Multiple Choice (2 pts. each)

I can #1

1. The balanced equation $2\ Cu + O_2 \rightarrow 2\ CuO$ tells us that 1 mole of Cu
   a. Reacts with 1 mol of O_2
   b. Produced 1 mole of CuO
   c. Must react with 32 grams of O_2
   d. Cannot react with oxygen
   e. Produces 2 mol of CuO

B

2. The coefficients in a chemical equation represent the
   a. Masses, in grams, of all the products and reactants
   b. Relative number of moles of reactants and products
   c. Number of atoms in each compound in a reaction
   d. Number of valence electrons involved in the reaction

B

I can #2

3. Knowing the mole ratio of a reactant and product in a chemical reaction would allow you to determine
   a. The energy released in the reaction
   b. The speed of the reaction
   c. The mass of the product produced from a known mass of reactant
   d. Whether the reaction was reversible

C

4. Each of the four types of reaction stoichiometry problems requires using a
   a. Table of bond energies
   b. Chart of electron configurations
   c. Lewis Structure
   d. mole ratio

D

I can #3

5. In the reaction $A + B \rightarrow C + D$, if there is more reactant B than is required to completely react with all of A, then
   a. A is the limiting reactant
   b. B is the limiting reactant
   C. there is no limiting reactant
   D. no product can be formed

A

6. The limiting reactant in a reaction is
   a. The reactant for which there is the least amount in grams
   b. The reactant which has the lowest coefficient in a balanced equation
   c. The reactant for which there is the most amount in grams
   d. The reactant for which there is the fewest number of moles
   e. None of the above

D

I can #5

7. To determine the limiting reactant in a chemical reaction, one must know the
   a. Available amount of one of the reactants
   b. Amount of product formed
   c. Available amount of each reactant
   d. Speed of the reaction

8. If the percent yield is equal to 100 %, then
   a. The actual yield is greater than the theoretical yield
   b. The actual yield is equal to the theoretical yield
   c. The actual yield is less than the theoretical yield
   d. There was no limiting reactant

9. When the limiting reactant in a chemical reaction is completely used, the
   a. Excess reactants begin to combine
   b. Reaction speeds up
   c. Reaction slows down
   d. Reaction stops

10. Which of the following would be investigated in reaction stoichiometry?
    a. The masses of hydrogen and oxygen
    b. The amount of energy released in chemical reactions
    c. The mass of potassium required to produce a known mass of potassium chloride
    d. The types of bond that break and form when acids react with metals

11. The actual yield of a chemical reaction is usually
    a. Less than the theoretical yield
    b. Greater than the theoretical yield
    c. Equal to the percent yield
    d. Great than the percent yield

Multiple Choice: (2 pts.)

I can #1

10. An assumption of the kinetic molecular theory of gases is that the particles of a gas have

C

A. Little attraction for each other and a significant volume
B. Strong attraction for each other and insignificant volume
C. Little attraction for each other and insignificant volume
D. Strong attraction for each other and a significant volume

11. Which change must result in an increase in the average kinetic energy of the molecules of a sample of nitrogen gas?

G

E. The pressure changes from 0.5 atmosphere to 1 atmosphere
F. The density changes from 2.0 g/L to 2.5 g/L
G. The temperature changes from 20 °C to 30 °C.
H. The volume changes from 1 liter to 2 liters.

12. What would happen to the average kinetic energy of the molecules of a gas sample if the temperature of the sample increased from 20 °C to 40 °C?

B

A. It would stay the same.
B. It would increase.
C. It would decrease
D. It would become half its value.
E. Two of these answers.

not in Kelvin!

I can #2

13. Which is an example of effusion?

A

a. air slowly escaping from a pinhole in a tire
b. the aroma of a cooling pie spreading across a room
c. helium dispersing into a room after a balloon pops
d. oxygen and gasoline fumes mixing in an automobile carburetor

I can #3

14. One reason that a real gas deviates from an ideal gas is that the molecules of the real gas have

B

a. Negligible volume
b. Forces of attraction for each other
C. no net loss of energy on collisions
D. a straight-line motion

I can #6

15. As the pressure of a gas at 101.3 kPa is changes to 50.65 kPa at constant temperature, the volume of the gas

C

a. Remains the same
b. Decreases
c. Increases

16. A sample of gas is at STP. As the pressure decreases and the temperature increases, the volume of the gas

A

a. Increases
b. Remains the same
c. Decreases

I can #12

D

17. Which gas will diffuse at the fastest rate under the same conditions of temperature and pressure?

d. F_2 B. O_2 C. N_2 D. H_2

I can #7

C

18. A 1-liter flask contains two gases at a total pressure of 3.0 atmospheres. If the partial pressure of one of the gases is 0.5 atmosphere, then the partial pressure of the other as must be

e. 1.0 atm C. 2.5 atm
f. 0.50 atm D. 1.5 atm

Answer each of the following questions showing all your work including the given and the unknown. Also remember to include the units and correct number of significant figures. Please CIRCLE your final answer.

All I Can

12. Answer all parts of the question using this data. For the reaction, $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$. 4.69 grams solid $CaCO_3$ is mixed with 6.78 grams HCl.

a.) What is the limiting reactant? (6 pts.)

$CaCO_3$ LR

$4.69\,g\ CaCO_3 \times \frac{1\,mol}{100.08\,g} = 0.04686\,mol\ CaCO_3 \times \frac{2\,HCl}{1\,CaCO_3} = 0.09375\,mol\ HCl$ needed

$6.78\,g\ HCl \times \frac{1\,mol}{36.46\,g} = 0.1875\,mol\ HCl \times \frac{1\,CaCO_3}{2\,HCl} = 0.09375\,mol\ CaCO_3$

b.) What is the amount in grams of carbon dioxide produced? (6 pts.)

