quydagicha ifodalanadi  $(2n + m)$  hamda (n) va (m) qiymatlari hech qanday farq qilmaydi, ya'ni  $n = 2$  bo'lganda,  $m = 2$  ga yoki  $n = 5$  bo'lganda,  $m = 5$  ga teng bo'ladi. Demak, (n) va (m) qiymatlarining o'zaro nisbatlari ana shunday tartibda o'zgarib boradi.

Algoritmik amallarga misollar:



Yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri- suvning  $H_2O$  koeffitsient qiymati ifodasi  $(n + m)$  va III variant kimyoviy algoritmi:



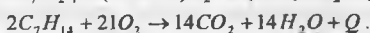
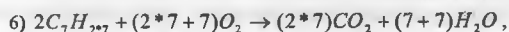
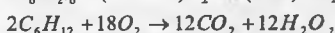
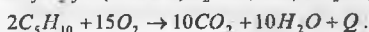
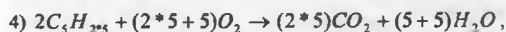
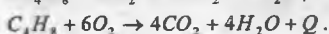
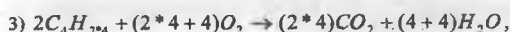
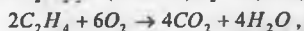
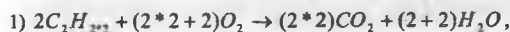
(n) va (m) qiymatlari orasidagi bog'liqlik:

$$n=2; m=2; \quad n=5; m=5;$$

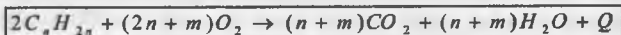
$$n=3; m=3; \quad n=6; m=6;$$

$$n=4; m=4; \quad n=7; m=7;$$

Algoritmik amallarga misollar:



Yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koeffisient qiymati ifodasi  $(n+m)$  va IV variant kimyoviy algoritmi:



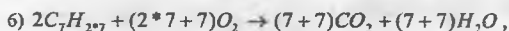
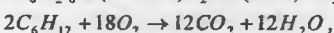
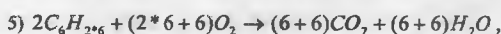
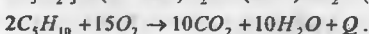
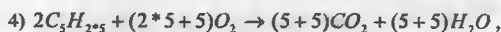
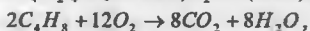
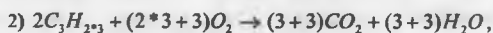
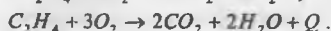
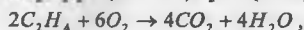
(n) va (m) qiymatlari orasidagi bog'liqlik:

$$n=2; m=2; \quad n=5; m=5;$$

$$n=3; m=3; \quad n=6; m=6;$$

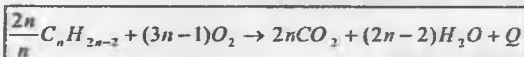
$$n=4; m=4; \quad n=7; m=7;$$

Algoritmik amallarga misollar:

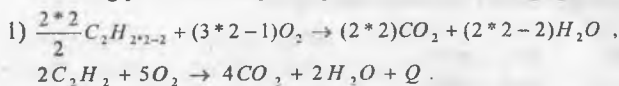


## DIEN VA ASETILEN QATORI UGLEVODORODLAR

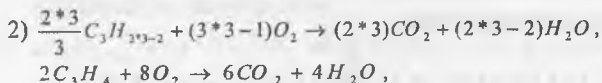
Molekulasida ikkita qo'shbog' bor to'yinmagan qator uglevodorodlari dien uglevodorodlar deyiladi. Asetilen qatori gomologlari vakillari molekulasida esa uchlamchi bog' bo'ladi. Ammo har ikkala sinf gomologlari vakillari uchun ushbu umumiy formuladan  $C_nH_{2n-2}$  foydalaniladi. Asetilen qatori va dien uglevodorodlarning tipik vakillari etin, propin, butin, pentin yoki butadien-1.3, pentadien-1.4 kabi ko'pgina birikmalarining xossalari organik kimyoda keng o'rganiladi va sanoatda xilma-xil maqsadlar uchun ishlatiladi. Masalan, asetilen - kislorod gazlari aralashmasi metallarni qirqish va payvandlashda ishlatilsa, butadien-1.3 sintetik kauchuk olish uchun asosiy xomashyo bo'lib hisoblanadi. Mazkur sinflar gomologlari vakillarining yonish reaksiya tenglamalarining kimyoviy algoritmini quydagicha ifodalaymiz:



Etinning yonish reaksiya tenglamasini tuzamiz:  $C_2H_2$



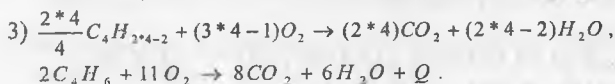
Propinning yonish reaksiya tenglamasini tuzamiz:  $C_3H_4$



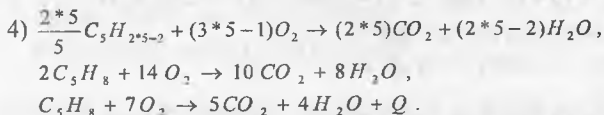
Ushbu reaksiya uchun kichik koeffisientlar topiladi.



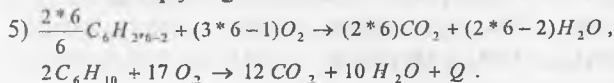
Butinning yonish reaksiya tenglamasini tuzamiz:  $C_4H_6$



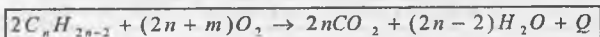
Pentinning yonish reaksiya tenglamasini tuzamiz:  $C_5H_8$



Geksinning  $C_6H_{10}$  yonish reaksiya tenglamasi uchun koeffisientlar quyidagicha tanlanadi:



Mazkur sinflar gomologlari vakillari yonish reaksiya tenglamalari kimyoviy algoritmining II varianti ushbu ko'rinishda ifodalanadi:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik proporsional ravishda (1) birlikka o'zgarib boradi. Bunda kislorodning  $O_2$  koeffisient qiymati ifodasi ushbu  $(2n + m)$  ko'rinishda bo'ladi.

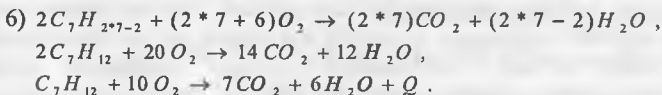
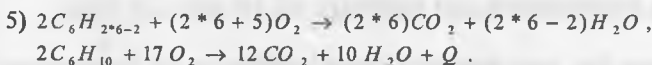
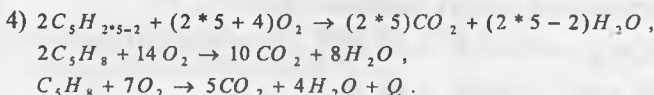
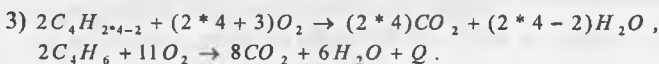
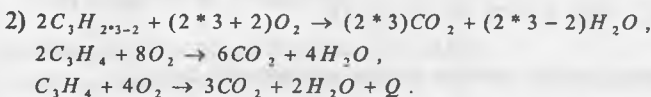
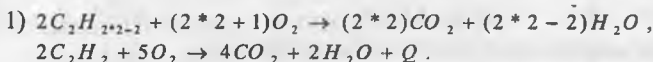
(n) va (m) qiymatlari orasidagi bog'liqlik:

$$n=2; m=1; \quad n=5; m=4;$$

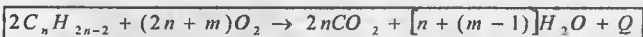
$$n=3; m=2; \quad n=6; m=5;$$

$$n=4; m=3; \quad n=7; m=6;$$

Algoritmik amallarga misollar:



Bu sinflar gomologlari vakillari yonish reaksiya tenglamalari kimyoviy algoritmining III varianti quydagicha ifodalanadi:

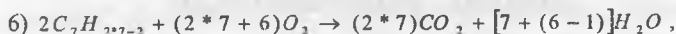
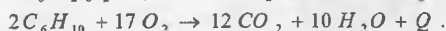
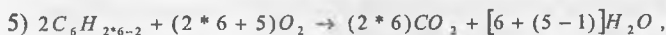
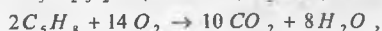
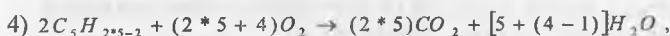
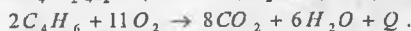
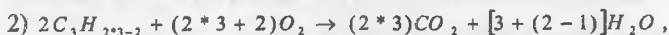
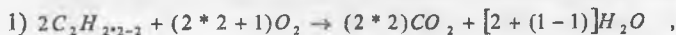


Suvning  $H_2O$  koeffitsient qiymati ushbu  $[n + (m - 1)]$  ifoda bilan aniqlanadi.

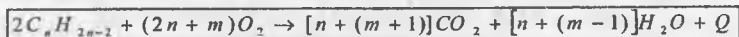
(n) va (m) qiymatlari jadvali:

n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

Algoritmik amallarga misollar:



Dien va asetilen qatori uglevodorodlar gomologlari vakillari yonish reaksiya tenglamalarining IV varianti uchun karbonat angidridning  $CO_2$  koeffitsient qiymati ifodasini  $[n + (m + 1)]$  ko'rishda yozib, ushbu kimyoviy algoritmdan foydalanamiz.



(n) va (m) qiymatlari jadvali:

n=2;	m=1;	n=5;	m=4;
n=3;	m=2;	n=6;	m=5;
n=4;	m=3;	n=7;	m=6;

Algoritmik amallarga misollar:

- 1)  $2C_2H_{2 \cdot 2 - 2} + (2 \cdot 2 + 1)O_2 \rightarrow [2 + (1 + 1)]CO_2 + [2 + (1 - 1)]H_2O$  ,  
 $2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O + Q$  .
- 2)  $2C_3H_{2 \cdot 3 - 2} + (2 \cdot 3 + 2)O_2 \rightarrow [3 + (2 + 1)]CO_2 + [3 + (2 - 1)]H_2O$  ,  
 $2C_3H_4 + 8O_2 \rightarrow 6CO_2 + 4H_2O$  ,  
 $C_3H_4 + 4O_2 \rightarrow 3CO_2 + 2H_2O + Q$  .
- 3)  $2C_4H_{2 \cdot 4 - 2} + (2 \cdot 4 + 3)O_2 \rightarrow [4 + (3 + 1)]CO_2 + [4 + (3 - 1)]H_2O$  ,  
 $2C_4H_6 + 11O_2 \rightarrow 8CO_2 + 6H_2O + Q$  .
- 4)  $2C_5H_{2 \cdot 5 - 2} + (2 \cdot 5 + 4)O_2 \rightarrow [5 + (4 + 1)]CO_2 + [5 + (4 - 1)]H_2O$  ,  
 $2C_5H_8 + 14O_2 \rightarrow 10CO_2 + 8H_2O$  ,  
 $C_5H_8 + 7O_2 \rightarrow 5CO_2 + 4H_2O + Q$  .
- 5)  $2C_6H_{2 \cdot 6 - 2} + (2 \cdot 6 + 5)O_2 \rightarrow [6 + (5 + 1)]CO_2 + [6 + (5 - 1)]H_2O$  ,  
 $2C_6H_{10} + 17O_2 \rightarrow 12CO_2 + 10H_2O + Q$  .
- 6)  $2C_7H_{2 \cdot 7 - 2} + (2 \cdot 7 + 6)O_2 \rightarrow [7 + (6 + 1)]CO_2 + [7 + (6 - 1)]H_2O$  ,  
 $2C_7H_{12} + 20O_2 \rightarrow 14CO_2 + 12H_2O$  ,  
 $C_7H_{12} + 10O_2 \rightarrow 7CO_2 + 6H_2O + Q$  .

### AROMATIK UGLEVODORODLAR

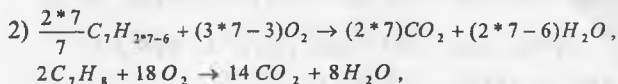
Aromatik uglevodorodlar gomologlari vakillarining umumiy formulasini ushbu ko'rinishda  $C_nH_{2n-6}$  yozish mumkin. Benzol aromatik uglevodorodlarning eng oddiy vakilidir. Uning birinchi gomologi metil benzol, ya'ni toluoldir  $C_7H_8$ . Boshqa ba'zi hosilalari kabi toluolning ham izomeri yo'q. Benzol yoki uning hosilalari uchun yonish reaksiya tenglamalari kimyoviy algoritmi shunday ifodalanadi:

$$\frac{2n}{n}C_nH_{2n-6} + (3n - 3)O_2 \rightarrow 2nCO_2 + (2n - 6)H_2O + Q$$

Benzolning  $C_6H_6$  yonish reaksiya tenglamasi quyidagicha tuziladi:

- 1)  $\frac{2 \cdot 6}{6}C_6H_{2 \cdot 6 - 6} + (3 \cdot 6 - 3)O_2 \rightarrow (2 \cdot 6)CO_2 + (2 \cdot 6 - 6)H_2O$  ,  
 $2C_6H_6 + 15O_2 \rightarrow 12CO_2 + 6H_2O + Q$  .

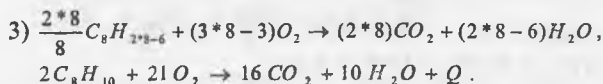
Toluolning kislorodda yonishi:  $C_7H_8$



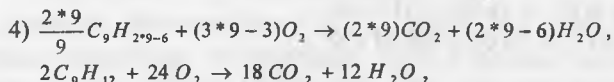
Kichik koeffitsientlar aniqlanadi:



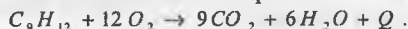
Ksilolning  $C_8H_{10}$  yonish reaksiya tenglamasi quyidagicha tuziladi:



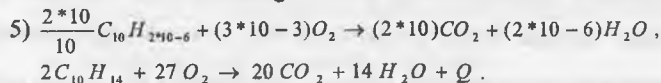
Trimetil benzolning kislorodda yonishi:  $C_9H_{12}$



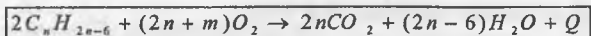
Kichik koeffitsientlar aniqlanadi:



Yana bitta misol keltirilgan.



Aromatik uglevodorodlar  $C_nH_{2n-6}$ , benzol yoki uning hosilalari uchun yonish reaksiya tenglamalari kimyoviy algoritmining II varianti shunday ifodalanadi:



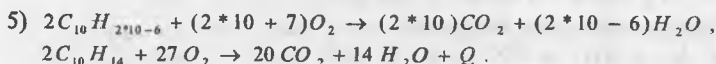
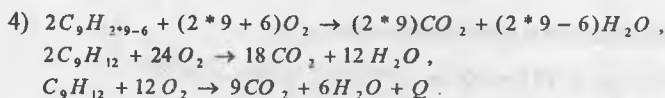
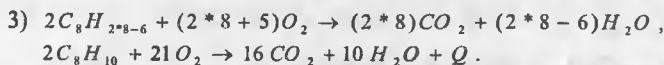
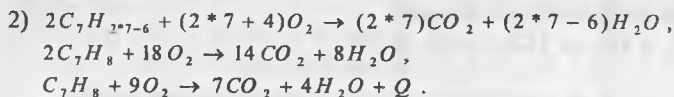
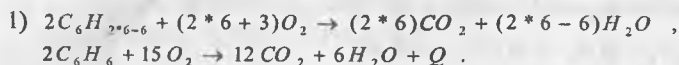
Aromatik uglevodorodlar gomologlari vakillari uchun ushbu II variantda yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorod  $O_2$  uchun koeffitsientlar tanlashda ushbu ifodadan  $(2n+m)$  foydalaniladi.

(n) va (m) qiymatlari jadvali:

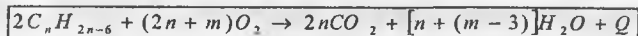
n=6;	m=3;	n=10;	m=7;
n=7;	m=4;	n=11;	m=8;
n=8;	m=5;	n=12;	m=9;
n=9;	m=6;	n=13;	m=10;



Algoritmik amallarga misollar:



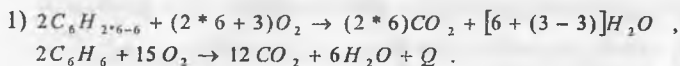
Yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri - suv  $H_2O$  uchun koeffitsient qiymati ifodasi  $[n + (m - 3)]$  bo'lsa, aromatik uglevodorodlar  $C_nH_{2n-6}$ , benzol yoki uning hosilalari kimyoviy algoritmining III varianti ushbu ko'rinishda yoziladi:

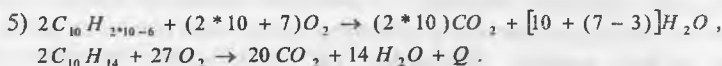
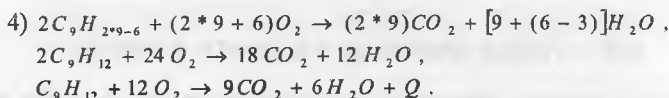
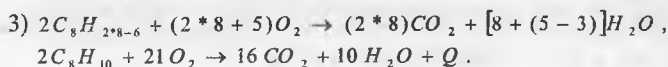
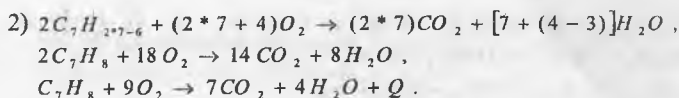


(n) va (m) qiymatlari orasidagi bog'liqlik:

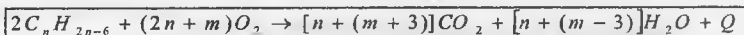
n=6;	m=3;	n=10;	m=7;
n=7;	m=4;	n=11;	m=8;
n=8;	m=5;	n=12;	m=9;
n=9;	m=6;	n=13;	m=10;

Algoritmik amallarga misollar:





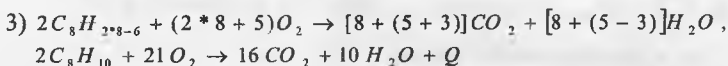
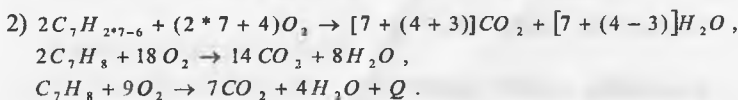
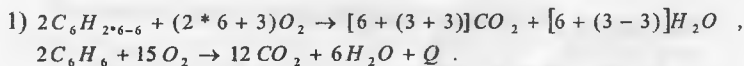
Aromatik uglevodorodlar  $C_nH_{2n-6}$ , benzol yoki uning hosilalari uchun karbonat anhidridning  $CO_2$  koeffisient qiymati ifodasini  $[n + (m + 3)]$  shaklida yozsak, yonish reaksiya tenglamalari kimyoviy algoritmining IV variantn quydagicha bo'ladi:

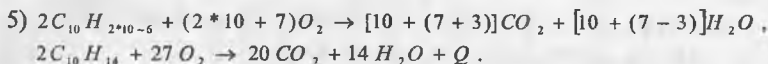
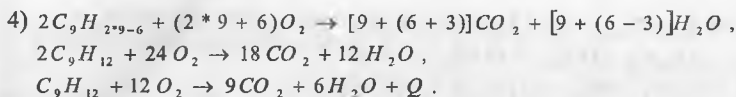


(n) va (m) qiymatlari orasidagi bog'liqlik:

n=6;	m=3;	n=10;	m=7;
n=7;	m=4;	n=11;	m=8;
n=8;	m=5;	n=12;	m=9;
n=9;	m=6;	n=13;	m=10;

Algoritmik amallarga misollar:

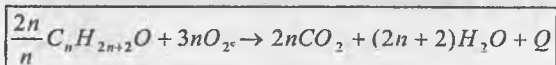




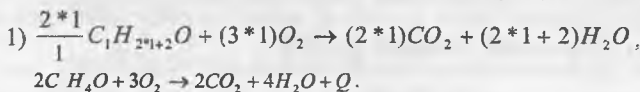
## BIR ATOMLI SPIRTLAR VA ODDIY EFIRLAR

Molekulasi tarkibida uglevodorod radikallaridagi bir yoki bir necha vodord atomlarining gidroksil guruhlarga almashingan birikmalar spirtlar deyiladi. Molekulasi tarkibidagi gidroksil guruhlarning soniga qarab ular bir atomli va ko'p atomli bo'lishi mumkin. Shuningdek, bir atomli spirtlar va oddiy efirlar gomologlari vakillari ushbu  $C_nH_{2n+2}O$  umumiy formula bilan ifodalanadi.

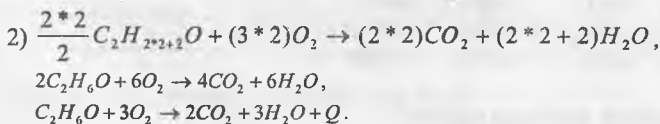
Quyida bir atomli spirtlar va oddiy efirlar gomologlari vakillari yonish reaksiya tenglamalarining kimyoviy algoritmi keltirilgan:



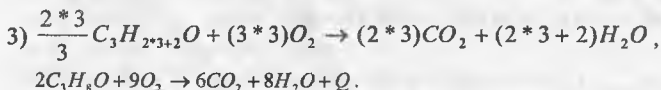
Metanolning yonish reaksiya tenglamasi:  $(CH_3OH)$



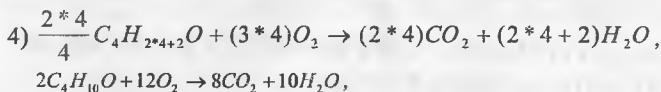
Etanolning yonish reaksiya tenglamasi:  $C_2H_5OH$



Propanolning yonish reaksiya tenglamasi:  $C_3H_7OH$



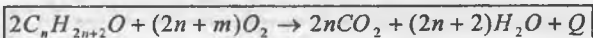
Butanolning yonishi:  $C_4H_9OH$



Kichik koeffisientlar aniqlanadi.



