Textbook Page 317 #1a, 2a, 3

1. ① $NH_3(g) \rightarrow \frac{1}{2}N_2(g) + \frac{3}{2}H_2(g)$ $\Delta H = +46\ kJ$

② $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ $\Delta H = -484\ kJ$

(a)

① × −4 $2N_2(g) + 6H_2(g) \rightarrow 4NH_3$ $\Delta H = -4(+46\ kJ)$

② × −3 $6H_2O(g) \rightarrow 6H_2(g) + 3O_2(g)$ $\Delta H = -3(-484\ kJ)$

$2N_2(g) + 6H_2O(g) \rightarrow 3O_2(g) + 4NH_3(g)$

$\Delta H = -4(+46\ kJ) + (-3)(-484\ kJ)$

$= +1268\ kJ$

2. ① $2ClF(g) + O_2(g) \rightarrow Cl_2O(g) + F_2O(g)$ $\Delta H = +167.4\ kJ$

② $2ClF_3(g) + 2O_2(g) \rightarrow Cl_2O(g) + 3F_2O(g)$ $\Delta H = +341.4\ kJ$

③ $2F_2(g) + O_2(g) \rightarrow 2F_2O(g)$ $\Delta H = -43.4\ kJ$

(a)

① × $\frac{1}{2}$ $ClF(g) + \frac{1}{2}O_2(g) \rightarrow \frac{1}{2}Cl_2O(g) + \frac{1}{2}F_2O(g)$ $\Delta H = \frac{1}{2}(167.4\ kJ)$

③ × $\frac{1}{2}$ $F_2(g) + \frac{1}{2}O_2(g) \rightarrow F_2O(g)$ $\Delta H = \frac{1}{2}(-43.4\ kJ)$

② × $-\frac{1}{2}$ $\frac{1}{2}Cl_2O(g) + \frac{3}{2}F_2O(g) \rightarrow ClF_3(g) + O_2(g)$ $\Delta H = -\frac{1}{2}(341.4\ kJ)$

$ClF(g) + F_2(g) \rightarrow ClF_3(g)$

$\Delta H = \frac{1}{2}(167.4\ kJ) + \frac{1}{2}(-43.4\ kJ) + (-\frac{1}{2})(341.4\ kJ)$

$= -108.7\ kJ$

3. ① $C_{graphite}(s) + \frac{1}{2}O_2(g) \rightarrow CO(g)$ $\Delta H = -110.5\ kJ$

② $C_{graphite}(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5\ kJ$

③ $2Fe(s) + \frac{3}{2}O_2(g) \rightarrow Fe_2O_3(s)$ $\Delta H = -824.2\ kJ$

③ × −1 $Fe_2O_3(s) \rightarrow 2Fe(s) + \frac{3}{2}O_2(g)$ $\Delta H = -1(-824.2\ kJ)$

① × −3 $3CO(g) \rightarrow 3C_{graphite}(s) + \frac{3}{2}O_2(g)$ $\Delta H = -3(-110.5\ kJ)$

② × 3 $3C_{graphite}(s) + 3O_2(g) \rightarrow 3CO_2(g)$ $\Delta H = 3(-393.5\ kJ)$

$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$

$\Delta H = (-1)(-824.2\ kJ) + (-3)(-110.5\ kJ) + 3(-393.5\ kJ)$

$= -24.8\ kJ$