

## CHAPTER 6

43.

a) endothermic

c) exothermic

b) exothermic

d) endothermic

45.



$$\begin{array}{|c|c|c|} \hline \text{a) } & 4.00 \text{ mol Fe} & 1652 \text{ kJ} \\ \hline & 4 \text{ mol Fe} & = 1650 \text{ kJ} \\ \hline \end{array}$$

$$\begin{array}{|c|c|c|} \hline \text{b) } & 1.00 \text{ mol Fe}_2\text{O}_3 & 1652 \text{ kJ} \\ \hline & 2 \text{ mol Fe}_2\text{O}_3 & = 826 \text{ kJ} \\ \hline \end{array}$$

$$\begin{array}{|c|c|c|} \hline \text{c) } & 1.00 \text{ g Fe} & 1 \text{ mol Fe} & 1652 \text{ kJ} \\ \hline & 55.85 \text{ g Fe} & 4 \text{ mol Fe} & = 7.39 \text{ kJ} \\ \hline \end{array}$$

$$\begin{array}{|c|c|c|} \hline \text{d) } & 10.0 \text{ g Fe} & 1 \text{ mol Fe} & 1652 \text{ kJ} \\ \hline & 55.85 \text{ g Fe} & 4 \text{ mol Fe} & = 73.9 \text{ kJ} \\ \hline \end{array}$$

Limiting Reactant Problem

$$\begin{array}{|c|c|c|} \hline \text{2.00 g O}_2 & 1 \text{ mol O}_2 & 1652 \text{ kJ} \\ \hline 32 \text{ g O}_2 & 3 \text{ mol O}_2 & = 34.4 \text{ kJ} \\ \hline \end{array}$$

61.



$T_i = 22.60^\circ\text{C}$

50.0 mL

50.0 mL

$T_f = 23.40^\circ\text{C}$

0.100 M

0.100 M

$\Delta T = 0.80^\circ\text{C}$

$$q_{\text{surr}} = m C_P \Delta T = (100.0 \text{ g})(4.18 \frac{\text{J}}{\text{g}^\circ\text{C}})(0.80^\circ\text{C}) = 334.4 \text{ J}$$

$$q_{\text{sys}} = -334.4 \text{ J}$$

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$$\Delta H = q_{sys} = -334.4 \text{ J} = -66880 \text{ J/mol} = -67 \text{ kJ/mol}$$

$\text{mol/L}$        $0.00500 \text{ mol}$

$$(0.100 \text{ M } \text{Ag}^+)(0.0500 \text{ L}) = 0.00500 \text{ mol Ag}^+$$

63.  $q_{surr} = mCP\Delta T$

$$q_{surr} = (125 \text{ g} + 10.5 \text{ g})(4.18 \frac{\text{J}}{\text{g}\cdot\text{C}})(21.1^\circ\text{C} - 24.2^\circ\text{C})$$

$$q_{surr} = -1756 \text{ J}$$

$$q_{sys} = +1756 \text{ J}$$

$$\frac{10.5 \text{ g KBr}}{119 \text{ g KF}} \mid \frac{1 \text{ mol KBr}}{1 \text{ mol KF}} = 0.08824 \text{ mol KBr}$$

$$\Delta H = 1756 \text{ J} = 19900 \text{ J/mol} = 20. \text{ kJ/mol}$$

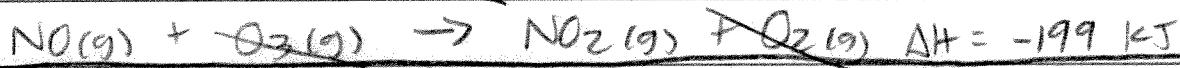
$0.08824 \text{ mol}$

$$\Delta H = 1756 \text{ J} \mid \frac{167.2 \text{ J/g}}{10.5 \text{ g}} = 170 \text{ J/g}$$

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71.  $\Delta H = (-92 \text{ kJ})(2) + (+484 \text{ kJ})(3) = \boxed{1268 \text{ kJ}}$

No, this rxn is not a useful rxn for making  $\text{NH}_3$  because it is highly endothermic, thus it would require much heat and money to produce  $\text{NH}_3$  with this rxn.



