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Research Article

METHODOLOGY OF MATHEMATICAL SOLUTIONS OF SOME CHEMICAL PROBLEMS IN PRACTICAL LESSONS IN MATHEMATICS

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Abstract

In this article, problems related to solutions and mixtures of different contents and the processes of solving them in a mathematical way were seen in practical exercises in mathematics. This can be used in the creation of new mixtures and the formation of colorful paints, which are important in many areas of industry.

Keywords

Higher education, mathematics, chemistry, study, integration, example and problem, solution, mixture, gold, silver, alcohol, copper, element, temperature, volume, concentration, application.

Introduction

It is an important task of today to pay attention to the fact that the future specialists studying in higher educational institutions have thorough professional training based on the requirements of the present time and become skilled masters of their profession. How knowledgeable are the staff and if he is skilled, he can greatly contribute to the development of the country [1, 2].

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For this, first of all, professors and teachers who teach mathematics, geometry, physics and chemistry in schools, lyceums and higher educational institutions should pay great attention to improving the ability of students and students to think mathematically.

It is important to teach pupils and students to apply it to life issues, providing the integration of mathematics with sciences such as geometry, physics, chemistry, biology, technology, economics, in order to develop their logical thinking in the process of teaching mathematics, especially in practical training [1, 2] .

In order to implement the integration of mathematics with the field of chemistry in educational activities, we will consider several such problems, paying attention to the process of solving problems related to solutions and mixtures in a mathematical way.

Issue 1. By mixing 10% and 25% salt solution, 3 kilograms of 20% solution was made. How many kilograms were taken from each solution [7] .

Solving. If x kilograms are obtained from a 10% solution, then 3-x kilograms are obtained from a 25% solution according to the condition of the problem.

By average value

$$\frac{10 \cdot x + 25(3-x)}{3} = 20$$

we get the equation and find the unknown x.

$$10 \cdot x + 75 - 25 \cdot x = 60$$

$$x = 1$$

So, 1 kg of 10% li, 2 kg of 25% li was obtained.

Issue 2. In one of the two mixtures of gold and silver, the ratio of gold to silver is 2:3, and in the second, it is 3:7. How much of each should be taken to make 8 kilograms of a new 5:11 solution[7].

Solving. If x kilograms are taken from solution 1 , it is necessary to take $8-x$ kilograms from solution 2 .

It is enough to solve the problem only with respect to gold:

$$\frac{2}{5}x + \frac{3}{10}(8-x) = 2{,}5$$

$$4x + 24 - 3x = 25$$

$$x = 1$$

So, 1 kg of gold and 7 kg of silver are taken to form a new solution.

Issue 3. There are two containers of water at different temperatures. If the ratio of the volumes of water taken from the 1st and 2nd container is 1:2, a mixture of 35^0 C will be formed. If taken in a ratio of 3:4, it is equal to 33^0 C. Find the temperature of the water in each container (density and specific heat capacity of water are unchanged) [7].

Solving. If we take the temperature of the water in the 1st container $t_1$and the temperature of the water in the 2nd container t_2:

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$$\begin{cases}\frac{1}{3}t_1+\frac{2}{3}t_2=35\\ \frac{3}{7}t_1+\frac{4}{7}t_2=33\end{cases}$$

we get a system of equations, from this system: $t_1=21$ and $t_2=42$ it turns out to be.

So, the temperature of the water in the 1st container $t_1=21^0C$ will be the temperature of the water in the 2nd container $t_2=42^0C$.

Issue 4. Two containers contain 4 and 6 kilograms of acid solutions of different concentrations. If they are mixed, a 35% solution is formed. If equal amounts of solution are taken from the containers and mixed, a 36% acid solution is formed. How many kilograms of acid are in each container[7].

Solving. If we find the acid concentration in each container, the problem is solved. Concentration, respectively, p and Let's say q.

In that case

$$\begin{cases}\frac{4\cdot p+6\cdot q}{10}=35\\ \frac{p+q}{2}=36\end{cases}$$

we create a system of equations, from which it turns out that $p=41\%$ and $q=31\%$. It follows that the concentration of acid in each container is in kilograms $m_2=6\cdot 0{,}31=1{,}86$, $m_1=4\cdot 0{,}41=1{,}64$

Issue 5. Gram with different contents in two containers m and n grams of alcohol solution. A homogenous amount of solution was taken from each container and mixed by pouring into the 2nd container. As a result, the same percentage solution was formed in both containers. Find how much solution was taken from each container[7].

Solving. We denote the initial content of alcohol in the bottles by p and q. And from each container$x$ gram of solution.

