ADVANCED PHYSICS CLUB

MARCH 14, 2021

Useful resources

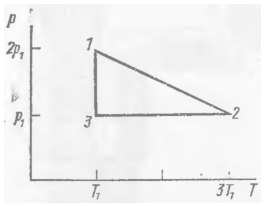
The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2020`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

Today's homework continues discussion of ideal gas laws.

Homework

1. A cyclic process 1-2-3-1 shown on a $p-T$ diagram is performed on some amount of ideal gas. Find the ratio of minimal and maximal volumes during this process.

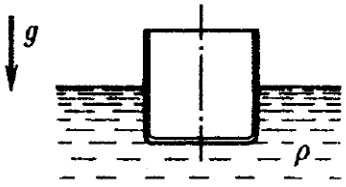


2. Atmosphere of Venus consists almost entirely of carbon dioxide. Its' temperature near the surface is about 500° C and pressure is about 100 atm. What volume should a space probe of mass 1000 kg have so that it could float in the bottom layer of Venus atmosphere?

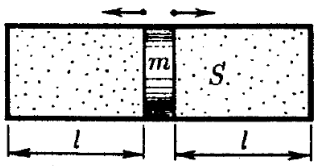
3. A cylindrical glass with thin walls floats in equilibrium when half-submerged into a liquid of density ρ. Height of the glass is h, atmospheric pressure is p_0.

(a) How much will the glass be submerged if it is placed on the surface of the liquid bottom up?

(b) Now if we move this bottom up glass further down, how deeply should it be submerged so that it starts sinking?



4. Find the period of small oscillations of a piston of mass m dividing a smooth cylindrical vessel of cross section S into two parts, each of length l. In both parts of the vessel there is air which has temperature T_0 and pressure p_0 when piston is in equilibrium. Assume that temperature is constant during the piston oscillations.



***5.** Estimate the number of molecules in the Earth's atmosphere.

***6.** A sealed container is filled with water in such a way that there is an air bubble on its bottom. Pressure at the bottom level is p_0. What will the pressure become if the bubble floats all the way up? Height of the container is H, water density is ρ.

For the next meeting

IMPORTANT: The next club's meeting is at 3:00pm, via Zoom, on Sunday, **March 21**.