

USEFUL RESOURCES

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:

https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2020

The practical information about the club and contacts can be found on the same web page.

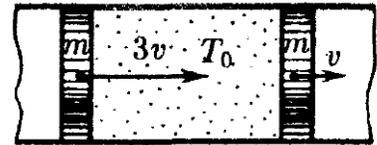
TODAY'S MEETING

Today's homework is about the first law of thermodynamics.

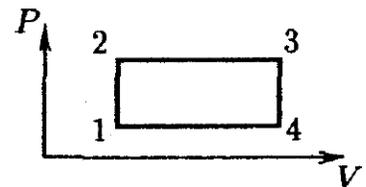
HOMEWORK

1. Air in a room was heated from temperature T_0 to some temperature T so that its' pressure did not change. How did internal energy of air in the room change?

2. One mole of ideal monatomic gas is located between two pistons of mass m in a long frictionless thermally insulated tube. Initially pistons have speeds v and $3v$ in the same direction. What will the maximal temperature of the gas be? Pistons do not conduct heat. Neglect mass of the gas compared to mass of the pistons.

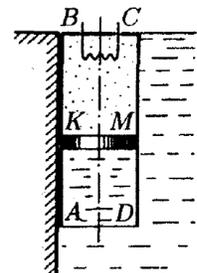


3. One mole of ideal gas participates in a cyclic process 1-2-3-4-1 shown on the figure. Temperatures of gas at points 1 and 3 are T_1 and T_3 respectively. Points 2 and 4 lie on the same isotherm. Find work done by the gas during the cycle.

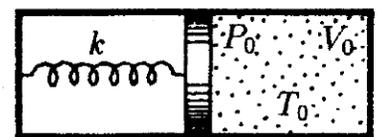


4. Two experiments are performed with the same amount of ideal gas. In both experiments the gas is heated by the same burner for the same amount of time. However in one case the heating happens isobarically (at constant pressure) and in the other case it happens isochorically (at constant volume). Initial values of pressure and volume are equal to p and V and are the same in both cases. The respective final values are V_1 and p_2 . The gas is thermally insulated. Find the ratio of molar heat capacities $\gamma = C_P/C_V$ from this data.

5. A cylinder $ABCD$ with cross section S is closed at the top and open at the bottom. It is attached to a wall of a pool filled with water of density ρ . In the upper half of the cylinder $KBCM$ there is one mole of helium separated from the water by a piston. Initial height of the helium is $BK = h$. The helium is heated. What is quantity of heat one should supply to the helium so that piston goes distance $h/2$ down? Neglect mass of the piston, friction and heat conductance. The pool is wide.



- *6. A system consists of gas with parameters p_0, V_0, T_0 in a container and a piston which is held by a spring. There is vacuum to the left of the piston. If it were not for the gas, the piston would touch the right wall of the container and the spring would not be deformed then. Find heat capacity of this system.



FOR THE NEXT MEETING

IMPORTANT: The next club's meeting is at 3:00pm, via Zoom, on Sunday, **March 28**.