

Name: Key
AP Chemistry Summer Assignment

Date: due ~~9/10/14~~
1st day of school

Worksheet #1 - Math Skills

Significant Figures (Sig Figs)

1. How many sig figs are in the following numbers?

a) 0.0450 3

b) 790 2

c) 32.10 4

2. Solve the following problems. Round your answer to the correct number of sig figs (and use the correct unit on your answer).

a) $825 \text{ cm} \times 32 \text{ cm} \times 0.248 \text{ cm}$

6500 cm^3

b) $\frac{15.68 \text{ g}}{2.885 \text{ mL}}$

5.435 g/mL

Density (round your answers to correct number of sig figs and show all work with units)

3. A cube of ruthenium metal 1.5 cm on a side has a mass of 42.0 g. What is the density in g/cm^3 ? Will ruthenium metal float on water?

$V = 1.5 \text{ cm} \times 1.5 \text{ cm} \times 1.5 \text{ cm} = 3.4 \text{ cm}^3$

$d = \frac{42.0 \text{ g}}{3.4 \text{ cm}^3} = \boxed{12 \text{ g/cm}^3}$

4. The density of bismuth metal is 9.8 g/cm^3 . What is the mass of a sample of bismuth that displaces 65.8 mL of water?

$1 \text{ cm}^3 = 1 \text{ mL}$

$\frac{9.8 \text{ g}}{\text{cm}^3} = \frac{m}{65.8 \text{ mL}}$

$m = \boxed{640 \text{ g}}$

Conversions (round answers correctly and show work with units)

5. Make the following conversions:

a) 16.2 m to km

$$\frac{16.2 \text{ m}}{1000 \text{ m}} \times 1 \text{ km} = 0.0162 \text{ km}$$

b) 5.44 nL to mL

$$\frac{5.44 \text{ nL}}{1 \times 10^9 \text{ nL}} \times \frac{1 \text{ L}}{1 \text{ L}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 5.44 \times 10^{-6} \text{ mL}$$

c) 45.7 mL/s to kL/hr

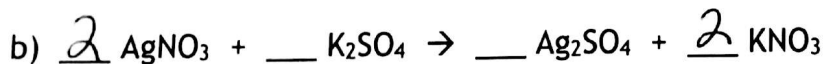
$$\frac{45.7 \text{ mL}}{1 \text{ s}} \times \frac{3600 \text{ s}}{1 \text{ hr}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ kL}}{1000 \text{ L}} = 0.165 \frac{\text{kL}}{\text{hr}}$$

Reactions

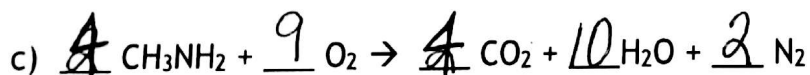
6. Balance the following and equations and tell what type of reaction it is (synthesis, decomposition, single replacement, double replacement, or combustion)



Type: decomposition



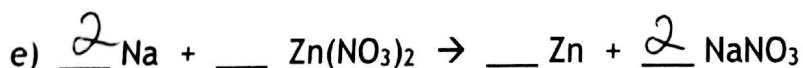
Type: double replacement



Type: Combustion

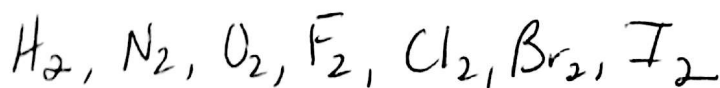


Type: Synthesis



Type: single replacement

7. What are diatomic molecules? List the 7.



Average Atomic Mass

8. Magnesium consists of 3 naturally occurring isotopes with the masses 23.98504, 24.98584, and 25.98259 amu. The relative abundances of these three isotopes are 78.70%, 10.13%, and 11.17% respectively. Calculate the average atomic mass.

$$23.98504(0.7870) + 24.98584(0.1013) + 25.98259(0.1117) =$$
$$18.88 + 2.531 + 2.902$$
$$= 24.31 \text{ amu}$$

Percent Composition

9. Calculate the percent composition of $C_{12}H_{22}O_{11}$ (sugar). (Give Percent of each element.) Show all work.

$$\% C = \frac{12(12.01)}{342.296} \times 100 = 42.10\%$$
$$\% H = \frac{22(1.008)}{342.296} = 6.479\%$$
$$\% O = \frac{11(16.00)}{342.296} = 51.42\%$$

