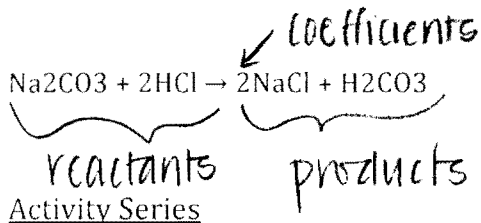


Reactants and Products

Label the reactants and products in the following equation:



Using the activity series predict and balance the following single replacement reactions. Use abbreviations to indicate the appropriate phase of reactants and products where possible. Note: Not all of the reactions will occur. For those that do not, write no reaction.

Activity Series

General Activity Series For Metals

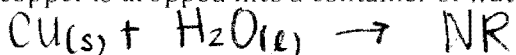
most active	Li	Ca	Na	Mg	Al	Zn	Fe	Pb	[H ₂]	Cu	Ag	Pt	least active
-------------	----	----	----	----	----	----	----	----	-------------------	----	----	----	--------------

General Activity Series For Nonmetals

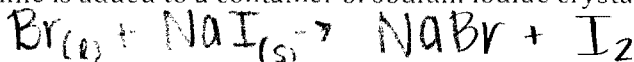
most active	F ₂	Cl ₂	Br ₂	I ₂	least active
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Practice Problems

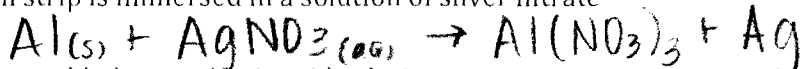
A piece of copper is dropped into a container of water



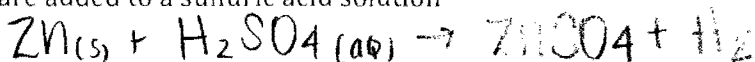
Liquid Bromine is added to a container of sodium iodide crystals



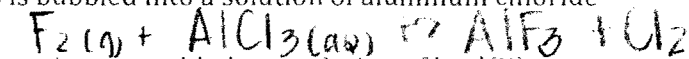
An aluminum strip is immersed in a solution of silver nitrate



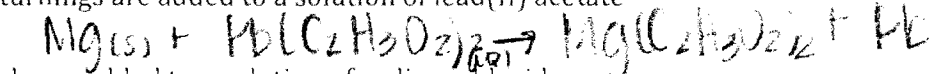
Zinc pellets are added to a sulfuric acid solution



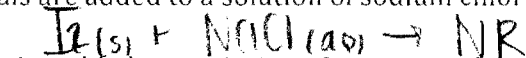
Fluorine gas is bubbled into a solution of aluminum chloride



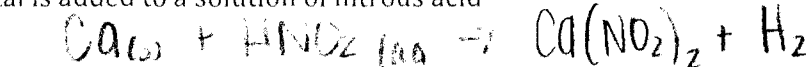
Magnesium turnings are added to a solution of lead(II) acetate



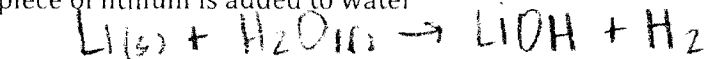
Iodine crystals are added to a solution of sodium chloride



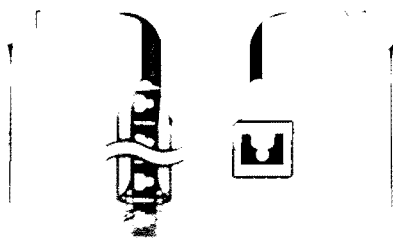
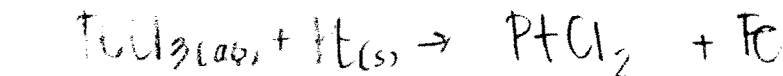
Calcium metal is added to a solution of nitrous acid



