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Application of Interactive Methods in Teaching Isoprocesses

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Abstract

This article presents the results of explaining the topic of the explanatory process to students using the method of problem-based learning, creating a problem situation in the classroom.

Keywords: logical thinking, mental creativity, independence, knowledge, skills, qualification, competence, consciousness, problem situation.

Introduction, Literature Review And Discussion

Full coverage of problematic situations on the topic in order to reveal the topic allows the reader to fully master it. To do this, "what is called an Isoprocesses"?, "What do you mean by the parameters of an ideal gas"?, "What are the types of processes"? starting the lesson with questions such as "what to do?", the creation of problematic situations, firstly, concentrates the student's attention; secondly, in the minds of students there is an "increased need to purchase products" related to the topic; thirdly, students develop knowledge, skills, skills and competencies in the field of logical thinking, solving logical problems.

Therefore, the presentation of the topic of is processes in the following way gives high results.

It follows from the parameters of the gas under study that the temperature, pressure or volume (T, P, V) remain unchanged, and the other parameters change.

Isothermal processes manifest themselves in three different forms. These are isothermal (T=const); isobaric (P=const); isocharic (V=const) and adiabatic (K=0) processes.

The process that proceeds without changing the temperature of an ideal gas with a constant mass is called an isothermal process [5.153-159-p]. This process is also called the Boyle-Marriott law. In the seventeenth century, the English physicist and chemist Robert Boyle and the French physicist Mariot created this law without knowing each other [6.226-232-p]. Therefore, this law became known as the Boyle-Marriott law.

From the fact that T=const in this process, it follows that PV=const:

If $P_1V_1=(\frac{m}{\mu})RT_1 = P_2V_2=(\frac{m}{\mu})RT_2$,$T_1=T_2=$const,

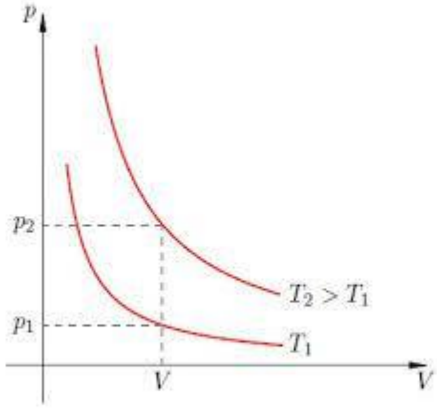
then

$P_1V_1=P_2V_2=\ldots P_nV_n=$ const.

From this it can be seen that, $\frac{P_1}{P_2}=\frac{V_1}{V_2}$ va $P \sim (\frac{1}{V})$.

Therefore, if T = const, the volume decreases with increasing pressure, and the pressure decreases with increasing volume.

The graph of the dependence of gas pressure on volume in an isothermal process has the form of a hyperbola, which is called a graphical isotherm [7.15-18-p]. (Figure 1)



The pressure of an ideal gas of a certain mass placed in a vessel remains unchanged, and the process occurring between volume and temperature is called an isobaric process [4,8,9. 174-177-p].The isobaric process expresses the Gay-Lussac law. They discovered this process in 1802, in their experiments to study the nature of gases when temperature changes. This will be P= const.

$$PV=(\frac{m}{\mu})RT$$

Formula 1

$$\frac{V}{T}=\frac{mR}{\mu P}=\text{const}$$

will be, that is

$$\frac{V_1}{T_1}=\frac{V_2}{T_2}=\ldots\frac{V_n}{T_n}=\text{const};\ V \sim T;$$

This formula expresses Gay-Lussac's law. However, the formula $V_0=V(1+\alpha\Delta t)$ is also a formula of the Gay-Lussac law. Where V_0 is the initial volume of the gas, Δt is the difference between the initial and subsequent temperatures, and a is the volumetric expansion coefficient or thermal coefficient, which is the same for all gases.

$\alpha=(\frac{1}{V_0})(\frac{\Delta V}{\Delta t})_P=\frac{1}{T}$ from this $\alpha=\frac{1}{T}$ will be $\alpha=(\frac{1}{273.15})$ $K^{-1}\approx 0.004\ K^{-1}$

Since the coefficient of volumetric expansion of an ideal gas is equal to the inverse of the absolute temperature. 0^{0}C is a coefficient, for example $\alpha=\frac{1}{273.15}$ K^{-1} will be equal to [3.33-35.-p].

The graph of the dependence of its volume on temperature, when the pressure remains unchanged, is called the isobar graph. On the isobar graph, the gas pressure corresponding to the straight line located closer to the temperature axis will have a greater value [5,6,7. 153-159-p] (Fig.2).

