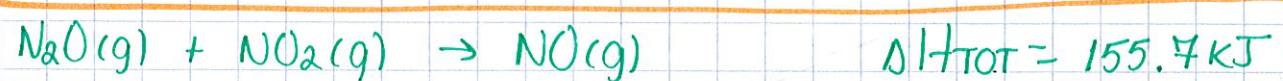
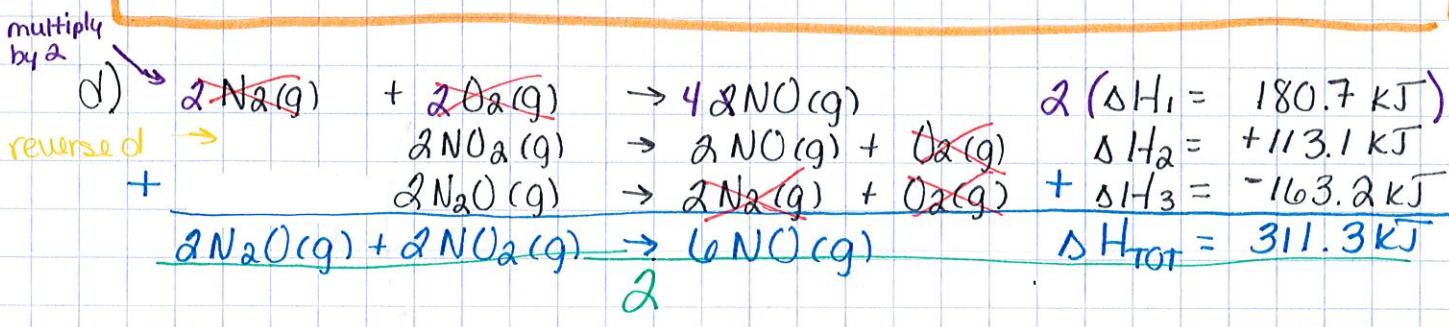
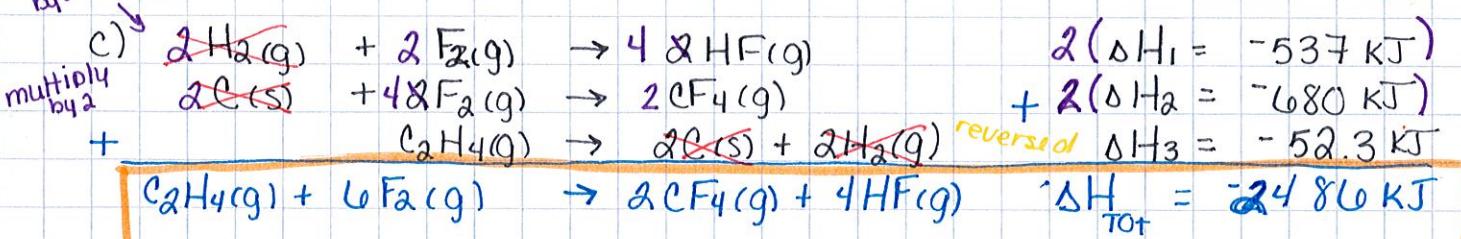
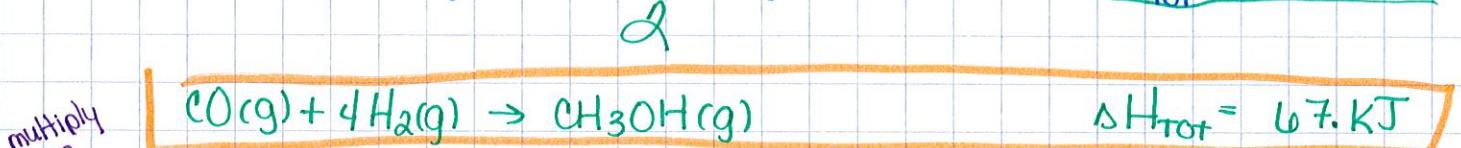
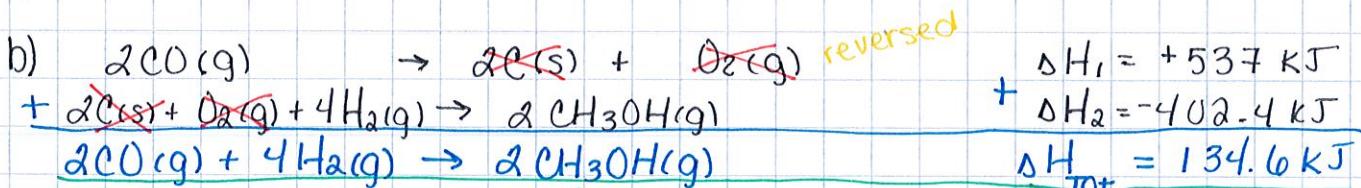
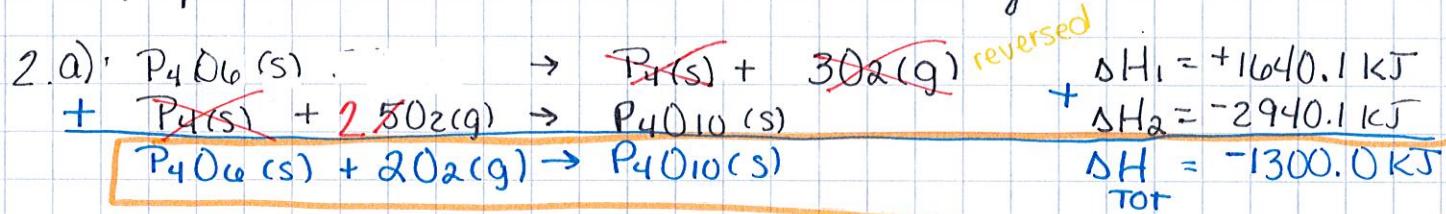