A pea-sized piece of lithium is added to water

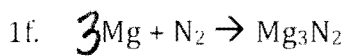
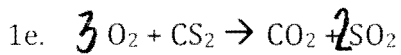
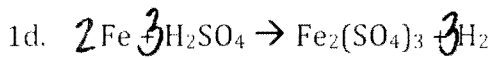
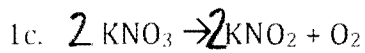
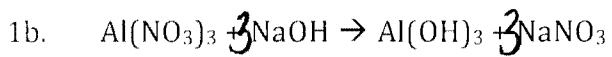
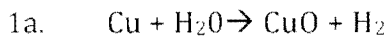


A solution of iron(III) chloride is poured over a piece of platinum wire

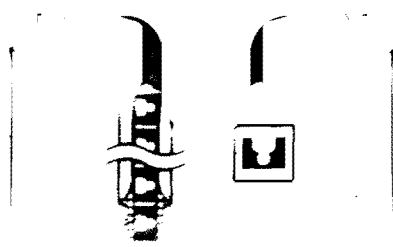
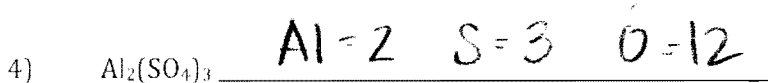
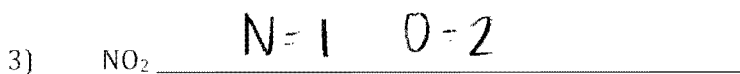


Balancing Equations

Write the balanced equations for each of the following reactions:



Counting Atoms



Reaction Types

Choose the correct symbol for the type of reaction. Place that answer in the blank at the beginning of each equation and then balance each equation correctly.

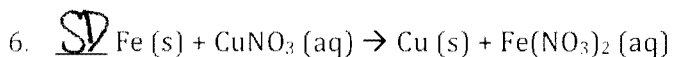
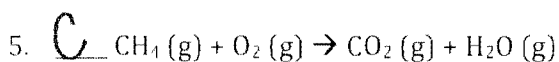
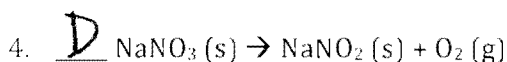
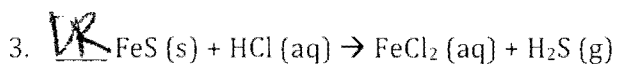
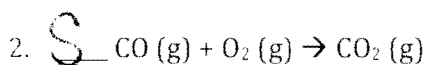
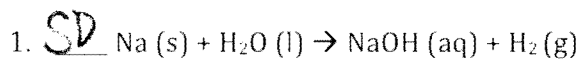
S = synthesis

SD = single displacement

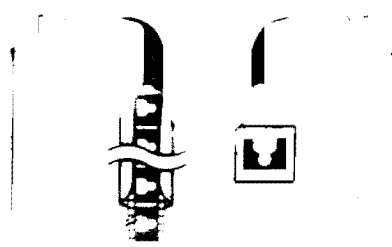
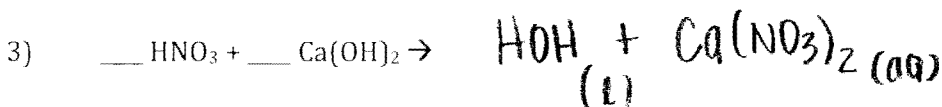
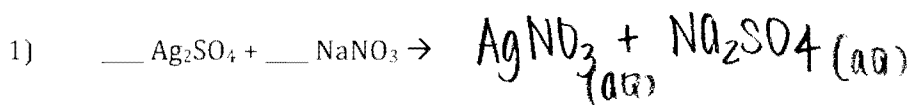
D = decomposition

