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APPLICATION OF TEACHING THE 1ST LAW OF "THERMODYNAMICS" TO ISOPROCESSES IN SECONDARY SCHOOLS

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ABSTRACT

In this article, IX graders of general education schools. In order to eliminate the problems and shortcomings in the teaching of the first law of thermodynamics from physics, information is presented using a methodical approach.

Keywords: thermodynamics, heat, temperature, internal energy, atom and molecule, adiabatic, isochoric, isobaric, isothermal, method.

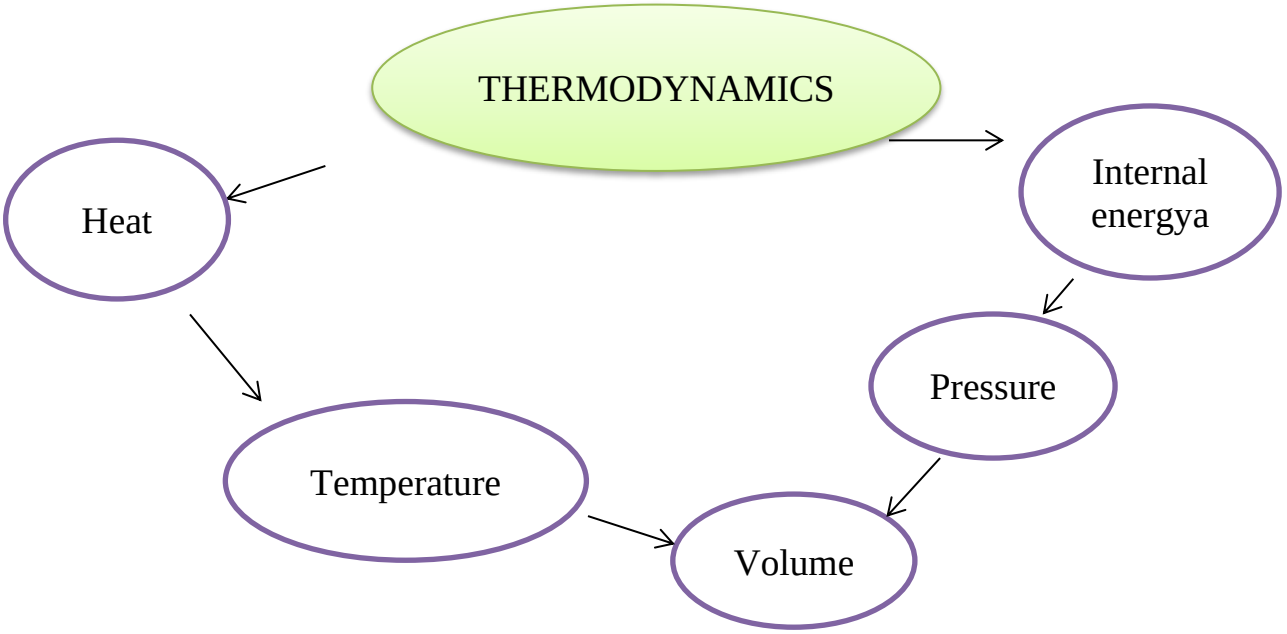
INTRODUCTION

Today, the large-scale reforms implemented in the education system of our country are aimed at raising the quality of education, taking its place in the world community, and raising children worthy of our great ancestors. In particular, based on the content of the priority tasks defined in the decree of the President of the Republic of Uzbekistan dated April 29, 2019 "On approval of the concept of development of the public education system of the Republic of Uzbekistan until 2030" No. PF-5712, science education based on modern requirements implies improvement of the content of teacher training processes and increase of their professional competence [1].

Studying the laws of thermodynamics in secondary schools, knowing the various events and processes that occur in our daily activities, is of great importance. For this, first of all, during the lesson, the teacher should provide students of the 9th grade with information about the laws of thermodynamics, based on new methods, and form the knowledge, skills and abilities of the student. In explaining the first law of thermodynamics to students, if we start by providing elementary information through interactive educational methods, it will be the basis for their understanding of key parts of the subject. For example, when repeating the knowledge of students on previous topics using the "Brainstorming" method, it is appropriate to ask the following questions:

1. Explain the concept of "heat"?
2. Tell me about internal energy?
3. What is pressure?
4. What is the volume?
5. What is the difference between temperature and heat?

or,



It is important for the teacher to provide knowledge to the students and prepare them for the lesson in the organization of their educational activities. The main issue here is to determine the type of lesson. It should correspond to the content of the subject taught and the didactic purpose of the lesson.