Mazkur sinflar vakillari kimyoviy algoritmining II varianti quydagicha bo'ladi:



(n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog'liqlik:

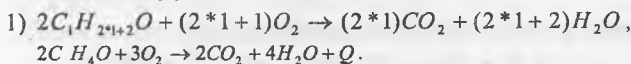
$$n=1; m=1; \quad n=4; m=4;$$

$$n=2; m=2; \quad n=5; m=5;$$

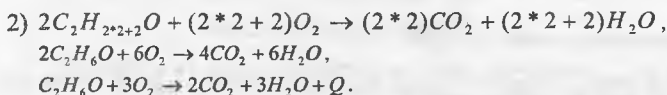
$$n=3; m=3; \quad n=6; m=6;$$

Kislorod  $O_2$  uchun - koeffisient qiymati ifodasi  $(2n+m)$  ga va (n) ning qiymati ham (m) ga teng bo'ladi. Bunda (n) va (m) qiymatlari farq qilmaydi, ya'ni  $n = 1$  bo'lganda,  $m = 1$  yoki  $n = 5$  bo'lganda,  $m = 5$  ga teng bo'ladi. Demak, (n) va (m) qiymatlariining o'zaro nisbatlari proporsional ravishda ana shunday tartibda o'zgarib boradi.

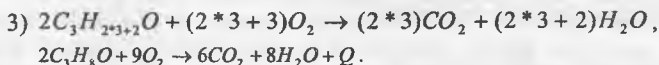
Metanolning yonish reaksiya tenglamasi:  $CH_3OH$



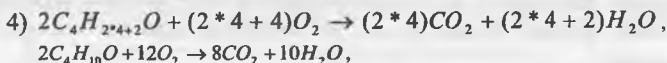
Etanolning yonish reaksiya tenglamasi:  $C_2H_5OH$



Propanolning yonish reaksiya tenglamasi:  $C_3H_7OH$



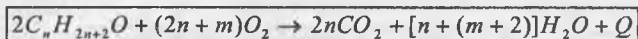
Butanolning yonishi:  $C_4H_9OH$



Kichik koefitsientlar aniqlanadi.



Mazkur sinflar vakillari kimyoviy algoritmining III varianti quyidagicha va suvning  $H_2O$  koefitsient qiymati ifodasi ushbu korinishda  $[n + (m + 2)]$  boladi.



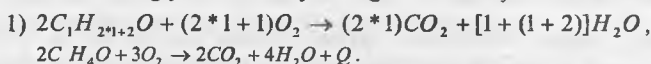
(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bogliqlik ;

$$n=1; m=1; \quad n=4; m=4;$$

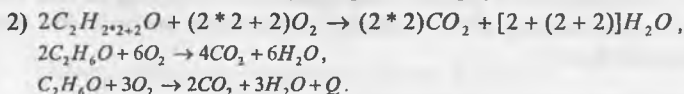
$$n=2; m=2; \quad n=5; m=5;$$

$$n=3; m=3; \quad n=6; m=6;$$

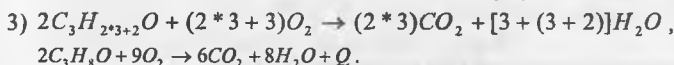
Metanolning yonish reaksiya tenglamasi :  $CH_3OH$



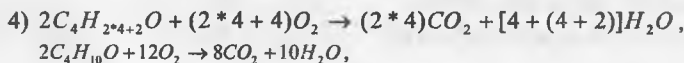
Etanolning yonish reaksiya tenglamasi:  $C_2H_5OH$



Propanolning yonish reaksiya tenglamasi :  $C_3H_7OH$



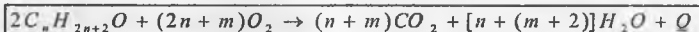
Butanolning yonishi:  $C_4H_9OH$



Kichik koefitsientlar aniqlanadi.



IV variantda reaksiyaning asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koefitsient qiymati ifodasi  $(n + m)$  va kimyoviy algoritmi esa quyidagi korinishda boladi:



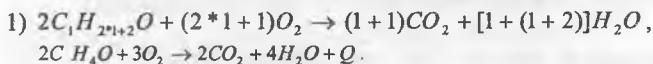
(n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog'liqlik:

$$n=1; m=1; \quad n=4; m=4;$$

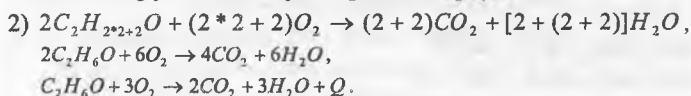
$$n=2; m=2; \quad n=5; m=5;$$

$$n=3; m=3; \quad n=6; m=6;$$

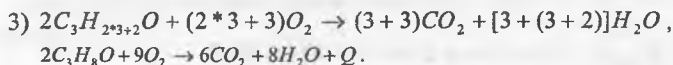
Metanolning yonish reaksiya tenglamasi:  $CH_3OH$



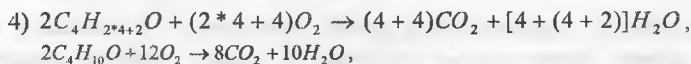
Etanolning yonish reaksiya tenglamasi:  $C_2H_5OH$



Propanolning yonish reaksiya tenglamasi:  $C_3H_7OH$



Butanolning yonishi:  $C_4H_9OH$

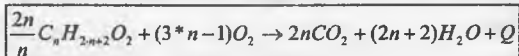


Kichik koeffitsientlar aniqlanadi.



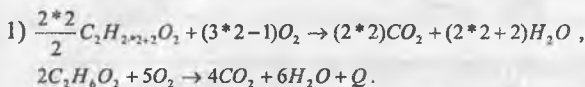
## IKKI ATOMLI SPIRTLAR

Ikki atomli spirtlar glikollar deb ham ataladi. "Glikol" so'zi grekcha bo'lib, "glikos" – "shirin" demakdir. Haqiqatan ham, ikki atomli spirtlarning ta'mi shirin bo'ladi. Ularning tipik vakili etilenglikol sanoatning turli tarmoqlarida keng ko'lamda ishlatiladigan organik birikmalardir. U suv bilan aralastirilganda suvning muzlash haroratini pasaytirib yuborishi sababli antifrizlar, ya'ni past haroratda muzlaydigan aralashmalar tayyorlashda ishlatiladi. Mazkur sinf gomologlari vakillarining umumiy formulasini ushbu ko'rinishda  $C_nH_{2n+2}O_2$  va yonish reaksiya tenglamalari kimyoviy algoritmini esa quydagicha ifodalaymiz:

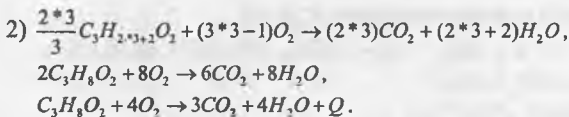


Algoritmik amallarga misollar:

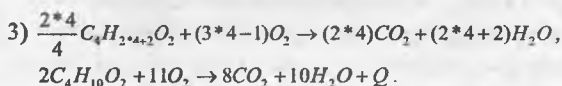
Etilenglikol:  $HO-CH_2-CH_2-OH$  yoki  $C_2H_6O_2$



Trimetilenglikol:  $HO-CH_2-CH_2-CH_2-OH$  yoki  $C_3H_8O_2$



Tetrametilenglikol:  $HO-(CH_2)_4-OH$  yoki  $C_4H_{10}O_2$



Yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(2n+m)$  bo'lganda, II variant kimyoviy algoritmi quydagicha bo'ladi:



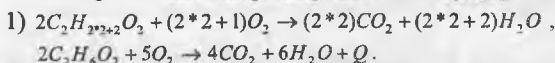
(n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog'liqlik:

$$\begin{array}{ll} n=2; & m=1; & n=5; & m=4; \\ n=3; & m=2; & n=6; & m=5; \\ n=4; & m=3; & n=7; & m=6 \end{array}$$

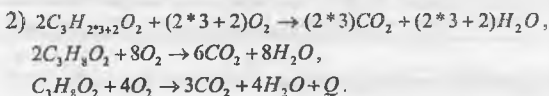
Jadvaldan ko'rinib turibdiki, (n) va (m) qiymatlari (1) birlikka farq qiladi, ya'ni  $n=2$  bo'lganda,  $m=1$  ga yoki  $n=5$  bo'lganda,  $m=4$  ga teng bo'ladi. Demak, (n) va (m) qiymatlarining o'zaro nisbatlari ana shunday tartibda o'zgarib boradi.

Algoritmik amallarga misollar:

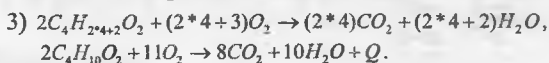
Etilenglikol:  $HO-CH_2-CH_2-OH$  yoki  $C_2H_6O_2$



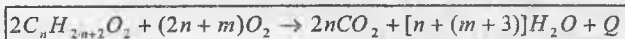
Trimetilenglikol:  $HO-CH_2-CH_2-CH_2-OH$  yoki  $C_3H_8O_2$



Tetrametilenglikol:  $HO-(CH_2)_4-OH$  yoki  $C_4H_{10}O_2$



Suvning  $H_2O$  koeffitsient qiymati ifodasi  $[n + (m + 3)]$  va III variant kimyoviy algoritmi:



(n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog'liqlik:

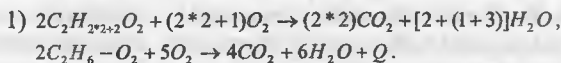
$$n=2; \quad m=1; \quad n=5; \quad m=4;$$

$$n=3; \quad m=2; \quad n=6; \quad m=5;$$

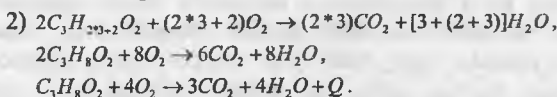
$$n=4; \quad m=3; \quad n=7; \quad m=6.$$

Algoritmik amallarga misollar:

Etilenglikol:  $HO-CH_2-CH_2-OH$  yoki  $C_2H_6O_2$

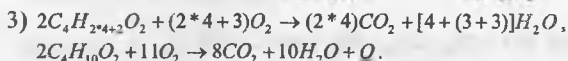


Trimetilenglikol:  $HO-CH_2-CH_2-CH_2-OH$  yoki  $C_3H_8O_2$

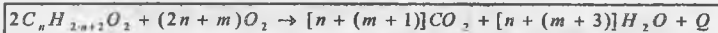




Tetrametilenglikol:  $HO-(CH_2)_4-OH$  yoki  $C_4H_{10}O_2$



Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasini  $[n + (m + 1)]$  shaklida yozib, IV variant kimyoviy algoritmini quydagicha tuzamiz:



(n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog'liqlik:

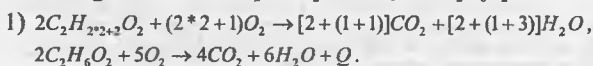
$$n=2; \quad m=1; \quad n=5; \quad m=4;$$

$$n=3; \quad m=2; \quad n=6; \quad m=5;$$

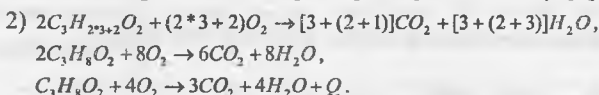
$$n=4; \quad m=3; \quad n=7; \quad m=6;$$

Algoritmik amallarga misollar:

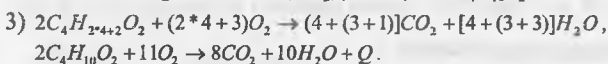
Etilenglikol:  $HO-CH_2-CH_2-OH$  yoki  $C_2H_6O_2$



Trimetilenglikol:  $HO-CH_2-CH_2-CH_2-OH$  yoki  $C_3H_8O_2$



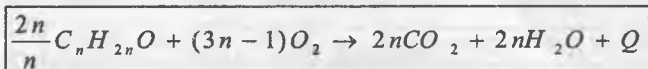
Tetrametilenglikol:  $HO-(CH_2)_4-OH$  yoki  $C_4H_{10}O_2$



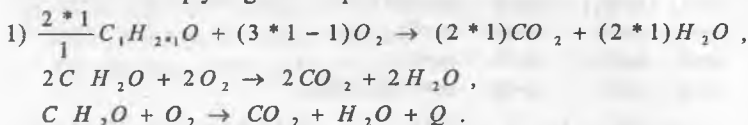
## ALDEGIDLAR, KETONLAR VA TO'YINMAGAN SPIRTLAR

Aldegidlar, ketonlar, va to'yinmagan spirtlar ham organik birikmalarning muhim sinflari bo'lib hisoblanadi. Bu sinflar gomologlari vakillarini umumiy formulasini  $C_nH_{2n}O$  shaklida ifodalash mumkin. Shuningdek, aldegidlar sinfining asosiy vakillari formaldegid va asetaldegidlarning fizikaviy va kimyoviy xossalari to'g'risidagi bilimlar darsliklar va o'quv qo'llanmalarda atroflicha yoritilgan. Xalqaro nomenklaturaga ko'ra aldegidlarning nomlanishi tegishli uglevodorod nomiga - "al" suffiksi qo'shish bilan hosil qilinadi. Aldegidlarning umumiy formulasini ushbu ko'rinishda  $C_nH_{2n+1}CHO$  yoki mazkur sinflar gomologlari vakillari uchun umumiy bo'lgan ushbu formuladan foydalanadigan bo'lsak

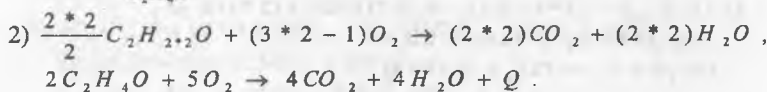
$C_nH_{2n}O$  ular uchun yonish reaksiya tenglamalari kimyoviy algoritmi quyidagicha bo'ladi:



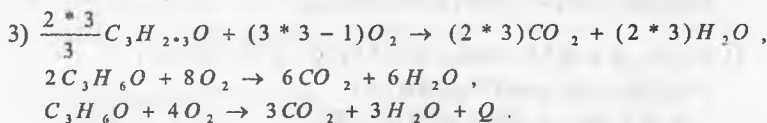
Metanalning  $CH_2O$  yonish reaksiya tenglamasi uchun koeffitsientlar quyidagicha aniqlanadi:



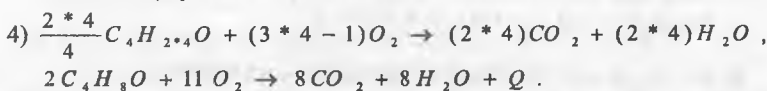
Etanal:  $C_2H_4O$



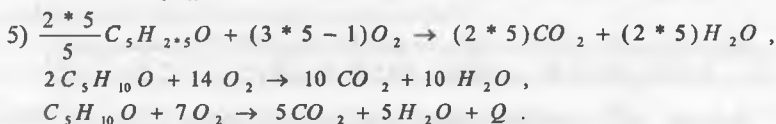
Propanal:  $C_3H_6O$



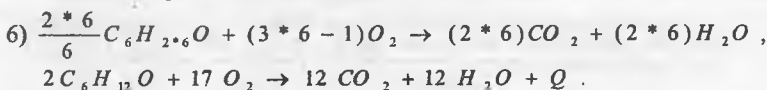
Butanal:  $C_4H_8O$



Pentanal:  $C_5H_{10}O$

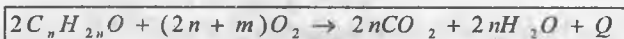


Geksanalning  $C_6H_{12}O$  yonish reaksiya tenglamasi:



Mazkur sinflar gomologlari vakillarining umumiy formulasini ushbu

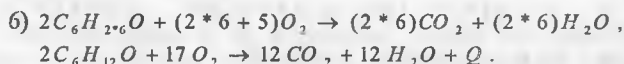
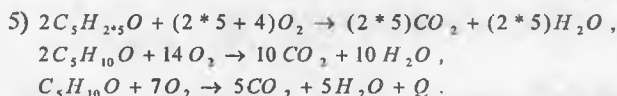
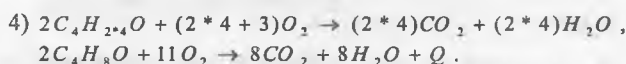
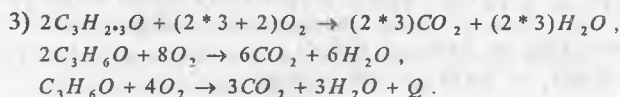
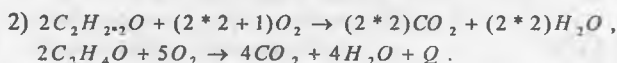
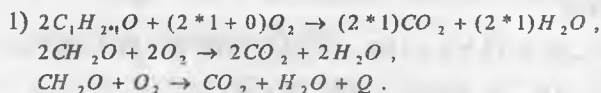
ko'rinishda  $C_nH_{2n}O$  yozib va kislorodning  $O_2$  koefitsient qiymati ifodasini  $(2n+m)$  shaklida ifodalab, yonish reaksiya tenglamalarining II varianti uchun quydagi kimyoviy algoritmdan foydalanish maqsadga muvofiqdir:



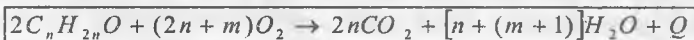
(n) va (m) qiymatlari orasidagi bog'liqlik:

n=1; m=0;      n=5;    m=4;  
 n=2; m=1;      n=6;    m=5;  
 n=3; m=2;      n=7;    m=6;  
 n=4; m=3;      n=8;    m=7 va hokazo

Misollar keltirilgan:



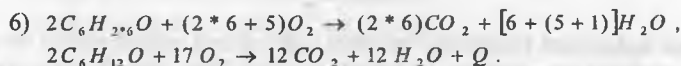
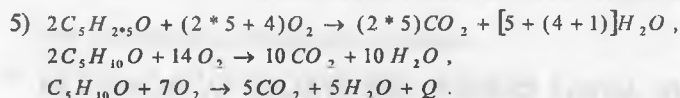
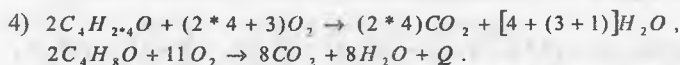
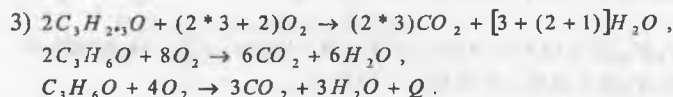
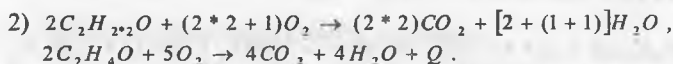
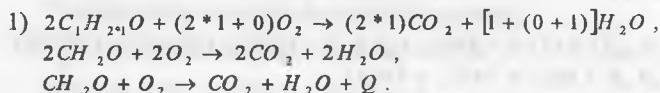
Suvning  $H_2O$  koefitsient qiymatini aniqlash uchun  $[n+(m+1)]$  ifodadan foydalansak, kimyoviy algoritmnning III varianti hosil bo'ladi:



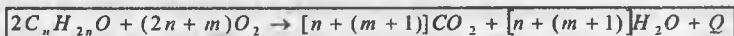
(n) va (m) qiymatlari orasidagi bog'liqlik:

n=1; m=0; n=5; m=4;  
n=2; m=1; n=6; m=5;  
n=3; m=2; n=7; m=6;  
n=4; m=3; n=8; m=7 va hokazo

Misollar keltirilgan:



Karbonat anhidridning  $CO_2$  koeffisient qiymatini aniqlash uchun ushbu  $[n+(m+1)]$  ifodadan foydalanib, mazkur sinf gomologlari vakillari uchun IV variant kimyoviy algoritmini quydagicha tuzamiz:



(n) va (m) qiymatlari orasidagi bog'liqlik:

n=1; m=0; n=5; m=4;  
n=2; m=1; n=6; m=5;  
n=3; m=2; n=7; m=6;  
n=4; m=3; n=8; m=7 va hokazo

Misollar keltirilgan:

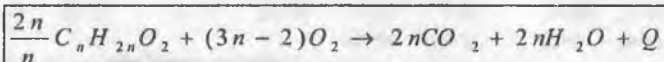
- 1)  $2C_1H_{2 \cdot 1}O + (2 \cdot 1 + 0)O_2 \rightarrow [1 + (0 + 1)]CO_2 + [1 + (0 + 1)]H_2O$  ,  
 $2CH_2O + 2O_2 \rightarrow 2CO_2 + 2H_2O$  ,  
 $CH_2O + O_2 \rightarrow CO_2 + H_2O + Q$  .
- 2)  $2C_2H_{2 \cdot 2}O + (2 \cdot 2 + 1)O_2 \rightarrow [2 + (1 + 1)]CO_2 + [2 + (1 + 1)]H_2O$  ,  
 $2C_2H_4O + 5O_2 \rightarrow 4CO_2 + 4H_2O + Q$  .
- 3)  $2C_3H_{2 \cdot 3}O + (2 \cdot 3 + 2)O_2 \rightarrow [3 + (2 + 1)]CO_2 + [3 + (2 + 1)]H_2O$  ,  
 $2C_3H_6O + 8O_2 \rightarrow 6CO_2 + 6H_2O$  ,  
 $C_3H_6O + 4O_2 \rightarrow 3CO_2 + 3H_2O + Q$  .
- 4)  $2C_4H_{2 \cdot 4}O + (2 \cdot 4 + 3)O_2 \rightarrow [4 + (3 + 1)]CO_2 + [4 + (3 + 1)]H_2O$  ,  
 $2C_4H_8O + 11O_2 \rightarrow 8CO_2 + 8H_2O + Q$  .
- 5)  $2C_5H_{2 \cdot 5}O + (2 \cdot 5 + 4)O_2 \rightarrow [5 + (4 + 1)]CO_2 + [5 + (4 + 1)]H_2O$  ,  
 $2C_5H_{10}O + 14O_2 \rightarrow 10CO_2 + 10H_2O$  ,  
 $C_5H_{10}O + 7O_2 \rightarrow 5CO_2 + 5H_2O + Q$  .
- 6)  $2C_6H_{2 \cdot 6}O + (2 \cdot 6 + 5)O_2 \rightarrow [6 + (5 + 1)]CO_2 + [6 + (5 + 1)]H_2O$  ,  
 $2C_6H_{12}O + 17O_2 \rightarrow 12CO_2 + 12H_2O + Q$  .

