



Journal Website:
<https://theusajournals.com/index.php/ijp>

Copyright: Original content from this work may be used under the terms of the creative commons attributes 4.0 licence.

METHODS OF SOLVING SAMPLE PROBLEMS ON THREE UNKNOWN MIXTURES IN ORGANIC CHEMISTRY

Submission Date: December 01, 2023, **Accepted Date:** December 05, 2023,

Published Date: December 10, 2023

Crossref doi: <https://doi.org/10.37547/ijp/Volume03Issue12-09>

Rakhmatova Guzal

Doctor Of Philosophy (Phd), Karshi Engineering Economics Institute, Karshi Uzbekistan

ABSTRACT

The article presents methods of solving problems related to three unknown compounds in organic chemistry.

KEYWORDS

Compounds, methane, propane, propylene, methylacetylene, hydrogen gas acetylene, oxygen, algebraic method.

INTRODUCTION

Among the problems related to calculations in chemistry, problems related to mixtures have a special place. The substances included in the mixture consist of systems that can be in different proportions with each other. Therefore, when determining the substances included in the mixture, it is necessary to create a separate equation for each component of the mixture, rather than using a general equation. When the general equation is written, the proportions between the components of the mixture are predetermined, which leads to errors.

Determining the composition of mixtures, the problems of finding volume fractions, mass fractions, mass fractions, and volume of its components are widespread. Among the problems given in organic chemistry, problems related to mixtures began to appear more and more later. Solving these problems requires students to know the reaction mechanisms and the mathematical method of solving systematic problems.

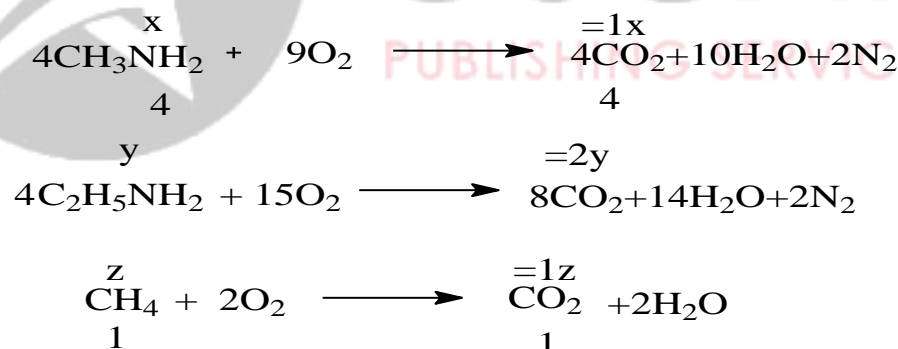
Work regularly with students on chemistry problems and exercises organize

LITERATURE ANALYSIS AND METHODOLOGY

them correctly, increase students' interest in chemistry and form independent learning skills. Increases interest and skills in choosing a profession.

Before starting to solve problems from organic chemistry, it is necessary to repeat the basic rules of the theory of chemical structure of organic compounds. He should be able to show how the atoms interact with each other in the molecules of various organic compounds. To determine the reactivity of substances, it is necessary to know the specific reactions of representatives of each class. Often, when solving problems with two unknowns and three unknowns, more conditions are given for the combustion reaction of hydrocarbons. It is one of the easiest ways to find the combustion reaction with the amount of moles of each substance. When solving problems, it is more convenient to find the solution

Now let's create an equation with three unknowns



$$x + y + z = 0,8 \text{ mole mixture Unknown } y$$

$$x + 2y + z = 1 \text{ mole CO}_2 \text{ let's make it equal}$$

$$x + y + z = 0,8 / \times 2 \qquad 2x + 2y + 2z = 1,6$$

$$x + 2y + z = 1 \qquad \longrightarrow \qquad x + 2y + z = 1$$

$$x + 0 + z = 0,6$$

$$0,8 - 0,6 = 0,2y$$

We reduced the equation (subtracted)

with the amount of moles, and in other ways, the solution is found by creating equations.

