Study Guide- Unit 5

Hint: List the type of compounds you are naming, *then* name the compounds!

formula	name	type
K_2S	potassium sulfide	I
HgI_2	mercury(II) iodide	I
Al_2O_3	aluminum sulfide	I
$Ca(OH)_2$	Calcium hydroxide (+2 -1)	I
$Co PO_4$	Cobalt (III) phosphate (+3 -3)	I
C_4N_3	Tetracarbon trinitride	C
NH_4Cl	Ammonium chloride (+1 -1)	I

formula	name	type
$MgCO_3$	magnesium carbonate	I
N_2H_4	dinitrogen tetrahydride	C
Ag_3N	Silver nitride	I
$CuCl_2$	Copper (II) chloride (+2 -1)	I
HgI	Mercury(I) iodide (+1 -1)	I
	~~Strontium silicate~~ X	I
CCl_4	Carbon tetrachloride	C

1. How many **grams** are there in 20.25 moles of Aluminum oxide? Al_2O_3

Al: 2 x 26.98 = 53.96
O: 3 x 16 = 48
101.96g

$$\frac{20.25 \text{ moles}}{1} \cdot \frac{101.96 \text{g}}{1 \text{ mole}} = 2064.69 \text{g}$$

2. How many **molecules** are there 600 g of dinitrogen tetrahydride? N_2H_4

N: 2 x 14.01 = 28.02
H: 4 x 1.01 = 4.04
32.06g

$$\frac{600 \text{g}}{1} \cdot \frac{1 \text{ mole}}{32.06 \text{ g}} \cdot \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole}} = 1.13 \times 10^{25} \text{ molecules } N_2H_4$$

3. Determine the **volume**, of 10.60 g Oxygen gas at STP. O_2

O: 2 x 16 = 32g

$$\frac{10.60 \text{g}}{1} \cdot \frac{1 \text{ mole}}{32 \text{ g}} \cdot \frac{22.4 \text{ L}}{1 \text{ mole}} = 7.42 \text{ L } O_2$$

4. How many **grams** are in 1690 L of Neon gas at STP? Ne

Ne: 20.18g

$$\frac{1690 \text{L}}{1} \cdot \frac{1 \text{mole}}{22.4 \text{L}} \cdot \frac{20.18 \text{g}}{1 \text{mole}} = 1522.5 \text{ g Ne}$$

5. How many **formula units** are in 0.125 g of Iron (III) oxide? Fe_2O_3

Fe: 2 x 55.85 = 111.7
O: 3 x 16 = 48
159.7g

$$\frac{0.125 \text{g}}{1} \cdot \frac{1 \text{ mole}}{159.7 \text{g}} \cdot \frac{6.022 \times 10^{23} \text{ f.u.}}{1 \text{ mole}} = 4.71 \times 10^{20} \text{ f.u. } Fe_2O_3$$

6. Calculate the percent composition of each element in the the following compounds

a) $NaHSO_3$

Na: 1 x 22.99 = 22.99
H: 1 x 1.01 = 1.01
S: 1 x 32.07 = 32.07
O: 3 x 16 = 48
total: 104.07

Na: 22.1%
H: .9%
S: 30.8%
O: 46.1%

b. $Ca(CO_3)_2$

Ca: 1 - 40.08 = 29.4%
C: 2 - 24.02 = 17.6%
O: 6 - 72.06 = 53%
136.14

7. Calculate the mass of the element in the given mass of compound:

a. Mass of Hydrogen in 350 g **$NaHSO_3$** 104.07 total H = 1.01 = 0.9% H

350g × .009 = 3.39g H in 350g $NaHSO_3$

b. Mass of Oxygen in 200.2 g of $Ca(CO_3)_2$ Ca: 22.79 C: 2×12.01 O: 6×16

C: 24.02 O: 96

= 143.01

200.2g × .671 = 134.4g O

$\frac{96}{143.01} = 67.1\%$

8. Calculate the percent composition of the compounds that are formed from these reactions: 12.03 g of Magnesium combine completely with 7.48 g of Oxygen.

Mg: $\frac{12.03}{19.51} = 61.7\%$ O: $\frac{7.48}{19.51} = 38.3\%$

9. Determine the molar masses for each compound. **Show all work!**

a. $MgCO_3$ = 84.32g/mol

b. $Co(NO_3)_3$ = 224.98g/mol

c. S_2Cl_2 = 135.04g/mol

10. How many molecules are present in 150.5mL of nitrogen dioxide gas at STP? [you need to write out the formula and change ml into L (1000ml=1L)]

$\frac{150.5mL}{1} \cdot \frac{1L}{1000mL} \cdot \frac{1mol}{22.4L} \cdot \frac{6.022\times10^{23}\ molecules}{1\ mole} = \frac{906.3}{22400} = 4.05\times10^{21}$ molecules

11. How many formula units are in 250.0g of Calcium Sulfate? (you need to write out the formula)

$\frac{250.0g}{1} \cdot \frac{1mol}{136.15g} \cdot \frac{6.022\times10^{23}\ f.u.}{1mol} = 1.11\times10^{24}$ f.u.

$CaSO_4$ = 136.15g/mol

12. If you have 52.5 x 10^{22} atoms of this hexachlorine trioxide, how many kg are present? ? [you need to write out the formula and change g into kg (1000g=1kg)] Cl_6O_3

$\frac{52.5\times10^{22}\ atoms}{1} \cdot \frac{1mole}{6.022\times10^{23}\ atoms} \cdot \frac{260.7\ g}{1\ mole} \cdot \frac{1\ kg}{1000\ g} = 2.27\times10^{-1} = .227$ kg

13. 60.24 g of Ba combine completely with 28.77 g of F in BaF. What is the percent composition each element in this compound?

Ba: $\frac{60.24}{89.01} = 67.7\%$ F: $\frac{28.77}{89.01} = 32.3\%$

14. Calculate the percent composition of magnesium in $MgCO_3$ 84.32

Mg: 28.8% C: 14.2% O: 56.9%

15. Calculate the percent composition of nitrogen in $Co(NO_3)_3$

Co: $\frac{58.93g}{244.96} = 24.1\%$ N: $\frac{42.03g}{244.96} = 17.2\%$ O: $\frac{144g}{244.96} = 58.8\%$