STUDENT REVIEW PACKET

Part I

Molar Mass

Find the molar mass of each of the following. Show all work:

1) N_2

2) H_2O

3) NaCl

4) Na_3PO_4

5) Au

6) $(NH_4)_2CO_3$

Percent Composition

Determine the percent composition for each of the following. Show all work:

1) SO_2

2) NaCl

3) H_2SO_4

4) K_2S

5) $C_6H_{12}O_6$

Convert the following. Show all work. Be sure to show the correct number of significant figures and units in your responses.

1. 25.0 g NaOH to moles NaOH

2. 0.67 moles H_3PO_4 to g H_3PO_4

3. 12.8 moles SO_2 to L SO_2

4. 0.0065 moles CO_2 to L CO_2

5. 1.23 moles NH_3 to molecules NH_3

6. 6.8×10^{27} molecules KOH to moles KOH

7. 90.0 g LiCl to moles LiCl

8. 1.7 moles F_2 to atoms F_2

9. 5.23×10^{24} atoms Cu to moles Cu

10. 22.4 mole C_2H_2 to molecules C_2H_2

Convert the following. Show all work. Be sure to show the correct number of significant figures and units in your responses.

1. How many molecules of H_2O are in 50.0 g H_2O?

2. Find the volume of CO_2 in 100.0 g CO_2.

3. A sample of diamond has a mass of 0.35 g. How many carbon atoms does it contain? (You may assume that the diamond is pure carbon.)

4. A typical helium tank contains 250.0 L of He. How many atoms is this?

5. How many grams does 7.12×10^{28} molecules of K_2CO_3 weigh?

Part II

1. What information is derived from the coefficients in a balanced equation?

3. In a chemical reaction, some items are always conserved while others may be conserved but are not necessarily conserved. Complete the table below by indicating <u>Always Conserved</u> OR <u>Sometimes Conserved</u> for each item. Use the balanced equation in question above to justify your answer.

$$2H_2(g) + O_2(g) \rightarrow 2\,H_2O(g)$$

SUMMARY OF ITEMS CONSERVED IN A CHEMICAL REACTION

ITEM	Always Conserved OR Sometimes Conserved	Justification
Atoms		
Molecules		
Moles		
Volume		

4. Which of these is the mole ratio used to convert grams of oxygen to grams of water in question above?

a) $\frac{1}{16.0}$

b) $\frac{1}{2}$

c) $\frac{2}{1}$

d) $\frac{18.02}{1}$

6. Balance each equation.

a) ___ H_2 + ___ Fe_3O_4 → ___ Fe + ___ H_2O

b) ___ $Al(OH)_3$ → ___ Al_2O_3 + ___ H_2O

c) ___ P_2O_5 + ___ H_2O → ___ H_3PO_4

d) ___ Na + ___ H_2O → ___ NaOH + ___ H_2

e) ___ $Pb(NO_3)_2$ + ___ NaI → ___ PbI_2 + ___ $NaNO_3$

f) ___ Ag_2SO_4 + ___$AlCl_3$ → ___ AgCl + ___ $Al_2(SO_4)_3$

g) ___ C_2H_2 + ___ O_2 → ___ CO_2 + ___ H_2O

7. Determine the molar mass of each compound.

$C_6H_{12}O_6$ - _____

$Ca_3(PO_4)_2$ - _____

$(NH_4)_2SO_4$ - _____

Directions: Use dimensional analysis or an acceptable Problem Solving Format. Be sure to include units, and report your answer to the correct number of significant figures.

8. Carbon disulfide is an important industrial solvent. It is prepared by the reaction of coke (carbon) with sulfur dioxide.

$$\mathbf{5C(}s\mathbf{)} + \mathbf{2SO_2(}g\mathbf{)} \rightarrow \mathbf{CS_2(}l\mathbf{)} + \mathbf{4CO(}g\mathbf{)}$$

- How many moles of carbon are needed to react with 5.44 moles of SO_2?

- How many moles of carbon monoxide form at the same time as 0.246 moles of CS_2 form?

- How many moles of SO_2 are required to make 118 moles of CS_2?

9. Lithium nitride reacts with water to form ammonia and aqueous lithium hydroxide.

$$\mathbf{Li_3N(}s\mathbf{)} + \mathbf{3H_2O(}l\mathbf{)} \rightarrow \mathbf{NH_3(}g\mathbf{)} + \mathbf{3LiOH(}aq\mathbf{)}$$

- What mass of water is needed to react with 32.9g Li_3N?

- When the above reaction takes place, how many molecules of NH_3 are produced?

10. The reaction of iron(III) oxide with carbon monoxide produces iron and carbon dioxide.

___ $Fe_2O_3(s)$ + ___ $CO(g)$ → ___ $Fe(s)$ + ___ $CO_2(g)$

- Balance the skeleton equation.

- If you have 39.5g Fe_2O_3, how many grams of CO are required for complete reaction?

- How many grams of Fe_2O_3 are required to produce 4.65 g Fe?

- How many grams of iron can be produced from 145 g Fe_2O_3?

- When 67.8 g Fe_2O_3 reacts with an excess of CO, 44.1 g Fe is produced. What is the percent yield?

11. The complete combustion of octane, C_8H_{18}, in the presence of oxygen produces carbon dioxide and water.

$$\_\_\_\ C_8H_{18}(g) + \_\_\_\ O_2(g) \xrightarrow{\text{heat}} \_\_\_\ CO_2(g) + \_\_\_\ H_2O(g)$$

- Balance the skeleton equation for the complete combustion of octane.

- What volume of CO_2 gas is released when 7.40 moles of octane react with excess oxygen at STP?

- What volume of oxygen gas is needed to react completely with 43.4 g octane?

12. Heating an ore of antimony, Sb_2S_3, in the presence of excess iron ore gives the element antimony, Sb, and iron(II) sulfide.

$$Sb_2S_3(s) + 3Fe(s) \xrightarrow{\text{heat}} 2Sb(s) + 3FeS(s)$$

The following data was recorded when the reaction was carried out in the laboratory.

DATA TABLE

Constant mass of evaporating dish	**45.50 g**
Mass of evaporating dish and Sb_2S_3	**60.50 g**
Mass of Sb_2S_3	
Mass of evaporating dish and Sb – First heating	**55.42 g**
Mass of evaporating dish and Sb – Second heating	**55.34 g**
Constant mass of evaporating dish and Sb	**55.34 g**
Mass of Sb	

a) Complete the Data Table by filling in the mass of Sb_2S_3 used in the reaction and the mass of Sb formed as the result of the reaction.

b) Calculate the percent yield of antimony, Sb, in this reaction.

13. List at least three (3) reasons why the percent yield of a product is usually less than 100%.

- _____
- _____
- _____
- _____
- _____

14. Describe a *real world* example of percent yield by applying the concept to a discipline other than chemistry. Be sure to include these terms in your answer: *actual yield, predicted or theoretical yield, and percent yield*.