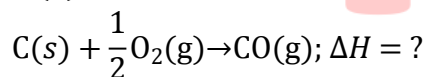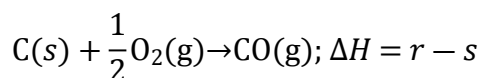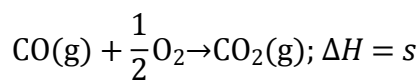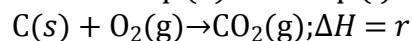## Topic :- THERMODYNAMICS

1. **(a)**
   Ice takes up heat to melt and thus, enthalpy
   change is +ve.

3. **(a)**
   When $\Delta H = -$ ve, $\Delta S = +$ ve and $\Delta G = -$ ve than
   reaction is spontaneous

4. **(d)**
   $KE = (3/2)RT$

5. **(b)**
   $C(s) + O_2(g) \rightarrow CO_2(g); \Delta H = r$
   ...(i)
   $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g); \Delta H = s$
   ...(ii)
   $C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g); \Delta H = ?$
   Subtract Eq. (ii) from Eq. (i)
   $C(s) + O_2(g) \rightarrow CO_2(g); \Delta H = r$
   $CO(g) + \frac{1}{2}O_2 \rightarrow CO_2(g); \Delta H = s$

   $-\quad\quad -\quad\quad -\quad\quad -$
   _____

   $C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g); \Delta H = r - s$

6. **(d)**
   $Cu(g) \rightarrow Cu^+(g) + e, \quad \Delta H = 745 \text{ kJ mol}^{-1}$
   $I(g) + e \rightarrow I^-(g); \quad \Delta H = -295 \text{ kJ mol}^{-1}$
   Adding $Cu^+(g) + I^-(g) \rightarrow CuI(g); \Delta H^\circ = -446 \text{ kJ mo}^{-1}$
   _____
   $Cu(g) + I(g) \rightarrow CuI(g); \quad \Delta H^\circ = 4 \text{ kJ mol}^{-1}$

7. **(a)**

Entropy of universe is tending towards maximum.

9 **(a)**

$$\Delta H_{(reaction)} = \Delta H_{f(diamond)} - \Delta H_{f(graphite)}$$
$$= 1.896 -$$

$0.23 = 1.666$ kJ/ mol

10 **(b)**

p=1 atm

$$\Delta V = (50 - 15) = 35 \text{ L}$$

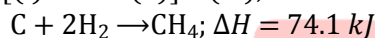$$\therefore \quad W = -p.\Delta V = -1 \times 35$$
$$= -35 \text{ Latm}$$

Hence, work done by the system on the surroundings is equal to 35 L-atm.

11 **(d)**

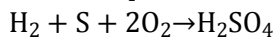The product possesses maximum energy and thus, least stable.

12 **(d)**

By eq. [(i) + 2 × (ii)] – (iii),
$$C + 2H_2 \rightarrow CH_4; \Delta H = 74.1 \ kJ$$

13 **(a)**

For the equation,
$$H_2 + S + 2O_2 \rightarrow H_2SO_4$$
Eqs. (i) +(ii)+(iii)+(iv)
$$\Delta H = -287.3 + (298.2) + (-98.7) + (-130.2)$$
$$= 814.4 \text{ kJ}$$

14 **(d)**

(a) For isochoric process, $\Delta V = 0$

$$W = p\Delta V = 0$$

$$\therefore \qquad\qquad \Delta E = Q$$

(b) For adiabatic process, $Q = 0$

$$\Delta E = W$$

(c) For isothermal process, $\Delta T = 0$

and $\qquad\qquad \Delta E = 0$
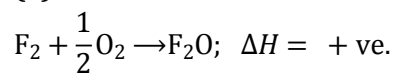
$$Q = -W$$

(d) For cyclic process, state functions like

$$\Delta E = 0$$

$$Q = -W$$

16 **(a)**

$\Delta G = \Delta H - T\Delta S = -ve - ve = -ve$

17 **(a)**

$F_2 + \dfrac{1}{2}O_2 \longrightarrow F_2O;\;\; \Delta H = +ve.$

18 **(c)**

Two equivalent of each are used.

19 **(a)**

Isothermally (at constant temperature) and reversible work.

$$W = 2.303\, nRT \log \frac{p_2}{p_1}$$

$$= 2.303 \times 1 \times 2 \times 300 \log \frac{10}{2}$$

$$= 2.303 \times 600 \times \log 5 = 965.84$$

At constant temperature, $\Delta E = 0$

$\Delta E = q + W,\, q = -W = -965.84$ cal

20 **(d)**

The gaseous phase have more entropy and thus, ΔS is +ve in (a) and (b). Also decrease in pressure increases disorder and thus, ΔS is +ve in (c). In (d) the disorder decreases in liquid state due to decrease in temperature. Thus, $\Delta S = -ve$.

ANSWER-KEY

Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	B	C	D	B	D	D	C	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	C	B	B	A	B	D	A	A	A

PE