$\boxed{\Delta H = -233 \text{ kJ}}$

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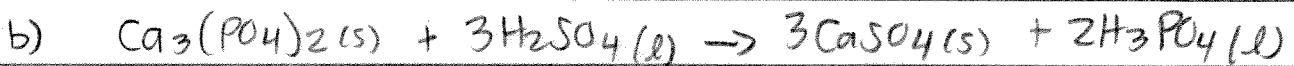


$$\Delta H^\circ = [(2)(135.1 \text{ kJ/mol}) + (6)(-242 \text{ kJ/mol})]$$

$$- [(2)(-46 \text{ kJ/mol}) + (3)(0 \text{ kJ/mol}) + (2)(-75 \text{ kJ/mol})]$$

$$\Delta H^\circ = [-1181.8 \text{ kJ/mol}] - [-242 \text{ kJ/mol}]$$

$$\Delta H^\circ = -939.8 = \boxed{-940. \text{ kJ/mol}}$$



$$\Delta H^\circ = [(3)(-1433 \text{ kJ/mol}) + (2)(-1267 \text{ kJ/mol})]$$

$$- [(1)(-4126 \text{ kJ/mol}) + (3)(-814 \text{ kJ/mol})]$$

$$\Delta H^\circ = [-6833 \text{ kJ/mol}] - [-6568 \text{ kJ/mol}]$$

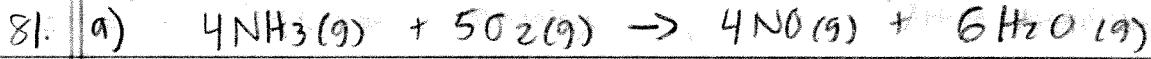
$$\Delta H^\circ = \boxed{-265 \text{ kJ/mol}}$$



$$\Delta H^\circ = [(1)(-314 \text{ kJ/mol})] - [(1)(-46 \text{ kJ/mol}) + (1)(-92 \text{ kJ/mol})]$$

$$\Delta H^\circ = [-314 \text{ kJ/mol}] - [-138 \text{ kJ/mol}]$$

$$\Delta H^\circ = \boxed{-176 \text{ kJ/mol}}$$



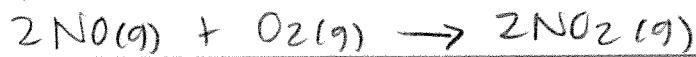
$$\Delta H^\circ = [(4)(90 \text{ kJ/mol}) + (6)(-242 \text{ kJ/mol})] - [(4)(-46 \text{ kJ/mol}) + 5(0 \text{ kJ/mol})]$$

$$\Delta H^\circ = [-1092 \text{ kJ/mol}] - [-184 \text{ kJ/mol}]$$

$$\Delta H^\circ = \boxed{-908 \text{ kJ/mol}}$$

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81a



cont'd.

$$\Delta H^\circ = [(2)(34 \text{ kJ/mol})] - [(2)(90 \text{ kJ/mol}) + (1)(0 \text{ kJ/mol})]$$

$$\Delta H^\circ = [68 \text{ kJ/mol}] - [180 \text{ kJ/mol}]$$

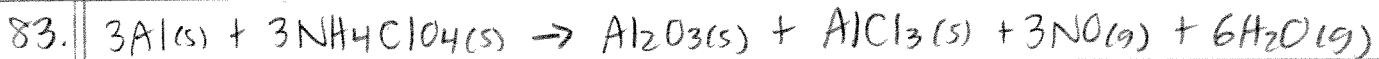
$$\boxed{\Delta H^\circ = -112 \text{ kJ/mol}}$$



$$\Delta H^\circ = [(2)(-207 \text{ kJ/mol}) + (1)(90 \text{ kJ/mol})] - [(3)(34 \text{ kJ/mol}) + (1)(-286 \text{ kJ/mol})]$$

$$\Delta H^\circ = [-324 \text{ kJ/mol}] - [-184 \text{ kJ/mol}]$$

$$\boxed{\Delta H^\circ = -140 \text{ kJ/mol}}$$



$$\Delta H^\circ = [(1)(-1676 \text{ kJ/mol}) + (1)(-704 \text{ kJ/mol}) + (3)(90 \text{ kJ/mol}) + (6)(-242 \text{ kJ/mol})] \\ - [(3)(0 \text{ kJ/mol}) + (3)(-295 \text{ kJ/mol})]$$

$$\Delta H^\circ = [-3562 \text{ kJ/mol}] - [-885 \text{ kJ/mol}]$$

$$\boxed{\Delta H^\circ = -2677 \text{ kJ/mol}}$$