## BIR ASOSLI KARBON KISLOTALAR VA MURAKKAB EFIRLAR

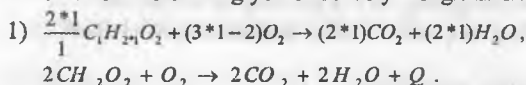
Karbon kislotalarni molekulasi tarkibida uglevodorod radikallaridagi bir yoki bir necha vodorod atomlarining karboksil guruhlar bilan almashingan organik birikmalar deb qarash mumkin. Shuningdek, bir asosli karbon kislotalarning ba'zi vakillari dastlab yog'lar tarkibidan olinganligi sababli, ular yog' kislotalar ham deb yuritiladi. Ularning birinchi vakili chumoli kislota  $H-COOH$  dastlab chumoli axlatidan ajratib olinganligi uchun ham shunday nomlangan. Ikkinchi vakili sirka kislota  $CH_3-COOH$  esa insoniyatga birinchi ma'lum bo'lgan kislotalardan biridir. Qadimgi zamonlardayoq bu modda achigan vinodan, ya'ni sirkadan ajratib olingan.

Chumoli, sirka, propion, moy, valerian, kapron, enant, palmitin va stearin kislotalar bir asosli karbon kislotalarning asosiy vakillari bo'lib hisoblanadi. Karbon kislotalar tabiatda keng tarqalgan bo'lib, ular sanoatda va turmushda juda ko'p maqsadlar uchun ishlatiladi. Bir asosli karbon kislotalar gomologlari vakillarining umumiy formulasini  $C_nH_{2n-1}-COOH$  yoki bir asosli karbon kislotalar

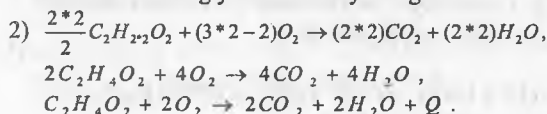
va murakkab efilar vakillarining umumiy formulasini quydagi shaklda ifodalasak  $C_nH_{2n}O_2$  ularning yonish reaksiya tenglamalari kimyoviy algoritmining dastlabki varianti ushbu ko'rinishda bo'ladi:



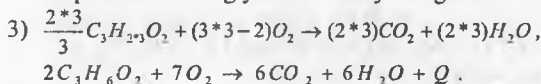
Chumoli kislotaning yonish reaksiya tenglamasi:



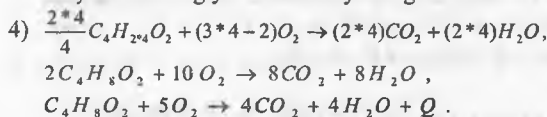
Sirka kislotaning yonish reaksiya tenglamasi:



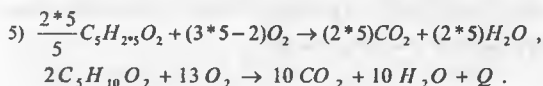
Propion kislotaning yonish reaksiya tenglamasi:



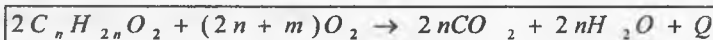
Moy kislotaning yonish reaksiya tenglamasi:



Valerian kislotaning yonish tenglamasi uchun koeffitsientlar quyidagicha tanlanadi:



Mazkur sinflar gomologlari vakillari yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(2n+m)$  va kimyoviy algoritmining II varianti quydagicha bo'ladi:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

$$n=1; \quad m=-1; \quad n=5; \quad m=3;$$

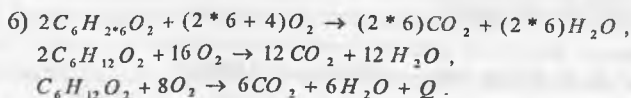
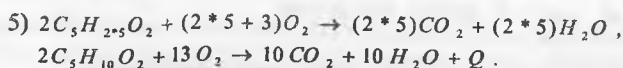
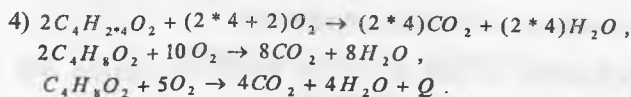
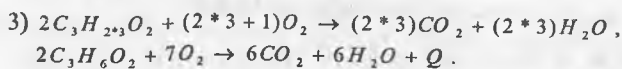
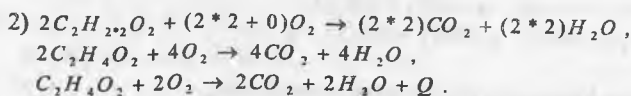
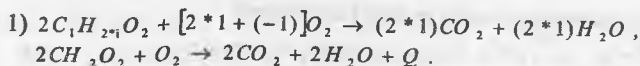
$$n=2; \quad m=0; \quad n=6; \quad m=4;$$

$$n=3; \quad m=1; \quad n=7; \quad m=5;$$

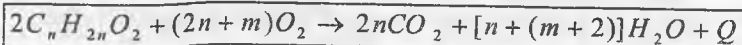
$$n=4; \quad m=2; \quad n=8; \quad m=6.$$

Ko'rinib turibdiki,  $n = 1$  bo'lganda,  $m = -1$  ga  $n = 2$  bo'lganda,  $m = 0$  ga yoki  $n = 4$  bo'lganda,  $m = 2$  ga teng bo'lib, (n) va (m) qiymatlari orasidagi farq ham shunday tartibda o'zgarib boradi.

Algoritmik amallarga misollar:



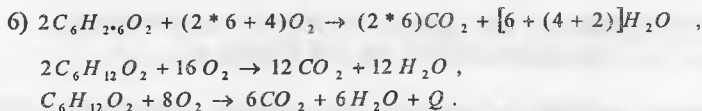
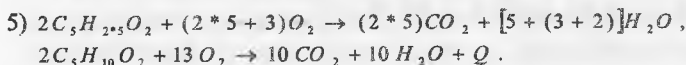
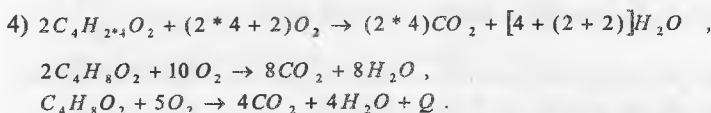
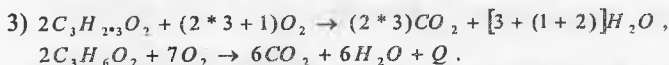
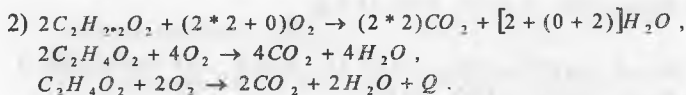
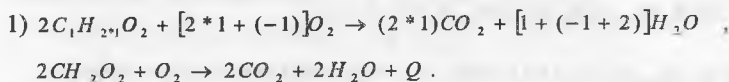
Suvning  $H_2O$  koeffitsient qiymati ifodasini  $[n + (m + 2)]$  shaklida yozsak, III variant kimyoviy algoritmi quydagicha bo'ladi:



(n) va (m) qiymatlari orasidagi bog'liqlik:

$$\begin{array}{llll} n=1; & m=-1; & n=5; & m=3; \\ n=2; & m=0; & n=6; & m=4; \\ n=3; & m=1; & n=7; & m=5; \\ n=4; & m=2; & n=8; & m=6. \end{array}$$

Algoritmik amallarga misollar:



Karbonat anhidridning  $CO_2$  koeffisient qiymati ifodasi quydagicha  $[n + (m + 2)]$  bo'lganda, mazkur sinf vakillarining IV variant kimyoviy algoritmi ushbu ko'rinishda bo'ladi:



(n) va (m) qiymatlari orasidagi bog'liqlik:

$$\begin{array}{llll} n=1; & m=-1; & n=5; & m=3; \\ n=2; & m=0; & n=6; & m=4; \\ n=3; & m=1; & n=7; & m=5; \\ n=4; & m=2; & n=8; & m=6. \end{array}$$

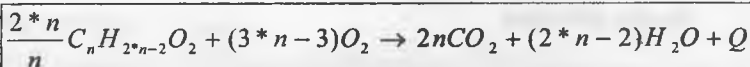


Algoritmik amallarga misollar:

- 1)  $2C_1H_{2n}O_2 + [2 * 1 + (-1)]O_2 \rightarrow [1 + (-1 + 2)]CO_2 + [1 + (-1 + 2)]H_2O$  ,  
 $2CH_2O_2 + O_2 \rightarrow 2CO_2 + 2H_2O + Q$  .
- 2)  $2C_2H_{2+2}O_2 + (2 * 2 + 0)O_2 \rightarrow [2 + (0 + 2)]CO_2 + [2 + (0 + 2)]H_2O$  ,  
 $2C_2H_4O_2 + 4O_2 \rightarrow 4CO_2 + 4H_2O$  ,  
 $C_2H_4O_2 + 2O_2 \rightarrow 2CO_2 + 2H_2O + Q$  .
- 3)  $2C_3H_{2+3}O_2 + (2 * 3 + 1)O_2 \rightarrow [3 + (1 + 2)]CO_2 + [3 + (1 + 2)]H_2O$  ,  
 $2C_3H_6O_2 + 7O_2 \rightarrow 6CO_2 + 6H_2O + Q$  .
- 4)  $2C_4H_{2+4}O_2 + (2 * 4 + 2)O_2 \rightarrow [4 + (2 + 2)]CO_2 + [4 + (2 + 2)]H_2O$  ,  
 $2C_4H_8O_2 + 10O_2 \rightarrow 8CO_2 + 8H_2O$  ,  
 $C_4H_8O_2 + 5O_2 \rightarrow 4CO_2 + 4H_2O + Q$  .
- 5)  $2C_5H_{2+5}O_2 + (2 * 5 + 3)O_2 \rightarrow [5 + (3 + 2)]CO_2 + [5 + (3 + 2)]H_2O$  ,  
 $2C_5H_{10}O_2 + 13O_2 \rightarrow 10CO_2 + 10H_2O + Q$  .
- 6)  $2C_6H_{2+6}O_2 + (2 * 6 + 4)O_2 \rightarrow [6 + (4 + 2)]CO_2 + [6 + (4 + 2)]H_2O$  ,  
 $2C_6H_{12}O_2 + 16O_2 \rightarrow 12CO_2 + 12H_2O$  ,  
 $C_6H_{12}O_2 + 8O_2 \rightarrow 6CO_2 + 6H_2O + Q$  .

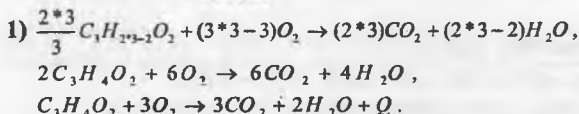
### TO'YINMAGAN BIR ASOSLI KARBON KISLOTALAR, DIALDEGIDLAR VA DIKETONLAR

Molekulasi tarkibida to'yinmagan uglevodorodlar radikallaridagi bitta vodorod atomining karboksil  $-COOH$  guruhiga almashinishidan hosil bo'lgan organik birikmalar to'yinmagan bir asosli karbon kislotalar  $C_nH_{2n-1}COOH$  sinfi vakillari bo'lib hisoblanadi. Akril va metakril kislotalar organik moddalar ushbu sinfining tipik vakillaridir. Organik moddalarning mazkur sinfi hamda dialdegidlar va diketonlar sinflari gomologlari vakillarining umumiy formulasini quydagicha:  $C_nH_{2n-2}O_2$  va yonish reaksiya tenglamalari kimyoviy algoritmi ushbu ko'rinishda bo'ladi:

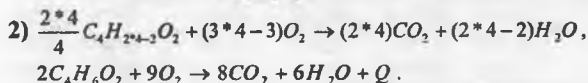


Misollar keltirilgan:

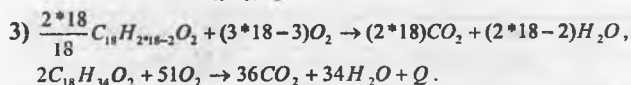
Akril kislotasi:  $C_3H_4O_2$



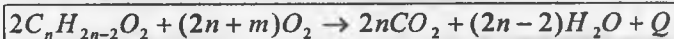
Metakril kislotasi:  $C_4H_6O_2$



Olein kislotasi:  $C_{18}H_{34}O_2$



Reaksiyaning asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(2n + m)$  bo'lganda, bu sinflar vakillari yonish reaksiya tenglamalarining II variant kimyoviy algoritmi quydagicha bo'ladi:



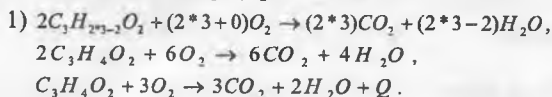
(n) va (m) qiymatlari orasidagi bog'liqlik:

n=3;	m=0;	n=7;	m=4;	---	---
n=4;	m=1;	n=8;	m=5;	n=16;	m=13;
n=5;	m=2;	n=9;	m=6;	n=17;	m=14;
n=6;	m=3;	n=10;	m=7;	n=18;	m=15.

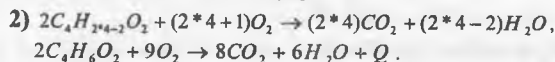
Jadvaldan ko'rinib turibdiki,  $n = 3$  ga teng bo'lganda,  $m = 0$  ga  $n = 4$  ga teng bo'lganda, esa  $m = 1$  ga teng bo'lib, (n) va (m) orasidagi farq (3) birlikka o'zgarib borar ekan.

Misollar keltirilgan:

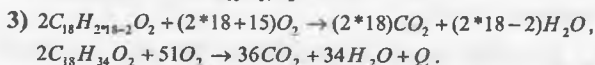
Akril kislotali:  $C_3H_4O_2$



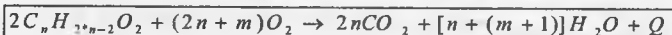
Metakril kislotali:  $C_4H_6O_2$



Olein kislotali:  $C_{18}H_{34}O_2$



Suvning  $H_2O$  koeffitsient qiymati ifodasi  $[n+(m+1)]$  va III variant kimyoviy algoritmi:

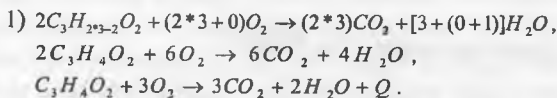


(n) va (m) qiymatlari orasidagi bog'liqlik:

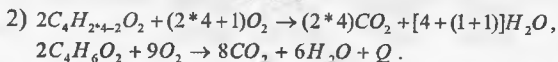
n=3;	m=0;	n=7;	m=4;	---	---
n=4;	m=1;	n=8;	m=5;	n=16;	m=13;
n=5;	m=2;	n=9;	m=6;	n=17;	m=14;
n=6;	m=3;	n=10;	m=7;	n=18;	m=15.

Misollar keltirilgan:

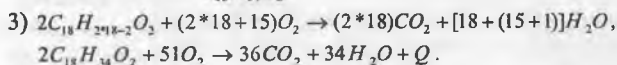
Akril kislotali:  $C_3H_4O_2$



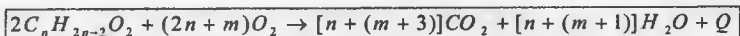
Metakril kislotali:  $C_4H_6O_2$



Olein kislotasi:  $C_{18}H_{34}O_2$



Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  
[ $n + (m + 3)$ ] va IV variant kimyoviy algoritmi keltirilgan:

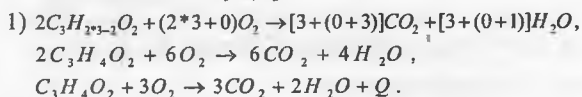


(n) va (m) qiymatlari orasidagi bog'liqlik:

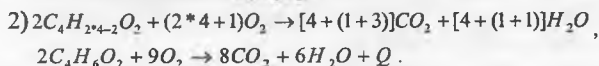
n=3;	m=0;	n=7;	m=4;	---	---
n=4;	m=1;	n=8;	m=5;	n=16;	m=13;
n=5;	m=2;	n=9;	m=6;	n=17;	m=14;
n=6;	m=3;	n=10;	m=7;	n=18;	m=15.

Misollar keltirilgan:

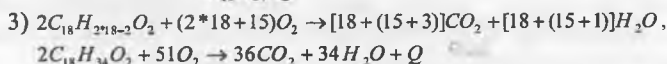
Akril kislotasi:  $C_3H_4O_2$



Metakril kislotasi:  $C_4H_6O_2$

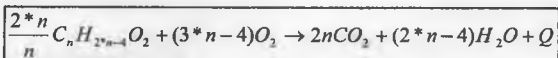


Olein kislotasi:  $C_{18}H_{34}O_2$

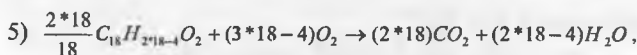
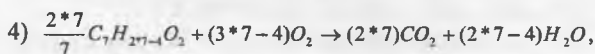
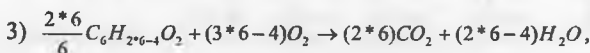
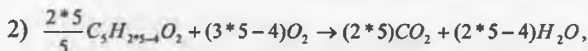
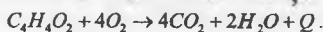
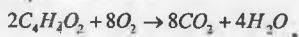
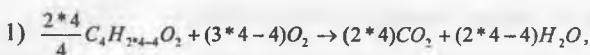


## KO'PROQ TO'YINMAGAN KARBON KISLOTALAR

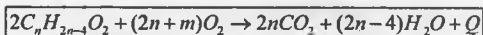
Mazkur sinf gomologlari vakillari ham o'simlik va hayvonlar organizmi to'qimalarida ko'proq uchraydi. Ularning umumiy formulasini ushbu ko'rinishda  $C_nH_{2n-4}O_2$  va yonish reaksiya tenglamalari kimyoviy algoritmini esa quydagicha ifodalaymiz:



Misolalar keltirilgan:



Ushbu sinf gomologlari vakillari yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasini quydagi ko'rinishda yozib  $(2n+m)$  II variant kimyoviy algoritmini shunday ifodalaymiz:



(n) va (m) qiymatlari jadvali:

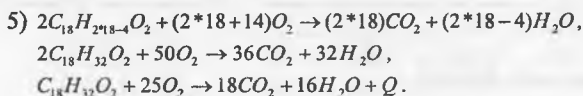
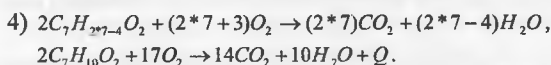
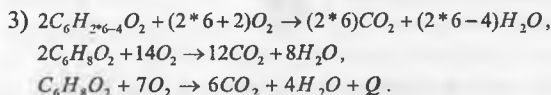
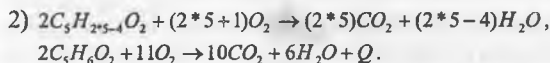
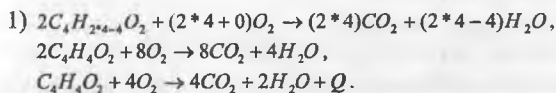
n=4; m=0;      n=7;    m=3;    n=10; m=6;

n=5; m=1;      n=8;    m=4;    n=-; m=-;

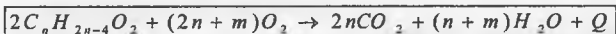
n=6; m=2;      n=9;    m=5;    n=18; m=14.

Jadvaldan ko'rinib turibdiki,  $n = 4$  bo'lganda,  $m = 0$  ga yoki  $n = 18$  bo'lganda,  $m = 14$  ga teng bo'ladi. Demak, bu sinf gomologlari vakillarida ham (n) va (m) qiymatlari proporsional ravishda (4) birlikka farq qilib, o'zgarib borishini ko'rish mumkin.

Algoritmik amallarga misollar:



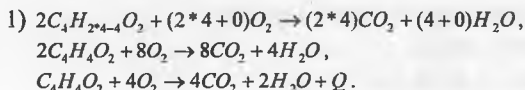
Suvning  $H_2O$  koeffitsient qiymati ifodasi ( $n + m$ ) va III variant kimyoviy algoritmi:



(n) va (m) qiymatlari jadvali:

$n=4;$	$m=0;$	$n=7;$	$m=3;$	$n=10;$	$m=6;$
$n=5;$	$m=1;$	$n=8;$	$m=4;$	$n=-;$	$m=-;$
$n=6;$	$m=2;$	$n=9;$	$m=5;$	$n=18;$	$m=14.$

Algoritmik amallarga misollar:



- 2)  $2C_5H_{2*5-4}O_2 + (2*5+1)O_2 \rightarrow (2*5)CO_2 + (5+1)H_2O$ ,  
 $2C_5H_6O_2 + 11O_2 \rightarrow 10CO_2 + 6H_2O + Q$ .
- 3)  $2C_6H_{2*6-4}O_2 + (2*6+2)O_2 \rightarrow (2*6)CO_2 + (6+2)H_2O$ ,  
 $2C_6H_8O_2 + 14O_2 \rightarrow 12CO_2 + 8H_2O$ ,  
 $C_6H_8O_2 + 7O_2 \rightarrow 6CO_2 + 4H_2O + Q$ .
- 4)  $2C_7H_{2*7-4}O_2 + (2*7+3)O_2 \rightarrow (2*7)CO_2 + (7+3)H_2O$ ,  
 $2C_7H_{10}O_2 + 17O_2 \rightarrow 14CO_2 + 10H_2O + Q$ .
- 5)  $2C_{18}H_{2*18-4}O_2 + (2*18+14)O_2 \rightarrow (2*18)CO_2 + (18+14)H_2O$ ,  
 $2C_{18}H_{32}O_2 + 50O_2 \rightarrow 36CO_2 + 32H_2O$ ,  
 $C_{18}H_{32}O_2 + 25O_2 \rightarrow 18CO_2 + 16H_2O + Q$ .