Moles

10. Calculate the number of moles of the following: (SHOW WORK)

- a) 42.8 g of KNO_3

$$\frac{42.8 \text{ g}}{101.1 \text{ g/mol}} = 0.423 \text{ mol } KNO_3$$

- b) 155.7 L of CO_2 at STP

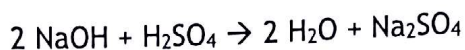
$$\frac{155.7 \text{ L } CO_2}{22.4 \text{ L/mol}} = 6.951 \text{ mol } CO_2$$

- c) 9.25×10^{26} molecules of $CaCl_2$

$$\frac{9.25 \times 10^{26} \text{ molecules}}{6.02 \times 10^{23} \text{ molecules/mol}} = 1540 \text{ mol}$$

Stoichiometry

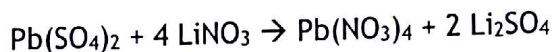
11. Using the following equation:



How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid?

$$\frac{200 \text{ g NaOH}}{39.998 \text{ g NaOH}} \times \frac{1 \text{ mol NaOH}}{2 \text{ mol NaOH}} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} \times 142.05 \text{ g Na}_2\text{SO}_4 = 400 \text{ g Na}_2\text{SO}_4$$

12. Using the following equation:



How many grams of lithium nitrate will be needed to make 250 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

$$\frac{250 \text{ g Li}_2\text{SO}_4}{109.95 \text{ g Li}_2\text{SO}_4} \times \frac{1 \text{ mol Li}_2\text{SO}_4}{2 \text{ mol Li}_2\text{SO}_4} \times \frac{4 \text{ mol LiNO}_3}{1 \text{ mol LiNO}_3} \times 68.95 \text{ g LiNO}_3 = 310 \text{ g LiNO}_3$$

13. Using the following equation: $\text{Fe}_2\text{O}_3 + 3 \text{H}_2 \rightarrow 2 \text{Fe} + 3 \text{H}_2\text{O}$

Calculate how many grams of iron can be made from 16.5 grams of Fe_2O_3 .

$$\frac{16.5 \text{ g Fe}_2\text{O}_3}{159.7 \text{ g Fe}_2\text{O}_3} \times \frac{1 \text{ mol Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} \times \frac{2 \text{ mol Fe}}{1 \text{ mol Fe}} \times 55.85 \text{ g Fe} = 11.5 \text{ g Fe}$$

Limiting Reactant & Percent Yield

1. Determine the grams of sodium chloride produced when 10.0 g of sodium react with 10.0 g of chlorine gas according to the equation: $2 \text{Na} + \text{Cl}_2 \rightarrow 2 \text{NaCl}$

$$\frac{10.0 \text{g Na}}{22.99 \text{g Na}} \times \frac{1 \text{mol Na}}{2 \text{mol Na}} \times \frac{2 \text{mol NaCl}}{2 \text{mol Na}} \times \frac{58.44 \text{g NaCl}}{1 \text{mol NaCl}} = 25.4 \text{g NaCl}$$

$$\frac{10.0 \text{g Cl}_2}{70.9 \text{g Cl}_2} \times \frac{1 \text{mol Cl}_2}{2 \text{mol Cl}_2} \times \frac{2 \text{mol NaCl}}{1 \text{mol Cl}_2} \times \frac{58.44 \text{g NaCl}}{1 \text{mol NaCl}} = 16.5 \text{g NaCl}$$

$$\boxed{\text{LR} = \text{Cl}_2 \quad 16.5 \text{g NaCl produced}}$$

2. Determine the mass of lithium hydroxide produced when 50.0g of lithium are reacted with 45.0g of water according to the equation: $2 \text{Li} + 2 \text{H}_2\text{O} \rightarrow 2 \text{LiOH} + \text{H}_2$

$$\frac{50.0 \text{g Li}}{6.94 \text{g Li}} \times \frac{1 \text{mol Li}}{2 \text{mol Li}} \times \frac{2 \text{mol LiOH}}{2 \text{mol Li}} \times \frac{23.94 \text{g LiOH}}{1 \text{mol LiOH}} = 17.2 \text{g LiOH}$$

