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METHODS OF SOLVING ISSUES IN WHICH THE LEVEL OF COMPLEXITY IS HIGHER THAN IN SELF-EDUCATION

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Abstract
This article presents methods for solving problems for "Mixture of metals", "Mixture of gases", "Solutions" and "Mixtures of organic substances" in the process of continuous education.

Key words: continuous learning process, educational value of solving problems in chemistry, tasks in chemistry of increased complexity, methods for solving problems related to mixtures.

In accordance with the decisions of the president of the Republic of Uzbekistan on August 12, 2020 PQ-4805 “on measures to improve the quality of Continuing Education and the productivity of Science in the areas of Chemistry and biology”, it is relevant to generate practical comets in them by applying the theoretical knowledge received by students in continuing education. It is worth noting that general secondary education in the process of continuing education is one of the main tasks of a chemistry teacher in schools and academic lyceums, teaching students to solve issues with a high level of complexity based on theoretical knowledge gained from chemistry.

Due to this, the educational significance of problem solving in the teaching of chemistry is that in the process of solving problems, chemical concepts about substances and processes are strengthened and improved, a solid acquisition of knowledge occurs[1;64].

Solving chemical issues connects living with production, labor education skills are formed, directing the acquisition of a specialty, and cross-subject communication in mathematics and Physical Sciences is realized.

By solving the problem, students understand the content and essence of their acquired theoretical knowledge, learn to think logically, allow the formation of personal qualities such as confidence in their own strength and knowledge[2;67].

In the classes of general secondary schools and academic lyceums, where chemistry is taught in depth, the level of complexity from chemistry has to be solved with a slightly higher level of complexity. In particular, when preparing students who have chosen a chemical specialty for admission to higher education institutions,

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conducting extracurricular classes in chemistry in secondary schools, preparing students for district, city, regional and Republican Science Olympiads, it becomes necessary to study methods of solving issues with a high degree of complexity.
Solving problems with a high degree of complexity in chemistry in the process of continuing education requires the teacher to take into account the knowledge of students, to quickly make a logical reasoning on the issue in any situation, to find a logical connection. Through methods close to the reader, it is necessary to solve the issue in the shortest possible ways.
We want to propose “algebraic methods for solving problems in mixtures”on several topics with a slightly higher level of complexity, which can be solved with students in the process of continuing education.

The issue of mixtures of metals

Issue 1. When a mixture of zinc with 2.33 g of iron was dissolved in acid, 896 ml of vododrod was released.Determine the composition of the mixture.
Given: m (Fe+Zn)=2.33 g;
$V(H_2)$=896ml=0.896 l;n (H_2)=0.896/22.4=0.04 mol; Ar (Fe) = 56; Ar (Zn)=65;
Need to find: m (Fe)=?; m (Zn)=?

Constructing an algebraic equation with one unknown:

1) m(Fe)=x; m(Zn)=2,33-x bilan belgilaymiz;

2) $$\underset{56\,g}{\overset{x}{Fe}} + H_2SO_4 \rightarrow FeSO_4 + \underset{22,4\,l}{\overset{V_1}{H_2}} \qquad \frac{x}{56}=\frac{V1}{22,4};\ V_1=\frac{22,4x}{56}=0,4x;$$

3) $$\underset{65\,g}{\overset{2,33-x}{Zn}} + H_2SO_4 \rightarrow ZnSO_4 + \underset{22,4\,l}{\overset{V_2}{H_2}} \qquad \frac{2,33-x}{65}=\frac{V2}{22,4};\ V_2=\frac{(2,33-x)22,4}{65};$$

4) we construct an unknown equation :
0.4 x +(2,33-x) 22,4) / 65=0,896 and solve it : 0.4 x+(2,33-x) 0,345 =0,896; 0.4 x+0,8038-0,345 x=0,896;
0.055 x=0.0922 ; x=1.676 1.68 G Fe; m(Zn)=2.33-1.68=0.65 g.
A: the mixture contained 1.68 g of iron vaq 0.65 g of zinc.
If mass shares are asked ω(Fe)=1.68/2.33100 = 72.1 % ;

ω (Zn)=0.65/2.33100=27.89 %.[4;128-129].

Issues of mixtures of gases

Issue 1. The density of a mixture of gases consisting of oxygen and ozone compared to hydrogen is 16.4. Calculate the volumetric shares of gases in the mixture.

Given:D (H_2)=16.4;M(O_2)=32g/mol; M(O_3)=48 g/mol;

Need to find:

φ (O_2)=?

φ (O_3)=?

Solution: 1.We calculate the average molecular mass of the mixture: M(med)=2 * D (H_2)=2 * 16.4=32.8;

2.We construct an equation and solve it: 32x+48(1-x)=32.8 ; 32x+48-48X=32.8 ; 16x = 15.2; x = 0.95 or 95% oxygen.

3. φ (O_2)=0.95 or 95 % ; φ (O_3)=0.05 or 5 %.

This means that the mixture contained 95% oxygen and 5% ozone.

Issue 2.Find the volume (l) of each gas in a mixture of 8 l CO_2 and SO_2 gases with a density of 25 relative to hydrogen.

Given: D (H_2)=25; M (CO_2)=44g/mol; (SO_2)=64 g / mol; V (mixture)=8L;

Need to find: V (CO_2)=? V (SO_2)=?

Solution: 1.We calculate the average molecular mass of the mixture: M(med)=2*D(H2)=2*25=50;

2.If you make an equation and solve it: 44x+64 (1-x)=50;44x+64-64x=50;

20x=14; x = 0.7 is the volumetric share of CO_2, and the volumetric share of SO2 is 0.3. Hence, the mixture contains V(CO_2)= φ(CO_2)* V(mixture)=0.7*8 = 5.6 l;

V(SO_2)= φ(SO_2)*V (mixture)=0.3*8=2.4 l.