$0.04686\,mol\ CaCO_3 \times \frac{1\,mol\ CO_2}{1\,mol\ CaCO_3} \times \frac{44.01\,g}{1\,mol\ CO_2} = \boxed{2.06\,g\ CO_2}$

c.) What is the amount of grams of excess reactant leftover? (8 pts.)

$0.1875 - 0.09375 = 0.09375$ left

$0.09375 \times \frac{36.46\,g}{1\,mol\ HCl} = \boxed{3.39\,g\ HCl}$

d.) If the actual yield of CO_2 is 1.50 g, calculate the % yield? (4 pts.)

$\frac{1.50\,g}{2.06\,g} \times 100 = \boxed{72.82\%}$

I can #7

13. In the decomposition of water, your percent yield is 56%. If the theoretical yield is 6.47 grams, what is the actual yield? (4 pts.)

$\frac{AY}{TY} \times 100 = \%Y$ $\quad AY = \frac{\%Y \cdot TY}{100}$

$Ay = \frac{56\% \cdot 6.47}{100} = \boxed{3.62g}$

I can #2

14. Hydrochloric acid (HCl) reacts with magnesium.

a.) Write the balanced chemical reaction. (4 pts.)

$2HCl + Mg \rightarrow MgCl_2 + H_2$

b.) If you have 15 moles of HCl how many moles of hydrogen will you produce? (4pts.)

$15 mol\ HCl \times \frac{1 mol\ H_2}{2 mol\ HCl} = \boxed{7.5 mol\ H_2}$

I can #2

15. For the reaction HCl + NaOH → NaCl + H_2O, how many moles of hydrochloric acid are required to produce 45.0 grams of water? (6 pts)

$45g \times \frac{1 mol}{18.02g} \times \frac{1 mol\ HCl}{1 mol\ H_2O} = \boxed{2.50 mol\ HCl}$

For each of the following questions, be sure to show all of your work. Remember to include units and significant figures.

I can # 4

1. Convert 3.6×10^2 atm to torr. (4 pts.)

$$3.6 \times 10^2 \text{ atm} \times \frac{760 \text{ torr}}{1 \text{ atm}} = 2.736 \times 10^5 \text{ torr}$$

I can #6

2. A gas occupies a volume of 202 mL at a pressure of 505 torr. To what pressure must the gas be subjected in order to change the volume to 65.0 mL? Assume constant temperature. (6 pts.)

$$202 \text{ mL} \cdot 505 \text{ torr} = P \cdot 65.0 \text{ mL}$$

$$1569 \text{ torr} = P$$

3. A helium balloon has a volume of 2.30 L at 23.5 °C and a pressure of 1.00 atm at sea level. The balloon is released and floats upward. At a certain height the atmospheric pressure is 0.810 atm and the temperature is 12.0 °C. Calculate the volume of the balloon. (6 pts.)

$$\frac{PV}{T} = \frac{PV}{T} \qquad \frac{1 \text{ atm} \cdot 2.3 \text{ L}}{296.5 \text{ K}} = \frac{0.810 \text{ atm} \cdot V}{285 \text{ K}}$$

$$2.73 \text{ L} = V$$

I can #10

4. How many moles of gas are contained in a 563 mL at 67 °C and 237.8 kPa? (8 pts.)

nRt

$$237.8 \text{ kPa} \times \frac{1 \text{ atm}}{101.3 \text{ kPa}} = 2.35 \text{ atm} \qquad 67^\circ + 273 = 340 \text{ K}$$

$$n = \frac{PV}{RT} = \frac{2.35 \cdot 0.563 \text{ L}}{0.0821 \cdot 340 \text{ K}} = 0.0474 \text{ mol}$$

I can # 5 & 10

5. The density of a gas is 3.07 g/L at STP. Calculate the gas's molar mass. (6 pts)

$$\frac{3.07 \text{ g}}{1 \text{ L}} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 68.77 \frac{\text{g}}{\text{mol}}$$

I can #7

6. Zinc metal is added to hydrochloric acid to generate hydrogen gas and is collected over a liquid whose vapor pressure is the same as pure water at 20 °C (18 torr). The volume of the mixture is 1.7 L, and its total pressure is 0.810 atm.

$0.81 \text{ atm} \times \frac{760 \text{ torr}}{1 \text{ atm}} = 615.6 \text{ torr}$

A. Determine the partial pressure of the hydrogen gas in this mixture? (8 pts)

$18 \text{ torr} \times \frac{1 \text{ atm}}{760 \text{ torr}} = 0.0237 \text{ atm}$

$0.81 \text{ atm} - 0.0237 \text{ atm} = 0.786 \text{ atm}$

or

$615.6 \text{ torr} - 18 \text{ torr} = 597.6 \text{ torr}$

I can #11

7. How many moles of O_2 are needed to react completely with 52.0 L of CH_4 at STP to produce CO_2 and H_2O according to the following reaction: (5 pts)

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

$52 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} = 2.32 \text{ mol } CH_4 \times \frac{2 \text{ mol } O_2}{1 \text{ mol } CH_4} = 4.64 \text{ mol } O_2$

I can #13

8. The effusion rate of an unknown gas is measured and found to be 31.50 mL/min. Under identical experimental conditions, the effusion rate of O_2 is found to be 30.50 mL/min. If the choices are CH_4, CO, NO, CO_2 and NO_2, what is the identity of the unknown gas? (5 pts)

9. When temperature increases what happens to pressure? Explain the relationship using the molecular behavior of gases.

As temperature increases pressure also increases since they are directly related.