Reaksiyaning asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[n+(m+4)]$  va IV variant kimyoviy algoritmi:

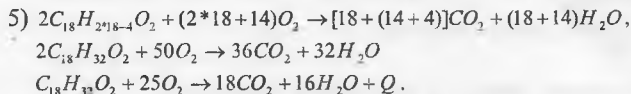
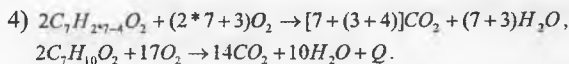


(n) va (m) qiymatlari jadvali:

n=4;	m=0;	n=7;	m=3;	n=10;	m=6;
n=5;	m=1;	n=8;	m=4;	n=-;	m=-;
n=6;	m=2;	n=9;	m=5;	n=18;	m=14.

Algoritmik amallarga misollar:

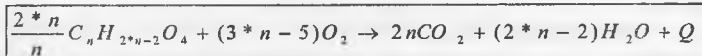
- 1)  $2C_4H_{2*4-4}O_2 + (2*4+0)O_2 \rightarrow [4+(0+4)]CO_2 + (4+0)H_2O$ ,  
 $2C_4H_4O_2 + 8O_2 \rightarrow 8CO_2 + 4H_2O$ ,  
 $C_4H_4O_2 + 4O_2 \rightarrow 4CO_2 + 2H_2O + Q$ .
- 2)  $2C_5H_{2*5-4}O_2 + (2*5+1)O_2 \rightarrow [5+(1+4)]CO_2 + (5+1)H_2O$ ,  
 $2C_5H_6O_2 + 11O_2 \rightarrow 10CO_2 + 6H_2O + Q$ .
- 3)  $2C_6H_{2*6-4}O_2 + (2*6+2)O_2 \rightarrow [6+(2+4)]CO_2 + (6+2)H_2O$ ,  
 $2C_6H_8O_2 + 14O_2 \rightarrow 12CO_2 + 8H_2O$ ,  
 $C_6H_8O_2 + 7O_2 \rightarrow 6CO_2 + 4H_2O + Q$ .



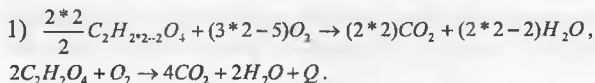
## IKKI ASOSLI KARBON KISLOTALAR

Molekulasi tarkibida uglevodorodlar radikallaridagi ikki vodorod atomi ikki karboksil guruhi  $-COOH$  bilan almashingan hosilalari ikki asosli to'yingan karbon kislotalar gomologlari vakillari bo'lib hisoblanadi. Ularning asosiy vakillaridan biri oksalat kislotasi  $HOOC-COOH$  o'simliklarda tuz holida uchraydi. Malon kislotasining  $HOOC-CH_2-COOH$  esa sholg'om suvida borligi aniqlangan hamda u dastavval sintez usuli bilan sirka kislotadan olingan. Qahrabo kislotasi  $HOOC-(CH_2)_2-COOH$  ham tabiatda keng tarqalgan ikki asosli kislotalardan biri bo'lib, qahraboda, qo'ng'ir ko'mirda, o'simliklarda ayniqsa, ho'l mevalarda ko'proq bo'ladi.

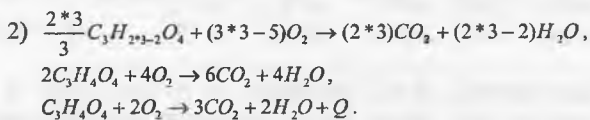
Ikki asosli karbon kislotalarning umumiy formulasini ushbu ko'rinishda  $C_nH_{2*n-2}O_4$  va yonish reaksiya tenglamalari kimyoviy algoritmini esa quydagicha ifodalaymiz:



Oksalat kislotasi:  $HOOC-COOH$  yoki  $C_2H_2O_4$

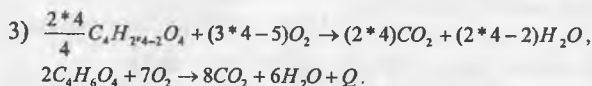


Malon kislotasi:  $HOOC-CH_2-COOH$  yoki  $C_3H_4O_4$

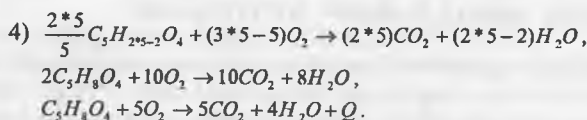




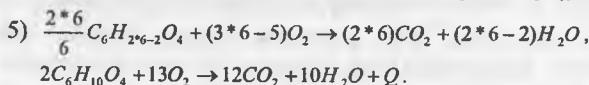
Qahrabo kislotasi:  $HOOC-(CH_2)_2-COOH$  yoki  $C_4H_6O_4$



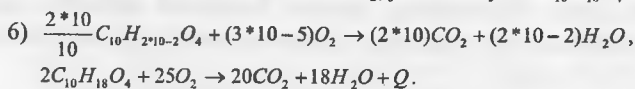
Glutar kislotasi:  $HOOC-(CH_2)_3-COOH$  yoki  $C_5H_8O_4$



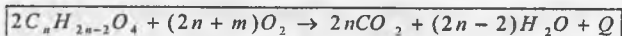
Adipin kislotasi:  $HOOC-(CH_2)_4-COOH$  yoki  $C_6H_{10}O_4$



Sebatsin kislotasi:  $HOOC-(CH_2)_8-COOH$  yoki  $C_{10}H_{18}O_4$



Yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasini quyidagi ko'rinishda yozib  $(2n+m)$  ushbu sinf gomologlari vakillari uchun II variant kimyoviy algoritmini shunday ifodalaymiz:



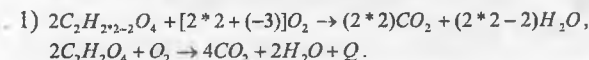
(n) va (m) qiymatlari jadvali:

n=2;	m=-3;	n=5;	m=0;	n=8;	m=3;
n=3;	m=-2;	n=6;	m=1;	n=9;	m=4;
n=4;	m=-1;	n=7;	m=2;	n=10;	m=5.

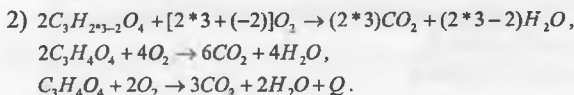
Jadvaldan ko'rinib turibdiki,  $n = 2$  bo'lganda,  $m = -3$  ga yoki  $n = 5$  bo'lganda,  $m = 0$  ga teng bo'ladi. Demak, bu sinf gomologlari vakillarida ham (n) va (m) qiymatlari proporsional ravishda (5) birlikka farq qilib, o'zgarib borishini ko'rish mumkin.

Algoritmik amallarga misollar:

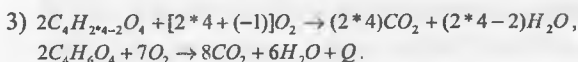
Oksalat kislotasi:  $HOOC - COOH$  yoki  $C_2H_2O_4$



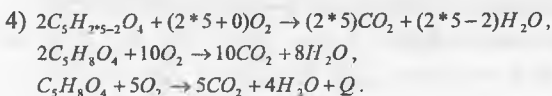
Malon kislotasi:  $HOOC - CH_2 - COOH$  yoki  $C_3H_4O_4$



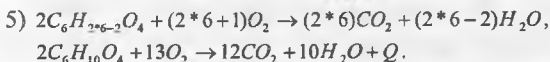
Qahrabo kislotasi:  $HOOC - (CH_2)_2 - COOH$  yoki  $C_4H_6O_4$



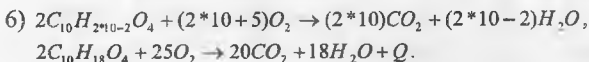
Glutar kislotasi:  $HOOC - (CH_2)_3 - COOH$  yoki  $C_5H_8O_4$



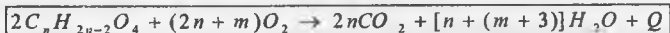
Adipin kislotasi:  $HOOC - (CH_2)_4 - COOH$  yoki  $C_6H_{10}O_4$



Sebatsin kislotasi:  $HOOC - (CH_2)_8 - COOH$  yoki  $C_{10}H_{18}O_4$



Mazkur sinf gomologlari vakillari uchun yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri - suvning  $H_2O$  koeffitsient qiymati ifodasini  $[n + (m + 3)]$  shaklida yozib, III variant kimyoviy algoritmini quydagicha ifodalaymiz:

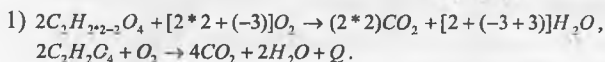


(n) va (m) qiymatlari jadvali:

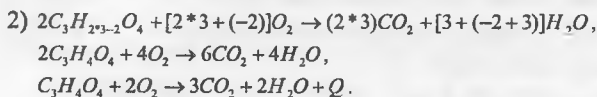
n=2;	m=-3;	n=5;	m=0;	n=8;	m=3;
n=3;	m=-2;	n=6;	m=1;	n=9;	m=4;
n=4;	m=-1;	n=7;	m=2;	n=10;	m=5.

Algoritmik amallarga misollar:

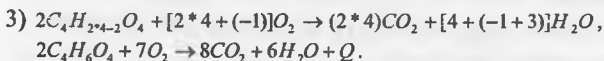
Oksalat kislotasi:  $HOOC - COOH$  yoki  $C_2H_2O_4$



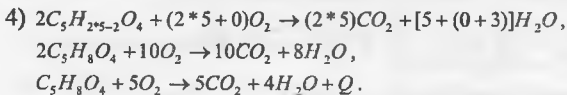
Malon kislotasi:  $HOOC - CH_2 - COOH$  yoki  $C_3H_4O_4$



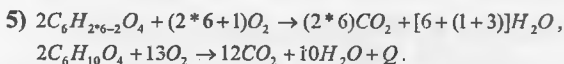
Qahrabo kislotasi:  $HOOC - (CH_2)_2 - COOH$  yoki  $C_4H_6O_4$



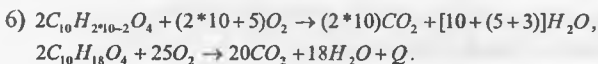
Glutar kislotasi:  $HOOC - (CH_2)_3 - COOH$  yoki  $C_5H_8O_4$



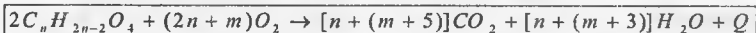
Adipin kislotasi:  $HOOC - (CH_2)_4 - COOH$  yoki  $C_6H_{10}O_4$



Sebatsin kislotasi:  $HOOC - (CH_2)_8 - COOH$  yoki  $C_{10}H_{18}O_4$



Asosiy reaksiya mahsulotlaridan biri – karbonat anhidridning  $CO_2$  koefitsient qiymati ifodasi  $[n + (m + 5)]$  va IV variant kimyoviy algoritmi:

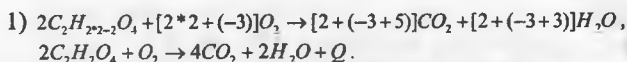


(n) va (m) qiymatlari jadvali:

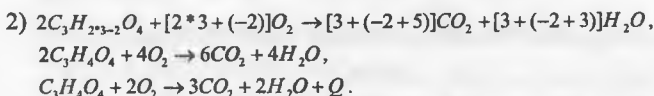
n=2;	m=-3;	n=5;	m=0;	n=8;	m=3;
n=3;	m=-2;	n=6;	m=1;	n=9;	m=4;
n=4;	m=-1;	n=7;	m=2;	n=10;	m=5.

Algoritmik amallarga misollar:

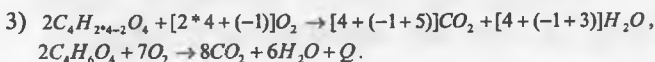
Oksalat kislotasi:  $HOOC - COOH$  yoki  $C_2H_2O_4$



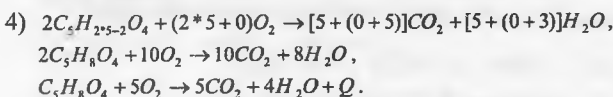
Malon kislotasi:  $HOOC - CH_2 - COOH$  yoki  $C_3H_4O_4$



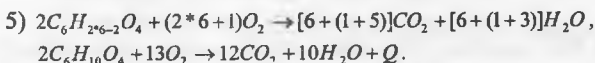
Qahrabo kislotasi:  $HOOC - (CH_2)_2 - COOH$  yoki  $C_4H_6O_4$



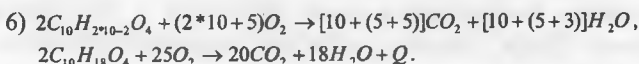
Glutar kislotasi:  $HOOC - (CH_2)_3 - COOH$  yoki  $C_5H_8O_4$



Adipin kislotasi:  $HOOC - (CH_2)_4 - COOH$  yoki  $C_6H_{10}O_4$

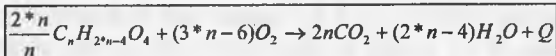


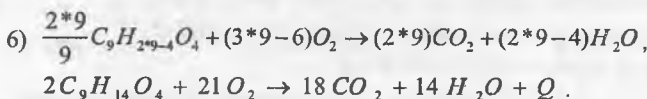
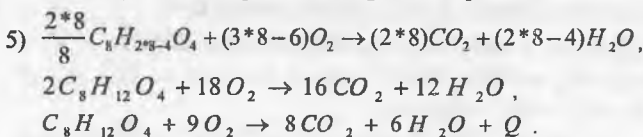
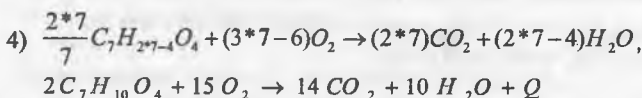
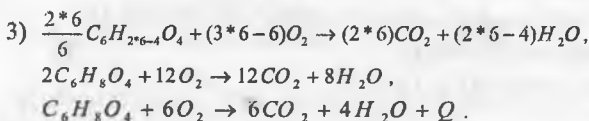
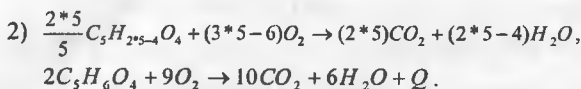
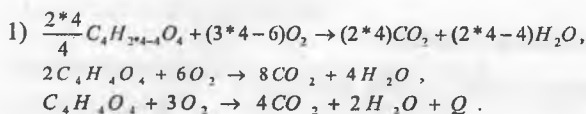
Sebatsin kislotasi:  $HOOC - (CH_2)_5 - COOH$  yoki  $C_{10}H_{18}O_4$



## TO'YINMAGAN IKKI ASOSLI KARBON KISLOTALAR

To'yinmagan uglevodorodlar radikallaridagi ikkita vodorod atomi ikkita karboksil guruhiga  $-COOH$  almashinishidan hosil bo'lgan birikmalar ikki asosli to'yinmagan (dikarbon) kislotalar deyiladi. Dikarbon kislotalardagi (R) radikallari etilen va asetilen bog'li uglevodordlar qoldig'i bo'lishi mumkin. To'yinmagan ikki asosli karbon kislotalar gomologlari vakillarining umumiy formulasi  $C_nH_{2*n-4}O_4$  va yonish reaksiya tenglamalari kimyoviy algoritmi:





Yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koefitsient qiymati ifodasi  $(2n + m)$  va bu sinf gomologlari vakillarining II variant kimyoviy algoritmi:

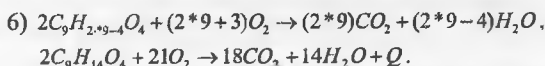
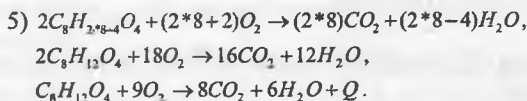
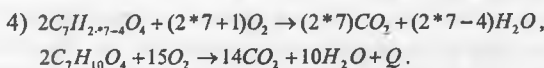
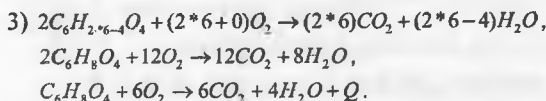
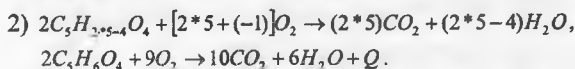
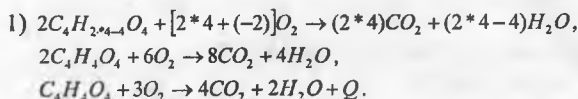


(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

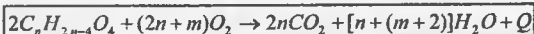
$$\begin{array}{ll} n=4; & m=-2; & n=7; & m=1; \\ n=5; & m=-1; & n=8; & m=2; \\ n=6; & m=0; & n=9; & m=3 \text{ va hokazo.} \end{array}$$

Jadvaldan ko'rinib turibdiki,  $n = 4$  bo'lganda,  $m = -2$  ga yoki  $n = 6$  bo'lganda,  $m = 0$  ga teng bo'ladi. Demak, (n) va (m) qiymatlari orasidagi farq (6) birlikka o'zgarib boradi.

Algoritmik amallarga misollar:



Reaksiyaning asosiy mahsulotlaridan biri – suvning  $H_2O$  koeffitsient qiymati ifodasi  $[n + (m + 2)]$  va III variant kimyoviy algoritmi:



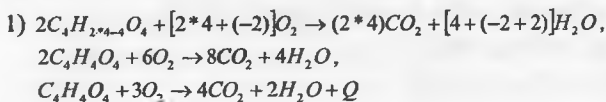
(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

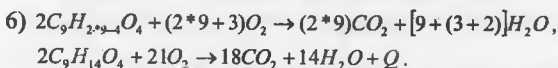
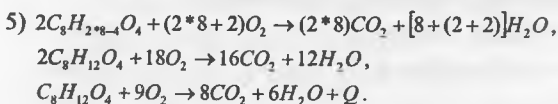
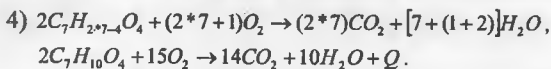
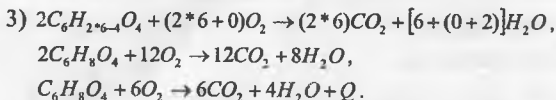
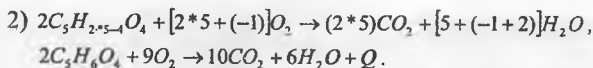
$$n=4; \quad m=-2; \quad n=7; \quad m=1;$$

$$n=5; \quad m=-1; \quad n=8; \quad m=2;$$

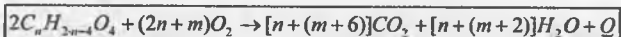
$$n=6; \quad m=0; \quad n=9; \quad m=3.$$

Algoritmik amallarga misollar:





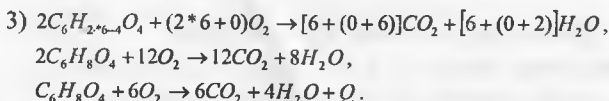
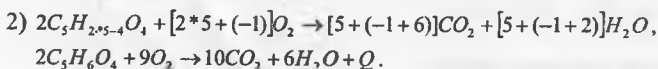
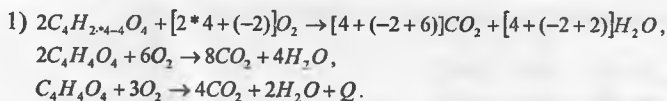
Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[n + (m + 6)]$  va IV variant kimyoviy algoritmi:

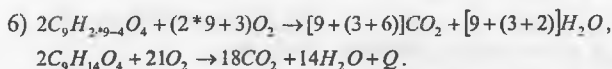
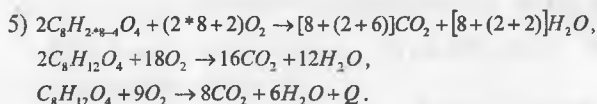
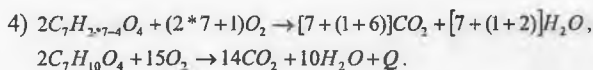


(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

$$\begin{array}{ll} n=4; & m=-2; & n=7; & m=1; \\ n=5; & m=-1; & n=8; & m=2; \\ n=6; & m=0; & n=9; & m=3. \end{array}$$

Algoritmik amallarga misollar:

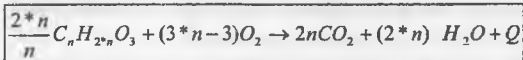




## MONOKSIKARBON KISLOTALAR

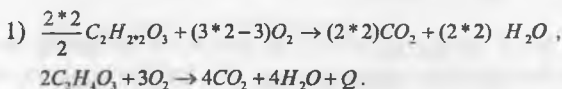
Monoksikarbon kislotalar yoki oksikislotalar molekulasi tarkibida gidroksil- $OH$  va karboksil- $COOH$  guruhleri kiradigan organik birikmalarning muhim sinfi vakillaridan biridir. Demak, bu sinf gomologlari vakillari molekulasi tarkibida ikki xil, ya'ni gidroksil va karboksil funksional guruhlariga ega bo'lgan birikmalardir.

