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USING PROBLEMS AND EXERCISES IN IMPROVING THE EFFICIENCY OF TEACHING CHEMISTRY

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Article history:		Abstract:
Received:	October 6th 2023	This article presents the role of issues and ways to solve them in increasing the interest of school and Lyceum students in chemistry.
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Studying chemistry in schools and academic lyceums requires knowledge, skills, qualifications, and scientific-pedagogical skills from teachers based on the specific features of teaching the subject. During the teaching of this subject based on theoretical knowledge, it is important to strengthen them and to form the ability to solve problems and exercises in order to be able to apply theoretical knowledge in a practical way. For this, it is necessary to develop the ability of the student to think independently and make decisions, to think logically. In order to acquire chemical knowledge in depth, it is necessary to have enough knowledge in a number of subjects. Knowledge of mathematics, geometry, physics, biology and other subjects is important for students to independently perform chemical problems and exercises. When organizing the teaching of chemistry in schools and academic lyceums, it is necessary to take into account the requirements set forth in the DTS, as well as the students' full and positive performance of the test questions and exercises used during the entrance exams to higher educational institutions .

Based on the above ideas, we will present the usual and unusual chemical problems and their processing methods.

Issue 1. If 10 mol of $Zn(NO_3)_2$ dissociates, 16 mol of NO_3^- ions are formed in the solution, find the degree of dissociation.

Solution: First, we write down the equation for the dissociation of $Zn(NO_3)_2$. We know that intermediate salts dissociate steplessly.

$$Zn(NO_3)_2 \leftrightarrow Zn^{2+} + 2NO_3^-$$

$_2$ moles of NO_3^{2-} ions were formed from 1 mole of Zn(NO $_3$) 2 . Based on this, we make a proportion :

1 mol $Zn(NO_3)_2$ -------------------2 mol NO_3^-

x mol--------------------16 mol NO_3^-

$$x = \frac{1 \cdot 16}{2} = 8$$

we learned that 8 moles of $Zn(NO_3)_2$ were dissociated . Using this information, we find the degree of dissociation. We use the proportion:

10 mol $Zn(NO_3)_2$ -----------------100%

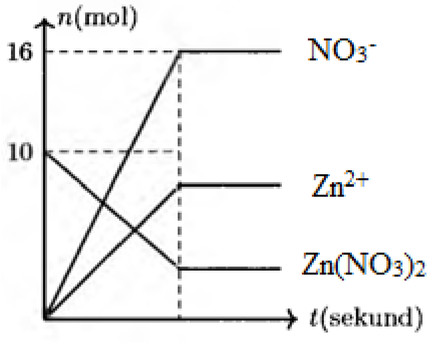
8 mol $Zn(NO_3)_2$ ------------------ x %

$$x = \frac{8 \cdot 100}{10} = 80$$

$$\text{or } \alpha = \frac{n}{N} \cdot 100 = \frac{8}{10} \cdot 100 = 80$$

Answer: the degree of dissociation is 80%, or 80% of zinc sulfate is dissociated.

This problem can be interpreted in an unconventional way as follows: based on the graph of the dissociation of Zn (NO_3) $_2$, find its degree of dissociation (%).



Now the reader should be able to analyze the condition of this problem by looking at the graph and thinking a little. This graph requires logical knowledge from the reader.

Solution: Zinc sulfate is a strong electrolyte. Its dissociation is as follows:

$$Zn(NO_3)_2 \leftrightarrow Zn^{2+} + 2NO_3^-$$

1) It can be seen that when this substance is dissociated, the amount of anion is twice as much as the amount of cation, and the amount of cation is equal to the amount of dissociated salt. As can be seen from the graph above, 16 mol of NO_3^- was formed, initially 10 mol of $Zn(NO_3)_2$ salt was present. How much of this salt is dissociated can be found from the amount of anion formed.

X mol *is 16 mol*

$$Zn(NO_3)_2 \leftrightarrow Zn^{2+} + 2NO_3^-$$

1 mol *2 mol*

$$x = \frac{1 \cdot 16}{2} = 8$$

That is, 8 moles of $Zn(NO_3)_2$ salt is dissociated.

2) We find the degree of dissociation.

10 mol $Zn(NO_3)_2$ -----------------100%

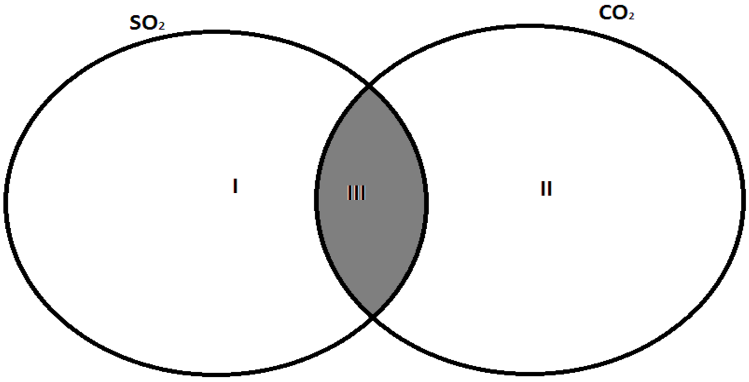
8 mol $Zn(NO_3)_2$ ------------------ x %

$$x = \frac{8 \cdot 100}{10} = 80$$

or $\alpha = \frac{n}{N} \cdot 100 = \frac{8}{10} \cdot 100 = 80$

Answer: the degree of dissociation is 80%, or 80% of zinc sulfate is dissociated.

Issue 2. We will determine the answer based on the Venn diagram below, which shows the specific and general characteristics of the given substances.



Solution: To solve this problem, the student should have enough theoretical knowledge about the properties of given substances. At the same time, it is also required to be able to solve the puzzle of the diagram. So, circle 1 is for sulfur(IV)-oxide, circle 2 is for carbon(IV)-oxide, and the intersecting part of the two circles is for both oxides. We are given the following answer options:

A) I-is formed on oxygen ;II-is formed from the combustion of glycine; III-the degree of hybridization of the central atom is +4;

B) oxidation level of the I-central atom is +4; it is formed from the combustion of II-cysteine ;Burns in III-oxygen;

C) I-crystal lattice is molecular; II-oxidation level of the central atom is +4; III-molecule is linear;

D) oxidation level of I-central atom is +4; II-occupies a volume of 22.4 liters under normal conditions; III-molecule also contains a metal atom;

Now let's analyze the above answers.

1) Combustion: I-SO_2 burns in oxygen and forms SO_3, i.e. burns.

$2SO_2+O_2=2SO_2$

CO_2 is a burnt product, that is, it does not burn.

2) When the amino acid II-Glycine burns, CO_2 is formed.

$2NH_2$-CH_2-COOH+4,5O_2=4CO_2+N_2+5H_2O

3) Oxidation level of central atom of III-both oxides is equal to +4.

Thus, we accept option A as the correct case o b.

Many such examples can be cited. The goal is to develop the student's ability to solve chemical problems, to develop the ability to apply theoretical knowledge in a practical way.

The solution methods are the same, but the condition of the problem is presented in a different form, which is important for strengthening the theoretical knowledge acquired by the students. Therefore, the use of non-traditional problems and exercises in the formation of knowledge and skills related to the topics in the curriculum of educational institutions and the tests prepared by the testers is necessary to increase the level of logical thinking in students and to perform this calculation. Forms an opportunity to connect the knowledge obtained from other sciences with chemistry.

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