DISCUSSION

We will consider 3 unknown issues

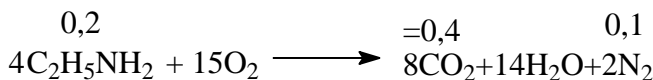
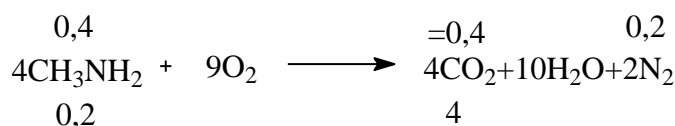
Issue 1. When 17.92 l (n. c.) mixture of methylamine, ethylamine and methane was burned, 6.72 l (n. c.) nitrogen and 22.4 l (n. c.) carbon dioxide were formed. Determine the volume fraction (%) of methylamine in the initial mixture.

To solve the problem in a convenient way, we will go from volume to mole

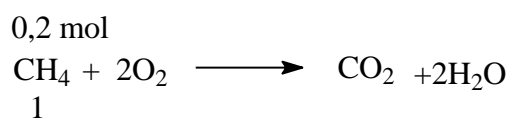
$17,92 \text{ l} \div 22,4 \text{ l} = 0,8 \text{ mole}$ There is a mixture of methylamine, ethylamine and methane

$6,72 \text{ l} \div 22,4 \text{ l} = 0,3 \text{ mole N}_2 \text{ formed}$

$22,4 \text{ l} \div 22,4 \text{ l} = 1 \text{ mole CO}_2 \text{ formed}$



first we find mole es of N_2 $0,3 - 0,1 = 0,2$ from that we find mole es of CH_3NH_2



$$0,8 - (0,4 + 0,2) = 0,2 \text{ mole } \text{CH}_4$$

$$0,8 \text{ mole} \times (22,4 \text{ l}) \longrightarrow 100\%$$

$$0,4 \text{ mole} \longrightarrow x = 50\% \text{ CH}_3\text{NH}_2 \leftarrow \text{ANSWER}$$

$$0,2 \text{ mole} \longrightarrow x = 25\% \text{ C}_2\text{H}_5\text{NH}_2$$

$$0,2 \text{ mole} \longrightarrow x = 25\% \text{ CH}_4$$

Issue 2. The density of a mixture of gases consisting of hydrogen, methane and carbon dioxide at two atmospheric pressure and 0°C temperature is 1.715 g/ml . 19 volumes of air are needed for complete combustion of 4 volumes of such a mixture. Determine the percent (%) composition of the resulting mixture.

Solution: Method I: First, the average mole eular mass of the mixture is determined. For this, the Mendelev-Clapeyron equation is used.

$$M = \frac{mRT}{PV} =$$

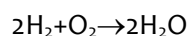
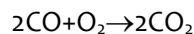
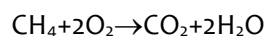
The formula for finding density

$$\rho = m/V$$

using the fact that it is worked out by pouring the given density into the formula

$$1) \quad M = 1,715 \cdot 0,082 \cdot 273 / 1 \cdot 2 = 19,2$$

The combustion reaction of three substances is written:



It is determined how much O_2 corresponds to 19 l of air.

$$100\% \longrightarrow 19$$

$$20\% \longrightarrow X$$

$$| \quad X = 3,8 \text{ l } \text{O}_2 \text{ spent}$$

So, 3.8 l of oxygen is needed to burn 4 l of the mixture.