In recent times, problem-based learning has received a positive response from most educational institutions. It's not for nothing. Because the problematic passage of the lesson not only equips the students with a collection of different arguments, but also ensures the high development of their mind and thinking abilities. In the course of teaching, the word "problem" is expressed by posing theoretical or practical questions unfamiliar to students. Solving such problems does not correspond to a known algorithm. Solving ulami requires students to find new ways of solving, independence in this process and a unique approach. Therefore, during problem teaching, their activity should always be in the spirit of creativity

We know that substances in nature are composed of atoms and molecules, regardless of their state of aggregate, and since the particles are always in random thermal motion, even if the body is at rest, it has a certain internal energy. If we give a certain amount of heat to the system from the outside, its internal energy will artificially increase, and as a result, the random movement of atoms and molecules will accelerate. A part of the amount of heat supplied to the system from the outside may be spent on work.

We would not be wrong if we say that looking at natural phenomena based on the law of energy conservation and transition from one form to another gives the meaning of thermodynamics. Thermodynamics is a branch of physics that examines systems in which energy can be exchanged between them without taking into account the microscopic structure of the bodies that make up the system. [4].

The first law of thermodynamics is defined as follows: The amount of heat given to a system is spent on the change of its internal energy and the work done in overcoming external forces:

$$\Delta Q = C_v \Delta T + p\Delta V$$

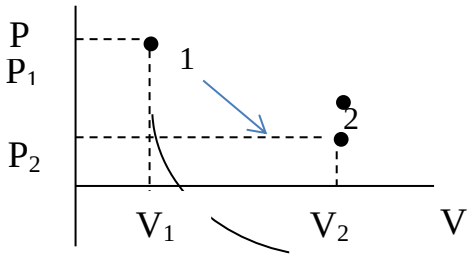
or, $Q = \Delta U + A.$

This law was developed by R. Mayer, a German scientist who was actually a doctor in the middle of the 19th century (1814-1878), It was discovered by the English scientist D.Joule (1818-1898). The German scientist G.Helmholz (1821-1894) described it more fully in his works.

There are the following processes that have their own characteristics of thermodynamics:

- **adiabatic process** – a procedure is followed that does not allow heat to enter and leave the system (Picture 1). PV = const.

In an adiabatic process, neither heat is gained nor released by the system.



$A = \frac{i}{2}(P_1 V_1 - P_2 V_2)$

(Figure 1). Temperature decreases during adiabatic expansion. In an adiabatic process $Q = 0$ and the appearance of the first law of thermodynamics $-\Delta U = A$ bo‘ladi.

An adiabatic process is a process that occurs without heat exchange with the external environment. "If during the change of the state of the system there is no heat exchange between the surrounding bodies and the system, the change in this case is called an adiabatic process."

- **isochoric process** – The relationship between the pressure and temperature of a gas of a given mass when the volume does not change is called an isochoric process (Figure 2).

In such a process, the amount of heat given to the gas is used to change the internal energy of the molecules, that is, the internal energy of the gas increases, V = cons heat capacity - $c_v = \Delta u$.

$Q = \Delta U$

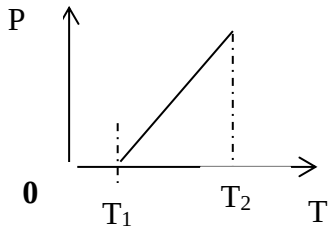
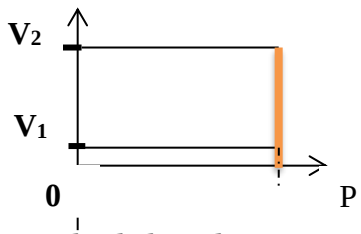


Figure 2. The given heat is spent on internal energy changes.

- **isobaric process** - a process in which the pressure does not change (Figure 3).

In this process, the amount of heat given to the system is spent on the change of internal energy and work done to overcome external forces: $P_1 = P_2 = cons$.



$\Delta Q = \Delta U + \Delta A$

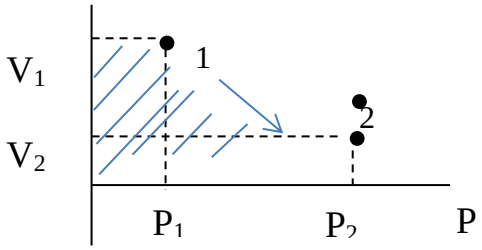
(Figure 3). Work performed when the system volume changes from V_1 to V_2

$A = p(V_2 - V_1).$

- **isothermal process** – a method that does not see a change in temperature (Figure 4).

