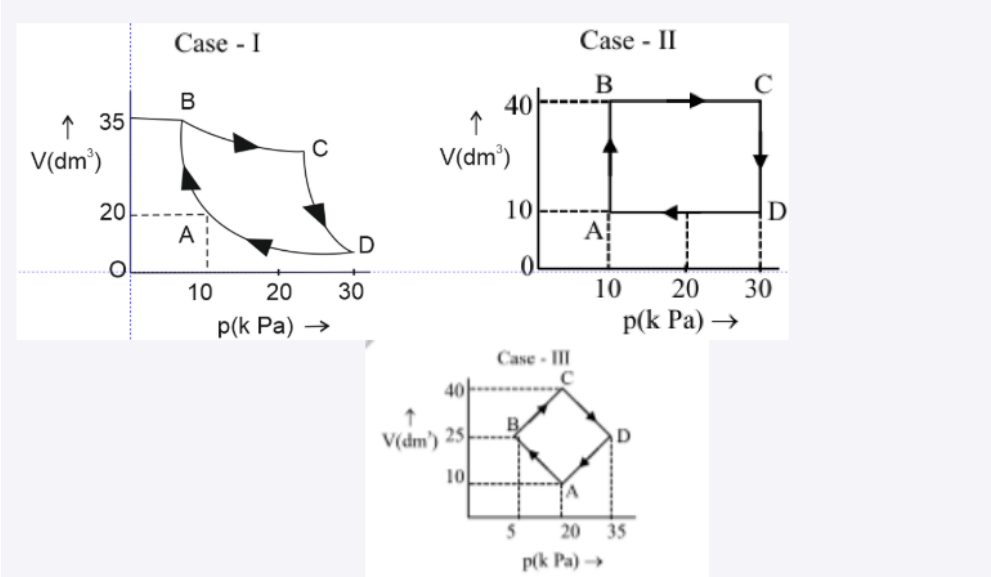
Practice session- 1

1. What is zeroth law of thermodynamics. How is the principle of thermometer related to it?

2. A solid 'A' is in thermal equilibrium with solid 'B' and solid B has the same temperature as solid 'C'. If the 3 solids have different masses and compositions which of the following statement is correct?
   (A) There will be no net transfer of energy if A is placed in thermal contact with C
   (B) 'B' may not necessarily be in thermal equilibrium with 'C'.
   (C) 'A' and 'B' have same heat capacity.
   (D) 'A' and 'C' have same latent heat capacity.

3. If a gas of volume 30m3 is contained in a rigid container and 60J of heat is provided to it. Then, calculate the change in internal energy. Assume that the gas exerts 1atm of pressure on the walls.

4. 

   An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracing the path A-B-C-D-A. What will be ΔU?

5. Recall the ideal gas law, written pressure as a function of T & V, use n=1 mol and R= 8.314 J/K mol in the formula and find out the value of $\frac{\partial P}{\partial T}$ and $\frac{\partial P}{\partial V}$ at T = 27 ℃ and V= 10 litres.

6. If an electric motor produced 15 kJ of energy each second as mechanical work and lost 2 kJ as heat to the surroundings, then the change in the internal energy of the motor each second is? (Atkins pg-49)
7. A chemical reaction takes place in a container of cross-sectional area 100 cm^2. As a result of the reaction, a piston is pushed out through 10 cm against an external pressure of 1.0 atm. Calculate the work done by the system. (Atkins pg-85)
8. With the present scale of absolute temperature, T, the 0 of the Celsius scale is defined as 273.15K exactly. Suppose we were to define an absolute scale, T', such that the 0 of the Celsius scale was at 300K', exactly. If the boiling point of water on the Celsius scale is 100 degree Celsius, what would be the boiling point of water on T' scale? (Castellan pg-110)
9. Calculate q, w, and U when 1.00 mol of water is heated from 0°C to 100°C at a fixed pressure of 1 atm. Densities of water are 0.9998 g/cm3 at 0°C and 0.9854 g/cm3 at 100°C. (Levine pg-50)
10. Prove that,
    $(\frac{\partial P}{\partial T})_v (\frac{\partial T}{\partial v})_p (\frac{\partial v}{\partial P})_T$ = -1 (Class notes)