Thermodynamics

- **First Law of Thermodynamics**
  $\Delta U=Q-W$
- **Isothermal Process :**
  PV=constant, $\Delta U=0$, Q=W, Molar Specific Heat=infinity
- **Adiabatic Process :**
  PV^{y}= constant=0, $\Delta U=-W$, Molar Specific Heat=zero
- **Polytrophic Process :**
  PV^{n}=constant, Molar Specific Heat=(R/y-1) + (R/1-n)
- **Isochoric process**
  Volume Constant: P/T=constant W=0, $\Delta U=Q$, Molar Specific Heat=C_v
- **Isobaric process :**
  Pressure Constant: V/T=constant $\Delta U=Q-W$, Molar Specific Heat=C_P
- Internal energy depends on Temperature.
  So for some temperature change ΔT
  $nC_v\Delta T=Q_1-W_1=Q_2-W_2=Q_3-W_3$
- **Molar Specific Heat Capacity of any process is given by**
  $$C = C_V + \left(\frac{P}{n}\right)\left(\frac{dV}{dT}\right)$$
  where n is no of moles of the gas
- **Work done by Gas**= $\int PdV$
  $C_p=C_v + R$
- **Thermal efficiency of heat engine**
  $$\eta = \frac{work\ output\ in\ energy\ units}{Heat\ input\ in\ same\ energy\ units}$$
  $$\eta = \frac{W}{Q_1} = \frac{(Q_1 - Q_2)}{Q_1} = 1 - \frac{Q_2}{Q_1}$$
- **Thermal Efficiency of Carnot Cycle**
  $=1-(T_2/T_1)$