T = const, ΔT = 0.

V



$T_1 = T_2 = const$
(Figure 1). The heat produced is used only for work.
$Q = A$

The basic expression of the first law of thermodynamics ("The change in the internal energy of a system is equal to the algebraic sum of the heat and the external work") often means that work is the result of heat. Indeed, as confirmed by the early concepts of thermodynamics, work occurs only as a result of changes in deformation coordinates; therefore, the change of the internal energy of the system (heat transfer and work) was considered as a result of external influences and not because of work [3].

While giving elementary information about the first law of thermodynamics to the students, the occurrence of all physical phenomena occurs due to changes in the movement of small particles (atoms and molecules) and energy, internal energy, temperature (temperature), heat phenomena. , we believe that it is necessary to form the physical concepts of pressure and force.

For example, in the 7th grade, the chapter on thermal phenomena is allocated 9 hours of lessons according to the national curriculum. In this section, firstly, what is heat?, what causes heat?, how does the movement of molecules change when a body is heated and cooled?, is there a relationship between heat and the movement of molecules?, how heat is transferred from one body to another? - you need to answer questions like. If the student can answer these questions, he will have a complete, reliable and clear picture of thermal phenomena. Random and non-stop movement of molecules is heat movement.

Problems provide material that requires the application of physical laws to phenomena that occur under certain specific conditions. Solving problems in physics is also an important element of the educational process, it develops students' logical thinking, imagination, initiative, determination and will to achieve the set goal and arouses interest in physics [2]. Therefore, solving problems related to the 1st law of thermodynamics in secondary schools is an urgent task for teachers.

What is a molecule? A molecule is the smallest particle that embodies all the chemical properties of a substance. Molecules are made up of atoms. Molecule is derived from the Latin word "molecule", which means to reduce, and "moles" is mass, the mass of a molecule of a substance.

N. Nizomov, E. N. Kurtaliyev, M. Z. Tilyayev, U. R. Arzibekov “Studying the structure of molecules and intermolecular interactions using electronic spectra” according to the information provided in the textbook, the smallest particle of matter is called a molecule. Molekula – lotincha «molekula» so’zidan olingan bo’lib, kichraytirish demakdir, «moles» – esa massa, modda molekulasining massasidir. Molekula berilgan modda xususiyatlariga ega bo’lgan, shu moddaning kichik zarrachasi bo’lib, ushbu zarrachalar o’zaro kimyoviy va fizikaviy bog’lanishlar orqali bog’langan atomlardan tuzilgan [3].

Before teaching students the first law of thermodynamics, they need to know about the law of conservation of energy, i.e. the law of conservation and circulation of mechanical energy; transformation of mechanical energy into thermal energy (internal energy) and vice versa; ways of changing the internal energy of bodies (heat storage, doing work); methods of heat transfer (heat conduction, convection, radiation), formulas for calculating the amount of heat given or received by an object ($Q=cm\Delta t$, $Q=rm$, $Q=\lambda m$), first of all, it is necessary to repeat, generalize, and then deepen[1]. After repeating and summarizing the known information about the interaction of different types of energy, it is appropriate to use the III (I knew, I want to know, I learned) interactive method of new knowledge. This, of course, leads to higher efficiency of teaching in the educational process.

In an era of rapidly evolving education, learning to transform the way we teach by adopting new pedagogical technologies is the only way to light up the lives of our students. The role and importance of current educational technologies and advanced educational methods in acquiring knowledge, teaching the acquired knowledge to others, knowing how to use knowledge in practice, and creating new knowledge can be expressed through the following points:

Giving knowledge is better than getting knowledge.

Giving knowledge is one of the rewards.

Knowing how to use knowledge is more important than imparting knowledge.

It is more important to expand the fields of use of knowledge than to be able to use it.

Teaching the mechanism of new knowledge creation is more important than imparting knowledge.

As can be seen from the above points, in the process of teaching science, it is important to effectively use educational methods in teaching students how to use knowledge, how to use it in practice, and ultimately the mechanism of creating new knowledge.

In conclusion, it is worth saying that the student should understand the task himself and try to complete it, and the teacher, in turn, should develop the skills of independent research of the students, in order to master the material covered more deeply. they should be encouraged to develop their ability to search for additional information.

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