

<p><u>-1</u> acetate, $C_2H_3O_2^-$, or CH_3COO^- bromate, BrO_3^- chlorate, ClO_3^- chlorite, ClO_2^- cyanide, CN^- hydrogen carbonate, HCO_3^- (also called bicarbonate) hydroxide, OH^- hypochlorite, ClO^- iodate, IO_3^- nitrate, NO_3^- nitrite, NO_2^- permanganate, MnO_4^- perchlorate, ClO_4^- thiocyanate, SCN^-</p>	<p><u>-2</u> carbonate, CO_3^{2-} chromate, CrO_4^{2-} dichromate, $Cr_2O_7^{2-}$ oxalate, $C_2O_4^{2-}$ peroxide, O_2^{2-} sulfate, SO_4^{2-} sulfite, SO_3^{2-}</p>	<p><u>-3</u> phosphate, PO_4^{3-} phosphite, PO_3^{3-} arsenate, AsO_4^{3-}</p>
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Be able to name polyatomic ions using the rules above such as these below:

HPO_4^{2-} hydrogen phosphate

HSO_3^{-1} hydrogen sulfite

FO_3^{-1} fluorate

HCO_3^{-1} hydrogen carbonate

Be able to write formulas for polyatomic ions using the rules above such as these below:

Bromite BrO_2^-

periodate IO_4^-

Dihydrogen phosphite $H_2PO_3^-$

hydrogen chromate $HCrO_4^{-1}$

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?

$$D = \frac{m}{V} = \frac{42.0 \text{ g}}{1.5 \text{ cm} \times 1.5 \text{ cm} \times 1.5 \text{ cm}} = \frac{42.0 \text{ g}}{3.375} = 12.444 \text{ g/cm}^3$$

 12.4 g/cm^3 No it will Not

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?

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

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

 $x = 640 \text{ g}$

5. Make the following conversions:

a) 16.2 m to km

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

b) 5.44 nL to mL

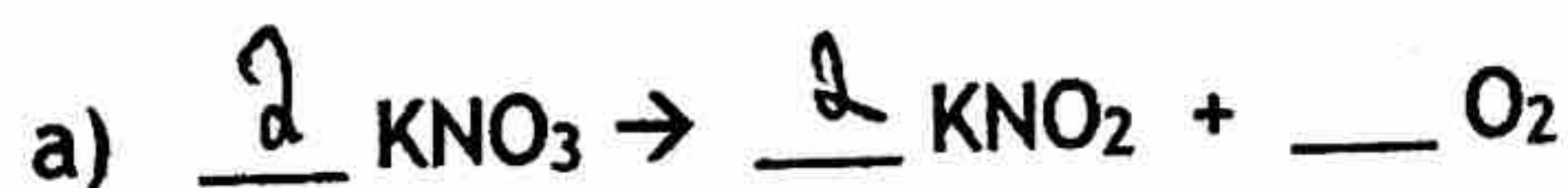
$$\frac{5.44 \text{ nL}}{1 \times 10^9 \text{ nL}} \times \frac{1 \text{ L}}{1 \times 10^3 \text{ mL}} = 5.44 \times 10^{-6} \text{ mL}$$

c) 45.7 mL/s to kL/hr

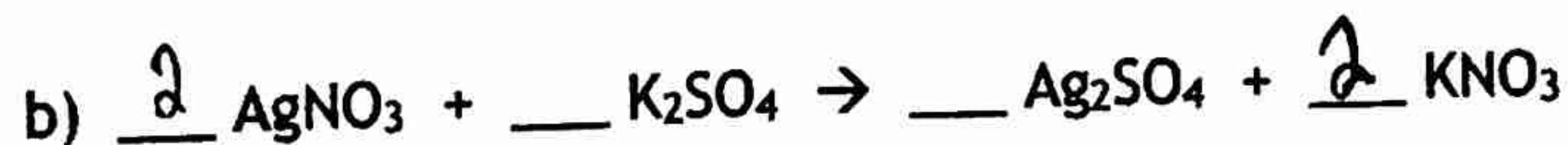
$$\frac{45.7 \text{ mL}}{\text{s}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ kL}}{1000 \text{ L}} \times \frac{60 \text{ s}}{1 \text{ m}} \times \frac{60 \text{ m}}{1 \text{ hr}} = 0.165 \text{ kL/hr}$$

