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Enthalpy (H):-

- Heat absorbed by system at constant pressure.
- It is state fun<sup>n</sup>.
- Extensive property

Molar Enthalpy: heat absorbed by one mole at constant P.

↳ intensive

$$H = E + PV$$

but we can't calculate absolute value of Enthalpy.

so we calculate change in enthalpy

$$q_p \rightarrow \Delta H = \Delta E + \Delta(PV) \quad \Delta PV = \Delta P V + P \Delta V$$

$$\Delta H = \Delta E + P \Delta V \quad P \rightarrow \text{constant}$$

$$\Delta PV = P \Delta V$$

$$P \Delta V = \Delta(nRT)$$

$$= \Delta nRT + nR \cancel{\Delta T}$$

↳ react<sup>n</sup> takes place at Const T

$$P \Delta V = \Delta n_g RT$$

$$\Delta H = \Delta E + \Delta n_g RT$$

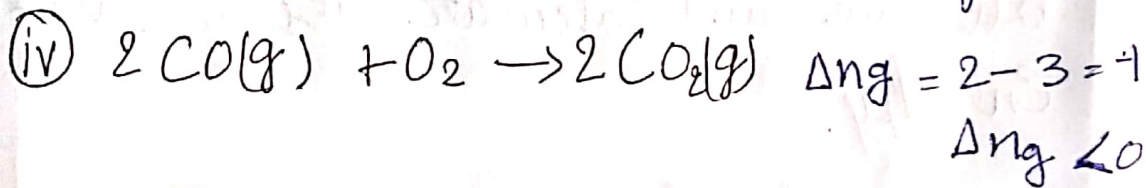
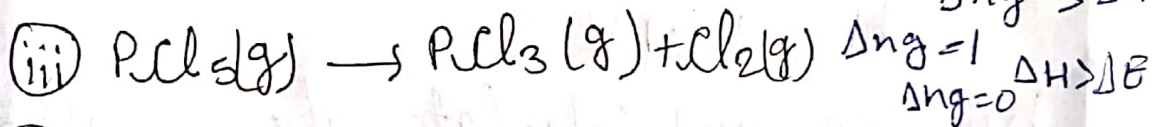
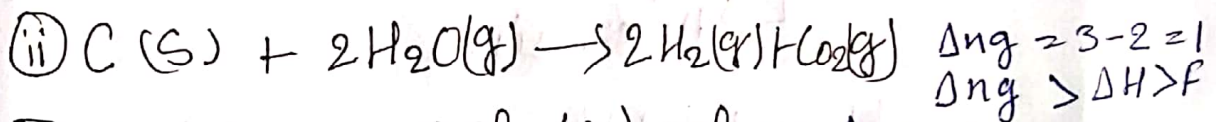
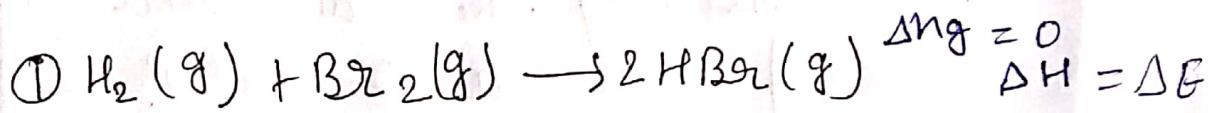
$$\Delta n_g = \sum \text{no. of moles of gaseous product} - \sum \text{no. moles of gaseous reactant}$$

- (2)
1.  $\Delta n_g = 0$        $\Delta H = \Delta E$
  2.  $\Delta n_g > 0$        $\Delta H > \Delta E$
  3.  $\Delta n_g < 0$        $\Delta H < \Delta E$

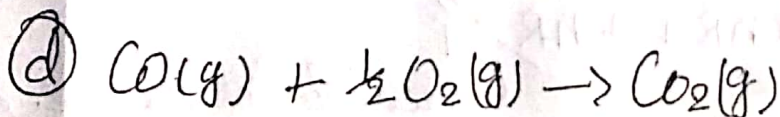
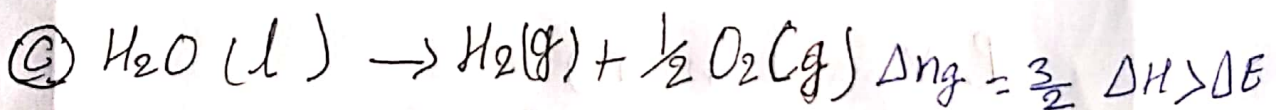
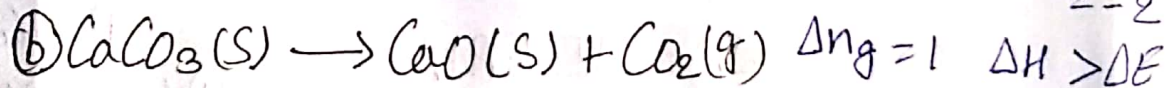
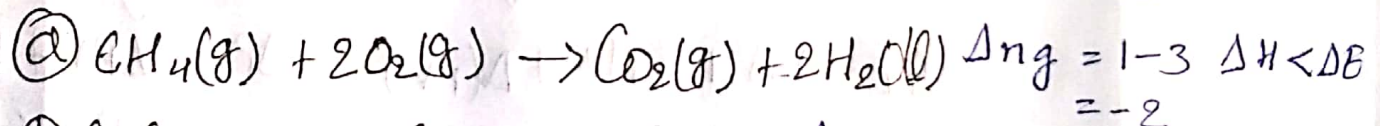
Ques! Assume each reac<sup>n</sup> is carried out in open container for which reac<sup>n</sup>.