Then (Figure 1)

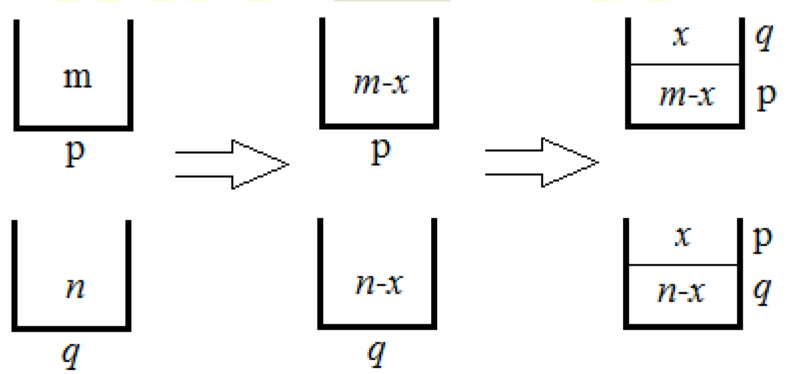

Figure 1.

as a result,

$$\frac{(m-x)p+xq}{m}=\frac{(n-x)q+px}{n}$$

the equation is formed.

From this equation

$$x=\frac{m\cdot n}{m-n}$$

we form the equation.

So, a gram of solution was taken from each container $\frac{m\cdot n}{m-n}$ and added to the other.

Issue 6. There are 6 kilograms in 1 of two containers, and 8 kilograms in 2, with alcohol solutions of different concentrations. A certain amount of solution was taken from the 1st container, and twice as much solution was taken from the 2nd container, and when it was poured into another container and mixed, the concentration of the solutions in the containers remained equal. How much solution was taken from each container[7].

Solving. We denote the concentration of alcohol in the containers by p and q (Fig. 2).

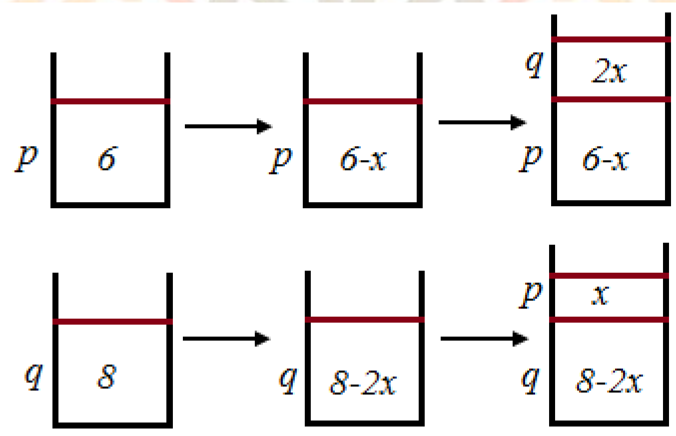

Figure 2.

According to the condition of the issue:

$$\frac{p(6-x)+2qx}{6+x}=\frac{(8-2x)q+px}{8-x}$$

we form the equation

So, if we solve this equation, we will get 2.4 kg of solution from container 1 and 4.8 kg from container 2.

Issue 7. There are 3 mixtures of elements A, B and C, 1- consisting of only A and B, 2- consisting of only B and C, 3- consisting of only A and C elements:

In the 1st mixture $A:B=1:2$, in the 2nd mixture $B:C=1:3$, in the 3rd mixture $A:C=2:1$. When taken from the three mixtures in what

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proportion, the new mixture will have $A:B:C = 11:3:8$ ratio [7] .

Solving. From each, respectively x , y and we get from z kilograms.

In that case

$$A: \quad \frac{1}{3}x + \frac{2}{3}z = \frac{11}{22}(x+y+z)$$

$$B: \quad \frac{2}{3}x + \frac{1}{4}y = \frac{3}{22}(x+y+z)$$

$$C: \quad \frac{3}{4}y + \frac{1}{3}z = \frac{4}{11}(x+y+z)$$

we form the equation

We make 1 $x + 3y = z$ and 3 of these equations. $48x - 51y = -47$ from this $52x - 39y = 0$ or $\frac{x}{y} = \frac{3}{4}$ is formed.

$x + 3y = z$ dividing $\frac{y}{z} = \frac{4}{15}$ ni by y we get the equality.

From this

$$x:y = 3:4$$

$$y:z = 4:15$$

it will be known. So, $3:4:15$ was obtained from all three mixtures.

Issue 8. The price of copper is proportional to the square of its mass. When 12 kilograms of copper was divided into two parts, the price decreased by 1.6 times. In what proportion is copper divided[7].

Solving. Let y be the price, x be the mass, and let k be the coefficient.

In that case $y = kx^2$, the previous price $y = 144k$.

$$\frac{144k}{kx^2 + k(12-x)^2} = 1{,}6$$

$$x^2 - 12x + 27 = 0$$

$$x_1 = 3, \quad x_2 = 9$$

So it is divided in the ratio $1:3$ or $3:1$.

With this, we will provide students studying in higher educational institutions with the integration of mathematics with subjects such as physics, chemistry, biology, technology, economics in mathematics training. This integration means that the processes of students' ability to apply the acquired mathematical knowledge in practice are contributed.

It is necessary to form mathematics lessons in a creative way, to harmonize various learning activities of students, and to provide quick feedback between participants.

It is desirable to organize mathematics trainings on a scientific and methodological basis, to form the skills of applying students in practice in accordance with their specializations, and to use an effective incentive management mechanism in trainings.

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