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Research Article

SOLVING DIFFERENT PROBLEMS RELATING TO PHYSICS ISOPROCESSES IN UNIVERSAL EDUCATION SCHOOLS

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ABSTRACT

The article describes the method of solving various problems related to physics in secondary schools.

KEYWORDS

school, gas laws, isoprocesses, isothermal, isobaric, isochoric, adiabatic processes, problem.

INTRODUCTION

It is desirable to form theoretical knowledge, practical skills and competences for students of general secondary schools in the process of physics education.

The use of various quantitative problems based on the equation of state of an ideal gas in the process of teaching physics helps students to understand the physical nature of phenomena related to isoprocesses and to apply them in practice, and forms skills.

It is necessary for general education schools to become familiar with the scientific foundations of physical phenomena, processes and laws that occur in the processes of physical, mechanical, biological, and chemical properties.

Taking into account the above conclusions, the following goals are set for the lessons designed for choosing and solving quantitative problems related to isoprocesses in physics classes:

1. The selection of issues will expand the students' knowledge of the processes in terms of content.

2. The use of different physics problems related to isoprocesses in the course of the lesson helps the students to learn widely and deeply.

3. Choosing and solving quantitative problems related to isoprocesses in physics classes will help students learn the essence of physical laws.

Choosing and solving various related problems on the basis of the ideal gas equation will help students apply the theoretical knowledge they have gained from physics and think logically.

Solving experimental problems related to isoprocesses from physics allows students to study the laws of nature in depth, to form and develop skills and abilities, to perform independent work, to consciously apply theoretical knowledge to practice, that is, to work in production. By choosing and solving experimental problems from physics related to the processes of the students, they will remain in the daily life they will choose in the future, and their interest will increase to acquire a profession in medicine, because the acquired skills and qualifications will be needed in production activities.

Students face problems in choosing and solving different types of problems from physics to isoprocesses. In solving such problems, students can encounter quantities found in quantitative, qualitative, graphical, experimental, and problematic problems. In this case, they can use several methods of solving the problem. In the process of solving mixed problems, students' problem-solving skills and competence increase.

Exercise 1. The initial volume of the gas was 0.2 l, and the pressure was 300 kPa. The gas expanded isothermally and reached a pressure of 120 kPa. Find the volume of soot of gas?

Given

$T = const$

$V_1 = 0,2\ l = 0,2 \cdot 10^{-3} m^3$

$p_1 = 300\ kPa = 3 \cdot 10^5\ Pa$

$p_2 = 120\ kPa = 1,2 \cdot 10^5 Pa$

$V_2 = ?$

Calculate:

$P_1 V_1 = p_2 V_2,$

$$V_2 = \frac{p_1 V_1}{p_2} = \frac{0,2 \cdot 10^{-3} \cdot 3 \cdot 10^5}{1,2 \cdot 10^5} =$$

$$= 0,5 \cdot 10^{-3} (м^3) = 0,5 l$$

Answer: $V_2 = 0,5$ l.

Exercise 2. The initial volume of gas trapped inside a piston cylinder is 24 〖sm〗^3. The pressure was 0.8 MPa. When the gas is compressed isothermally and the volume of the gas is reduced to 16 〖sm〗^3, what value will its pressure reach?

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Given:

$V_1 = 24\ sm^3 = 24 \cdot 10^{-6}\ m^3$

$p_1 = 0{,}8\ MPa = 0{,}8 \cdot 10^6\ Pa$

$V_2 = 16\ sm^3 = 16 \cdot 10^{-6}\ m^3$

$p_2 = ?$

Calculate:

$$p_2 = \frac{p_1 V_1}{V_2} = \frac{0{,}8 \cdot 10^6 \cdot 24 \cdot 10^{-6}}{16 \cdot 10^{-6}} =$$

$$= 1{,}2 \cdot 10^6\ Pa = 1{,}2\ MPa.$$

Answer: $P_2 = 1{,}2$ MPa.

Exercise 3: The average pressure in the gas cylinder of a car running on gas is 3·105 Pa and its volume is 0.03 m3. Determine the volume of gas polluting the atmosphere if its pressure becomes equal to 1.5·105Pa as a result of combustion.

Given:

$p_1 = 3 \cdot 10^5\ Pa$

$p_2 = 1{,}5 \cdot 10^5\ Pa$

$V_1 = 0{,}03\ m^3$

$V_2 = ?$

Formula:

From $p_2 = \frac{p_1}{2}$ (1)

$V_2 = \frac{V_1}{2}$ (2)

Calculate:

$$V_2 = \frac{V_1}{2} = \frac{0{,}03\, m^3}{2} = 0{,}015\, m^3.$$

Answer: $V_1 = 0{,}015\ m^3$. exhaust gas pollutes the atmosphere.

Exercise 4. Under conditions of normal atmospheric pressure, an ideal gas occupies a volume of 50 l. If the pressure increases 4 times, how much volume will the gas occupy? The temperature does not change

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Given:

$T = const$

$p_1 = 10^5 Pa$

$T = 273K = 125 \cdot 10^{-3}\, m^3$

$p_2 = 4p_1$

$V_1 = 50\, l = 50 \cdot 10^{-3}\, m^3$

$V_2 = ?$

Calculate:

$p_1 V_1 = p_2 V_2 \Rightarrow$

$V_2 = \frac{P_1 V_1}{P_2} = \frac{10^5 \cdot 50 \cdot 10^{-3}}{4 \cdot 10^5} = 12{,}5\ l.$

Answer: $\boldsymbol{V_2 = 12,5}$ **л.**

Exercise 5: The volume of an ideal gas with a temperature of 〖27〗^(0)C was 10 l. How does the volume change when the gas is isobarically heated to 〖327〗^0 C?

Given:

$P = const$

$t_1 = 27^0\, C$

$V_1 = 10\, l = 10^{-2}\, m^3$

$t_2 = 327^0\, C$

$V_2 = ?$

Calculate:

$T_1 = t_1 + 273 = 27 + 273 = 300K$

$T_2 = t_2 + 273 = 327 + 273 = 600K$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$ Gay-Lussac's law

$$V_2 = \frac{V_1 T_2}{T_1} = \frac{10^{-2} \cdot 600}{300} = 20\ l.$$

Answer: $\boldsymbol{V_2 = 20\ l.}$

The problems presented above, the selection and solving of the quantitative problems of the molecular physics chapter "Isojarayons" are important for students to apply their theoretical knowledge of physics in practice, to acquire a profession in the national economy.

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During the educational process, quantitative, qualitative, graphic, experimental, mixed problems were solved in the traditional way. Also, the contents of the issues related to the curriculum and program of the school physics course were presented.

The method of choosing and solving different types of problems related to iso-contrasts from molecular physics was searched for.

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