THE SIGNIFICANCE OF THE USE OF CHEMICAL EXPERIMENTS IN THE STUDY OF THE TOPIC "PATTERNS OF CHEMICAL REACTIONS"

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Abstract. *The importance of using chemical experiments in teaching the topic "Regularities of chemical reactions" is shown.*

Based on the scientific principle, a didactic analysis of the logical sequence of studying the concepts of reaction rate and chemical equilibrium in chemical education was made and recommendations were developed.

Keywords: *chemistry education, chemistry experiment, reaction rate, chemical equilibrium, didactic analysis, learning efficiency.*

INTRODUCTION. Today, when fundamental reforms are taking place in the education system of our republic, it is one of the urgent problems to train and bring up to adulthood mature, highly qualified, highly moral, cultured specialists who are devoted to their profession.

As well as all educational subjects, chemical experiments are of great importance in the thorough and effective mastering of chemistry. Pupils' understanding of the content of the given topics, assimilation of chemical concepts, laws, and evidential data on the example of some substances is carried out with the help of teaching methods. In order for all of this to be at the required level, the use of chemical experiments that are unique to chemistry education in chemistry education today has a good effect, because the lessons conducted with them help the student to think independently, to deeply understand the nature of the laws of reactions. will help.

The purpose of this research work is to develop recommendations for the use of advanced chemical experiments in the study of the laws of chemical reactions and to determine their effectiveness in the course of teaching.

MAIN PART

Improved experiments to study the rate of chemical reactions.

The purpose of the experiment: to perform experiments on the topic of the rate of chemical reactions and chemical equilibrium.

Chemical experience is the basis of chemistry education. Increasing the theoretical level of chemistry teaching and strengthening its practical importance is one of the important tasks of modern education. For this reason, special attention has been paid to the experience and skills that pupils and students need to acquire in the standard high school and high school chemistry programs and state education standards.

Based on the above requirements, we present the improved experiments on determining the rate of chemical reactions, which are intended to be performed in secondary and higher school programs.

It is of great theoretical and practical importance to create knowledge and skills in the students of secondary and higher education institutions regarding the rate of chemical reaction and

its determination, as well as the influence of various factors on the rate of reaction.

The more readers and students know about the rates of chemical reactions, the easier it will be for them to understand the nature and mechanism of chemical reactions. In the process of observing chemical experiments, they learn that the speed of reactions varies, as well as the important factors that affect the reaction (temperature, pressure, concentration of reactants and catalyst).

Understanding the speed of reactions in a chemistry course will help students to understand that there is an integral connection between the nature of the reactants and the conditions of the reaction. It should be noted that the knowledge of the speed of chemical reactions is given a special place in the general and inorganic chemistry course program. The speed of chemical reactions depends on various factors and there are few methodological recommendations for its determination. In most cases, teachers are satisfied with listing the factors that increase the speed of chemical reactions. In the experiments that we recommend, readers and students will see that the speed of reactions depends on temperature, the presence of a catalyst, and the surface of solids. They develop analytical skills depending on the speed of the reaction, the amount of reacting substances or the amount of a new substance (often a gas) formed.

In order to create an understanding among pupils and students about the influence of various factors on the speed of chemical reactions, substances and catalysts such as bertole salt, potassium permanganate, zinc metal, marble, hydrochloric acid are taken in exact optimal amounts for the reaction, and the conditions are measured. , the results of the experiment are put into the formula and studied. Below, the universal tool for studying the influence of various factors (catalyst, temperature, substance concentration and surface area of substances) on the rate of reaction, recommended by us, is assembled according to the purpose (Fig. 1).

With the help of this tool, it is possible to demonstrate the dependence of the reaction rate on various factors.