Reactions

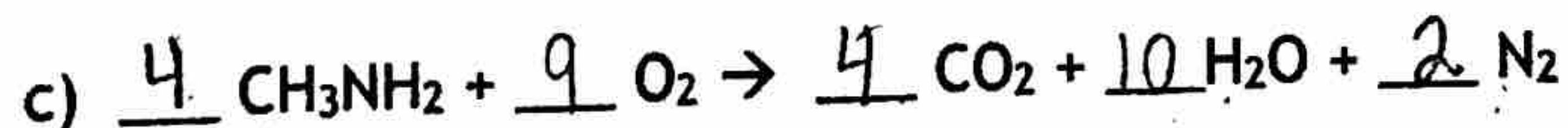
6. Balance the following and equations and tell what type of reaction it is (synthesis, decomposition, single replacement, double replacement, or combustion)



Type: D



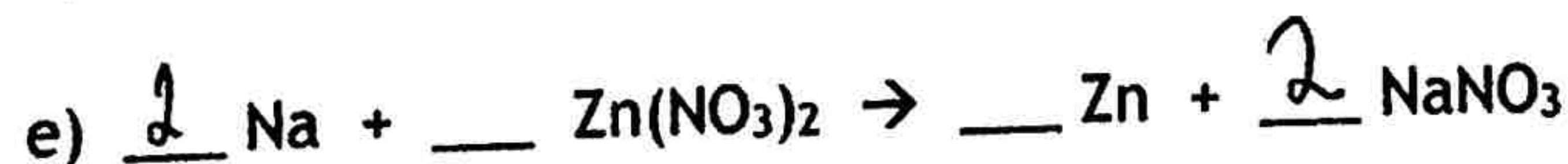
Type: DR



Type: C



Type: S



Type: SR

7. What are diatomic molecules? List the 7.

Br I N Cl H O F

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.

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

Percent Composition

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

$$\begin{array}{l} \text{C} \quad \frac{144.12}{342.296} \times 100 = 42.10\% \\ \text{H} \quad \frac{22.176}{342.296} \times 100 = 6.48\% \\ \text{O} \quad \frac{176}{342.296} = 51.42\% \end{array}$$

Moles

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

- a) 42.8 g of KNO_3

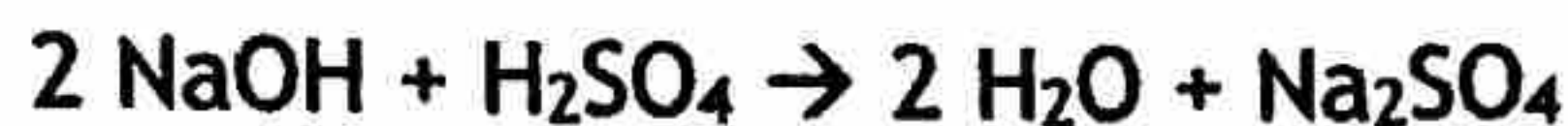
$$\frac{42.8 \text{ g}}{101.1 \text{ g}} \times 1 \text{ mol} = 0.423 \text{ mol}$$

- b) 155.7 L of CO_2 at STP

$$\frac{155.7 \text{ L } CO_2}{22.4 \text{ L}} \times 1 \text{ mol} = 6.95 \text{ mol}$$

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

$$\frac{9.25 \times 10^{26} \text{ molecules } CaCl_2}{6.022 \times 10^{23} \text{ molecules } CaCl_2} \times 1 \text{ mol} = 1540 \text{ mol } CaCl_2$$



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?

$$\begin{array}{l|l|l|l} 200 \text{ g NaOH} & 1 \text{ mol NaOH} & 1 \text{ mol Na}_2\text{SO}_4 & 142.05 \text{ g Na}_2\text{SO}_4 \\ \hline & 39.998 \text{ g NaOH} & 2 \text{ mol NaOH} & 1 \text{ mol Na}_2\text{SO}_4 \\ & & & = 400 \text{ g Na}_2\text{SO}_4 \end{array}$$

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?

$$\begin{array}{l|l|l|l} 250 \text{ g Li}_2\text{SO}_4 & 1 \text{ mol Li}_2\text{SO}_4 & 1 \text{ mol Pb}(\text{SO}_4)_2 & 399.32 \text{ g Pb}(\text{SO}_4)_2 \\ \hline & 109.94 \text{ g Li}_2\text{SO}_4 & 2 \text{ mol Li}_2\text{SO}_4 & 1 \text{ mol Pb}(\text{SO}_4)_2 \\ & & & = 450 \text{ g Pb}(\text{SO}_4)_2 \end{array}$$

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 .