Unit 5 Test Study Guide Key

1. a) heat - flow of energy due to a difference in temperature
- b) temperature - measure of the average kinetic energy of the molecules in a substance
- c) exothermic - heat is released, q is negative
- d) endothermic - heat is absorbed, q is positive
- e) enthalpy - measurement of the amount of heat energy absorbed or released by a chemical reaction
- f) Boyle's Law - the pressure of a gas is inversely proportional to its volume
- g) Charles's Law - the volume of a gas is directly proportional to its temperature in Kelvin
- h) Avogadro's Law - the volume of a gas is directly proportional to the number of moles of gas



3. a) $q = ?$
 $m = 80.0\text{g}$
 $C = 2.22 \text{ J/gK}$
 $\Delta T = 25.0^\circ\text{C}$
 $\frac{10.0^\circ\text{C}}{15.0^\circ\text{C} + 273}$
 $= 288\text{K}$

$q = mC\Delta T$
 $q = (80.0\text{g})(2.22 \text{ J/gK})(288\text{K})$
 $q = 51148.8 \text{ J} = \boxed{51100 \text{ J}}$ endothermic

b) $q = ?$
 $m = 45.0\text{g}$
 $C = .385 \text{ J/g}^\circ\text{C}$
 $\Delta T = 15.0^\circ\text{C}$
 $\frac{-30.0^\circ\text{C}}{-15.0^\circ\text{C}}$

$q = mC\Delta T$
 $q = (45.0\text{g})(.385 \text{ J/g}^\circ\text{C})(-15.0^\circ\text{C})$
 $q = -259.875 \text{ J} = \boxed{-260. \text{ J}}$ exothermic

c) $q = -1500. \text{ J}$
 $m = 99.88\text{g}$
 $C = 1.020 \text{ J/g}^\circ\text{C}$
 $\Delta T = ?$

$$\Delta T = \frac{q}{(m \cdot C)}$$

$$\Delta T = \frac{-1500. \text{ J}}{(99.88\text{g} \cdot 1.020 \text{ J/g}^\circ\text{C})}$$

$$\Delta T = -14.72355061^\circ\text{C} = \boxed{-14.72^\circ\text{C}}$$

5a) $V_1 = 5.00\text{L}$ Charles's Law: $V_1 T_2 = V_2 T_1$
 $T_1 = 24.0^\circ\text{C} + 273 = 297\text{K}$
 $V_2 = ?$
 $T_2 = -272^\circ\text{C} + 273 = 1\text{K}$

$$\frac{(5.00\text{L})(1\text{K})}{297\text{K}} = \frac{V_2(297\text{K})}{397\text{K}}$$

$$.016835017\text{L} = V_2$$

$$\boxed{.02\text{L} = V_2}$$

b. $V_1 = 652\text{mL}$
 $n_1 = .214\text{mol}$
 $V_2 = ?$
 $n_2 = .375\text{mol}$

Avogadro's Law: $V_1 n_2 = V_2 n_1$
 $\frac{(652\text{mL})(.375\text{mol})}{.214\text{mol}} = \frac{V_2 (.214\text{mol})}{.214\text{mol}}$

$$1142.523364\text{ L} = V_2$$

$$\boxed{1140\text{ L} = V_2}$$

(3)