If the masses of the gases are desired, m (SO2)=φ (SO2)*M (SO_2)=0.3*64=19.2;

m(CO_2)= φ(CO_2)*M (CO_2)=0.7*44=30.8;

If mass shares of gases are desired, ω(SO_2)= 19.2/50=0.384 or 38.4 %; ω (CO_2)=30.8/50=0.616 or 61.6%.

Solving issues related to solutions

Issue 1.If a solution of 205.2 g of aluminum sulfate contains 66.22 1024 protons, find the mass fraction of salt in the solution.

Given:m($Al_2(SO_4)_3$) solution=205.2 g; N(proton)=66.22 1024;

M ($Al_2(SO_4)_3$)=342 g/mol; M (Water)=18 g / mol;

Need to find: ω(Al_2 $(SO_4)_3$)=?

Solution: 1. we determine the number of protons contained in $Al_2(SO_4)_3$: 26+48+96=170;

2.And the protons in H_2O are 2+8=10;

3.Using the given and found values, we construct a system of equations and solve it: $\begin{cases} 342\,x + 18\,y = 205{,}2 \\ 170\,x + 10\,y = 110 \end{cases}$ We multiply Equation 2 by 1.8, resulting in $\begin{cases} 342\,x + 18\,y = 205{,}2 \\ 306x + 18\,y = 198 \end{cases}$

36 x=7.2 ; x=0.2 mol is the quantity of $Al_2(SO_4)_3$, using which we determine the mass: m($Al_2(SO_4)_3$)=0.2 342 = 68.4 g;

4.Mass fraction of salt in solution :

ω (Al_2 $(SO_4)_3$)=68,4/205,2·100=33,33 %.

Issue 2. Calculate the mass fraction(%)of the anhydrous salt in the solvent formed when 114.8 g of $ZnSO_4 \cdot 7H_2O$ crystallohydrate is dissolved in 85.2 g of water.

Given: m ($ZnSO_4 \cdot 7H_2O$)=114.8 g; m(Water) = 85.2 g;

Need to find: ω (ZnSO4)=?;

Solution: 1.M ($ZnSO_4 \cdot 7H_2O$)=161+126=287 g/mol;

2.287 g $ZnSO_4 \cdot 7H_2O$ -----161 g has ZnSO4;

114.8 g $ZnSO_4 \cdot 7H_2O$.----- x g has ZnSO4. x=64.4 g .

3.M=114.8+85.2 =200 g ;

4. ω (ZnSO4)=64,4/200·100%=32,2%.[6;12].

Mixtures of organic matter

Example 1. 15.68 l (consisting of CH_4, CO and C_3H_8 n.sh.) when the mixture was burned, 48.4 g of CO_2 and 28.8 g of H_2O were formed. The substances contained in the initial mixture (ber-tart.) determine the mole ratio.

Solution: 1) n(ar)=15.68 / 22.4=0.7 mol n(CO_2) = 48.4/44=1.1 mol; n(H_2O) = 28.8 / 18=1.6 mol

2) x y 2x

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2y 2y

$2CO + O_2 \rightarrow 2CO_2$

z 3z 4z

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

$$\begin{cases} x+2y+z=0{,}7 \\ x+2y+3z=1{,}1 \\ 2x+4z=1{,}6 \end{cases}$$

$$\begin{cases} x+2y+3z=1{,}1 \\ x+2y+z=0{,}7 \\ \hline 2z=0{,}4 \end{cases}$$

2x+4·0,2=1,6

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2x+0,8=1,6 z=0,2 mol propan
2x=0,8
x=0,4mol metan
0,4+2y+0,2=0,7
2y=0,1 is gazi
y=0,05mol
0,4:0,1:0,2=4:1:2 Anser: 4:1:2

Example 2. 17.92 l (consisting of methylamine, ethylamine and methane n.sh.) when the mixture is burned 6.72 l (. n.sh.) nitrogen 22.4 l (. n.sh.) CO_2 was formed. Determine the volumetric shares (%) of gases in the initial mixture.
Solution: 1) n(ar.)=17.92/22.4=0.8 mol $n(N_2)$=6.72/22.4=0.3 mol; $n(CO_2)$=1mol

4x 4x 2x
2) $4CH_3NH_2+9O_2\ 4CO_2+2N_2+10H_2O$
4y 8x 2x
$4C_2H_5NH_2+15O_2\ 8CO_2+2N_2+4H_2O$
z z
$CH_4 +2O_2\ CO_2+2H_2O$

3) $\left.\begin{array}{l} 4x+4y+z=0,8 \\ 4x+8y+z=1 \\ 2x+2y=0,3 \end{array}\right\}$ $\begin{array}{l} 4x+8y+z=1 \\ 4x+4y+z=0,8 \\ 4y=0,2\text{mol etilamin} \end{array}$

2x+2·0,2=0,3
2x=0,2 4·0,1+0,2+z=0,8
x=0,1 0,4+0,2+z=0,8
4x=4.0,1=0.4 mol methylamine z=0.2 mol methane
4)V(methylamine)=0.4.22.4=8.96
V(ethylamine)=0.2.22.4=4.48
V(methane)=0.2.22.4=4.48
φ(methylamine)=8,96/17,92.100=50%
φ (ethylamine)=4,48/17,92.100=25%
φ(methane)=4,48/17,92.100=25%.[2;137-138].

Teaching students to solve an issue from chemistry in several ways causes the teacher's skills to increase even more due to the fact that he requires the teacher to constantly work and seek on himself.
It allows practical competencies to be formed in students due to the use of the theoretical knowledge they receive in the performance of practical exercises.

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