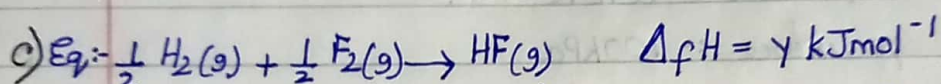


c) i) The enthalpy change of a reaction is independent of the path taken in converting reactants into products, provided the initial and final conditions are the same.

ii) $\Delta_c H^\circ = (3 \times -394) + (4 \times -286) - (-2220) = -106 \text{ kJ mol}^{-1} //$

9ai) The enthalpy change when one mole of a bond in the gaseous state is broken. Energy is required to break the bonds, so the process is endothermic.

b) $(\frac{1}{2} \times 436) + [\frac{1}{2} E(\text{Cl}-\text{Cl})] - 431 = -92$
 $= \frac{1}{2} \times 436 + (-431) = -213 \Rightarrow E(\frac{1}{2} (\text{Cl}-\text{Cl})) = -92 + 213 \Rightarrow 121 \text{ kJ mol}^{-1}$
 $\Rightarrow E(\text{Cl}-\text{Cl}) \Rightarrow \frac{121}{0.5} \Rightarrow 242 \text{ kJ mol}^{-1} //$



So, $\gamma = (\frac{1}{2} \times 436) + (\frac{1}{2} \times 158) - 562 \Rightarrow -265 \Delta_f H$

$\therefore \Delta_f H [\text{HF}(\text{g})] = -265 \text{ kJ mol}^{-1} //$

10a) The enthalpy change when one mole of water is formed by neutralisation of acid with alkali.

b) Burette or volumetric flask

c) To make sure that all the acid is neutralised.

di) $\Delta T = 33.6^\circ\text{C} - 20^\circ\text{C} \Rightarrow 13.6 \text{ K}$

To find mol $\Rightarrow n(\text{HCl}) = n(\text{H}_2\text{O}) \Rightarrow (0.0500 \times 2.00) = 0.100 \text{ mol.}$ $\text{kJ} \rightarrow \text{J} \div 1000$

$1 \text{ g/cm}^3 = 1000 \text{ g}$ $Q = 100.0 \text{ g} \times 4.18 \text{ J g}^{-1} \text{K}^{-1} \times 13.6 \text{ K} \Rightarrow 5684.8 \text{ J} \Rightarrow 5.68 \text{ J}$

$\therefore \Delta H = \frac{-Q}{n} = \frac{-5.68}{0.100} \Rightarrow -56.8 \text{ kJ mol}^{-1} //$

11ai) $\Delta H = \text{Bonds broken} - \text{Bonds formed} \Rightarrow \left[\begin{matrix} (3 \times 412) + 463 \\ + 360 + (496 \times 1.5) \end{matrix} \right] - \left[\begin{matrix} (743 \times 2) + \\ (463 \times 4) \end{matrix} \right] \Rightarrow -535 \text{ kJ mol}^{-1} //$

b) B

c) $6E(\text{S}-\text{F}) = 1000 + 223 + (3 \times 158) = 1797$
 $= E(\text{S}-\text{F}) = \frac{1797}{6} \Rightarrow +299.5 \text{ kJ mol}^{-1} //$