

How to Equip Modern Chemical Laboratory Rooms

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Abstract

Today, there are gaps in the knowledge of students in the organization of laboratory classes in chemistry. Recommendations are given on using modern equipment to eliminate these gaps.

Keywords: methodology, laboratory training, experience, reactive, teaching, interesting, didactic, small group, lesson.

Introduction

It is known from the historical development of any country that the rapid development of the country, the achievement of certain achievements, and the well-being of the people depend on the level of attention paid to the education and future of the youth in that country. In this sense, the issue of youth in Uzbekistan is one of the most priority areas of state policy^[1]

At the moment, great attention is being paid to improving the effectiveness of the educational process in order to improve the educational process in our republic. All the theoretical knowledge of chemistry is useless if it is not applied in the laboratory. Therefore, R. As Boyle said, it is not difficult to understand that the study of chemical laws, concepts, properties of substances, their formation based on experiments is a factor that allows for more perfect research of science.

The discovery of many theoretical laws in chemistry is the result of experiments carried out with a specific goal in mind. Any opinion and reasoning expressed in chemistry, which is one of the natural sciences, must be confirmed with the help of experience. In the early stages of the development of the science of chemistry, A. Vyurs, O. Tenar, Gay-Lussac, W. Charles, Berselius, Kuper, Kekule, Vyoler, Mendeleev, J.B.Bio, Faraday, Beilstein, O. Loran, Mollus and many other chemists later in the science many experiments were carried out, which led to the discovery of important laws. It was their work that was an important factor in the development of applied chemistry [3].

In general secondary schools, the chemistry room consists of a laboratory room and a laboratory where reagents are stored. In the laboratory room there will be cabinets for storing

¹ Decision No. PD-4884 of the President of the Republic of Uzbekistan dated 06.11.2020,



various instruments and reagents, tables for students to practice, various models and stands. Students' desks and the teacher's desk are equipped according to the content of each lesson [4]. Next to the table where the teacher demonstrates experiments, there must be a water heater and a gas burner. Students use an alcohol lamp. A laboratory tripod, a tripod with test tubes, a 100 or 250 ml flask, a 2 or 5 milliliter pipette, a 25 cm long glass rod, a beaker, a funnel and a porcelain glass are placed on the student's desk. Solutions of various concentrations of salt, acid and bases are kept in the lab room (laboratory) and the lab technician himself pours them to the students when necessary. In addition, the laboratory room should have fire fighting equipment (sandbox, fire extinguisher, etc.) and a first aid kit at one end and within easy reach. In any laboratory, there is definitely a specialist working as a laboratory technician. The duties and tasks of each laboratory assistant are determined based on the uniqueness of the institution where he works [5].

In any laboratory, there is definitely a specialist working as a laboratory technician. The duties and tasks of each laboratory assistant are determined based on the characteristics of the institution where he works. A laboratory assistant monitors students' compliance with safety rules while performing laboratory work. The laboratory assistant must constantly improve his theoretical and practical knowledge and pass an exam to the teacher every year. At the end of every day, he checks that the electrical devices in the office are turned off, that there are no reagents left on the tables, that the water and gas taps are closed, and then he locks the office. Every laboratory technician should have a gown, glasses, and rubber gloves [6].

It is necessary to use active methods of teaching in chemistry lessons, to pay great attention to the experiments and laboratory exercises that are the basis of the lessons, to organize them correctly, to attract the full attention of the students to the experiments, and to achieve that the students approach each event as a researcher. The main goal of the practical training is to find out how thoroughly the theoretical knowledge of all the topics covered is mastered. When conducting such an exercise, all necessary equipment and reagents must be prepared in advance.

Equipment of chemical laboratory rooms in higher educational institutions

Bachelor's degree in chemistry - teaching subjects related to specialization in general secondary, secondary special, vocational education institutions, organizations of the general secondary, secondary special, vocational education system, the Academy of Sciences of the Republic of Uzbekistan and branch research institutes, science and production, covers a complex set of issues related to specialization in enterprises and organizations, state administration bodies, environmental protection laboratories, drinking water preparation and control laboratories, laboratories of sanitary epidemiology stations, Ministry of Emergency Situations laboratories, customs service laboratories, state and non-state educational institutions [7].

PD-4805 of the President of the Republic of Uzbekistan, adopted on August 12, 2020, the development of chemistry and biology in our country, the improvement of the quality of education and the effectiveness of science in these areas are set among the priorities of the State Program "Year of Science, Enlightenment and Digital Economy". It is also determined to equip higher education institutions with modern information and communication technologies, to



expand the access of students, teachers and young researchers of higher education institutions to world educational resources, electronic catalogs and databases of modern scientific literature [2].

In the lessons organized on the basis of new pedagogical technologies, the organization of laboratory activities taking into account the intellectual ability of students, the culture of speaking, mutual friendship and friendliness will lead to the awakening of the feeling of help, friendship and friendliness to each other, and through this, it will be easier for them to acquire skills and abilities. will come. Conducting laboratory and practical training, first of all, serves to strengthen the students' theoretical knowledge of this subject, it is natural that experiments with various qualitative and quantitative reactions with changes in color and quantity, sedimentation and gas release arouse great interest in science. The availability of various chemical containers and chemicals and the teacher's ability to use them wisely are necessary conditions for conducting practical training and laboratory work [8].

