International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 03 ISSUE 12 PAGES: 43-48
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 6. 676)
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY

Publisher: Oscar Publishing Services

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

Research Article

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

International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 03 ISSUE 12 PAGES: 43-48
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 6. 676)
OCLC – 1121105677
Publisher: Oscar Publishing Services

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 mole ecules 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 mole es of each substance. When solving problems, it is more convenient to find the solution with the amount of mole es, 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 l÷ 22,4 l = 0,8 mole There is a mixture of methylamine, ethylamine and methane

6,72 l ÷ 22,4 l = 0,3 mole N_2 formed

22,4 l ÷ 22,4 l = 1 mole CO_2 formed

Now let's create an equation with three unknowns

$$\overset{x}{4CH_3NH_2} + 9O_2 \longrightarrow \overset{=1x}{4CO_2} + 10H_2O + 2N_2$$
$$\overset{4}{}\qquad\qquad\qquad\qquad\overset{4}{}$$

$$\overset{y}{4C_2H_5NH_2} + 15O_2 \longrightarrow \overset{=2y}{8CO_2} + 14H_2O + 2N_2$$

$$\overset{z}{CH_4} + 2O_2 \longrightarrow \overset{=1z}{CO_2} + 2H_2O$$
$$\overset{1}{}\qquad\qquad\qquad\overset{1}{}$$

x + y + z = 0,8 mole mixture Unknown **y**

x + 2y + z = 1 mole CO_2 et's make it equal

x + y + z = 0,8 / ×2 → 2x +2y +2z = 1,6

x +2y +z = 1 → x + 2y + z = 1

x + 0 + z = 0,6

0,8 – 0,6 = 0,2y

We reduced the equation (subtracted)

International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 03 ISSUE 12 PAGES: 43-48
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 6. 676)
OCLC – 1121105677
Publisher: Oscar Publishing Services

$$\underset{0,2}{4CH_3NH_2} + 9O_2 \longrightarrow \underset{=0,4}{4CO_2} + \underset{4}{10H_2O} + \underset{0,2}{2N_2}$$

$$\underset{0,2}{4C_2H_5NH_2} + 15O_2 \longrightarrow \underset{=0,4}{8CO_2} + \underset{0,1}{14H_2O} + 2N_2$$

first we find mole es of N2 0.3 – 0.1 = 0.2 from that we find mole es of CH_3NH_2

$$\underset{1}{\underset{0,2\ mol}{CH_4}} + 2O_2 \longrightarrow CO_2 + 2H_2O$$

0,8 – (0,4 + 0,2) = 0,2 mole CH_4

0,8mole ×(22,4l) ——— 100%
0,4 mole ——— **x= 50% CH_3NH_2 ← ANSWER**
0,2 mole ——— x= 25% $C_2H_5NH_2$
0,2 mole ——— x= 25% 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 ecular mass of the mixture is determined. For this, the Mendeleev-Clapeyron equation is used.

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

The formula for finding density
ρ=m/V
using the fact that it is worked out by pouring the given density into the formula
1) M=1,715·0,082·273/1·2=19,2
The combustion reaction of three substances is written:
$CH_4+2O_2 \rightarrow CO_2+2H_2O$
$2CO+O_2 \rightarrow 2CO_2$
$2H_2+O_2 \rightarrow 2H_2O$
It is determined how much O_2 corresponds to 19 l of air.
100 % ——— 19
20 % ——— X | X = 3,8 l O_2 spent
So, 3.8 l of oxygen is needed to burn 4 l of the mixture.

International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 03 ISSUE 12 PAGES: 43-48
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 6. 676)
OCLC – 1121105677
Publisher: Oscar Publishing Services

4) As can be seen from the above reaction equation, 2 mole es of O_2 are needed to burn 1 mole e of CH_4, and 0.5 mole es of O_2 are needed to burn 1 mole e 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:

X CH_4 —— 2X O_2 if necessary

(4-X) CO and H_2 —— 0,5 (4-X) O_2 will be needed.

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

$2X + 0,5\ (4-X) = 3,8$

$2X + 2-0,5X = 3,8$

$1,5X = 1,8$

$X = 1,2$ mol CH_4

6) CH_4 the volume fraction of %

4 —— 100 %

1,2 —— X | 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·n

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

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

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

$26X = 13$ | X = 0,5 mol yoki 50% 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 ality 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 l or divide the equation by 2,

4X + Y + Z = 1,9 the result is obtained.

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

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

$X + Y + Z = 1$

$4X + Y + Z = 1,9$

$16X + 28Y + 2Z = 19,2$

Subtract the first from equation 2,

$4X + Y + Z = 1,9$

— $X + Y + Z = 1$

$3X + 0 + 0 = 0,9$

$3X = 0,9$

International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 03 ISSUE 12 PAGES: 43-48
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 6. 676)
OCLC – 1121105677
Publisher: Oscar Publishing Services

X = 0,3

X = 0,3 mol or 30 % CH_4 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 mole. Or 50 % CO.

z = 0,7–y taking advantage of the fact that, z = 0,7–0.5=0.2 mol yoki 20 % H_2 it is found that.

Answer: 30 % CH_4. 50 % CO 20 % H_2.

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 H_2SO_4, the mass of the acid increased by 0.9 g. Determine the composition of the mixture.

Solution: Method 1: The mole ar amounts of C_3H_8, C_3H_6, C_3H_4 obtained for the reaction are denoted by X, Y, Z, and the combustion reaction is written.

$C_3H_8 + 5O_2 = 3CO_2 + 4H_2O$

$C_3H_6 + 4,5O_2 = 3CO_2 + 3H_2O$

$C_3H_4 + 4O_2 = 3CO_2 + 2H_2O$

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

C_3H_6 and C_3H_4 combine with bromine water:

$C_3H_6 + Br_2 = C_3H_6Br_2$

$C_3H_4 + 2Br_2 = C_3H_4Br_4$

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

From this Y = 0,01 -2Z

International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 03 ISSUE 12 PAGES: 43-48
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 6. 676)
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

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

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

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

$44Z = 0{,}11$

$Z = 0{,}0025$ | $Z = 0{,}0025$ mole C_3H_4

8) If Y is found from this , $Y=0{,}01-2Z = 0{,}01-(2\cdot0{,}0025) = 0{,}005$ mole C_3H_6.

9) From the first equation, X is found:

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

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

Volume of gases

$C_3H_8 = 0{,}0075\cdot22{,}4 = 0{,}168$ l

$C_3H_6 = 0{,}005\cdot22{,}4 = 0{,}112$ l

$C_3H_4 = 0{,}0025\cdot22{,}4 = 0{,}056$ l

Answer: $C_3H_8 = 0{,}168$ l; $C_3H_6 = 0{,}112$ l; $C_3H_4 = 0{,}056$ 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. Informasionno-kompyuternix texnologiy v pedagogicheskoy deyatelnosti //Ximiya: Metodika prepodavaniya v shkole.- 2002 .- №2. -S. 11-15.
4. Vivyurskiy 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'ituvchi,1997.-223 b.
6. Tojimuhamedov H., Eshchanov E, Abdushukurov A. Organik kimyodan testlar.-Toshkent: o'qituvchi, 2000.-112 b.