

The Importance of Using Virtual Laboratories in Teaching the Subject of Solutions

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ANNOTATION

This article provides detailed information about the importance of teaching and learning the subject of solution and solution concentration in chemistry classes in secondary schools using virtual laboratories, programs that are currently used and can be used in the future. , you will get information about working with programs. This article is about facilitating the experimental part of chemistry.

KEYWORDS: Crocodile chemistry, virtual laboratory, QR-code, periodic table, animation, video tutorial, you tube, video laboratory, interesting experiments, picture, graph and tables.

Introduction

We know that practical training and laboratory work are of great importance in teaching chemistry, strengthening theoretical knowledge. During practical experiments, laboratory equipment and reagents are not always enough. Since chemistry is one of the experimental exact sciences, knowledge and skills are strengthened more in laboratory training. In many cases, the use of toxic and harmful, flammable and explosive reagents and complex equipment is required for laboratory training. Reviewing it in a virtual state with the help of a computer before directly starting to perform laboratory work - saves reagents, ensures safety, and increases the efficiency of the educational process. For this reason, many chemical virtual laboratories have been developed.

In addition, there are experiences where unfavorable conditions may arise during the performance of certain laboratory works. Then it is appropriate to use a virtual laboratory and additional computer programs. But there is no sufficient guide in Uzbek for working with these programs. [4:B-125-128].

Material and Methods

Students should constantly improve their qualifications and skills, practice questions and assignments. Which subject should be experimented with, engaged in everyday life, expanding the acquired knowledge, deepening and strengthening in practical lessons.

The relevance of the use of virtual laboratory work is that it does not require the creation of complex devices, storage and replacement of devices and reagents, as well as repair work and washing of chemical containers. All laboratory work is stored in computer memory or

external memory in an electronic version and in one place. The computer device is safe, not difficult to use, and at the same time requires the user to work only with specific programs.

The instructional manual shows the main part of the work in the form of questions and tasks for students, interesting experiments, pictures, graphs and tables, and for teachers to fully control the work of students, allows to organize a wider work with programs. As a result, the teacher conducts classes using virtual laboratories to strengthen theoretical knowledge in the course of the lesson, conducts experiments while working individually with each student in the course of the laboratory, makes the course of the lesson more productive and high-quality. In the case of laboratory training in chemistry, various chemical programs that enable it to be performed (Crocodile chemistry 605, Chemistry (class 8-11) Virtual laboratory, Periodic table, ChemsK12, Chemical calculator, ChemDraw Ultra 11.0, CHEMIX 12, GaussView, Chembalance Wiziard32, Khumua42) is the subject of research. [3:B-133-139, 2:B-89-96].

The Crocodile Chemistry program allows you to study the physical and chemical properties of all the elements in the Periodic Table. Usually, during a chemical reaction, it is not possible to observe the structure of the molecule during the transformation of the substances participating in the reaction into other substances, but through this program, it is possible to observe the dynamics of the molecule during the reaction. Through this program, you can study catalytic reactions with and without a catalyst, observe the reaction mechanism and, most importantly, perform these tasks safely. [2:B-85-98].

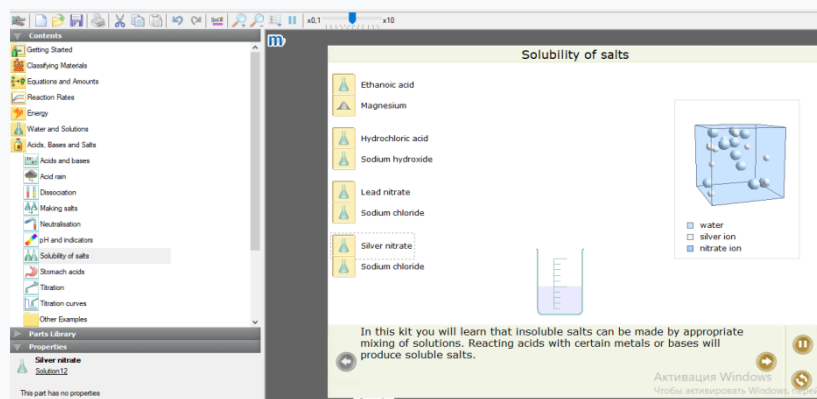


Figure 1. Working window of the program Crocodile Chemistry

In the first section, there is chemical equipment, and we can get the necessary equipment for the chemical reaction.



Figure 2. A set of dishes in the Chemist program

In the second section, there are chemical substances, solid, liquid, gas, and organic substances are given separately.



Figure 3. A collection of substances in the Chemist program

Results and Discussion

Based on the above information, we compiled video labs on solutions, posted them on YouTube video hosting, took QR codes and used them in the course of the lesson. The list of video laboratories used in the course:

Preparation of a solution with a known solute concentration

Preparation of table salt solution.

1. Calculate the masses of table salt and water needed to prepare 50 g of a table salt solution with a mass fraction of 0.1.
2. The calculated amount of salt is measured on a scale, and water is measured using a measuring tube.
3. Place the weighed salt in a flask, pour measured water over it and mix until a homogeneous solution is formed.
4. The prepared solution is poured into the container. A label with the formula of the salt, the concentration of the solution and the preparation time is attached to the container. [4: B-93-94].

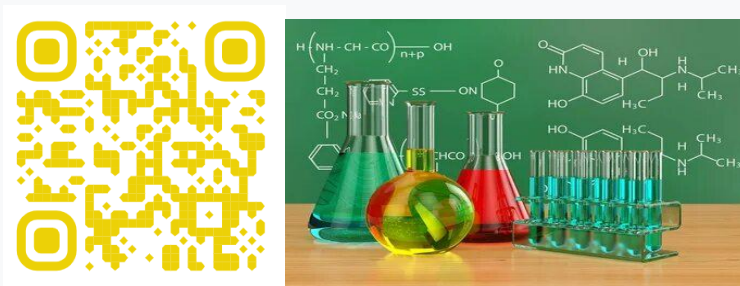


Interaction of metals with salt solutions

1. Pour 2-3 ml of silver (I) nitrate solution into the first test tube, copper (II) sulfate solution into the second test tube, and lead (II) nitrate solution into the third test tube.

- Put a copper wire into the first test tube, iron powder into the second, and copper powder into the third.

What substances were formed in each test tube? [5:B-198].



Interaction of aluminum with acid and base solutions

- Place aluminum pieces in two test tubes.
- Pour hydrochloric acid solution into the first test tube.
- Pour sodium caustic solution into the second test tube.
- Observe the processes that occur [5:B-199].



Interaction of potassium metal with water

Compounds of potassium with nonmetals are ionic solids. Potassium reacts with water under normal conditions very violently, even with burning and explosion. As a result, potassium hydroxide and hydrogen are formed: [5:B-80-85].

Conclusion

To sum up, increasing the quality and effectiveness of education, creating an opportunity for students to acquire independent and excellent knowledge, expanding their worldview and imagination, and developing their thinking skills are important for the intellectual potential of the teacher, advanced pedagogy in the course of the lesson. depends on appropriate and efficient use of technologies. Due to the rapid development of information technologies, various computer programs have entered the technology of teaching chemistry.

Today, laboratory exercises of school chemistry textbooks are provided in the electronic version in the form of video tapes. The reader is limited to watching this video feed only. It is not possible to obtain the desired results by changing the conditions of laboratory work. Currently created chemical virtual laboratories have such opportunities and allow the student to think independently and get the desired results even in extreme cases.

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