4) As can be seen from the above reaction equation, 2 moles of O_2 are needed to burn 1 mole of CH_4 , and 0.5 moles of O_2 are needed to burn 1 mole of CO and H_2 . Therefore, if the volume of CH_4 is defined as X , and the volume of CO and H_2 is defined as $(4-X)$, the following proportion is formed:

$$\begin{array}{l} X \text{ CH}_4 \text{ ——— } 2X \text{ O}_2 \text{ if necessary} \\ (4-X) \text{ CO and H}_2 \text{ ——— } 0,5 (4-X) \text{ O}_2 \text{ will be needed.} \end{array}$$

5) The total amount of O_2 Using 3.8 liters, the equation is created

$$\begin{array}{rcl} 2X + 0,5 (4-X) & = & 3,8 \\ 2X + 2 - 0,5X & = & 3,8 \\ 1,5X & = & 1,8 \\ X & = & 1,2 \text{ mol CH}_4 \end{array}$$

6) CH_4 the volume fraction of %

$$\begin{array}{l} 4 \text{ ——— } 100 \% \\ 1,2 \text{ ——— } X \end{array} \quad | \quad X = 30 \%$$

5) So, CO and H_2 make up 70% of the mixture, that is, 0.7 mole. A general equation is created based on the formula $m = M \cdot n$

In this case, the mole of carbon dioxide is defined as $-X$, and that of hydrogen is defined as $0.7-X$:

$$\begin{array}{rcl} 0,3 \cdot 16 + X \cdot 28 + 2 \cdot (0,7-X) & = & 19,2 \\ 4,8 + 28X + 1,4 - 2X & = & 19,2 \\ 26X & = & 13 \end{array} \quad | \quad X = 0,5 \text{ mol yoki } 50\% \text{ CO}$$

Answer: 30% CH_4 , 50% CO and 20% $(100-(30+50)) H_2$

Method 2. This problem can be solved by creating a system of equations.

1) Based on 1 mole of a mixture of three gases, the following definition is introduced. CH_4 the amount of $-X$ mole, $CO - Y$ mole, $H_2 - Z$ mole.

2) Based on the combustion reaction $X+Y+Z=1$, the following equation is created by specifying the amount of O_2 used for the combustion of each gas. It is taken into account that the mixture is 4 l, and O_2 is 3.8 l.

$$8X + 2Y + 2Z = 3,8 \text{ l or divide the equation by 2,}$$

$$4X + Y + Z = 1,9 \text{ the result is obtained.}$$

3) This equation is based on the fact that the average molecular weight is 19.2.

4) $16X + 28Y + 2Z = 19,2$ using the above, a system of 3 unknown equations is created

$$\begin{array}{rcl} X + Y + Z & = & 1 \\ 4X + Y + Z & = & 1,9 \\ 16X + 28Y + 2Z & = & 19,2 \end{array}$$

Subtract the first from equation 2,

$$\begin{array}{r} 4X + Y + Z = 1,9 \\ - \quad X + Y + Z = 1 \\ \hline 3X + 0 + 0 = 0,9 \\ 3X = 0,9 \end{array}$$

$$X = 0,3$$

X = 0,3 mol or 30 % CH₄ while knowing that.

Z is found by putting 0.3 instead of X in equation 1

$$0,3 + Y + Z = 1$$

$$Z = 1 - 0,3 - Y$$

$$Z = 0,7 - Y$$

Values of x and z are put into equation 3.

$$16 \cdot 0,3 + 28 X + 2(0,7 - X) = 19,2$$

$$4,8 + 28 X + 1,4 - 2 X = 19,2$$

$$26 X = 13.$$

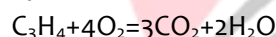
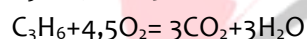
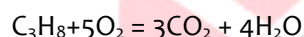
$$X = 0,5 \text{ mole. Or } 50 \% \text{ CO.}$$

z = 0,7 - y taking advantage of the fact that, z = 0,7 - 0,5 = 0,2 mol yoki 20 % H₂ it is found that.

Answer: 30 % CH₄. 50 % CO 20 % H₂.

Issue 3. When 0.336 l of propane, propylene, methylacetylene mixture is passed through bromine water, 1.91 g of heavy liquid is formed. When such a gas mixture is ignited, the resulting gas mixture is passed through concentrated H₂SO₄, the mass of the acid increased by 0.9 g. Determine the composition of the mixture.

