Thermodynamics
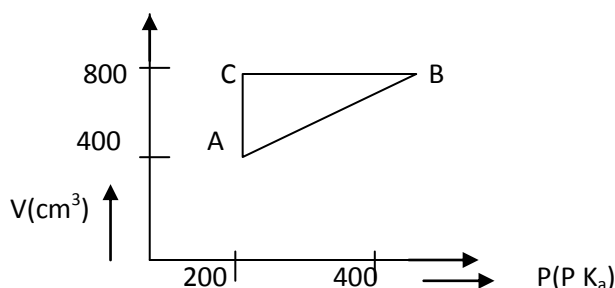
Q.1. A gas has more than one specific heat, whereas a liquid and solid have only one. Why?   1

Q.2. The speeds of three molecules are 3v, 4v and 5v respectively. Find their rms speed.   1

Q.3. An ideal gas is compressed at constant pressure of 10^6 Pa until its volume is halved. If the initial volume of the gas is $3.0 \times 10^{-2} m^3$. Find the work done by the gas.   1

Q.4. For a gas $\gamma = \frac{9}{7}$. What is the number of degrees of freedom of the molecule of this gas?   1

Q.5. In the given fig. An ideal gas is taken through a cyclic process ABCA. Calculate the value of mechanical equivalent of heat (J) when 4.8 cal of heat is given in the process.   2

Q.6. Three bars of equal length and equal area of cross section are connected in series. Their thermal conductivities are in the ratio 2:4:3. If the open ends of the first and the last bars at temperatures 200^0C and 18^0C respectively in the steady state. Calculate the temperatures of both junctions.   2

Q.7. Railway lines are laid with gaps to allow for expansion. If the gap between steel rails 66m long be 3.63cm at 10^0C, then at what temperature will be lines first touch?(coefficient of linear expansion = 11×10^{-6} C^{-1})   2

Q.8. An ideal gas $\left(\gamma = \frac{3}{2}\right)$ is compressed adiabatically from volume 400cm^3 to 100cm^3. The initial pressure and temperature are 100KPa and 400K. Find: 5

(i) the number of moles of the gas.

(ii) the molar heat capacity at constant pressure.

(iii) the final pressure and temperature.

(iv) the work done by the gas in the process.

(v) the change in the internal energy of the gas. (R = 8.31 J/mol K)