**12-THERMODYNAMICS**

**1. Work Done during a Cyclic Process**

1. Work done during the expansion or compression of a gas is equal to the area enclosed between the P-V curve and the volume axis. 2. Work done per cycle = Area of the loop representing the cycle 3.If the loop is traced *clockwise*, the work done is *positive* and work is done by the system. 4. If the loop is traced *anticlockwise*, the work done is *negative* and work is done on the system.

**2. First Law of Thermodynamics**

1. According to first law of thermodynamics *dQ = dU + dW =dU + PdV* 2. For change of state, *dQ* =*mL* 3. For rise in temperature, *dQ* = *mC* ∆T 4. Change in internal energy, *dU* = *Uf,- Ui*

**3. Relation between Two Specific Heats of a Gas**

1. For one mode of a s gas, (i) (When *CP, CV* are in units of work) (ii) *Cp - Cv* = (when *CP, CV* are in units of heat)

2. For 1 g of a gas (i)  (when cP, cV are in units of work) (ii) cp – cV = (when cP, cV are in units of heat) where= gas constant for 1 g of a gas 3. Heat lost or gained by a gas. (i)  (At constant pressure) (ii)  (At constant volume) where *n* = Number of moles of gas 

**4. Isothermal and Adiabatic Processes**

1. Equation for isothermal process *PV = constant*  or *P1V1* = *P2V2* 2. Equations for adiabatic processes, (i)  (ii)  (iii) , Where  3. Work done when 1 mole of a gas expands isothermally, (i)  (ii)  4. Work done when 1 mole of a gas expands adiabatically and its temperature falls from T1 to T2, (i)  (ii) 

**5. Carnot Engine**

1. Efficiency of a heat engine,  2. Efficiency of a Carnot’s engine (an ideal heat engine),  where Q1 = Heat extracted from the source Q2 = heat rejected to the sink T1 = temperature of the source T2 = temperature of the sink

**6. Refrigerator**

Coefficient of performance of a refrigerator, 

Where Q2 = heat drawn per cycle from sink W = work done per cycle on refrigerator