Monoksikarbon kislotalar ham tabiatda keng tarqalgan. Oksisirka kislotasi, sut kislotasi shular jumlasidandir. Ularning umumiy formulasini  $C_nH_{2n}O_3$  ko'rinishda ifodalaydigan bo'lsak, yonish reaksiya tenglamalari kimyoviy algoritmi quydagicha bo'ladi:

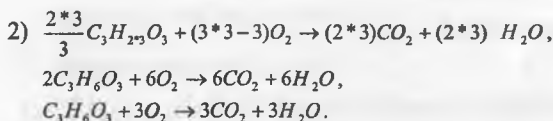


Algoritmik amallarga misollar:

Oksisirka kislotasi:  $C_2H_4O_3$

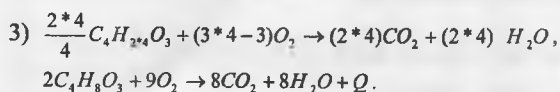


Sut kislotasi:  $C_3H_6O_3$

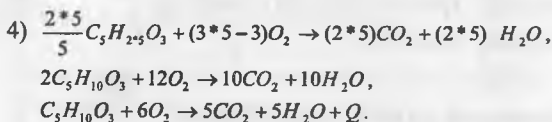




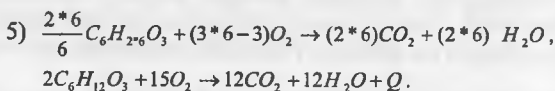
Oksimoy kislotasi:  $C_4H_8O_3$



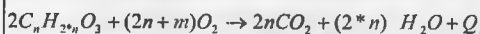
Oksivalerian kislotasi:  $C_5H_{10}O_3$



Oksikapron kislotasi:  $C_6H_{12}O_3$



Yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorod  $O_2$  uchun koeffitsient qiymati ifodasi  $(2n + m)$  va II variant kimyoviy algoritmi:



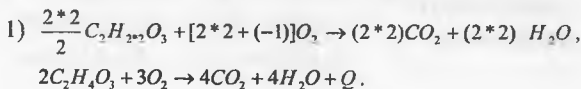
(n) va (m) qiymatlari jadvali:

n=2;	m=-1;	n=5;	m=2;
n=3;	m=0;	n=6;	m=3;
n=4;	m=1;	n=7;	m=4.

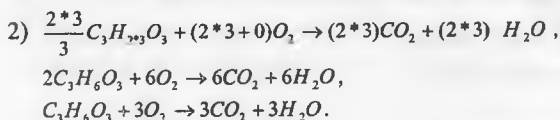
Demak, jadvaldan  $n = 2$  bo'lganda,  $m = -1$  ga yoki  $n = 5$  bo'lganda,  $m = 2$  ga tengligini va (n) va (m) qiymatlar orasidagi farq (3) birlikka o'zgarib, ortib borishini ko'rish mumkin.

Algoritmik amallarga misollar:

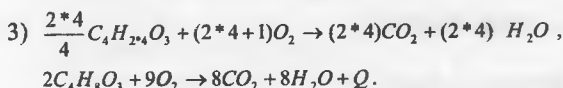
Oksisirka kislotasi:  $C_2H_4O_3$



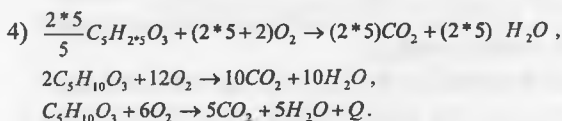
Sut kislotasi:  $C_3H_6O_3$



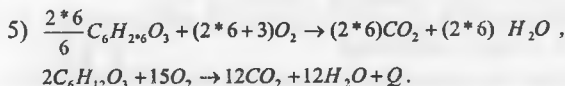
Oksimoy kislotasi:  $C_4H_8O_3$



Oksivalerian kislotasi:  $C_5H_{10}O_3$



Oksikapron kislotasi:  $C_6H_{12}O_3$



Reaksiyanning asosiy mahsulotlaridan biri – suvning  $H_2O$  koeffitsient qiymati ifodasi  $[n + (m + 3)]$  va III variant kimyoviy algoritmi:

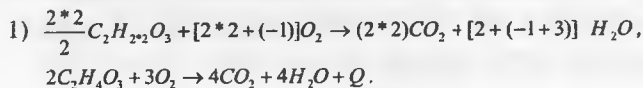


(n) va (m) qiymatlari jadvali:

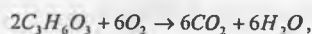
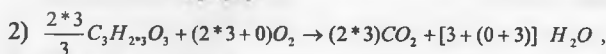
n=2;	m=-1;	n=5;	m=2;
n=3;	m=0;	n=6;	m=3;
n=4;	m=1;	n=7;	m=4.

Algoritmik amallarga misollar:

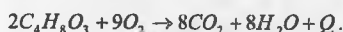
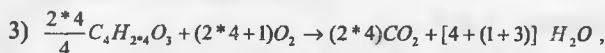
Oksisirka kislotasi:  $C_2H_4O_3$



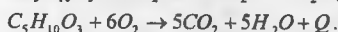
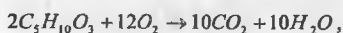
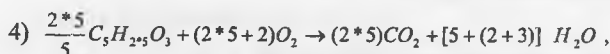
Sut kislotasi:  $C_3H_6O_3$ ,



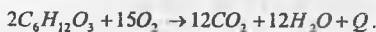
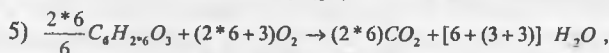
Oksimoy kislotasi:  $C_4H_8O_3$ ,



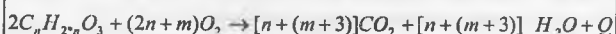
Oksivalerian kislotasi:  $C_5H_{10}O_3$ ,



Oksikapron kislotasi:  $C_6H_{12}O_3$ ,



Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[n + (m + 3)]$  va IV variant kimyoviy algoritmi:



(n) va (m) qiymatlari jadvali:

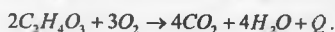
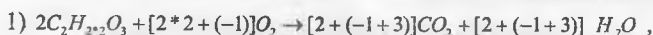
$$n=2; \quad m=-1; \quad n=5; \quad m=2;$$

$$n=3; \quad m=0; \quad n=6; \quad m=3;$$

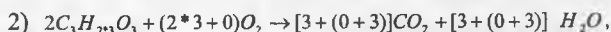
$$n=4; \quad m=1; \quad n=7; \quad m=4.$$

Algoritmik amallarga misollar:

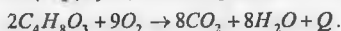
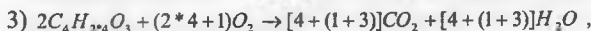
Oksisirka kislotasi:  $C_2H_4O_3$ ,



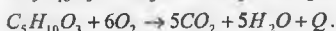
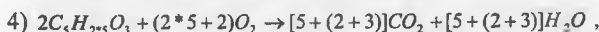
Sut kislotasi:  $C_3H_6O_3$



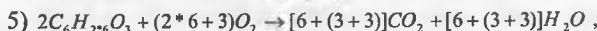
Oksimoy kislotasi:  $C_4H_8O_3$



Oksivalerian kislotasi:  $C_5H_{10}O_3$



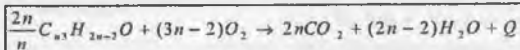
Oksikapron kislotasi:  $C_6H_{12}O_3$



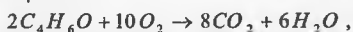
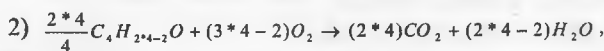
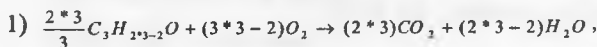
## TO'YINMAGAN ALDEGIDLAR VA KETONLAR

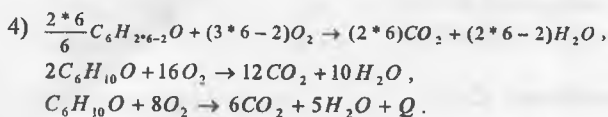
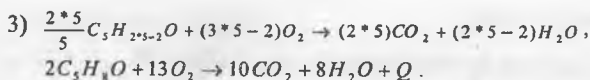
Molekulasi tarkibida to'yinmagan uglevodorodlar radikalidagi bitta vodorod atomi aldegid guruhi  $-CHO$  bilan almashingan organik birikmalar to'yinmagan aldegidlar sinfini tashkil etadi.

Shuningdek, to'yinmagan aldegidlar va ketonlarning umumiy formulasi  $C_nH_{2n-2}O$  bo'lganda, ularning yonish reaksiya tenglamalari kimyoviy algoritmini ushbu ko'rinishda ifodalash mumkin:



Kimyoviy algoritmik amallarga misollar:





Mazkur sinf gomologlari vakillari yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasini ushbu ko'rinishda yozib  $(2n+m)$ , kimyoviy algoritmining II variantini quydgicha ifodalaymiz:

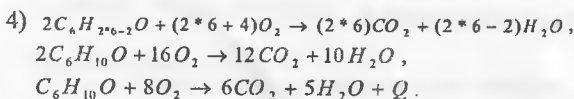
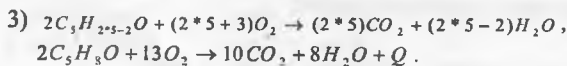
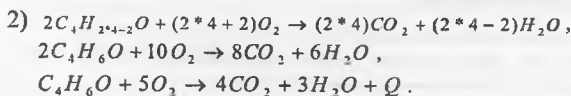
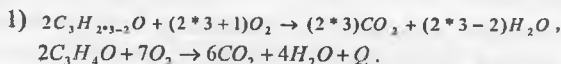


(n) va (m) qiymatlari jadvali:

n=3;	m=1;	n=6;	m=4;
n=4;	m=2;	n=7;	m=5;
n=5;	m=3;	n=8;	m=6.

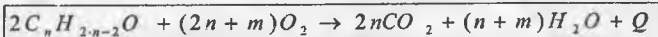
Jadvaldan ko'rinib turibdiki, (n) va (m) qiymatlari orasidagi farq (2) birlikka o'zgarib borar ekan.

Kimyoviy algoritmik amallarga misollar:



Organik moddalarning ushbu sinfi gomologlari vakillari yonish reaksiya

tenglamalarining asosiy mahsulotlaridan biri - suvning  $H_2O$  koeffitsient qiymati ifodasini  $(n+m)$  shaklida yozganimizda, III variant kimyoviy algoritmi quydagi ko'rinishda bo'ladi:



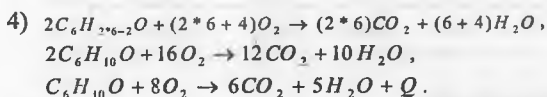
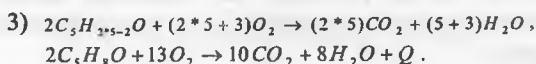
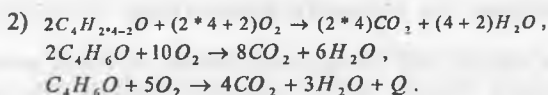
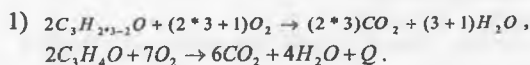
(n) va (m) qiymatlari jadvali:

$$n=3; m=1; n=6; m=4;$$

$$n=4; m=2; n=7; m=5;$$

$$n=5; m=3; n=8; m=6.$$

Kimyoviy algoritmik amallarga misollar:



Reaksiyaning asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[n+(m+2)]$  va IV variant kimyoviy algoritmi:



(n) va (m) qiymatlari jadvali:

$$n=3; m=1; n=6; m=4;$$

$$n=4; m=2; n=7; m=5;$$

$$n=5; m=3; n=8; m=6.$$

Kimyoviy algoritmik amallarga misollar:

- 1)  $2C_3H_{2 \cdot 3 - 2}O + (2 \cdot 3 + 1)O_2 \rightarrow [3 + (1 + 2)]O_2 + (3 + 1)H_2O$  ,  
 $2C_3H_4O + 7O_2 \rightarrow 6CO_2 + 4H_2O + Q$  .
- 2)  $2C_4H_{2 \cdot 4 - 2}O + (2 \cdot 4 + 2)O_2 \rightarrow [4 + (2 + 2)]CO_2 + (4 + 2)H_2O$  ,  
 $2C_4H_6O + 10O_2 \rightarrow 8CO_2 + 6H_2O$  ,  
 $C_4H_6O + 5O_2 \rightarrow 4CO_2 + 3H_2O + Q$  .
- 3)  $2C_5H_{2 \cdot 5 - 2}O + (2 \cdot 5 + 3)O_2 \rightarrow [5 + (3 + 2)]CO_2 + (5 + 3)H_2O$  ,  
 $2C_5H_8O + 13O_2 \rightarrow 10CO_2 + 8H_2O + Q$  .
- 4)  $2C_6H_{2 \cdot 6 - 2}O + (2 \cdot 6 + 4)O_2 \rightarrow [6 + (4 + 2)]CO_2 + (6 + 4)H_2O$  ,  
 $2C_6H_{10}O + 16O_2 \rightarrow 12CO_2 + 10H_2O$  ,  
 $C_6H_{10}O + 8O_2 \rightarrow 6CO_2 + 5H_2O + Q$  .

### ALDEGIDO VA KETONOKISLOTALAR

Molekulasi tarkibida aldegid yoki keton guruhi hamda karboksil guruhi bo'ladigan organik birikmalar aldegido va ketonokislotalar deyiladi. Ularning birinchi vakili gliksil kislotasi pishib yetilmagan ho'l mevalarda uchraydi. Aldegido va ketonokislotalarning umumiy formulasi  $C_nH_{2n-2}O_3$  va yonish reaksiya tenglamalari kimyoviy algoritmi:

$$\frac{2n}{n} C_n H_{2n-2} O_3 + (3n - 4) O_2 \rightarrow 2n CO_2 + (2n - 2) H_2O + Q$$

Algoritmik amallarga misollar:

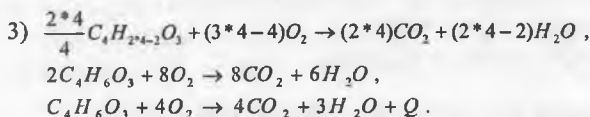
Gliksil kislotasi:  $CHO - COOH$  yoki  $C_2H_2O_3$

- 1)  $\frac{2 \cdot 2}{2} C_2 H_{2 \cdot 2 - 2} O_3 + (3 \cdot 2 - 4) O_2 \rightarrow (2 \cdot 2) CO_2 + (2 \cdot 2 - 2) H_2O$  .  
 $2C_2H_2O_3 + 2O_2 \rightarrow 4CO_2 + 2H_2O$  ,  
 $C_2H_2O_3 + O_2 \rightarrow 2CO_2 + H_2O + Q$  .

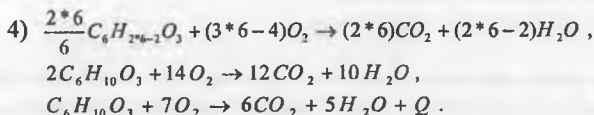
Propanon kislotasi:  $C_3H_4O_3$

- 2)  $\frac{2 \cdot 3}{3} C_3 H_{2 \cdot 3 - 2} O_3 + (3 \cdot 3 - 4) O_2 \rightarrow (2 \cdot 3) CO_2 + (2 \cdot 3 - 2) H_2O$  ,  
 $2C_3H_4O_3 + 5O_2 \rightarrow 6CO_2 + 4H_2O + Q$  .

Asetosirka kislotasi:  $CH_3 - CO - CH_2 - COOH$  yoki  $C_4H_6O_3$



Asetosirka efiri:  $CH_3 - CO - CH_2 - COOC_2H_5$  yoki  $C_6H_{10}O_3$



Kislorod  $O_2$  uchun koeffitsient qiymati ifodasini  $(2n+m)$  shaklida yozib, mazkur sinf vakillari yonish reaksiya tenglamalari II varianti kimyoviy algoritmini ushbu ko'rinishda ifodalaymiz:



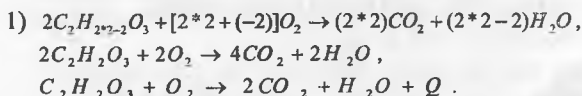
(n) va (m) qiymatlari orasidagi bog'liqlik:

$$\begin{array}{llll} n=2; & m=-2; & n=5; & m=1; \\ n=3; & m=-1; & n=6; & m=2; \\ n=4; & m=0; & n=7; & m=3. \end{array}$$

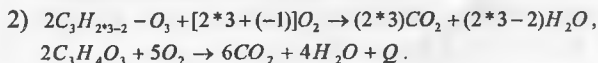
Jadvaldan ko'rinib turibdiki,  $n = 2$  ga teng bo'lganda,  $m = -2$  ga teng bo'lib, (n) va (m) qiymatlari (4) birlikka farq qilib o'zgarib boradi.

Algoritmik amallarga misollar:

Gliksil kislotasi:  $CHO - COOH$  yoki  $C_2H_2O_3$

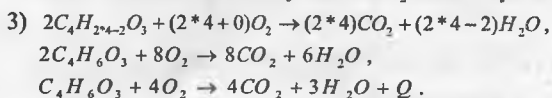


Propanon kislotasi:  $C_3H_4O_3$

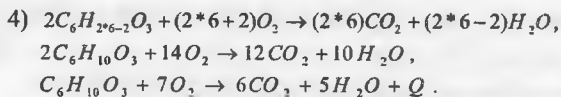




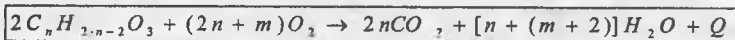
Asetosirka kislotasi:  $CH_3 - CO - CH_2 - COOH$  yoki  $C_4H_6O_3$ ,



Asetosirka efiri:  $CH_3 - CO - CH_2 - COOC_2H_5$ , yoki  $C_6H_{10}O_3$ ,



Reaksiyaning asosiy mahsulotlaridan biri – suvning  $H_2O$  koeffitsient qiymati ifodasini quydagicha ifodalab  $[n + (m + 2)]$ , III variant kimyoviy algoritmini ushbu ko'rinishda yozamiz:

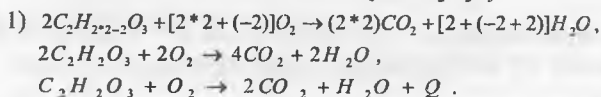


(n) va (m) qiymatlari orasidagi bog'liqlik:

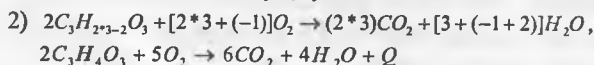
$$\begin{array}{llll} n=2; & m=-2; & n=5; & m=1; \\ n=3; & m=-1; & n=6; & m=2; \\ n=4; & m=0; & n=7; & m=3. \end{array}$$

Algoritmik amallarga misollar:

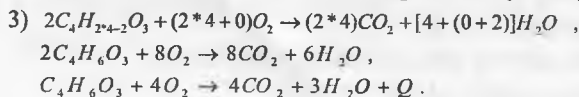
Gliksil kislotasi:  $CHO - COOH$  yoki  $C_2H_2O_3$ ,



Propanon kislotasi:  $C_3H_4O_3$ ,



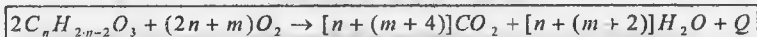
Asetosirka kislotasi:  $CH_3 - CO - CH_2 - COOH$  yoki  $C_4H_6O_3$ ,



Asetosirka efiri:  $CH_3 - CO - CH_2 - COOC_2H_5$ , yoki  $C_6H_{10}O_4$ ,

- 4)  $2C_6H_{2*6-2}O_3 + (2*6+2)O_2 \rightarrow (2*6)CO_2 + [6+(2+2)]H_2O$ ,  
 $2C_6H_{10}O_3 + 14O_2 \rightarrow 12CO_2 + 10H_2O$ ,  
 $C_6H_{10}O_3 + 7O_2 \rightarrow 6CO_2 + 5H_2O + Q$ .

Reaksiyaning asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi quydagicha  $[n+(m+4)]$  va IV variant kimyoviy algoritmi ushbu ko'rinishda bo'ladi:



(n) va (m) qiymatlari orasidagi bog'liqlik:

n=2; m=-2; n=5; m=1;  
n=3; m=-1; n=6; m=2;  
n=4; m=0; n=7; m=3.

Algoritmik amallarga misollar:

Gliksil kislotasi:  $CHO - COOH$  yoki  $C_2H_2O_3$ ,

- 1)  $2C_2H_{2*2-2}O_3 + [2*2+(-2)]O_2 \rightarrow [2+(-2+4)]CO_2 + [2+(-2+2)]H_2O$ ,  
 $2C_2H_2O_3 + 2O_2 \rightarrow 4CO_2 + 2H_2O$ ,  
 $C_2H_2O_3 + O_2 \rightarrow 2CO_2 + H_2O + Q$ .

Propanon kislotasi:  $C_3H_4O_3$ ,

- 2)  $2C_3H_{2*3-2}O_3 + [2*3+(-1)]O_2 \rightarrow [3+(-1+4)]CO_2 + [3+(-1+2)]H_2O$ ,  
 $2C_3H_4O_3 + 5O_2 \rightarrow 6CO_2 + 4H_2O + Q$ .

