76.(B) $Mg(s) + 2HCl(aq.) \longrightarrow MgCl_2(aq.) + H_2(g)$ $\quad \Delta_r H_1^o = -467$ kJ/mol ....(i)

$MgO(s) + 2HCl(aq.) \longrightarrow MgCl_2(aq.) + H_2O(\ell)$ $\quad \Delta_r H_2^o = -151$ kJ/mol .....(ii)

Operate (i) – (ii) :

$Mg(s) + H_2O(\ell) \longrightarrow MgO(s) + H_2(g)$ $\quad \Delta_r H^o = -467 - (-151) = -316$ kJ/mol

$\Rightarrow \quad -316 = [\Delta_f H^\circ_{MgO} + O] - [0 + \Delta_f H^o_{H_2O}] \Rightarrow -316 + (-286) = \Delta_f H^o_{MgO} = -602$ kJ/mol

77.(C) $\Delta_f H^o_{CO_2} = -393.5$ kJ/mol , $\Delta_f H^o_{H_2O} = -285.8$ kJ/mol and $\Delta_f H^o_{\text{Aracidonic Acid}} = -636$ kJ/mol

Now, Arachidonic acid $(C_{20}H_{32}O_2) + 27O_2(g) \longrightarrow 20CO_2(g) + 16H_2O(\ell)$

$\Rightarrow \quad \Delta_c H^o = 20(-393.5) + 16(-285.8) - (-636) = -11.81$ MJ/mol

$\Rightarrow \quad$ mass required $= \left[\dfrac{500 \times 4.18 \times (25-5) \times 10^3 \text{ J}}{11.81 \times 10^6}\right] \times 304\text{gm} = 1.08$ kg

78.(C) $\Delta_f H^o_{SrCO_3} = \Delta_f H^o_{SrO} + \Delta_f H^o_{CO_2} - \Delta_{\text{heating}}\ H^o_{SrCO_3} = \dfrac{1}{2}(-1180) + \dfrac{1}{2}(-788) - 234 = -1218$ kJ/mol

79.(D) $\Delta_r H^o = -\Delta_f H^o_{NH_3} - \Delta_f H^o_{CH_4} + \Delta_f H^o_{HCN} = -\dfrac{1}{2}(-91.8) - (74.9) + \dfrac{1}{2}(261.0) = 101.5$ kJ/mol

80.(B) Heat Liberated due to neutralisation $= 56 \times (0.5 \times 35 \times 10^{-3})$ kJ $= 0.98$ kJ

[Meq. H_2O formed $= 0.5 \times 35$]

$\Rightarrow \quad$ Heat Liberated due to neutralisation = Heat gained by the system

$\Rightarrow \quad 980 = (60 \times 1) \times 4.18 \times (T - 25)$ [$\because$ Total volume of solution = 60 ml] $\Rightarrow T = 28.9^oC$

81.(A) $3O_2(g) \longrightarrow 2O_3(g)$ $\quad \Delta_r H > 0$

$\Rightarrow \quad$ Energy required to break 3 moles of O_2 molecules is greater than energy liberated due to the formation of 2 moles of O_3 molecules. Thus, O = O bond in O_2 is stronger than O = O bond in O_3.

82.(CD) Heat involved during the neutralisation $= (10 \times 1 \times 10^{-3}) \times c \times 2 = 0.02c$

0.02c heat is evolved due to the neutralization or formulation of $(0.1 \times 5) = 0.5$ m moles of H_2O .

(A) Heat evolved = $0.04c = (20 \times 1 \times 10^{-3}) \times c \times \Delta T \Rightarrow \Delta T = 2^oC$ [$0.1 \times 10 = 1$ m moles of H_2O formed]

(B) No temperature rise as there is no neutralization

(C) M moles of H_2O formed $= 0.1 \times 5 = 0.5$ but heat evolved will be less than 0.04c as NH_3 is a weak base.

(D) Similar to (C). [CH_3COOH is a weak acid]

83.(BD) (B) CO_2 should be formed from C (s, graphite) and $O_2(g)$

(D) NaCl(s) should be formed Na(s) and $Cl_2(g)$

84.(AC) (A) Process is exothermic as the product is stable (lower in energy due to conjugation) than the reactant

(C) Enthalpy of combustion of product is lesser than the reactant as the former is more stable.

(D) Combustion of any hydrocarbon is always exothermic

85.(AB) (A) $\Delta_r H^o = 2(-1263) - (-285) - (-2238) = -3 \Rightarrow$ Reaction is slightly exothermic

(B) $C_{12}H_{22}O_{11}(aq) + 12O_2(g) \longrightarrow 12CO_2(g) + 11H_2O(\ell)$ $\Delta_c H_1^o$

$2C_6H_{12}O_6(aq.) + 12O_2(g) \longrightarrow 12CO_2(g) + 12H_2O(\ell)$ $\Delta_c H_2^o$

$\Delta_c H_1^o = 2(x) + 11(-285) - (-285) - (-2238) = 12x - 897$ and

$\Delta_c H_2^o = 2(x) + 12(-285) - 2(-1263) = 12x - 894$

Clearly: $\Delta_c H_1^o > \Delta_c H_2^o$ [as x will be negative]

(C) Increasing T will shift the reaction in backward direction. So, 'h' of α – maltose will decrease with temperature.

(D) $\Delta_r H^o$ will change if solid α – maltose is taken instead of aq.