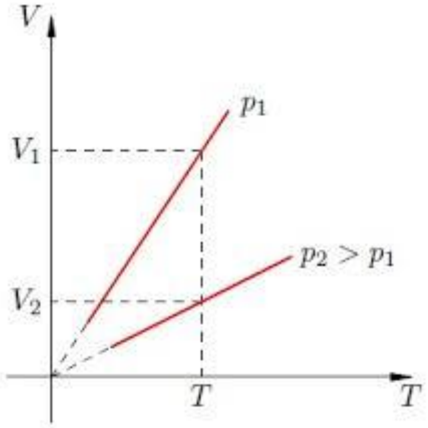


Figure 2

An explanation of the process is a process in which the volume of an ideal gas remains unchanged, and it's other parameters (T, P) change. The French physicist Charles predicted this process in 1787, who predicted that the volume also remains unchanged during experiments, and they began to call the elementary process Charles' law.

In this case, V = const, that is, if $\frac{P}{T} = \frac{MR}{\mu P}$ = const, then $\frac{P}{T}$ = const.

$\frac{P_1}{T_1} = \frac{P_2}{T_2} = \ldots \frac{P_n}{T_n}$ = const or P = P_0 (1+$\alpha\Delta$t) will be. Hence, it will be P~T and P~V.

In the isoprocesse, the pressure changes linearly in temperature, the graph of this change is called isochoric (Fig.3).

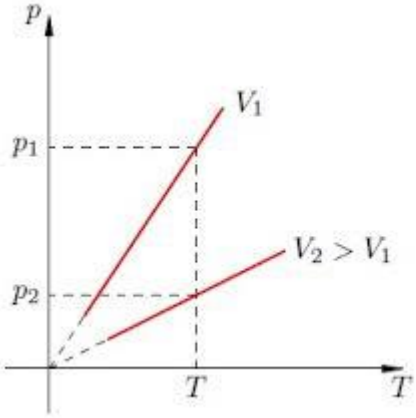


Figure 3

The adiabatic process is a process that proceeds without heat exchange with the external environment. In this case, the value of the amount of heat will be equal to Q = 0. Of course, this seems ideal, because there is absolutely no heat exchange process, but in relatively heat exchange systems, this process can be observed. An example of these systems is a thermostat and, again, a calorimeter[10.153-159-p].

The first law of thermodynamics has also been applied to explanatory processes. At the same time, the first law of thermodynamics states: the amount of heat given to the system is spent on changing the internal energy of the system and on the system performing work on external bodies [5,6,7,8, 153-159-p].

Q = ΔU+A

We see the realization of the first law of thermodynamics for an isothermal process. Q = ΔU+A, where ΔU = $(\frac{i}{2})$ PV and A = PΔV. Since T = const in an isothermal process, ΔU = 0. If the temperature does not change, the internal energy is also equal to U = 0. From this, it can be seen: Q = A will be equal to. This means that in the isothermal process, the amount of heat released to the substance will be completely spent on work[11,12. 153-159-p].

Now let us look at the application of the first law of thermodynamics to the isobaric process as i = 3, that is, for monatomic gases.

Q = ΔU+A and ΔU = $(\frac{i}{2})$ PV = $(\frac{3}{2})$ PV; A = PV. This means that = $(\frac{i}{2})$ PV+PV = $(\frac{i+2}{2})$ PV = $(\frac{5}{2})$ PV, from which it follows that Q = $(\frac{5}{2})$A and Q = 100%, then A = $\frac{100\%}{2.5}$ = 40% and ΔU= 60% will be.

Isobaric process claims that 40% of the amount of heat generated for monatomic gases will be spent on 60% internal energy to do the work. Similarly, for two, three and polyatomic gases, this process can be seen, given that in diatomic $i = 5$ in triatomic and polyatomic $i = 6$ it is possible to determine what percentage of the amount of heat is spent on work, and what percentage is spent on internal energy. Thus, in the isobaric process, the first law of thermodynamics is fully fulfilled [13. 153-159-p].

If we see the implementation of the first law of thermodynamics for an isoprocesse, where V = const, that is, the volume remains unchanged. When the volume changes, the work is done. The work is not performed if the volume does not change A=0 is equal to: $Q = \Delta U + A$ when $Q = \Delta U$.

In the isoprocesse, the amount of heat given to the system is completely consumed for internal energy.

Consider the application of the first law of thermodynamics to the last process, the adiabatic process. In an adiabatic process, heat exchange should not occur, as we say, that is, let Q = 0. In it: since $C = \Delta U + A = 0$, dU remains= -A.

Therefore, we are trying to understand the gas laws with the help of explanations. And isothermal processes help us to better understand the gas laws.

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