Asetosirka kislotasi:  $CH_3 - CO - CH_2 - COOH$  yoki  $C_4H_6O_3$ ,

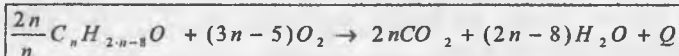
- 3)  $2C_4H_{2*4-2}O_3 + (2*4+0)O_2 \rightarrow [4+(0+4)]CO_2 + [4+(0+2)]H_2O$ ,  
 $2C_4H_6O_3 + 8O_2 \rightarrow 8CO_2 + 6H_2O$ ,  
 $C_4H_6O_3 + 4O_2 \rightarrow 4CO_2 + 3H_2O + Q$ .

Asetosirka efiri:  $CH_3 - CO - CH_2 - COOC_2H_5$ , yoki  $C_6H_{10}O_4$ ,

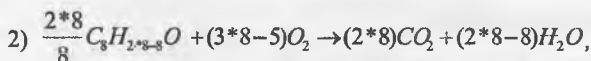
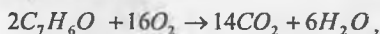
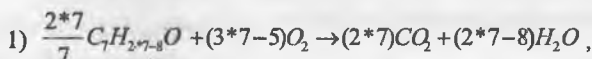
- 4)  $2C_6H_{2*6-2}O_3 + (2*6+2)O_2 \rightarrow [6+(2+4)]CO_2 + [6+(2+2)]H_2O$ ,  
 $2C_6H_{10}O_3 + 14O_2 \rightarrow 12CO_2 + 10H_2O$ ,  
 $C_6H_{10}O_3 + 7O_2 \rightarrow 6CO_2 + 5H_2O + Q$ .

## AROMATIK ALDEGIDLAR VA KETONLAR

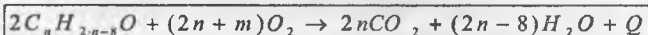
Aromatik aldegidlar va ketonlar organik birikmalarning muhim siniflaridan biri bo'lib hisoblanadi. Ularning gomologlari ayrim vakillarining umumiy formulasini ushbu ko'rinishda yozib  $C_nH_{2n-8}O$ , yonish tenglamalari kimyoviy algoritmini quydagicha ifodalaymiz:



Algoritmik amallarga misollar:



Kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(2n+m)$  va II variant kimyoviy algoritmi:



(n) va (m) qiymatlari jadvali:

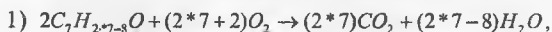
$$n=7; \quad m=2; \quad n=10; \quad m=5;$$

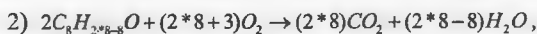
$$n=8; \quad m=3; \quad n=11; \quad m=6;$$

$$n=9; \quad m=4; \quad n=12; \quad m=7.$$

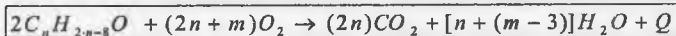
Jadvaldan (n) va (m) qiymatlari orasidagi farq (5) birlikka o'zgarib borishini ko'rish mumkin.

Algoritmik amallarga misollar:





Suvning  $H_2O$  koeffitsient qiymati ifodasi  $[n + (m - 3)]$  va III vairant kimyoviy algoritmi:

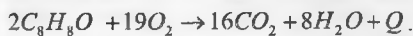
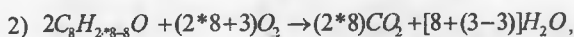
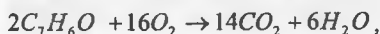
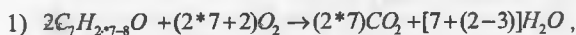


$$n=7; \quad m=2; \quad n=10; \quad m=5;$$

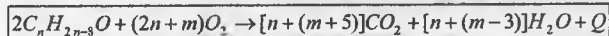
$$n=8; \quad m=3; \quad n=11; \quad m=6;$$

$$n=9; \quad m=4; \quad n=12; \quad m=7.$$

Algoritmik amallarga misollar:



Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[n + (m + 5)]$  va IV vairant kimyoviy algoritmi:

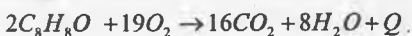
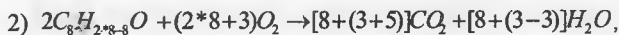
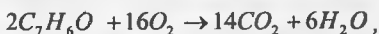
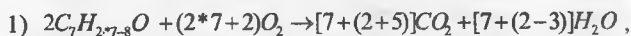


$$n=7; \quad m=2; \quad n=10; \quad m=5;$$

$$n=8; \quad m=3; \quad n=11; \quad m=6;$$

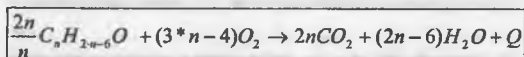
$$n=9; \quad m=4; \quad n=12; \quad m=7.$$

Algoritmik amallarga misollar:



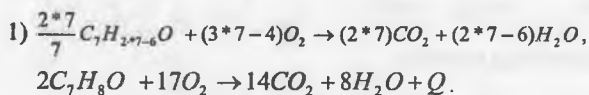
## AROMATIK SPIRTLAR

Aromatik spirtlarning ayrim vakillari uchun ushbu umumiy formuladan  $C_nH_{2n-6}O$  foydalanib, yonish reaksiya tenglamalari uchun quyidagi kimyoviy algoritm tavsiya qilinadi:

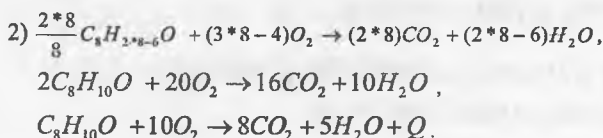


Algoritmik amallarga misollar:

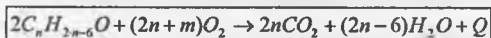
Benzil spirti:  $C_7H_8O$



Fenil-etil spirti:  $C_8H_{10}O$



Bu sinf gomologlari vakillari yonish reaksiya tenglamalarining asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(2n+m)$  va II variant kimyoviy algoritmi ushbu ko'rinishda bo'ladi:



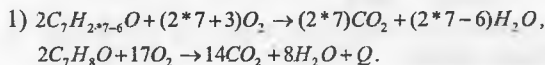
(n) va (m) qiymatlari jadvali:

n=7;	m=3;	n=10;	m=6;
n=8;	m=4;	n=11;	m=7;
n=9;	m=5;	n=12;	m=8.

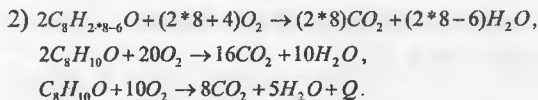
Jadvaldan ko'rinib turibdiki, (n) va (m) qiymatlari orasidagi farq (4) birlikka o'zgarib boradi.

Algoritmik amallarga misollar:

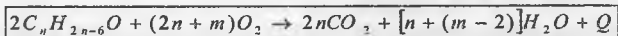
Benzil spirti:  $C_7H_8O$



Fenil-etil spirti:  $C_8H_{10}O$



Suvning  $H_2O$  koeffitsient qiymati ifodasi  $[n + (m - 2)]$  va III variant kimyoviy algoritmi:

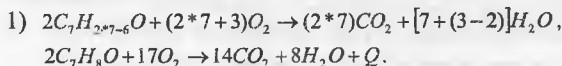


(n) va (m) qiymatlari jadvali:

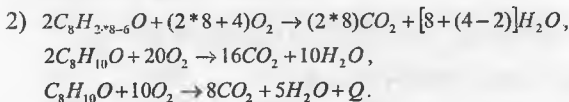
n=7;	m=3;	n=10;	m=6;
n=8;	m=4;	n=11;	m=7;
n=9;	m=5;	n=12;	m=8.

Algoritmik amallarga misollar:

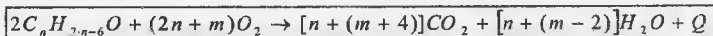
Benzil spirti:  $C_7H_8O$



Fenil - etil spirti:  $C_8H_{10}O$



Mazkur sinf vakillari uchun karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[n + (m + 4)]$  va yonish reaksiya tenglamalarining IV variant kimyoviy algoritmi:

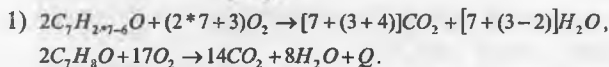


(n) va (m) qiymatlari jadvali:

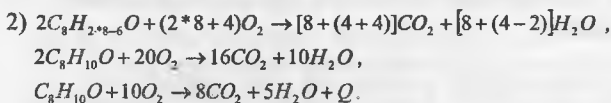
n=7;	m=3;	n=10;	m=6;
n=8;	m=4;	n=11;	m=7;
n=9;	m=5;	n=12;	m=8.

Algoritmik amallarga misollar:

Benzil spirti:  $C_7H_8O$

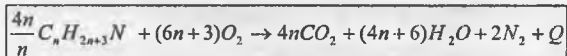


Fenil-etil spirti:  $C_8H_{10}O$

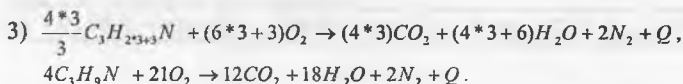
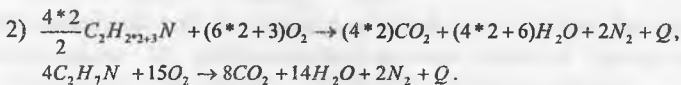
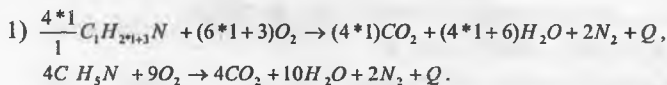


## BIRLAMCHI, IKKILAMCHI VA UCHLAMCHI AMINLAR

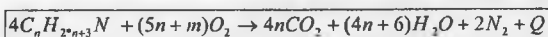
Aminlar molekulasida ammiakning bir ikki yoki hamma vodrod atomlarining uglevodород radikallari bilan almashigan organik birikmalarning hosilalaridir. Bu sinf vakillari tabiatda keng tarqalgan bo'lib, ular birlamchi, ikkilamchi, uchlamchi aminlar guruhlariga bo'linadi. Aminlar sinfi gomologlari vakillarining umumiy formulasini  $C_nH_{2n+3}N$  shaklida ifodalab, yonish reaksiya tenglamalari kimyoviy algoritmini ushbu ko'rinishda yozamiz:



Algoritmik amallarga misollar:



Reaksiyaning asosiy ishtirokchisi - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(5n+m)$  bo'lganda, II variant kimyoviy algoritmi quydagicha bo'ladi:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

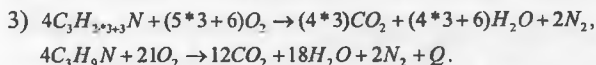
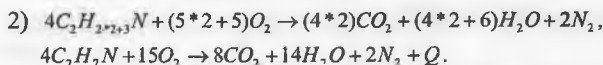
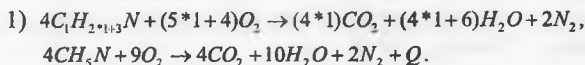
$$n=1; \quad m=4; \quad n=4; \quad m=7;$$

$$n=2; \quad m=5; \quad n=5; \quad m=8;$$

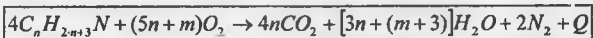
$$n=3; \quad m=6; \quad n=6; \quad m=9.$$

Demak,  $n = 1$  bo'lganda,  $m = 4$  ga yoki  $n = 3$  bo'lganda,  $m=6$  ga teng bo'lib, (n) va (m) qiymatlari orasidagi farq proporsional ravishda (3) birlikka o'zgarib borishini ko'rish mumkin.

Algoritmik amallarga misollar:



Shuningdek, suvning  $H_2O$  koeffitsient qiymati ifodasi quydagicha  $[3n+(m+3)]$  va III variant kimyoviy algoritmi ushbu ko'rinishda bo'ladi:



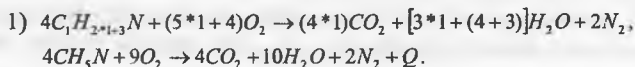
(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

$$n=1; \quad m=4; \quad n=4; \quad m=7;$$

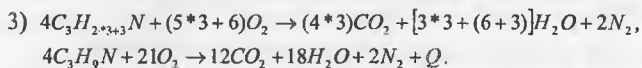
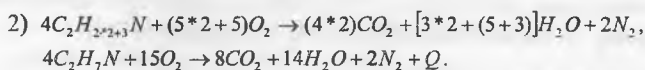
$$n=2; \quad m=5; \quad n=5; \quad m=8;$$

$$n=3; \quad m=6; \quad n=6; \quad m=9.$$

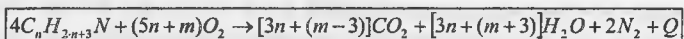
Algoritmik amallarga misollar:







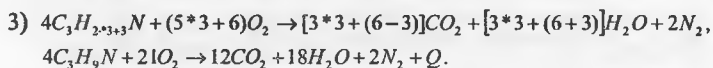
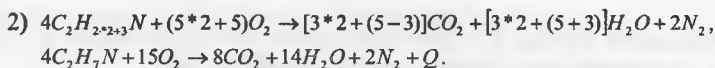
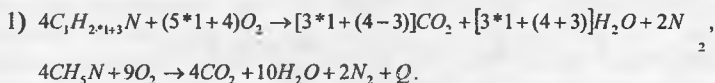
Reaksiya mahsulotlaridan biri karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasini  $[3n + (m - 3)]$  shaklida yozib, IV variant kimyoviy algoritmini shunday ifodalaymiz:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

n=1;	m=4;	n=4;	m=7;
n=2;	m=5;	n=5;	m=8;
n=3;	m=6;	n=6;	m=9.

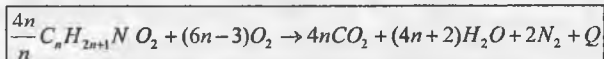
Algoritmik amallarga misollar:



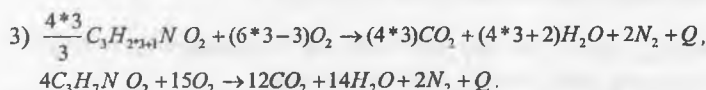
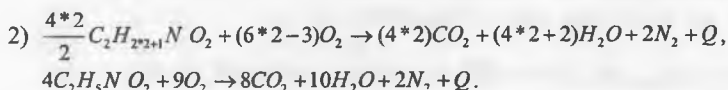
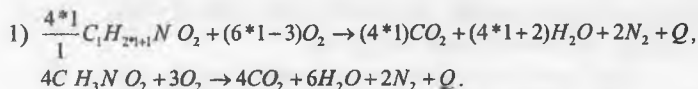
## AMINOKISLOTALAR VA NITROALKANLAR

Aminokislotalar uglevodorod radikallaridagi vodorod atomlarining ham amino guruh  $-NH_2$ , ham karboksil guruh  $-COOH$  bilan almashingan geterofunksionl birikmalaridir. Molekulasi tarkibidagi amino va karboksil guruhlarning soniga hamda uglevodorod radikallariga bog'liq holda ular monoaminokarbon kislotalar, diaminokarbon kislotalar, aminodikarbon, aromatik va geterosiklik birikmalarga bo'linadi. Shuningdek, monoaminokarbon kislotalar bilan nitroalkanlarning umumiy formulasini  $C_nH_{2n+1}NO_2$  shaklida ifodalab, bu sinf gomologlari vakillarining yonish reaksiya tenglamalari kimyoviy algoritmini

quydagicha yozamiz:



Algoritmik amallarga misollar keltiramiz:



Agar aminokislotalar vakillarining formulalarini ushbu shakllarda yozadigan bo'lsak:

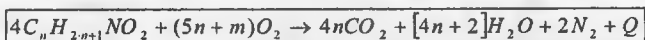
$\alpha$  -aminosirka kislotasi:  $H_2N-CH_2-COOH$  yoki  $C_2H_5NO_2$

$\beta$  - aminopropion kislotasi:  $H_2N-(CH_2)_2-COOH$  yoki  $C_3H_7NO_2$

$\gamma$  - aminomoy kislotasi:  $H_2N-(CH_2)_3-COOH$  yoki  $C_4H_9NO_2$

demak, nitroalkanlarning yonish reaksiya tenglamalari uchun keltirilgan kimyoviy algoritmlardan "aminokislotalar" sinfi gomologlari vakillari uchun ham foydalanish mumkin.

Mazkur sinflar gomologlari vakillari uchun reaksiyaning asosiy ishtirokchisi kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(5n+m)$  bo'lganda, II variant kimyoviy algoritmi quydagicha bo'ladi:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

$n=1;$      $m=-2;$      $n=5;$      $m=2;$

$n=2;$      $m=-1;$      $n=6;$      $m=3;$

$n=3;$      $m=0;$      $n=7;$      $m=4;$

$n=4$      $m=1;$      $n=8;$      $m=5.$

Jadvaldan ko'rinib turibdiki,  $n = 1$  bo'lganda,  $m = -2$  ga yoki  $n = 4$  bo'lganda,  $m = 1$  ga teng bo'lib,  $(n)$  va  $(m)$  qiymatlari o'rtasidagi farq  $(3)$  birlikka proporsional ravishda o'zgarib borishini kuzatish mumkin.

Misollar keltirilgan:

- $$4C_1H_{2*1+1}NO_2 + [5*1 + (-2)]O_2 \rightarrow (4*1)CO_2 + (4*1 + 2)H_2O + 2N_2,$$

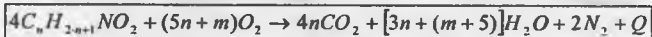
$$4CH_3NO_2 + 3O_2 \rightarrow 4CO_2 + 6H_2O + 2N_2 + Q.$$
- $$4C_2H_{2*2+1}NO_2 + [5*2 + (-1)]O_2 \rightarrow (4*2)CO_2 + (4*2 + 2)H_2O + 2N_2,$$

$$4C_2H_5NO_2 + 9O_2 \rightarrow 8CO_2 + 10H_2O + 2N_2 + Q.$$
- $$4C_3H_{2*3+1}NO_2 + [5*3 + 0]O_2 \rightarrow (4*3)CO_2 + (4*3 + 2)H_2O + 2N_2,$$

$$4C_3H_7NO_2 + 15O_2 \rightarrow 12CO_2 + 14H_2O + 2N_2 + Q.$$
- $$4C_4H_{2*4+1}NO_2 + (5*4 + 1)O_2 \rightarrow (4*4)CO_2 + (4*4 + 2)H_2O + 2N_2,$$

$$4C_4H_9NO_2 + 21O_2 \rightarrow 16CO_2 + 18H_2O + 2N_2 + Q.$$

Reaksiyaning asosiy mahsulotlaridan biri - suvning  $H_2O$  koeffitsient qiymati ifodasini  $[3n + (m + 5)]$  shaklida yozsak, mazkur sinflar gomologlari vakillarining III variant kimyoviy algoritmi ushbu ko'rinishga ega bo'ladi:



$(n)$  va  $(m)$  qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

$n=1;$	$m=-2;$	$n=5;$	$m=2;$
$n=2;$	$m=-1;$	$n=6;$	$m=3;$
$n=3;$	$m=0;$	$n=7;$	$m=4;$
$n=4$	$m=1;$	$n=8;$	$m=5.$

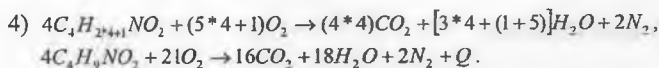
Misollar keltirilgan:

- $$4C_1H_{2*1+1}NO_2 + [5*1 + (-2)]O_2 \rightarrow (4*1)CO_2 + [3*1 + (-2 + 5)]H_2O + 2N_2,$$

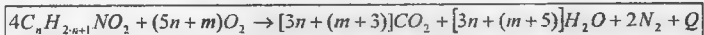
$$4CH_3NO_2 + 3O_2 \rightarrow 4CO_2 + 6H_2O + 2N_2 + Q$$
- $$4C_2H_{2*2+1}NO_2 + [5*2 + (-1)]O_2 \rightarrow (4*2)CO_2 + [3*2 + (-1 + 5)]H_2O + 2N_2,$$

$$4C_2H_5NO_2 + 9O_2 \rightarrow 8CO_2 + 10H_2O + 2N_2 + Q.$$
- $$4C_3H_{2*3+1}NO_2 + [5*3 + 0]O_2 \rightarrow (4*3)CO_2 + [3*3 + (0 + 5)]H_2O + 2N_2,$$

$$4C_3H_7NO_2 + 15O_2 \rightarrow 12CO_2 + 14H_2O + 2N_2 + Q.$$



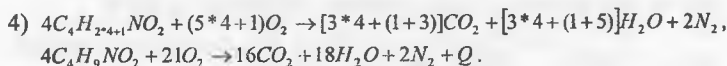
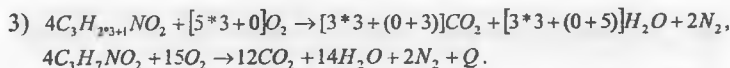
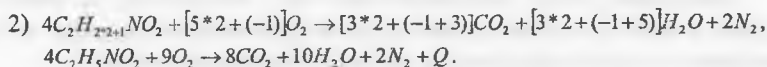
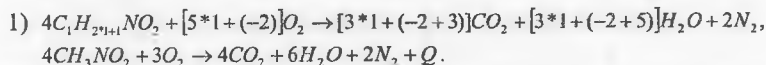
Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  
 $[3n + (m + 3)]$  va IV variant kimyoviy algoritmi:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

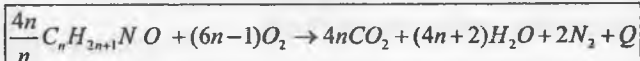
n=1;	m=-2;	n=5;	m=2;
n=2;	m=-1;	n=6;	m=3;
n=3;	m=0;	n=7;	m=4;
n=4	m=1;	n=8;	m=5.