$$\frac{45.0 \text{g H}_2\text{O}}{18.016 \text{g H}_2\text{O}} \times \frac{1 \text{mol H}_2\text{O}}{2 \text{mol H}_2\text{O}} \times \frac{2 \text{mol LiOH}}{2 \text{mol H}_2\text{O}} \times \frac{23.94 \text{g LiOH}}{1 \text{mol LiOH}} = 59.8 \text{g LiOH}$$

$$\boxed{\text{LR} = \text{H}_2\text{O} \quad 59.8 \text{g LiOH}}$$

3. Determine the percent yield of water produced when 68.3 g of hydrogen reacts with 85.4g of oxygen and 86.4g of water are collected. $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$

$$\frac{68.3 \text{g H}_2}{2.016 \text{g H}_2} \times \frac{1 \text{mol H}_2}{2 \text{mol H}_2} \times \frac{2 \text{mol H}_2\text{O}}{2 \text{mol H}_2} \times \frac{18.016 \text{g H}_2\text{O}}{1 \text{mol H}_2\text{O}} = 610.0 \text{g H}_2\text{O}$$

$$\frac{85.4 \text{g O}_2}{32.00 \text{g O}_2} \times \frac{1 \text{mol O}_2}{2 \text{mol O}_2} \times \frac{2 \text{mol H}_2\text{O}}{1 \text{mol O}_2} \times \frac{18.016 \text{g H}_2\text{O}}{1 \text{mol H}_2\text{O}} = 96.2 \text{g H}_2\text{O}$$

$$\text{LR} = \text{O}_2 \quad 96.2 \text{g H}_2\text{O} = \text{Theoretical Yield}$$

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

$$\% = \frac{86.4 \text{g}}{96.2 \text{g}} \times 100 = 89.8\%$$

Worksheet #2: Practice Naming Compounds

1. Provide names for the following ionic compounds:

- a. AlF_3 Aluminum fluoride
- b. $Fe(OH)_2$ Iron (II) hydroxide
- c. $Cu(NO_3)_2$ Copper (II) nitrate
- d. $Ba(ClO_4)_2$ Barium ~~chloride~~ perchlorate
- e. Li_3PO_4 Lithium phosphate
- f. Hg_2S Mercury (I) sulfide
- g. $Cr_2(CO_3)_3$ Chromium (III) carbonate
- h. $(NH_4)_2SO_4$ Ammonium sulfate

2. Write the chemical formulas for the following compounds:

- a. Copper(I) oxide Cu_2O
- b. Potassium peroxide K_2O_2
- c. Iron(III) carbonate $Fe_2(CO_3)_3$
- d. Zinc nitrate $Zn(NO_3)_2$
- e. Sodium hypobromite $NaBrO$
- f. Aluminum hydroxide $Al(OH)_3$

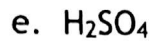
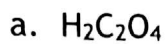
3. Give the name or chemical formula for each of the following molecular substances:

- a. SF_6 Sulfur hexafluoride
- b. XeO_3 Xenon trioxide
- c. Dinitrogen tetroxide N_2O_4
- d. Hydrogen cyanide HCN
- e. IF_5 Iodine pentafluoride
- f. Dihydrogen monoxide H_2O
- g. Tetraphosphorous hexasulfide P_4S_6

4. Give the name or chemical formula for the following compounds:

- a. Ammonium oxalate $(NH_4)_2C_2O_4$
- b. Manganese(III) dichromate $Mn_2(Cr_2O_7)_3$
- c. $Ti(OH)_4$ Titanium (IV) hydroxide
- d. $Ni(ClO_2)_3$ Nickel (III) chlorite
- e. Dinitrogen pentoxide N_2O_5
- f. Aluminum oxide Al_2O_3
- g. Fe_2S_3 Iron (III) sulfide

5. Name the following acids



Oxalic acid

bromic acid

hydrobromic acid

nitrous acid

sulfuric acid

~~o~~ hypochlorous acid

6. Write formulas for the following acids.

a. hydrochloric acid

b. sulfuric acid

c. nitric acid

d. phosphoric acid

e. carbonic acid

f. acetic acid

HCl

H_2SO_4

HNO_3

H_3PO_4

H_2CO_3

$\text{HC}_2\text{H}_3\text{O}_2$