①  $\Delta H = \Delta E$

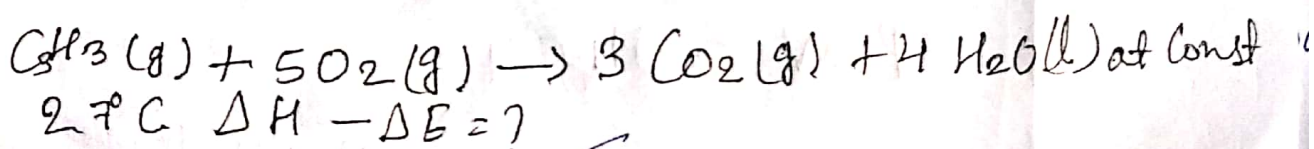
②  $\Delta H < \Delta E$



$\Delta H < \Delta E$

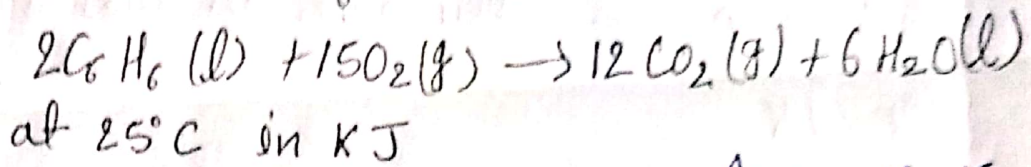


Ques! for the reac<sup>n</sup>.



②  $RT$       ③  $3RT$       ④  $-3RT$       ⑤  $-RT$   
 $\Delta n_g = 3 - 6 = -3$        $\Delta H - \Delta E = \Delta n_g RT = -3RT$

3) Ques: what is diff. b/w heat of reac<sup>n</sup> at const P & Const V for reac<sup>n</sup>



$$\Delta n_g = 12 - 15 = -3$$

$$\Delta H - \Delta E = n_g RT$$

$$= -3RT$$

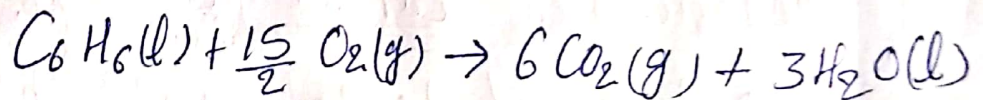
$$= -3 \times 8.3 \times 300$$

$$= 24.9 \times 300$$

$$= 249 \times 30 \approx 7470 J$$

$$= 7.470 KJ$$

Ques: For Combustion of 1 mol of  $C_6H_6(l)$  at 27°C the heat of reac<sup>n</sup> at const P is -780.9 K Cal then find heat of reac<sup>n</sup> at const Vol.?



$$\Delta H = q_p = -780.9 \text{ Kcal} = -780.9 \times 10^3 \text{ Cal}$$

$$\Delta E = q_v = ?$$

$$\Delta n_g = 6 - \frac{15}{2} = \frac{12-15}{2} = -\frac{3}{2}$$

$$\Delta H = \Delta E + \Delta n_g RT$$

$$\Delta E = \Delta H - \Delta n_g RT$$

$$= -780.9 \times 10^3 - \left(-\frac{3}{2}\right) \times 8.3 \times 300$$

$$\Delta E = -780900 \text{ Cal}$$

$$= -780900 + 900$$

Heat Capacity :- (C) It is heat required to ↑ Temp. of given amt. of substance by 1°C or 1K

$$C = \frac{q}{\Delta T}$$

$$q = C \Delta T$$

It :- J K<sup>-1</sup> or Cal K<sup>-1</sup>

Molar Heat Capacity (C<sub>m</sub>) :- It is heat req. to ↑ Temp. of 1 mol. of substance 1°C or 1K

$$C = \frac{q}{n \Delta T}$$

$$q = n C \Delta T$$

It :- J mol<sup>-1</sup> K<sup>-1</sup>

Specific Heat Capacity (C) :- It is heat required to ↑ temp. of 1g substance by 1°C or 1K

$$C = \frac{q}{m \Delta T}$$

$$q = m C \Delta T$$

It :- J gm<sup>-1</sup> K<sup>-1</sup>

Intensive ← Heat Capacity  $\Delta H = C_p \Delta T$   $\Delta E = C_v \Delta T$

Intensive ← Molar Heat Capacity  $\Delta H = n(C_m)_p \Delta T$   $\Delta E = n(C_m)_v \Delta T$

Intensive ← Sp. Heat Capacity  $\Delta H = m C_p \Delta T$   $\Delta E = m C_v \Delta T$