

Ch. 6 - page 285-288

$$15a) \Delta H = \frac{-891 \text{ kJ}}{2 \text{ mol H}_2\text{O} (l)} = \boxed{\frac{-446 \text{ kJ}}{1 \text{ mol H}_2\text{O}}}$$

$$b) \Delta H = \frac{-891 \text{ kJ}}{2 \text{ mol O}_2} = \boxed{\frac{-446 \text{ kJ}}{1 \text{ mol O}_2}}$$

$$16. a) \Delta H = \frac{+90.7 \text{ kJ}}{1 \text{ mol Hg}} \rightarrow \boxed{90.7 \text{ kJ required}} \text{ to produce 1 mol Hg}$$

$$b) \frac{+90.7 \text{ kJ}}{\frac{1}{2} \text{ mol O}_2} = \frac{181.4 \text{ kJ}}{\text{mol O}_2} \rightarrow \boxed{181.4 \text{ kJ required}} \text{ to produce 1 mol O}_2$$

$$c) \Delta H = 2(-90.7 \text{ kJ}) = -181.4 \text{ kJ} \rightarrow \boxed{181.4 \text{ kJ released}}$$

$$30. \Delta E = q + w \\ = -125 \text{ kJ} + 104 \text{ kJ} = \boxed{-21 \text{ kJ}}$$

$$34. a) \Delta E = q + w \\ = -23 \text{ J} + 100. \text{ J} = \boxed{77 \text{ J}}$$

$$b) W = -P\Delta V = -(1.90 \text{ atm})(2.80 \text{ L} - 8.30 \text{ L}) \\ = 10.5 \text{ atm} \cdot \text{L} \times \frac{101.3 \text{ J}}{\text{L} \cdot \text{atm}} = 1060 \text{ J}$$

$$\Delta E = q + w \\ = 350. \text{ J} + 1060 \text{ J} = \boxed{1410 \text{ J}}$$

$$c) W = -P\Delta V = -(1.00 \text{ atm})(29.1 \text{ L} - 11.2 \text{ L}) \\ = -17.9 \text{ atm} \cdot \text{L} \times \frac{101.3 \text{ J}}{\text{L} \cdot \text{atm}} = -1810 \text{ J}$$

$$\Delta E = q + w = 1037 \text{ J} + -1810 \text{ J} = \boxed{-770 \text{ J}}$$

44. a) exothermic - combustion of gas releases heat

b) exothermic - condensation releases heat

c) endothermic - $\text{CO}_2(s) \rightarrow \text{CO}_2(g)$

d) endothermic - $\text{F}_2(g) \rightarrow 2\text{F}(g)$ energy is required to break the bond.

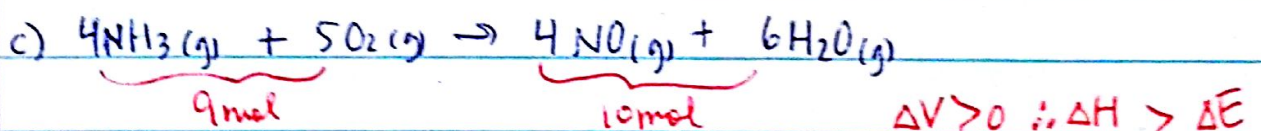
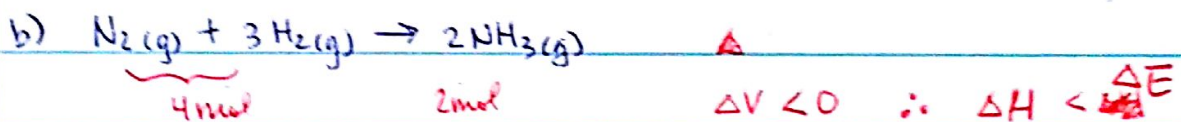
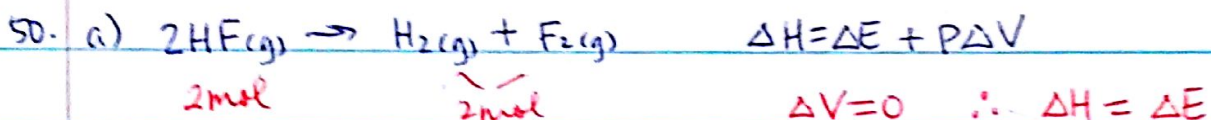
46. a) $\Delta H = \frac{-572 \text{ kJ}}{2 \text{ mol H}_2\text{O}} = \frac{-286 \text{ kJ}}{1 \text{ mol}} \rightarrow \boxed{286 \text{ kJ evolved}}$

b) $4.03 \text{ g H}_2 \times \frac{1 \text{ mol H}_2}{2.016 \text{ g H}_2} \times \frac{-572 \text{ kJ}}{2 \text{ mol H}_2} = -572 \text{ kJ} \rightarrow \boxed{572 \text{ kJ released}}$

c) $186 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32.00 \text{ g O}_2} \times \frac{-572 \text{ kJ}}{1 \text{ mol O}_2} = -3320 \text{ kJ} \rightarrow \boxed{3320 \text{ kJ released}}$

d) $n_{\text{H}_2} = \frac{PV}{RT} = \frac{(1.0 \text{ atm})(2.0 \times 10^5 \text{ L})}{(0.0821 \text{ atm}\cdot\text{L}) (298 \text{ K})} = 8.2 \times 10^6 \text{ mol H}_2$