$$\begin{array}{l|l|l|l} 16.5 \text{ g Fe}_2\text{O}_3 & 1 \text{ mol Fe}_2\text{O}_3 & 2 \text{ mol Fe} & 55.85 \text{ g Fe} \\ \hline & 159.7 \text{ g Fe}_2\text{O}_3 & 1 \text{ mol Fe}_2\text{O}_3 & 1 \text{ mol Fe} \\ & & & = 11.5 \text{ g Fe} \end{array}$$

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: $2 \text{Na} + \text{Cl}_2 \rightarrow 2 \text{NaCl}$

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

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

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

$$\frac{50.0 \text{g Li}}{6.94 \text{g Li}} \times \frac{1 \text{ mol Li}}{1 \text{ mol Li}} \times \frac{2 \text{ mol LiOH}}{2 \text{ mol Li}} \times \frac{23.948 \text{ g LiOH}}{1 \text{ mol LiOH}} = 173 \text{g LiOH}$$

$$\frac{45.0 \text{g H}_2\text{O}}{18.016 \text{g H}_2\text{O}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} \times \frac{2 \text{ mol LiOH}}{2 \text{ mol H}_2\text{O}} \times \frac{23.948 \text{ g LiOH}}{1 \text{ mol LiOH}} = 59.8 \text{g LiOH}$$

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. $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$

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

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

TY

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

Worksheet #2: Practice Naming Compounds

Write names for the following ionic compounds:

- a. AlF_3 aluminum fluoride
- b. $\text{Fe}(\text{OH})_2$ Iron(II) hydroxide
- c. $\text{Cu}(\text{NO}_3)_2$ Copper(II) nitrate
- d. $\text{Ba}(\text{ClO}_4)_2$ Barium ~~oxide~~ perchlorate
- e. Li_3PO_4 lithium phosphate
- f. Hg_2S mercury(I) sulfide
- g. $\text{Cr}_2(\text{CO}_3)_3$ chromium(III) carbonate
- h. $(\text{NH}_4)_2\text{SO}_4$ ammonium sulfate

Write the chemical formulas for the following compounds:

- a. Copper(I) oxide Cu_2O
- b. Potassium peroxide K_2O_2
- c. Iron(III) carbonate $\text{Fe}_2(\text{CO}_3)_3$
- d. Zinc nitrate $\text{Zn}(\text{NO}_3)_2$
- e. Sodium hypobromite NaBrO
- f. Aluminum hydroxide $\text{Al}(\text{OH})_3$

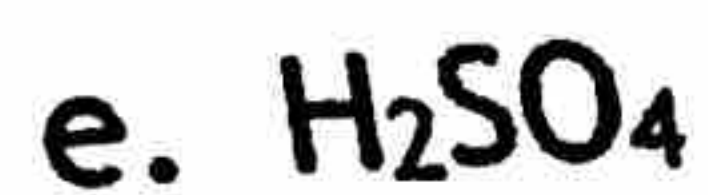
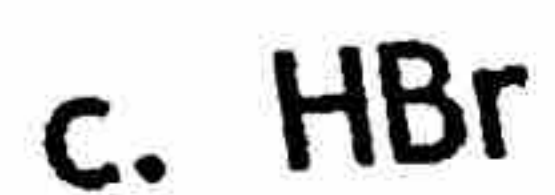
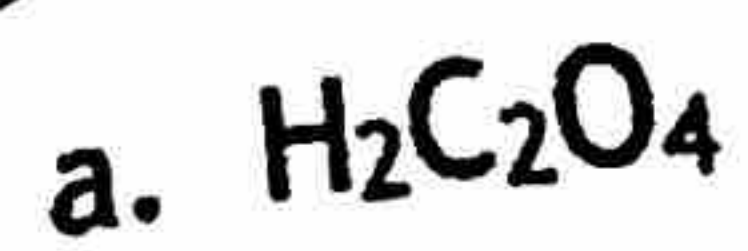
3. Give the name or chemical formula for each of the following molecular substances:

- a. SF_6 sulfur hexafluoride
- b. XeO_3 xenon trioxide
- c. Dinitrogen tetroxide N_2O_4
- d. Hydrogen cyanide HCN
- e. IF_5 Iodine
- 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 $(\text{NH}_4)_2\text{C}_2\text{O}_4$
- b. Manganese(III) dichromate $\text{Mn}_2(\text{Cr}_2\text{O}_7)_3$
- c. $\text{Ti}(\text{OH})_4$ Titanium(IV) hydroxide
- d. $\text{Ni}(\text{ClO}_2)_3$ 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

~~HBr~~ hydrobromic acid

nitrous acid

sulfuric acid

hypochlorous acid

HCl

H_2SO_4

HNO_3

H_3PO_4

H_2CO_3

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

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