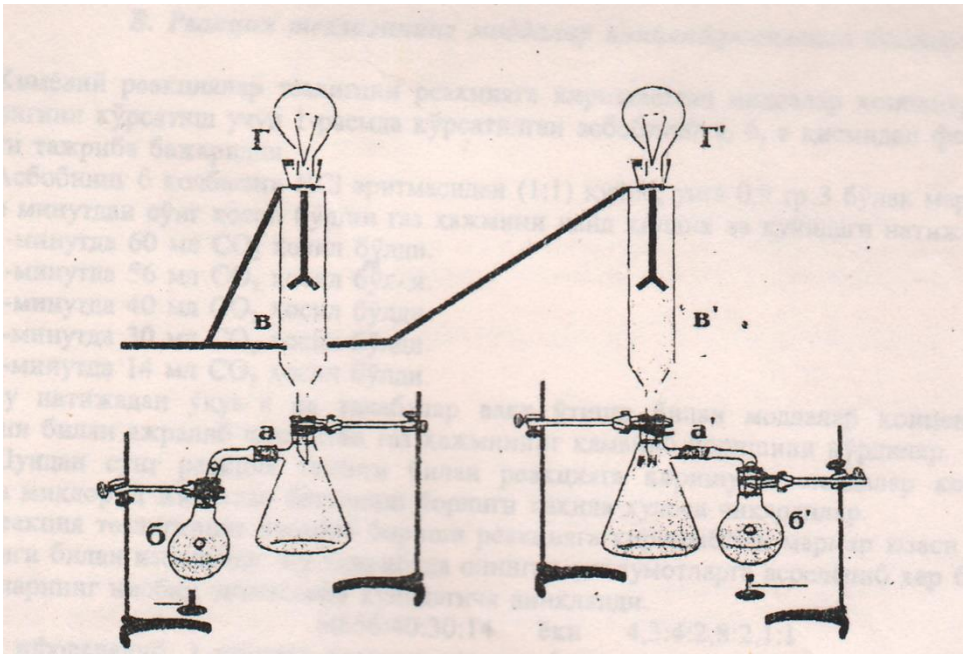

Figure 1

2 conical flasks with a volume of 500 ml (a, a') and 2 round bottom flasks with a volume of 100 ml (b, b'), 2 graduated glass tubes of 250 ml (v, v'), 2 light bulbs (g, g') a device for studying electrical conductivity of solutions is assembled. The order of assembly of tools is shown in Fig.1.

Results

A. Effect of catalyst and temperature on reaction rate

The dependence of the reaction speed on various factors is studied through parallel experiments. The effect of catalyst and temperature on the reaction rate is studied using the methods of obtaining oxygen. In this experiment, the reaction rate is determined depending on the volume of the new substance (oxygen) formed. Because solid substances (MnO_2, HCl) remain after the reaction in place of Bertol's salt. For this purpose, 0.73 grams of Bertole salt was added to the flasks (b, b') of the device shown in the picture. 0.8 g of catalyst MnO_2 is added to b'. The flasks are heated in the same flame and the following results are obtained.

1. g' bulb lights up 1 minute after the start of heating (it is known that a catalyst was added to b' flask) (Fig. 1).

2. light bulb lights up after 6 minutes (tube b was without catalyst).

3. As a result of both reactions, the same volume (200 ml) of oxygen is formed.

The speed of the reaction in the presence of a catalyst,

V= v/ t = 200 ml/ 1 min=200 ml/ min

The speed of the reaction without a catalyst,

V= v/ t = 200 ml/ 6 min=33.3 ml/min

Students compare the speed of these two reactions and find out that the reaction speed increases 6 times in the presence of a catalyst. In the same procedure, potassium permanganate ($KMn0_4$) salt is taken instead of bertole salt, placed in the same amount in flasks (b, b') and flask b is heated in a stronger flame than flask b'.

Heating starts at the same time. Pupils will witness the light bulb g lit 2 minutes earlier compared to the light bulb g' and draw a conclusion about the decay reaction, the speed of which increases due to temperature.

B. The dependence of the reaction rate on the size of the surface of the reacting substances

The dependence of the reaction rate on the surface area of the reacting substances is studied as follows.

The same amount of 3% HCl solution is poured into the flasks (b, b') of the device shown in Fig. 1. Granular zinc metal is poured into flask b, and pyx metal (from 0.49 grams) into flask b' at the same time. is placed in it. In this case, due to the large surface width of the zinc in the b tube, hydrogen is released faster in this tube, and the bulb g lights up 1.5 minutes before the bulb g'. After the experiment, the reader and students will come to the conclusion that the larger the surface of a solid substance, the greater the speed of the reaction in which this substance participates.

V. Dependence of the reaction rate on the concentration of substances

To demonstrate the relationship between the speed of chemical reactions and the concentration of reacting substances, parts a, b, v of the device shown in Figure 1 are used and the following experiment is performed.

Pour HCL solution (1:1) into flask b of the instrument, add 0.9 g of 3 pieces of marble, and after every minute, the volume of gas produced is recorded and the following result is obtained.

60 ml of CO_2 is produced in 1 minute.

In the 2nd minute, 56 ml of CO_2 is formed.

40 ml of $CO_2$is formed in the 3rd minute.

In the 4th minute, 30 ml of CO_2 is formed.

In the 5th minute, 14 ml of CO_2 is formed.

From this result, readers and students will see that the volume of gas released decreases with time as the concentration of substances decreases.

After that, they conclude that there is a quantitative relationship between the reaction rate and the concentration of reactants.

The decrease in the reaction rate is explained by the dependence on the surface and quantity of the reacting marble. Based on the data obtained in this experiment, the relative rates of reactions per minute are determined as follows.

Expressed as 60:56:40:30:14 or 4.3:4:2.8:2.1:1, the reaction rate in 1 minute is 4.3 times faster than the reaction rate in 5 minutes, and the reaction rate in 2 minutes is 4 times faster than in 5 minutes. shows that it has gone.

Pupils and students can perform similar experiments in the topics of "Oxygen", "Hydrogen", "Sulfur", "Nitrogen" and "Phosphorus".

CONCLUSION

Thus, the use of improved experiments in studying the laws of chemical reactions will closely help pupils and students to gain a deep understanding of the essence of chemistry and increase the effectiveness of education.

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