$8.2 \times 10^6 \text{ mol H}_2 \times \frac{-572 \text{ kJ}}{2 \text{ mol H}_2} = -2.3 \times 10^9 \text{ kJ} \rightarrow \boxed{2.3 \times 10^9 \text{ kJ of heat released!}}$



52. a) $q = mc\Delta T$
 $= (150.0 \text{ g})(0.24 \text{ J/g}\cdot\text{K})(298 \text{ K} - 273 \text{ K})$
 $= (150.0 \text{ g})(0.24 \text{ J/g}\cdot\text{K})(25^\circ\text{C}) = 900 \text{ J} = \boxed{9.0 \times 10^2 \text{ J}}$
 2 sf.

b) $0.24 \text{ J/g}\cdot\text{K} \times \frac{107.9 \text{ g Ag}}{1 \text{ mol Ag}} = \boxed{\frac{26 \text{ J}}{\text{mol}\cdot\text{K}}}$

c) $q = mc\Delta T \quad 1.25 \text{ kJ} \times \frac{1000 \text{ J}}{1 \text{ kJ}} = 1250 \text{ J}$
 $1250 \text{ J} = m \left(\frac{0.24 \text{ J}}{\text{g}\cdot\text{K}} \right) (15.2^\circ\text{C} - 12.0^\circ\text{C})$
 $1250 = m(0.24)(3.2)$
 $m = 1627.6 \text{ g} = \boxed{1600 \text{ g}}$

54.

$$q = mc\Delta T$$

$$585 \text{ J} = (125.6 \text{ g})(c)(53.5^\circ\text{C} - 20.0^\circ\text{C})$$

$$585 = (125.6)(c)(33.5)$$

$$c = \boxed{0.139 \frac{\text{J}}{\text{g}^\circ\text{C}}}$$

$$0.139 \frac{\text{J}}{\text{g}^\circ\text{C}} \times \frac{200.6 \text{ g}}{1 \text{ mL Hg}} = \boxed{27.9 \frac{\text{J}}{\text{mL}^\circ\text{C}}}$$

56.

$$q_{\text{cold}} = (90.0 \text{ g}) \left(4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (37.0^\circ\text{C} - 22.0^\circ\text{C})$$

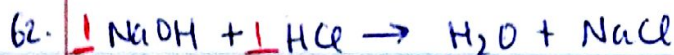
$$= (90.0)(4.184)(15.0) = 5648.4 \text{ J}$$

$$q_{\text{cold}} = -q_{\text{hot}}$$

$$5648.4 \text{ J} = -(m) \left(4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (37.0^\circ\text{C} - 55.0^\circ\text{C})$$

$$5648.4 = -(m)(4.184)(-18.0)$$

$$m = \boxed{75.0 \text{ g}}$$



100.0 mL
of 1.0 M
(0.10 mol)

100.0 mL
of 1.0 M
(0.10 mol)

everything reacts!

$$\text{Volume of sol'n} = 100.0 \text{ mL} + 100.0 \text{ mL} = 200.0 \text{ mL}$$

$$\text{mass of sol'n} = 200.0 \text{ mL} \times \frac{1 \text{ g}}{1 \text{ mL}} = 200.0 \text{ g}$$

$$q = mc\Delta T = (200.0 \text{ g}) \left(4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (31.3^\circ\text{C} - 24.6^\circ\text{C})$$

$$= 5606.56 \text{ J} = 5.60 \times 10^3 \text{ J of heat lost or } \underline{5.60 \text{ kJ}}$$

$$\Delta H = \frac{-5.60 \text{ kJ}}{0.10 \text{ mol}}$$

$$= \boxed{-56.0 \frac{\text{kJ}}{\text{mol}}}$$

$$100.0 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.1000 \text{ L} \times \frac{0.10 \text{ mol}}{\text{L}} =$$

$$\boxed{0.10 \text{ mol HCl}}$$



$$100.0 \text{ mL HCl} \rightarrow .1000 \text{ L} \times \frac{0.500 \text{ mol HCl}}{\text{L}} \times \frac{-118 \text{ kJ}}{2 \text{ mol HCl}} = -2.95 \text{ kJ heat released}$$

$$300.0 \text{ mL Ba(OH)}_2 \rightarrow .3000 \text{ L} \times \frac{0.100 \text{ mol Ba(OH)}_2}{\text{L}} \times \frac{-118 \text{ kJ}}{1 \text{ mol Ba(OH)}_2} = -3.54 \text{ kJ heat released}$$

HCl produces the smaller amt. of heat, \therefore it is limiting.

$$q = 2.95 \text{ kJ} = 2950 \text{ J}$$

$$q = mc \Delta T$$

$$2950 \text{ J} = (400.0 \text{ g}) \left(\frac{4.184 \text{ J}}{\text{g}^\circ\text{C}} \right) (\Delta T)$$

$$\Delta T = 1.79^\circ\text{C}$$

$$\Delta T = T_f - T_i$$

$$1.79^\circ\text{C} = T_f - 25.0^\circ\text{C}$$

$$T_f = \boxed{26.8^\circ\text{C}}$$