Carrying out chemical experiments in laboratory classes is one of the most necessary conditions for the successful study of chemistry, and it sets the task of strengthening the theoretical educational material in the minds of students. Understanding the experiment from a cybernetic point of view is the first time It is given in V. M. Glushkov's research works. According to O. K. Tikhomirov, "experiment" is a goal shown in certain conditions. L.L. Gurova explains the concept of experiment as follows: "Experiment is an object of thinking activity consisting of theoretical question-and-answer or demanding practical changes by searching for conditions that reveal the relationship between its known and unknown elements." SL Rubinstein sees the experiment as a proof of purpose and conditions. D. I. Mendeleev said: "Experiment" is the art of questioning nature [9].

New on-bottle dispenser DispensMate-Pro

Features:

- Excellent chemical resistance;
- Fully autoclavable at 121 degrees;
- A reagent recovery function reduces waste and prevents drips during downtime;
- Fast, reliable and repeatable volume locking mechanism;
- Easy disassembly and cleaning, minimal maintenance;
- With 6 different adapters for reagent bottles of different sizes;
- For liquid with vapor pressure up to 500 mbar, viscosity up to 500 mm²/s, temperature up to 40 degrees, density up to 2.2 g/cm³;



The flexible filling tube adapts to different sizes of reagent bottles.

20L Industrial Digital Rotary Evaporator RE200-Pro

Features:

Large LCD digital display with heating temperature, rotation speed, clockwise and counterclockwise time information

One-click automatic motor lifting (stroke 180mm), smooth and quiet.

Wide temperature water/oil heating bath from room temperature to 180 degrees [10].

Speed range from 10 to 150 rpm, and intermittent operation in clockwise and counter-clockwise directions for drying process

Three-layer high-efficiency condensation tube with large condensation area and strong evaporation capacity ensures efficient sample recovery.

Evaporation flask and patented connector for quick installation

PTFE double sealing ring with excellent sealing performance

Replacement valve for continuous collection without compromising system vacuum and solvent distillation

Electronic titrator dTrite

The dTrite Digital Burette provides accurate, precise, and convenient on-bottle titration as well as optimal operator safety.

It combines the functions of a magnetic stirrer and a titrator, allowing the operator to perform analytical chemistry, food industry, water analysis, etc. makes it easier to achieve satisfactory results [11].

Features:

A high-quality tool with excellent accuracy and precision.

Electronic control ensures fatigue-free operation.

Remote control prevents manual tampering during operation.

Built-in magnetic stirrer for complete and easy operation [12].

Pipette filler Levo Plus

Features:

Fits most plastic and glass pipettes from 0.1 -100ml.

Six different speed modes for aspiration and dispensing of different liquids

Large LCD display with low battery warning and speed settings

Allows one-handed operation with minimal effort

Lightweight and ergonomic design allows easy use

High-capacity Li-ion battery allows long-time operation

A powerful pump fills a 25 ml pipette<5>

0.45 µm replaceable hydrophobic filter

Recharges during use [13].



In each lesson, and especially during practical sessions, the teacher should introduce students to modern science and technology innovations and show them experiments related to these innovations as much as possible. New information technologies can be effectively used in traditional lessons, including practical lessons in chemistry, laboratory work, demonstration experiments. The effectiveness of using the latest information technology tools in the educational process largely depends on the successful solution of methodological tasks related to information content. The teacher may not always be able to perform the experiment he wants, because the material base of the classroom does not always meet the requirements of a modern chemistry classroom. Therefore, the use of computer tools can help to solve this problem effectively. The advantage of students working with software is that such activity serves to stimulate research and creative activity [14].

Can be used to support active learning in chemistry classes and extracurricular activities. Therefore, virtual experiences in chemistry education have the following advantages, such as: Conducting experiments that are not available in the school chemistry laboratory; remote seminars and laboratory work, including interactions with children with disabilities and regional remote school students;

work speed, save reagents; - to increase the interest of schoolchildren in learning [15].

no need to collect all the setup again before each lesson, spend time to check the tools, put them in place;

security equipment is much higher than normal conditions;

you can conduct several different experiments in a short time, then summarize the results and draw conclusions;

display time can be slowed down or accelerated [16].

Although this process is very important, it should also be taken into account that chemistry teachers cannot completely abandon real laboratory work, because in the teaching of science, visual thinking is more developed than the method, and in the future, if it is based on the theoretical level of summarizing the process of teaching students, a computer that develops students' logical thinking models can be used. I would like to emphasize that the use of modern equipment in experiments performed on the basis of high accuracy allows for faster and deeper mastering of the studied subject, helps to understand difficult-to-perceive issues, and increases interest in the subject [17]. Usually, laboratory exercises are conducted in specially designed rooms under the guidance of a teacher, and the rules of technical safety are observed separately.

_ The effectiveness of laboratory training is integrally related to the method of its organization and conduct [18]

First of all, the goal of the speech exercise is clear and the students should be able to achieve it.

Secondly, all facilities, reactive and modern equipment necessary for conducting laboratory training must be ready.

Thirdly, the structure of modern equipment, principles of operation should be explained verbally and in writing [19].

Fourthly, it is necessary for each student to be active in using the equipment during the laboratory training session.



Fifthly, in the course of laboratory training, students should maintain an aesthetic taste and observe technical safety rules in working with modern equipment [20].

The student should know why the experiment is being performed and what problem can be determined based on the experiment. The student is required to study materials with the help of tools - equipment and indicators, and as a result, it is necessary to be able to draw conclusions based on the theoretical concepts related to the experimental results. Conducting laboratory training is important in connecting students' theoretical knowledge with the laboratory, clarifying it, forming and developing the educational skills specified in the program [21].

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