Misollar keltirilgan:



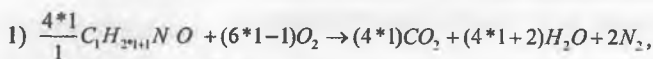
## KISLOTA AMIDLARI

Kislota amidlari ham eng muhim azotli organik birikmalar sinflaridan biri bo'lib hisoblanadi. Bu sinf vakillarining umumiy formulasini ushbu  $C_nH_{2n+1}NO$  ko'rinishda yozib, yonish reaksiya tenglamalari kimyoviy algoritmini shunday ifodalaymiz:

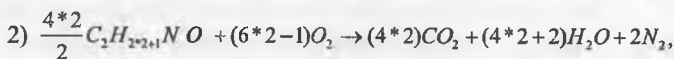


Misollar keltirilgan:

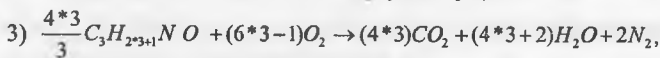
Formamid:  $H-CO-NH_2$ , yoki  $CH_3NO$



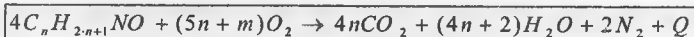
Asetamid:  $CH_3-CO-NH_2$ , yoki  $C_2H_5NO$



Propioamid  $CH_3-CH_2-CO-NH_2$ , yoki  $C_3H_7NO$



Reaksiyaning asosiy ishtirokchilaridan biri - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(5n+m)$  va ushbu sinf gomologlari vakillarining yonish reaksiya tenglamalari kimyoviy algoritmining II varianti quydagicha bo'ladi:



(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

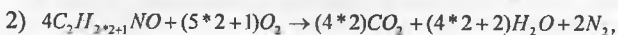
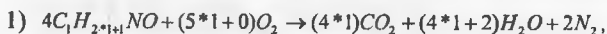
$$n=1; \quad m=0; \quad n=4; \quad m=3;$$

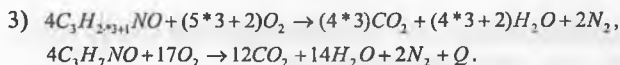
$$n=2; \quad m=1; \quad n=5; \quad m=4;$$

$$n=3; \quad m=2; \quad n=6; \quad m=5.$$

Bundan (n) va (m) qiymatlari (1) birlikka farq qilib, proporsional ravishda o'zgarib borishini ko'rish mumkin.

Misollar keltirilgan:





Suvning  $H_2O$  koeffitsient qiymati ifodasini  $[3n + (m + 3)]$  shaklida yozib,

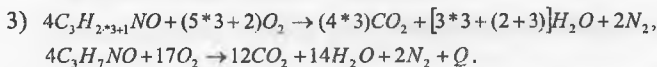
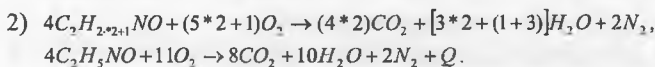
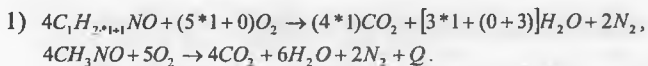
III variant kimyoviy algoritmini quyidagicha ifodalimiz:



(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

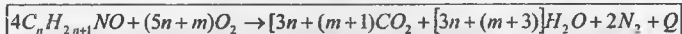
$$\begin{array}{llll} n=1; & m=0; & n=4; & m=3; \\ n=2; & m=1; & n=5; & m=4; \\ n=3; & m=2; & n=6; & m=5. \end{array}$$

Misollar keltirilgan:



Karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi

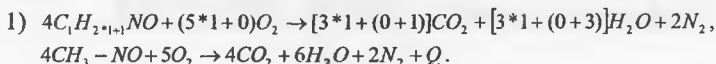
$[3n + (m + 1)]$  va IV variant kimyoviy algoritmi:

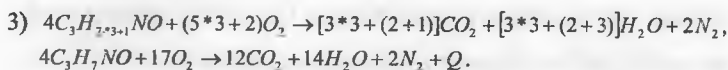
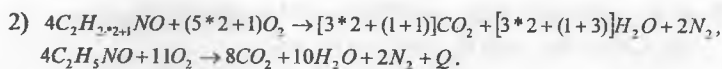


(n) va (m) qiymatlari orasidagi ketma - ketlikdagi bog'liqlik:

$$\begin{array}{llll} n=1; & m=0; & n=4; & m=3; \\ n=2; & m=1; & n=5; & m=4; \\ n=3; & m=2; & n=6; & m=5. \end{array}$$

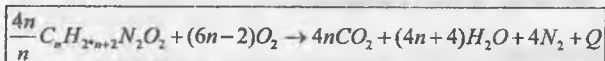
Misollar keltirilgan:



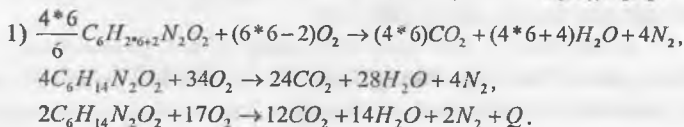


## DIAMINOKARBON KISLOTALAR

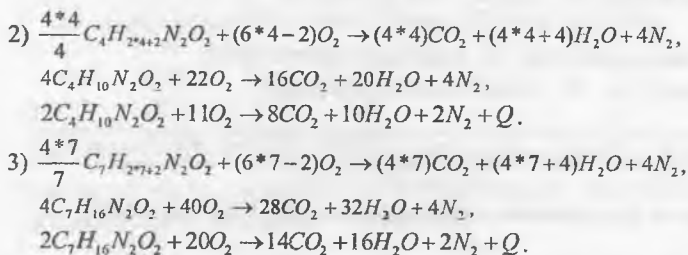
Diaminokarbon kislotalar ham oqsillarning tarkibida uchraydigan organik birikmalarning muhim sinfi vakillaridir. Diaminokarbon kislotalar gomologlari vakillarining umumiy formulasi  $C_nH_{2n+2}N_2O_2$  va ular uchun yonish reaksiya tenglamalari kimyoviy algoritmi:



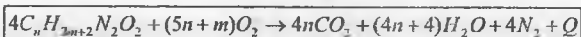
Tipik vakili lizinning yonish reaksiya tenglamasi:  $C_6H_{14}N_2O_2$



Boshqa misollar ham keltirilgan:



Reaksiyaning asosiy ishtirokchisi - kislorod  $O_2$  uchun koeffitsient qiymati ifodasi  $(5n+m)$  bo'lganda, II variant kimyoviy algoritmi ushbu ko'rinishda bo'ladi:

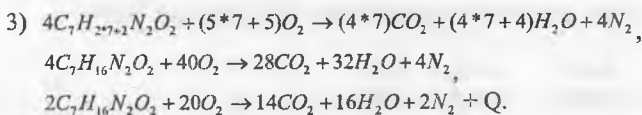
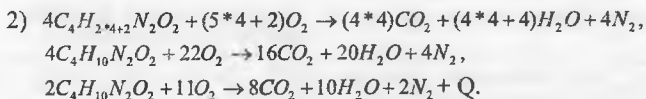
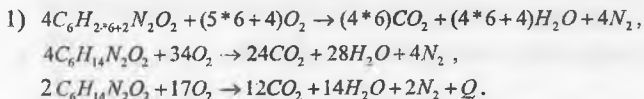


(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

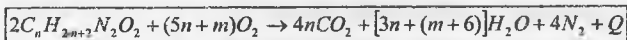
$$\begin{array}{llll} n=2; & m=0; & n=5; & m=3; \\ n=3; & m=1; & n=6; & m=4; \\ n=4; & m=2; & n=7; & m=5. \end{array}$$

Jadvaldan ko'rinish turibdiki,  $n = 2$  ga teng bo'lganda,  $m = 0$  ga yoki  $n = 4$  ga teng bo'lganda,  $m = 2$  ga teng bo'lib, (n) va (m) qiymatlari orasidagi farq ham shunday tartibda o'zgarib borishi mumkin.

Algoritmik amallarga misollar:



Reaksiyaning asosiy mahsulotlaridan biri - suvning  $H_2O$  koeffisient qiymati ifodasi  $[3n + (m + 6)]$  bo'lganda, III variant kimyoviy algoritmi quydagi ko'rinishga ega bo'ladi:

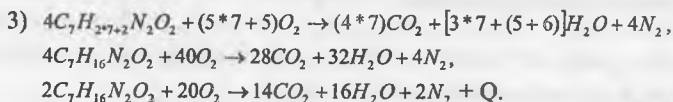
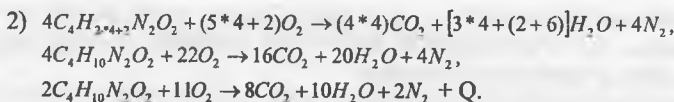
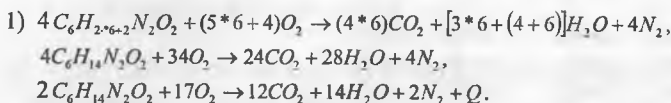


(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

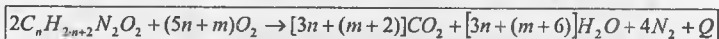
$$\begin{array}{llll} n=2; & m=0; & n=5; & m=3; \\ n=3; & m=1; & n=6; & m=4; \\ n=4; & m=2; & n=7; & m=5. \end{array}$$



Misollar keltirilgan:



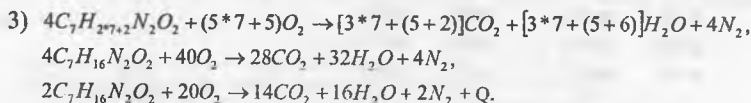
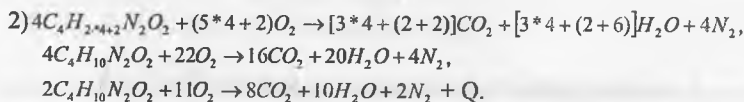
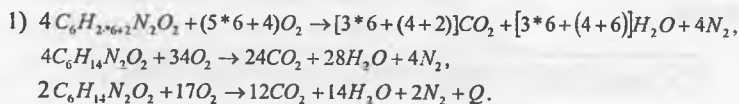
Reaksiyaning asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[3n + (m + 2)]$  va IV variant kimyoviy algoritmi:



(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

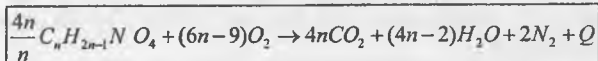
n=2;	m=0;	n=5;	m=3;
n=3;	m=1;	n=6;	m=4;
n=4;	m=2;	n=7;	m=5.

Misollar keltirilgan:

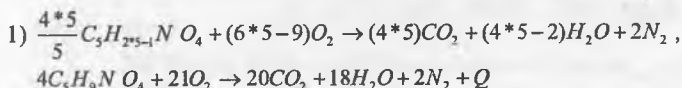


## AMINODIKARBON KISLOTALAR

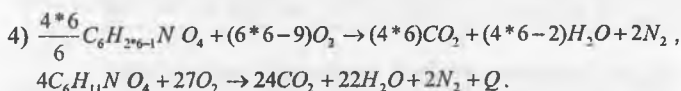
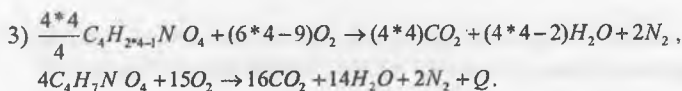
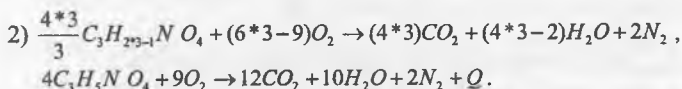
Organik moddalarning ushbu vakillari ham oqsillar tarkibida uchraydigan aminokislotalarning muhim sinfi gomoglari vakillari hisoblangan aminodikarbon kislotalar bo'lib, ularning umumiy formulasini  $C_n H_{2n-1} N O_4$  shaklida ifodalaydigan bo'lsak, yonish reaksiya tenglamalari kimyoviy algoritmi quydagi ko'rinishda bo'ladi:



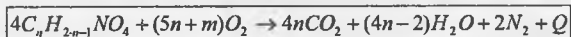
Glutamin kislotalaning yonish reaksiya tenglamasi:  $C_5 H_9 N O_4$



Boshqa misollar keltirilgan:



Aminodikarbon kislotalar gomoglari vakillari yonish reaksiya tenglamalarining asosiy ishtirokchilaridan biri - kislorodning  $O_2$  koeffitsient qiymati ifodasi  $(5n+m)$  va III varianti kimyoviy algoritmi:

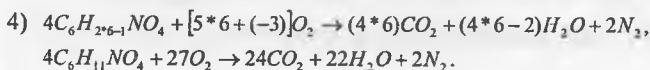
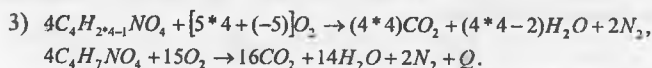
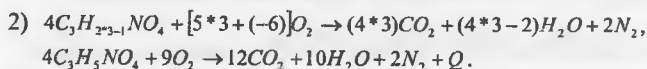
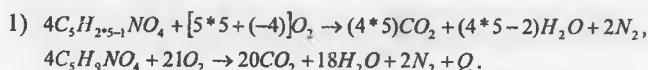


(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

$$\begin{array}{llll} n=3; & m=-6; & n=7; & m=-2; \\ n=4; & m=-5; & n=8; & m=-1; \\ n=5; & m=-4; & n=9; & m=0; \\ n=6; & m=-3; & n=10; & m=1. \end{array}$$

Jadvaldan ko'rinib turibdiki,  $n = 3$  bo'lganda,  $m = -6$  ga  $n = 7$  bo'lganda,  $m = -2$  ga yoki  $n = 9$  bo'lganda,  $m = 0$  ga teng bo'lib, (n) va (m) qiymatlari proporsional ravishda (9) birlikka farq qilib, shunday tartibda o'zgarib boradi.

Misollar keltirilgan:



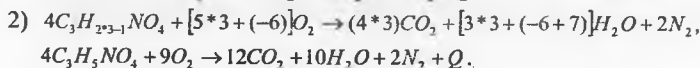
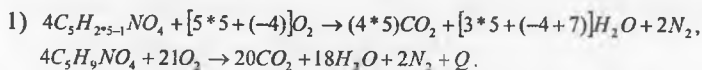
Yonish reaksiya tenglamalarining asosiy mahsulotlaridan biri - suvning  $H_2O$  koeffitsient qiymati ifodasi  $[3n + (m + 7)]$  va III variant kimyoviy algoritmi:

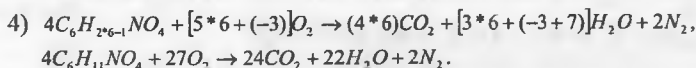
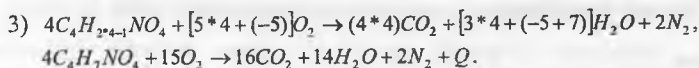


(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

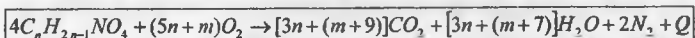
$$\begin{array}{llll} n=3; & m=-6; & n=7; & m=-2; \\ n=4; & m=-5; & n=8; & m=-1; \\ n=5; & m=-4; & n=9; & m=0; \\ n=6; & m=-3; & n=10; & m=1. \end{array}$$

Misollar keltirilgan:





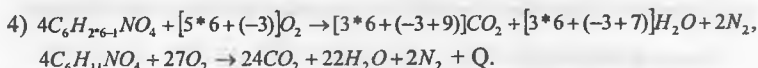
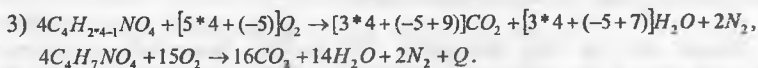
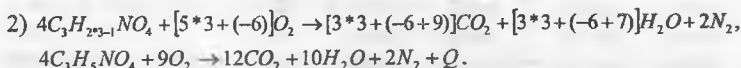
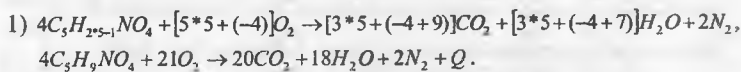
Reaksiyaning asosiy mahsulotlaridan biri - karbonat anhidridning  $CO_2$  koeffitsient qiymati ifodasi  $[3n + (m + 9)]$  va IV variant kimyoviy algoritmi:



(n) va (m) qiymatlari orasidagi ketma-ketlikdagi bog'liqlik:

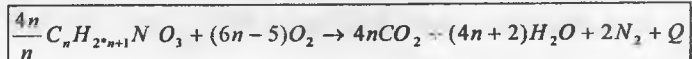
n=3;	m=-6;	n= 7;	m=-2;
n=4;	m=-5;	n= 8;	m=-1;
n=5;	m=-4;	n= 9;	m= 0;
n=6;	m=-3;	n=10;	m= 1.

Misollar keltirilgan:

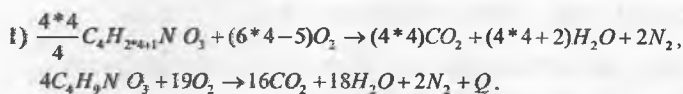


## OKSIAMINOKISLOTALAR

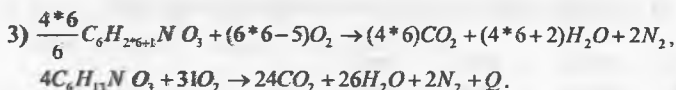
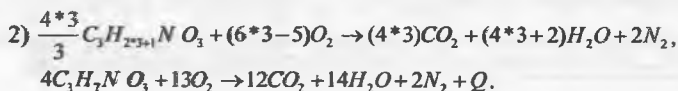
Oksiaminokislotalar gomologlari vakillari ham azotli organik birikmalarning muhim siniflaridan biridir. Mazkur sinfga kiruvchi organik moddalarning umumiy formulasini  $C_nH_{2n+1}NO_3$  shaklida ifodalab, yonish reaksiya tenglamalari kimyoviy algoritmini quydagi ko'rishda yozamiz:



Tipik vakili treoninning yonish reaksiya tenglamasi:  $C_4H_9NO_3$



Boshqa misollar keltirilgan:



Reaksiyaning asosiy ishtirokchisi - kislorodning  $O_2$  koefitsient qiymati ifodasi  $(5n+m)$  bo'lganda, II variant kimyoviy algoritmi quydagicha bo'ladi:

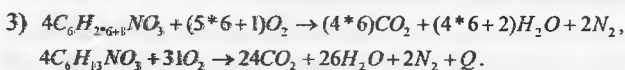
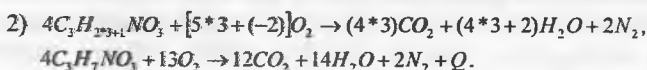
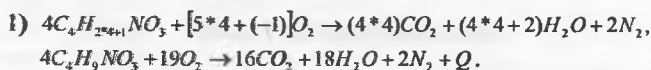


(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

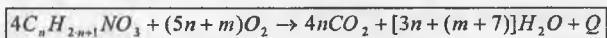
n=3;	m=-2;	n= 7;	m=2;
n=4;	m=-1;	n= 8;	m=3;
n=5;	m= 0;	n= 9;	m=4;
n=6;	m= 1;	n=10;	m=5.

Bunda (n) va (m) qiymatlari (5) birlikka farq qiladi, ya'ni  $n = 3$  bo'lganda,  $m = -2$  ga yoki  $n = 6$  bo'lganda,  $m = 1$  ga teng bo'ladi. Demak, (n) va (m) qiymatlarining o'zaro nisbatlari ana shunday tartibda o'zgarib boradi.

Misollar keltirilgan:



Reaksiya mahsulotlaridan biri - suvning  $H_2O$  koeffitsient qiymati ifodasini  $[3n+(m+7)]$  shaklida yozib, III variant kimyoviy algoritmini shunday ifodalaymiz:



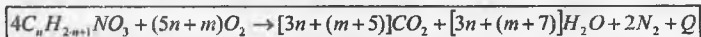
(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

n=3;	m=-2;	n= 7;	m=2;
n=4;	m=-1;	n= 8;	m=3;
n=5;	m= 0;	n= 9;	m=4;
n=6;	m= 1;	n=10;	m=5.

Misollar keltirilgan:

- 1)  $4C_4H_{2*4+1}NO_3 + [5*4+(-1)]O_2 \rightarrow (4*4)CO_2 + [3*4+(-1+7)]H_2O + 2N_2$ ,  
 $4C_4H_9NO_3 + 19O_2 \rightarrow 16CO_2 + 18H_2O + 2N_2 + Q$ .
- 2)  $4C_3H_{2*3+1}NO_3 + [5*3+(-2)]O_2 \rightarrow (4*3)CO_2 + [3*3+(-2+7)]H_2O + 2N_2$ ,  
 $4C_3H_7NO_3 + 13O_2 \rightarrow 12CO_2 + 14H_2O + 2N_2 + Q$ .
- 3)  $4C_6H_{2*6+1}NO_3 + (5*6+1)O_2 \rightarrow (4*6)CO_2 + [3*6+(1+7)]H_2O + 2N_2$ ,  
 $4C_6H_{13}NO_3 + 31O_2 \rightarrow 24CO_2 + 26H_2O + 2N_2 + Q$ .

Shuningdek, reaksiya mahsulotlaridan biri - karbonat angidridning  $CO_2$  koeffitsient qiymati ifodasini  $[3n+(m+5)]$  shaklida yozib, IV variant kimyoviy algoritmini shunday ifodalaymiz:

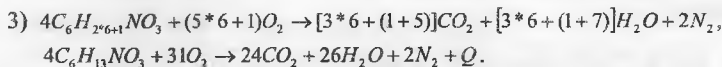
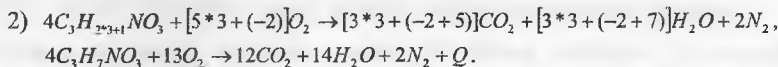


(n) va (m) qiymatlari orasidagi ketma- ketlikdagi bog'liqlik:

n=3;	m=-2;	n= 7;	m=2;
n=4;	m=-1;	n= 8;	m=3;
n=5;	m= 0;	n= 9;	m=4;
n=6;	m= 1;	n=10;	m=5.

