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Methodology for Solving Physical Problems Related to the 1st Law of Thermodynamics Using Mathematical Formulas

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Abstract: This article shows the method of using new pedagogical technologies in the teaching of physics, using computer programs to solve physical problems graphically. The ability to solve physical problems helps students to have a deeper and more complete understanding of physical phenomena and better understanding of theoretical material. This article shows that the role of solving problems in learning physics is very important.

Key words: We learn to solve problems of thermodynamics, isothermal, isobaric and isocharic processes

1. Introduction

Solving a problem using new formulas means automatically performing operations on the original data based on the created algorithm and displaying the desired results. The concept of "solving a scientific and technical problem" using mathematical programs is a word in a broad sense and is divided into the following stages. Our goal is to determine how some stages are performed without the involvement of specialists, and others using mathematical programs, and also to study the stages in full.

Main part. The article was written with the aim of re-examining the problems of practical training, which is one of the main difficulties in the science of physics, and conveying it to university students.

The object of the study is the process of teaching physics to students of higher educational institutions.

The subject of the research is the methodological basis for using problems in a physics course.

Purpose of the study: Clarification of methodological approaches to collecting problems and their use in a high school physics course.

The study is based on the following hypothesis hypothesis The use of new approaches in organizing the process of solving problems in physics by higher education significantly increases the level of knowledge of students.

Problem 1. The amount of heat transferred to a diatomic gas. Find the work done on the expansion of the gas if the gas expands at constant pressure.

Solution: The work done during isobaric expansion of a gas is equal to

$Q = 2{,}093 к ж$

$P = const$

$i = 5$

$$A = \frac{m}{M} R \cdot \Delta T \quad (1)$$

- mass of gases and; - molar mass;

There is a close relationship between the amount of heat given off to the gas and the change in gas temperature.

$$Q = \frac{m}{M} \cdot \frac{i+2}{2} R\Delta T \quad (2)$$

In that $\frac{m}{M} R \cdot \Delta T = \frac{2Q}{i+2}$ (3)

$$A = \frac{2Q}{i+2} \quad (4)$$

$$A = \frac{2 \cdot 2{,}093 \cdot 10^{3} ж}{5+2} = 600\ ж$$

Problem 2 Oxygen weighing 2 kg occupies a volume of 1 m3 under a pressure of 2.02□105 Pa. When the gas was first heated at constant pressure, its volume increased to 3 m3, then when heated while maintaining a constant volume, its pressure increased to 5.05□105 Pa. Find the increment in the internal energy of the gas, the work done and the amount of heat given to it.

The:

m=2 кг ;	Solution: Internal energy of gas.
$P_1=2{,}02 \cdot 10^5$ Па	is determined by the following formula.
$V_1=1$ м^3 ;	$\Delta U = C_V m \Delta T$ (1)
μ=32 кг/кмол ;	Here the volume Cv has not changed.
i=5	

a) P=const, $V_2=3$ м^3

b) V=const, $P=5{,}05 \cdot 10^5$ Па

$C_V = \frac{IR}{\mu}$ (2)

Should find:ΔU - ? ΔA -? ΔQ -?

here i is the degree of freedom of the gas molecule, R=8.31 J/mol□K is the universal gas constant, i=5, since oxygen consists of 2 atoms.

$$\Delta U = \frac{i}{2} \frac{Rm\Delta T}{M} \quad (3)$$

Using the Mendeleev-Clapeyron equation (PV=vRT) (4), we find the initial and final gas temperatures.

Hence, T1=388K T2=2910K From (4) we find T2-T1 and

$\Delta U = 3.27 \times 10^6$ J

A=R (V2-V1) is the level of static pressure of the gas expansion valve. Iz uravneniya Mendeleeva-Klapeyrona

$V_1 = \frac{mRT_1}{\mu P}$ $V_2 = \frac{mRT_2}{\mu P}$

find the volumes and express the work done in terms of the temperature difference: $A=\frac{mR\Delta T}{\mu}$

heating a gas without changing its volume, the work done is zero, i.e. A2 = 0, then the work done by the gas

$$A=A_1=\frac{mR\Delta T}{\mu}=1.32\times 10^6 ж$$

According to the 1st law of thermodynamics, the amount of heat transferred to the gas is equal to: ΔQ=ΔU+ΔA. If we put numeric values

$$Q= 3,27\cdot10^6 ж+1,32\cdot10^6 ж=4,59\cdot10^6 ж$$

Conclusion: The uniqueness of the modern physics lesson and the requirements for it, training and education of students based on effective methods, he is a teacher creatively using all means of teaching with high skill, special attention to the creative independence of students when organizing a lesson. This requires a wider use of comparison in the process of teaching problem situations. Analysis of modern physics lessons shows that students in lessons in addition to achieving group activity, as well as their individual you also need to pay attention to the characteristics.

References

1.ABDINAZAROV A. ET AL. RARE EARTH IONS FARADAY GYROMAGNETIC EFFECT OF EU3+ IN CRYSTALS //SCIENCE AND INNOVATION IN THE EDUCATION SYSTEM. – 2022. – Т. 1. – №. 6. – С. 115-118.

2.BAXRIDDIN O'G'LI A. A. MOLEKULYAR FIZIKADAN MASALALARNI "BALIQ SKLETI" GRAFIK ORGANAYZER SENARIYASI METODIDA YECHILISHI //AMALIY VA FUNDAMENTAL TADQIQOTLAR JURNALI| JOURNAL OF APPLIED AND FUNDAMENTAL RESEARCH. – 2023. – Т. 2. – №. 7. – С. 13-18.

3. Я. А.Коменский. «Великая дидактика» М. Просвещение, 1988

4. И. Ф.Харламов. Педагогика - М., 2004

5. Е.С.Полат. Новые педагогические и информационные технологии в системе образования. Под редакцией - М., 2003.

6. В.С.Кукушин Дидактика (теория обучения) - Москва - Ростов- на- Дону, 2003

7. П.И.Пидкасистый. Педагогика. М. Педагогическое общество России, 2002.

8. К.Барт. Трудности обучения: раннее предупреждение. М.:Академия, 2006

9. Н.В.Бордовская. Педагогика. – Санкт – Петербург, «Питер», 2000.

10. Клинберг Л. Проблемы теории обучения. – М., 1984.

11. В.В.Краевский.Проблемы научного обоснования обучения: Методологический анализ. – М., 1997.

12. Ч. Куписевич Основы общей дидактики. – М., 1986.

13. В.Оконь. Введение в общую дидактику. – М., 1990.

14. В. В.Давыдов. Теория развивающего обучения. М., 1996

15. В.А.Сластенин, И.Ф.Исаев, Е.Н.Шиянов. Общая педагогика: Учеб. пособие для студ. высш. учеб. заведений / Под ред. В 2 ч. М., 2002

16. И.Я.Лернера, И.К.Журавлева.Современная дидактика: теория и практика / Под ред. М., 2004 17. А.В.Хуторской. Современная дидактика: Учебник для вузов. СПб.: Питер, 2001.

18. У.А.Эшниѐзов. Масофавий таьлим шаклида “Электротехника”фанидан “яримўтказгичли тўғрилагичлар” мавзусини “Swot”методи ѐрдамида, ўқитишда инновацион ѐндашувлар. Academic Research in Educational Sciences, 1(4), 713- 722, 2020. 19. I.G. Tursunov, U.A .Eshniyozov, S.A. Durdiyeva. “Turli muhitlarda elektr toki” mavzusini o'qitishdagi innovatsiyalar. Academic Research in Educational Sciences, v.2, issue.2, pp.513-523, 2021