ADVANCED PHYSICS CLUB

APRIL 11, 2021

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

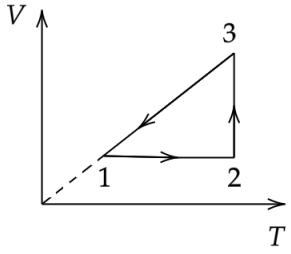
Today's homework is about the first law of thermodynamics.

Homework

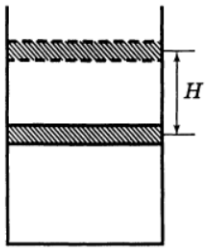
1. Find molar heat capacity of a monatomic gas expanding in such a way that $pV^n = const$ where n is some number. For which values of n molar heat capacity is equal to zero? To infinity?

2. In some process molar heat capacity of ideal monatomic gas is directly proportional to temperature: $C(T) = \dfrac{3RT}{4T_1}$ where T_1 is the initial temperature of the gas, R is the universal gas constant. Find work done by n moles of this gas until the moment when its' volume is minimal in this process.

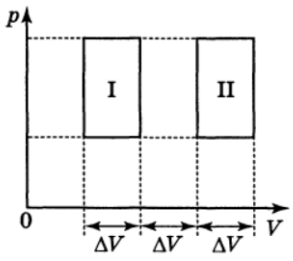
3. Does an ideal gas do positive or negative work during a cycle shown on the figure?



***4.** Air with the same temperature as the environment is under a heavy piston in a vertical vessel. The piston is slowly moved from the equilibrium position and lifted to height H. After temperature of air in the vessel reaches the environment temperature again, the vessel is made thermally insulated and after that the piston is released. What will the displacement of the piston with respect to the initial position be after oscillations have stopped? Heat capacities of vessel and piston are negligible, atmospheric pressure is small.



***5.** One mole of ideal monatomic gas is used in a heat engine. Cycles I and II performed on this gas are shown on the figure. Find energy conversion efficiency of these cycles, η_1 and η_2, if it is known that $\dfrac{\eta_1}{\eta_2} = 1.6$.



For the next meeting

IMPORTANT: The next club's meeting is at 3:00pm, via Zoom, on Sunday, **April 18**.