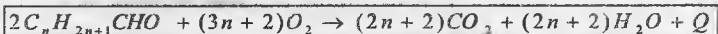
Misollar keltirilgan:

- 1)  $4C_4H_{2*4+1}NO_3 + [5*4+(-1)]O_2 \rightarrow [3*4+(-1+5)]CO_2 + [3*4+(-1+7)]H_2O + 2N_2$ ,  
 $4C_4H_9NO_3 + 19O_2 \rightarrow 16CO_2 + 18H_2O + 2N_2 + Q$ .

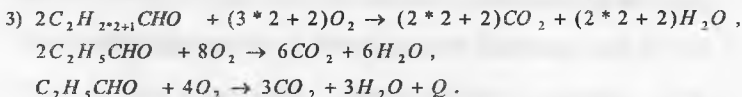
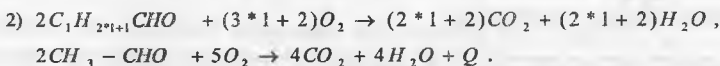
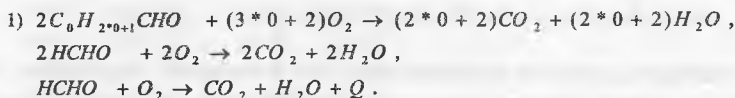


## FUNKSIONAL GURUHLI ORGANIK BIRIKMALARNING KIMYOVIY ALGORITMLARI

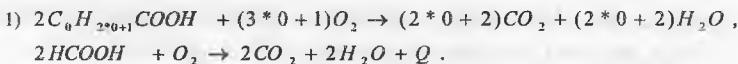
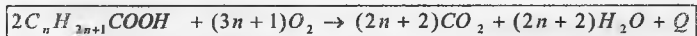
Yonish reaksiyalari tenglamalari qatorida  $-CHO$ ,  $-COOH$  yoki boshqa funksional guruhlar bilan bog'langan organik birikmalarda kimyoviy algoritmlarning ayrim qonuniyatlari namoyon bo'ladi. Chunonchi, chumoli aldegidi  $H-CHO$  yoki ushbu  $H-COOH$  formula bilan ifodalanadigan chumoli kislotasida  $-CHO$  va  $-COOH$  funksional guruhlari faqat vodorod atomlari bilan bog'langan, ya'ni ularda  $(C H_2)$  radikalining qiymati (0) ga teng. Mazkur organik moddalarda  $(C H_2)$  radikalining (0) ga tengligini aynan ushbu turdagi kimyoviy algoritmlar tasdiqlaydi. Quyida shunday algoritmlarga misollar keltirilgan. Masalan, aldegidlarning umumiy formulasi  $C_n H_{2n+1} - CHO$  bo'lganda, yonish tenglamalari kimyoviy algoritmi ushbu ko'rinishda bo'ladi:

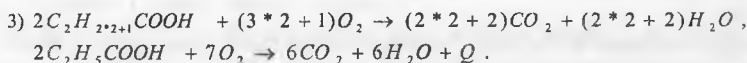
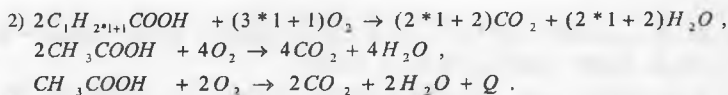


Misollar keltirilgan:

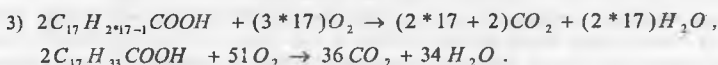
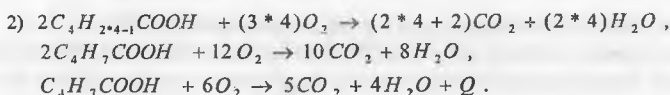
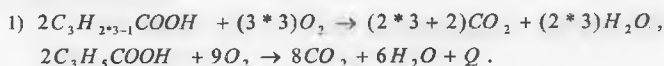


Bir asosli karbon kislotalarning umumiy formulasi  $C_n H_{2n+1} COOH$  va yonish tenglamalari kimyoviy algoritmi:

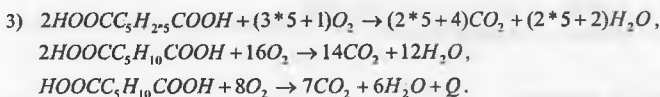
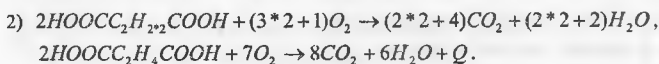
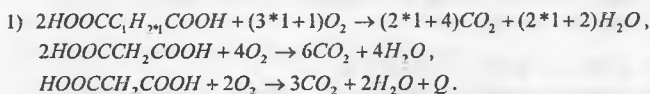
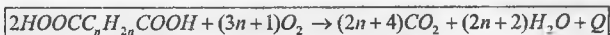




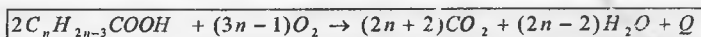
Bir asosli to'yinmagan karbon kislotalarning umumiy formulasi  $C_nH_{2n-1}COOH$  va kimyoviy algoritmining umumiy ko'rinishi:



Ikki asosli karbon kislotalarning umumiy formulasi  $HOOCC_nH_{2n}COOH$  va yonish reaksiya tenglamalari kimyoviy algoritmi:



Ko'proq to'yinmagan karbon kislotalarning umumiy formulasi  $C_nH_{2n-3}COOH$  va yonish reaksiya tenglamalari kimyoviy algoritmi:





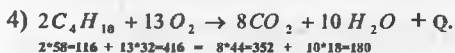
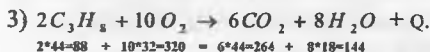
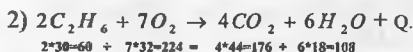
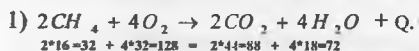
- 1)  $2C_3H_{2*3-3}COOH + (3*3-1)O_2 \rightarrow (2*3+2)CO_2 + (2*3-2)H_2O + Q$ ,  
 $2C_3H_3COOH + 8O_2 \rightarrow 8CO_2 + 4H_2O$ ,  
 $C_3H_3COOH + 4O_2 \rightarrow 4CO_2 + 2H_2O + Q$ .
- 2)  $2C_4H_{2*4-3}COOH + (3*4-1)O_2 \rightarrow (2*4+2)CO_2 + (2*4-2)H_2O$ ,  
 $2C_4H_5COOH + 11O_2 \rightarrow 10CO_2 + 6H_2O + Q$ .
- 3)  $2C_5H_{2*5-3}COOH + (3*5-1)O_2 \rightarrow (2*5+2)CO_2 + (2*5-2)H_2O$ ,  
 $2C_5H_7COOH + 14O_2 \rightarrow 12CO_2 + 8H_2O$ ,  
 $C_5H_7COOH + 7O_2 \rightarrow 6CO_2 + 4H_2O + Q$ .

## KIMYOVIY ALGORITMLARNING MATEMATIK TAHLILLARI

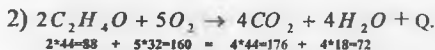
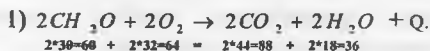
Tahlillar shuni ko'rsatadiki, kimyo fanining reaksiyaga kirishgan moddalarning massasi reaksiya natijasida hosil bo'lgan moddalarning massasiga tengligiga doir klassik qonuni yonish reaksiya tenglamalari qatorida ma'lum bir izchillikda takrorlanishini quydagi xulosalar yana bir bor tasdiqlaydi.

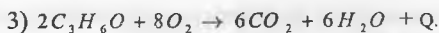
Yonish reaksiyalari tenglamalari qatorida molekulasi tarkibida uglerod, vodorod yoki uglerod, vodorod va kislorod tutgan hamda izchillik koeffitsienti  $2n/n$  bo'lgan birikmalarda dastlabki organik moddaning massasi 28.a.m.b. ga, reaksiyaning asosiy ishtirokchisi - kislorodning  $O_2$  massasi 96.a.m.b. ga va reaksiyaning asosiy mahsulotlari - karbonat anhidridning  $CO_2$  massasi 88.a.m.b. ga hamda suvning  $H_2O$  massasi esa 36.a.m.b. qiymatiga proporsional ravishda ortib yoki kamayib boradi.

Alkanlar misolida:



Aldegidlar misolida:





$$2 \cdot 58 = 116 + 8 \cdot 32 = 256 = 6 \cdot 44 = 264 + 6 \cdot 18 = 108$$



$$2 \cdot 72 = 144 + 11 \cdot 32 = 352 = 8 \cdot 44 = 352 + 8 \cdot 18 = 144$$

Yonish reaksiyalari tenglamalari qatorida molekular tarkibida uglerod, vodorod, azot yoki uglerod, vodorod, azot va kislorod tutgan hamda izchillik ko'ffisienti  $4n/n$  bo'lgan birikmalarda dastlabki organik moddaning massasi 56 a.m.b. ga, reaksiyaning asosiy ishtirokchisi -kislorodning  $O_2$  massasi 192 a.m.b. ga va reaksiyaning asosiy mahsulotlari -karbonat anhidridning  $CO_2$  massasi 176 m.u.b. ga hamda suvning  $H_2O$  massasi esa 72 a.m.b. qiymatiga proporsional ravishda ortib yoki kamayib boradi.

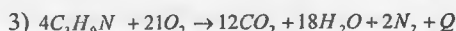
Aminlar misolida:



$$4 \cdot 31 = 124 + 9 \cdot 32 = 288 = 4 \cdot 44 = 176 + 10 \cdot 18 = 180 + 2 \cdot 28 = 56$$



$$4 \cdot 45 = 180 + 15 \cdot 32 = 480 = 8 \cdot 44 = 352 + 14 \cdot 18 = 252 + 2 \cdot 28 = 56$$



$$4 \cdot 59 = 236 + 21 \cdot 32 = 672 = 12 \cdot 44 = 528 + 18 \cdot 18 = 324 + 2 \cdot 28 = 56$$

Nitroalkanlar misolida:



$$4 \cdot 61 = 244 + 3 \cdot 32 = 96 = 4 \cdot 44 = 176 + 6 \cdot 18 = 108 + 2 \cdot 28 = 56$$



$$4 \cdot 75 = 300 + 9 \cdot 32 = 288 = 8 \cdot 44 = 352 + 10 \cdot 18 = 180 + 2 \cdot 28 = 56$$



$$4 \cdot 89 = 356 + 15 \cdot 32 = 480 = 12 \cdot 44 = 528 + 14 \cdot 18 = 252 + 2 \cdot 28 = 56$$



$$4 \cdot 103 = 412 + 21 \cdot 32 = 672 = 16 \cdot 44 = 704 + 18 \cdot 18 = 324 + 2 \cdot 28 = 56$$

Kimyoviy reaksiya tenglamalarida, reaksiyaga kirishayotgan moddalar massalarining miqdorlarini, hosil bo'lgan moddalarning massalari miqdorlariga taqqoslaganda gomologik qatorlarda ularning miqdori ma'lum izchillikda o'zgarishini ko'rish mumkin. Shuningdek, yuqori molekulyar tuzilishga ega moddalardan (oqsillar, yog'lar, uglevodlar va boshqalar) quyi molekulyar tuzilishga ega bo'lgan (aminokislotalar, yuqori molekulyar karbon kislotalar,

glyukoza, karbonat anhidrid, suv va boshqalar) moddalarning hosil bo'lish jarayoni ham ana shunday qonuniyatga amal qiladi.

Demak, ushbu natijalarni **“reaksiyaga kirishgan moddalarning massasi reaksiya natijasida hosil bo'lgan moddalarning massasiga tengligiga”** doir kimyo fani klassik qonunining mantiqiy davomi sifatida **“kimyoviy reaksiyalarda moddalar massalari miqdorlarining ma'lum bir izchillikda o'zgarib, ortib yoki kamayib borishi”** qonunini quydagicha ifodalash maqsadga muvofiqdir:

**Yonish reaksiyalari tenglamalari qatorida reaksiyaga kirishgan va hosil bo'lgan moddalar massalarining miqdorlari ma'lum bir izchillikda o'zgarib, ortib yoki kamayib boradi.**

Ushbu natijalar kimyoviy reaksiyalarni matematik jihatdan algoritmlash va modellashtirish mumkinligini yana bir bor tasdiqlaydi. Aytish mumkinki, jonsiz va jonli tabiatda sodir bo'ladigan kimyoviy jarayonlar, mazkur kimyoviy jarayonlarda ishtirok etadigan moddalar massalari miqdorlarining ma'lum bir izchillikda o'zgarib, ortib yoki kamayib borishi asosida ro'y beradi. Demak, har qanday kimyoviy jarayon qandaydir matematik qonuniyatga bo'ysunadi.

Kimyoviy algoritmlarning  $O_2$ ,  $CO_2$  va  $H_2O$  uchun  
koeffitsient qiymati ifodalari jadvali

Organik moddalarning asosiy sinflari	$O_2$ ning koeffi- sient qiymati ifodasi	$CO_2$ ning koeffitsient qiymati ifodasi	$H_2O$ ning koeffitsient qiymati ifodasi
1.To'yingan uglevodorodlar	$2n + m$	$[n + (m - 1)]$	$[n + (m + 1)]$
2.Sikloparafinlar va etilen qatori uglevodorodlar	$2n + m$	$(n + m)$	$(n + m)$
3.Dien va asetilen qatori uglevodorodlar	$2n + m$	$[n + (m + 1)]$	$[n + (m - 1)]$
4.Aromatik uglevodorodlar	$2n + m$	$[n + (m + 3)]$	$[n + (m - 3)]$
5.Bir atomli spirtlar va oddiy efirlar	$2n + m$	$n + m$	$[n + (m + 2)]$
6.Ikki atomli spirtlar	$2n + m$	$[n + (m + 1)]$	$[n + (m + 3)]$
7.Aldegidlar ketonlar va to'yinmagan spirtlar	$2n + m$	$[n + (m + 1)]$	$[n + (m + 1)]$
8. Bir asosli karbon kislotalar va murakkab efirlar	$2n + m$	$[n + (m + 2)]$	$[n + (m + 2)]$
9.To'yinmagan bir asosli karbon kislotalar, dialdegidlar va diketonlar	$2n + m$	$[n + (m + 3)]$	$[n + (m + 1)]$
10.Ko'proq to'yinmagan karbon kislotalar	$2n + m$	$[n + (m + 4)]$	$n + m$
11.Ikki asosli karbon kislotalar	$2n + m$	$[n + (m + 5)]$	$[n + (m + 3)]$
12.To'yinmagan ikki asosli karbon kislotalar	$2n + m$	$[n + (m + 6)]$	$[n + (m + 2)]$
13. Monoksikarbon kislotalar	$2n + m$	$[n + (m + 3)]$	$[n + (m + 3)]$
14.To'yinmagan aldegidlar va ketonlar	$2n + m$	$[n + (m + 2)]$	$n + m$
15.Aldegido va ketonokislotalar	$2n + m$	$[n + (m + 4)]$	$[n + (m + 2)]$
16.Aromatik aldegidlar va ketonlar	$2n + m$	$[n + (m + 5)]$	$[n + (m - 3)]$
17.Aromatik spirtlar	$2n + m$	$[n + (m + 4)]$	$[n + (m - 2)]$
18.Aminlar	$5n + m$	$[3n + (m - 3)]$	$[3n + (m + 3)]$
19.Aminokislotalar va nitroalkanlar	$5n + m$	$[3n + (m + 3)]$	$[3n + (m + 5)]$
20.Kislota amidlari	$5n + m$	$[3n + (m + 1)]$	$[3n + (m + 3)]$
21. Diaminokarbon kislotalar	$5n + m$	$[3n + (m + 2)]$	$[3n + (m + 6)]$
22.Aminodikarbon kislotalar	$5n + m$	$[3n + (m + 9)]$	$[3n + (m + 7)]$
23.Oksiaminokarbon kislotalar	$5n + m$	$[3n + (m + 5)]$	$[3n + (m + 7)]$

“Kimyoviy algoritm”larning organik moddalar asosiy sinflari  
gomologlari birinchi vakili uchun (n) va (m) qiymatlari jadvali

Organik moddalarning asosiy sinflari	Umumiy formulasi	Gomologlarning dastlabki vakili	(n) va (m) sonlarining qiymatlari
1. To'yingan uglevodorodlar	$C_n H_{2n+2}$	$C H_4$	n = 1 m = 2
2. Sikloparafinlar va etilen qatori uglevodorodlar	$C_n H_{2n}$	$C_2 H_4$	n = 2 m = 2
3. Dien va asetilen qatori uglevodorodlar	$C_n H_{2n-2}$	$C_2 H_2$	n = 2 m = 1
4. Aromatik uglevodorodlar	$C_n H_{2n-6}$	$C_6 H_6$	n = 6 m = 3
5. Bir atomli spirtlar va oddiy efirlar	$C_n H_{2n+2} O$	$C H_4 O$	n = 1 m = 1
6. Ikki atomli spirtlar	$C_n H_{2n+2} O_2$	$C_2 H_6 O_2$	n = 2 m = 1
7. Aldegidlar ketonlar va to'yinmagan spirtlar	$C_n H_{2n} O$	$C H_2 O$	n = 1 m = 0
8. Bir asosli karbon kislotalar va murakkab efirlar	$C_n H_{2n} O_2$	$C H_2 O_2$	n = 1 m = -1
9. To'yinmagan bir asosli karbon kislotalar, dialdegidlar va diketonlar	$C_n H_{2n-2} O_2$	$C_3 H_4 O_2$	n = 3 m = 0
10. Ko'proq to'yinmagan karbon kislotalar	$C_n H_{2n-4} O_2$	$C_4 H_4 O_2$	n = 4 m = 0
11. Ikki asosli karbon kislotalar	$C_n H_{2n-2} O_4$	$C_2 H_2 O_4$	n = 2 m = -3
12. To'yinmagan ikki asosli karbon kislotalar	$C_n H_{2n-4} O_4$	$C_4 H_4 O_4$	n = 4 m = -2
13. Monoksikarbon kislotalar	$C_n H_{2n} O_3$	$C_3 H_4 O_3$	n = 2 m = -1
14. To'yinmagan aldegidlar va ketonlar	$C_n H_{2n-2} O$	$C_3 H_4 O$	n = 3 m = 1
15. Aldegido va ketonokislotalar	$C_n H_{2n-2} O_3$	$C_2 H_2 O_3$	n = 2 m = -2
16. Aromatik aldegidlar va ketonlar	$C_n H_{2n-8} O$	$C_7 H_6 O$	n = 7 m = 2
17. Aromatik spirtlar	$C_n H_{2n-6} O$	$C_7 H_8 O$	n = 7 m = 3
18. Aminlar	$C_n H_{2n+3} N$	$C H_3 N$	n = 1 m = 4
19. Aminokislotalar va nitroalkanlar	$C_n H_{2n+1} N O_2$	$C H_3 N O_2$	n = 1 m = -2
20. Kislota amidlari	$C_n H_{2n+1} N O$	$C H_3 N O$	n = 1 m = 0
21. Diaminokarbon kislotalar	$C_n H_{2n+2} N_2 O_2$	$C_2 H_6 N_2 O_2$	n = 2 m = 0
22. Aminodikarbon kislotalar	$C_n H_{2n-1} N O_4$	$C_3 H_5 N O_4$	n = 3 m = -6
23. Oksiaminokarbon kislotalar	$C_n H_{2n+1} N O_3$	$C_3 H_7 N O_3$	n = 3 m = -2

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## MUNDARIJA

Kimyoviy reaksiyalarni algoritmlashning istiqbollari .....	105
«Kimyoviy algoritmlar»ning asosiy qoidalari va tushunchalari .....	111
To'yingan uglevodorodlar .....	116
Sikloparafinlar va etilen qatori uglevodorodlar .....	121
Dien va asetilen qatori uglevodorodlar .....	125
Aromatik uglevodorodlar .....	129
Bir atomli spirtlar va oddiy efirlar .....	133
Ikki atomli spirtlar .....	136
Aldegidlar ketonlar va to'yinmagan spirtlar .....	140
Bir asosli karbon kislotalar va murakkab efirlar .....	144
To'yinmagan bir asosli karbon kislotalar, dialdegidlar va diketonlar .....	148
Ko'proq to'yinmagan karbon kislotalar .....	151
Ikki asosli karbon kislotalar .....	154
To'yinmagan ikki asosli karbon kislotalar .....	158
Monoksikarbon kislotalar .....	162
To'yinmagan aldegidlar va ketonlar .....	167
Aldegido va ketonokislotalar .....	169
Aromatik aldegidlar va ketonlar .....	173
Aromatik spirtlar .....	175
Birlamchi, ikkilamchi va uchlamchi aminlar - .....	177
Aminokislotalar va nitroalkanlar .....	179
Kislota amidlari .....	182
Diaminokarbon kislotalar .....	185
Aminodikarbon kislotalar .....	187
Oksiaminokislotalar .....	190
Funksional guruhli organik birikmalarning kimyoviy algoritmlari .....	193
Kimyoviy algoritmlarning matematik tahlillari .....	195
Foydalanilgan adabiyotlar ro'yxati .....	199

Xolmurod Egamberdiev

**KIMYOVIY ALGORITMLARNING  
NAZARIY ASOSLARI**

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