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CHEM 141 - CH6 - ASSIGNMENT

(1) -150 J.

(2) 7.82×10^3 J/°C

(4) 222 KJ/mol

(6) 107 KJ/mol

(7) 52.8 L

(8) 125 KJ

(10) -372 KJ

(11) -188 KJ

(12) -453 J

(13) T.

(14) F.

(15) T.

(16) T.

Q1) $q = -575\ J$ / $w = +425\ J$

$\Delta E = q + w$

$= (-575\ J) + (+425\ J) = \boxed{-150\ J}$

Q8) $\frac{1}{2} HCHO_2 + \frac{1}{2} H_2O \longrightarrow \frac{1}{2} CH_3OH + \frac{1}{2} O_2$ $\quad \Delta H = \frac{411}{2}\ KJ$

$\frac{1}{2} CO_2 + H_2 \longrightarrow \frac{1}{2} CH_3OH$ $\quad \Delta H = \frac{-128}{2}\ KJ$

$\frac{1}{2} HCHO_2 \longrightarrow \frac{1}{2} CO + \frac{1}{2} H_2O$ $\quad \Delta H = \frac{-33}{2}\ KJ$

$HCHO_2 + H_2 \longrightarrow \frac{1}{2} O_2 + CH_3OH$

$\Delta H = \left(\frac{411}{2}\right)^{KJ} + \left(\frac{-128}{2}\right)^{KJ} + \left(\frac{-33}{2}\right)^{KJ} = \boxed{125\ KJ}$

Q10)

$MnO + \frac{1}{2} O_2 \longrightarrow MnO_2$ $\quad \Delta H = -\frac{264}{2}\ KJ$

$MnO_2 + Mn \longrightarrow 2MnO$ $\quad \Delta H = -240\ KJ$

$Mn + \frac{1}{2} O_2 \longrightarrow MnO$

$\Delta H_f^\circ (MnO) = \left(\frac{-264}{2}\right)^{KJ} + -240\ KJ$

$= \boxed{-372\ KJ}$

(11) $Mg_3N_2 + 6MgO \longrightarrow 8Mg + Mg(NO_3)_2$ $\quad \Delta H = +3884\ KJ$

$3Mg + N_2 \longrightarrow Mg_3N_2$ $\quad \Delta H = -463\ KJ$

$6Mg + 3O_2 \longrightarrow 6MgO$ $\quad \Delta H = -1203 \times 3\ KJ$

$$Mg + 3O_2 + N_2 \longrightarrow Mg(NO_3)_2$$

ΔH of $Mg(NO_3)_2$:—

$$(3884)\ KJ + (-463)\ KJ + (-1203 \times 3)\ KJ$$

$$= \boxed{-188\ KJ}$$

(12) $2NH_3 + 2.5\,O_2 \longrightarrow 2NO + 3H_2O$

$$\Delta \overset{\circ}{H}_{rxn} = 2 \times \Delta \overset{\circ}{H}[NO] + 3 \times \Delta \overset{\circ}{H}[H_2O] - 2\,\Delta \overset{\circ}{H}[NH_3] + 5\,\Delta \overset{\circ}{H}[H_2O]$$

zero

$$= 2(90.3)\ \frac{KJ}{mol} + 3(-241.8)\ \frac{KJ}{mol} - 2(45.9)\ \frac{KJ}{mol}$$

$$= \boxed{-453\ KJ}$$

Q 14) Enthaply (H) is a state function, so any change in enthalpy (ΔH) is independent of how the change occurred, At constant P, the value of ΔH equals ΔE + PV work, which occurs when the volume of the system changes in the presence of an external pressure.

Q 16) Enthaply is a state function because it is defined in terms of state functions, U, P, and V are all state functions, their values depend only on the state of the system and not the paths taken to reach their values, A linear combination of state functions is also a state function.

$$\Delta H_1 = -\sum \Delta^\circ H_f \text{ (react)}$$

$$\Delta H_2 = \sum \Delta^\circ H_f \text{ (product)}$$

$$\Delta^\circ H_{rxn} = \Delta H_1 + \Delta H_1 = \sum \Delta H^\circ_f \text{ (product)} - \sum \Delta H^\circ_f \text{ (react)}$$