C. $P_1 = 1.00 \text{ atm}$
 $V_1 = 33.0 \text{ L}$
 $P_2 = .562 \text{ atm}$
 $V_2 = ?$

Boyle's Law: $P_1 V_1 = P_2 V_2$

$$\frac{(1.00 \text{ atm})(33.0 \text{ L})}{.562 \text{ atm}} = \frac{(.562 \text{ atm}) V_2}{.562 \text{ atm}}$$

$$58.7188612 \text{ L} = V_2$$

$$58.7 \text{ L} = V_2$$

D. $V_1 = 1900 \text{ mL}$
 $n_1 = .777 \text{ mol}$
 $V_2 = \frac{1.200 \text{ L}}{1000 \text{ mL}} = 1200 \text{ mL}$
 $n_2 = ?$

Avogadro's Law: $V_1 n_2 = V_2 n_1$

$$\frac{(1900 \text{ mL}) n_2}{1900 \text{ mL}} = \frac{(1200 \text{ mL})(.777 \text{ mol})}{1900 \text{ mL}}$$

$$n_2 = .490736842 \text{ mol}$$

$$n_2 = .491 \text{ mol}$$

E. $P_1 = .3456 \text{ atm}$
 $V_1 = 1234 \text{ mL}$
 $P_2 = ?$
 $V_2 = 2345 \text{ mL}$

Boyle's Law: $P_1 V_1 = P_2 V_2$

$$\frac{(.3456 \text{ atm})(1234 \text{ mL})}{2345 \text{ mL}} = \frac{P_2 (2345 \text{ mL})}{2345 \text{ mL}}$$

$$.18186371 \text{ atm} = P_2$$

$$.1819 \text{ atm} = P_2$$

F. $V_1 = 3.00 \text{ L}$

Charles's Law: $V_1 T_2 = V_2 T_1$

$$T_1 = 25.00^\circ\text{C} + 273 = 298 \text{ K}$$

$$V_2 = 2 \times 3.00 \text{ L} = 6.00 \text{ L}$$

$$T_2 = ?$$

$$\frac{(3.00 \text{ L}) T_2}{3.00 \text{ L}} = \frac{(6.00 \text{ L})(298 \text{ K})}{3.00 \text{ L}}$$

$$T_2 = 596 \text{ K}$$

g. $P = 126.7 \text{ kPa}$
 $V = 25.00 \text{ L}$
 $n = 16.3 \text{ g Na}$
 $R = .08206 \frac{\text{Latm}}{\text{mol K}}$
 $T = ?$

Ideal Gas Law: $PV = nRT$

(4)

$$\frac{126.7 \text{ kPa}}{101.325 \text{ kPa}} \left| \frac{1 \text{ atm}}{1 \text{ atm}} \right. = \frac{1.250 \text{ atm}}{1}$$

$$\frac{16.3 \text{ g Na}}{28.02 \text{ g}} \left| \frac{1 \text{ mol}}{1 \text{ mol}} \right. = \frac{.582 \text{ mol}}{1}$$

$$\frac{(1.250 \text{ atm})(25.00 \text{ L})}{(.582 \text{ mol})(.08206 \frac{\text{Latm}}{\text{mol K}})} = \frac{(.582 \text{ mol})(.08206 \frac{\text{Latm}}{\text{mol K}}) T}{(.582 \text{ mol})(.08206 \frac{\text{Latm}}{\text{mol K}})}$$

$$654.3280292 \text{ K} = T$$

$$654 \text{ K} = T$$

h. $P = 720 \text{ torr}$

Ideal Gas Law: $PV = nRT$

$$V = ?$$

$$n = 100.0 \text{ g Kr}$$

$$R = .08206 \frac{\text{Latm}}{\text{mol K}}$$

$$T = -99.66^\circ\text{C} + 273 = 173 \text{ K}$$

$$\frac{720 \text{ torr}}{760 \text{ torr}} \left| \frac{1 \text{ atm}}{1 \text{ atm}} \right. = .955 \text{ atm}$$

$$\frac{100.0 \text{ g Kr}}{83.80 \text{ g}} \left| \frac{1 \text{ mol}}{1 \text{ mol}} \right. = 1.193 \text{ mol}$$

$$\frac{(.955 \text{ atm}) V}{.955 \text{ atm}} = \frac{(1.193 \text{ mol})(.08206 \frac{\text{Latm}}{\text{mol K}})(173 \text{ K})}{.955 \text{ atm}}$$

$$V = 17.73432601 \text{ L}$$

$$V = 17.7 \text{ L}$$