Solution: Method 1: The mole ar amounts of C₃H₈, C₃H₆, C₃H₄ obtained for the reaction are denoted by X, Y, Z, and the combustion reaction is written.

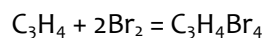
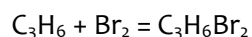


2) The total mole of the mixture $n = V/22,4 = 0,336/22,4 = 0,015$ mole.

3) X + Y + Z = 0,015. Here 0.9 g of water is calculated and its weight $n = m/M = 0,9/18 = 0,05$ mole water.

$$4) 4X + 3Y + 2Z = 0,05$$

C₃H₆ and C₃H₄ combine with bromine water:



5) So, taking into account that the heavy liquid is 1.91 g, a system of three unknowns is created:

$$X + Y + Z = 0,015$$

$$4X + 3Y + 2Z = 0,05$$

$$202Y + 360Z = 1,91$$

6) If the second equation is subtracted from the first, 1 unknown must be lost. However, for this situation above, both sides of equation 1 are multiplied by 4.

$$4X + 4Y + 4Z = 0,06$$

$$- 4X + 3Y + 2Z = 0,05$$

$$0 + Y + 2Z = 0,01$$

$$\text{From this } Y = 0,01 - 2Z$$

7) If the value of Y is put into equation 3,

$$202(0,01-2Z) + 360Z = 1,91$$

$$2,02 - 404Z + 360Z = 1,91$$

$$44Z = 0,11$$

$$Z = 0,0025 \quad | \quad Z = 0,0025 \text{ mole } C_3H_4$$

8) If Y is found from this, $Y = 0,01 - 2Z = 0,01 - (2 \cdot 0,0025) = 0,005$ mole C_3H_6 .

9) From the first equation, X is found:

$$X + Y + Z = 0,015$$

$$X = 0,015 - (Y + Z) = 0,015 - (0,005 + 0,0025) = 0,0075 \text{ mole } C_3H_8$$

$$\text{Volume of gases } C_3H_8 = 0,0075 \cdot 22,4 = 0,168 \text{ l}$$

$$C_3H_6 = 0,005 \cdot 22,4 = 0,112 \text{ l}$$

$$C_3H_4 = 0,0025 \cdot 22,4 = 0,056 \text{ l}$$

Answer: $C_3H_8 = 0,168 \text{ l}$; $C_3H_6 = 0,112 \text{ l}$; $C_3H_4 = 0,056 \text{ l}$.

CONCLUSION

The peculiarity of organic chemistry is combustion reactions of hydrocarbons. All organic matter produces carbon dioxide and water when burned. It is necessary to know whether the representatives of each class are similar to each other in some aspect or differ in some aspect. In particular, this theoretical knowledge helps students to form a chemical understanding when solving chemical problems. Moreover, solving problems has an educational value for students. Because they ensure positive changes in the student, that is, determination, seriousness, freedom, responsibility in one's work, education, neatness and readiness for any difficulties.

REFERENCES

1. Anvarova N. Kimyo fanida kompyuter dasturlari //Xalq ta'limi.- 2002- №4.-80-81 b.
2. Aranskaya O.S, Popkova Ye.V. Podgotovka uchitelya ximii k ispolzovaniyu

3. Informacionno-kompyuternix texnologiy v pedagogicheskoy deyatel'nosti //Ximiya: Metodika prepodavaniya v shkole.- 2002.- №2.-S. 11-15.
4. Viv'yurskiy V.Ya. Ximiyadan bilim olishni va foydalanishni o'rganaylik.- Toshkent: O'qituvchi, 1991.-100 b.
5. Muftaxov A.G. Organik kimyodan olimpiada masalalari va ularning yechimlari.- Toshkent:O'qituvchi,1997.-223 b.
6. Tojimuhamedov H., Eshchanov E, Abdushukurov A. Organik kimyodan testlar.-Toshkent: o'qituvchi, 2000.-112 b.