DR = double replacement

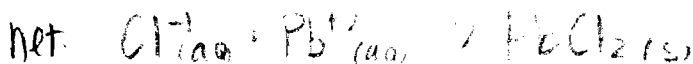
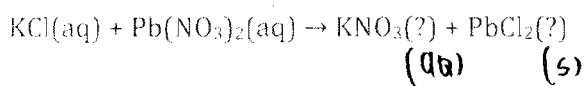
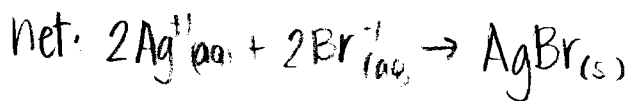
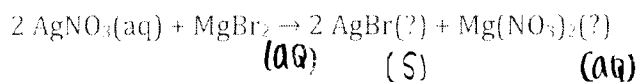
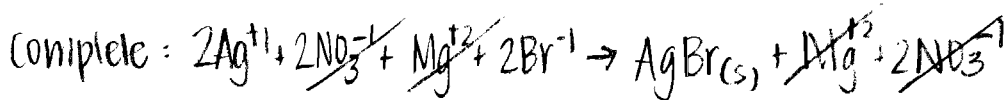
C = combustion



Predicting Products/Solubility Rules

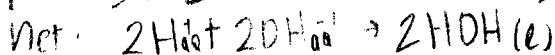
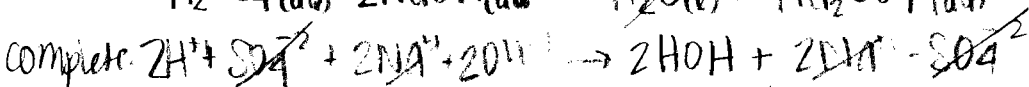
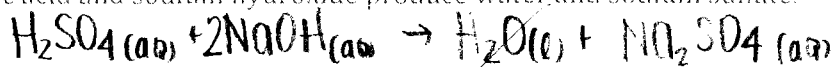


Solubility/predicting products/NIE

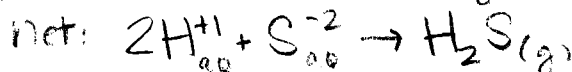
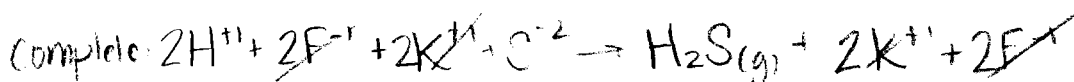
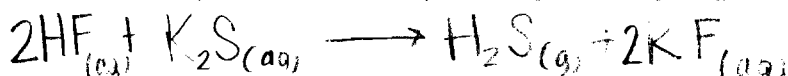


NIE (complete vs. net ionic equations)

Sulfuric acid and sodium hydroxide produce water and sodium sulfate.



Hydrofluoric acid and potassium sulfide produce gaseous hydrogen sulfide and potassium fluoride.



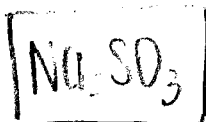
EF from Percent

Find the empirical formula of a compound with the mass percent composition; 36.48% Na, 25.44% S, 38.08% O

$36.48g Na \times \frac{1mol Na}{22.99g Na} = 1.59 mol Na / 0.79 = 2$

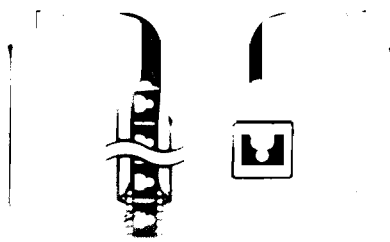
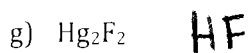
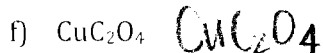
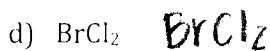
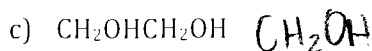
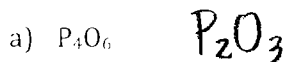
$25.44g S \times \frac{1mol S}{32.07g S} = 0.79 mol S / 0.79 = 1$

$38.08g O \times \frac{1mol O}{16.00g O} = 2.38 mol O / 0.79 = 3$



EF from MF

Write the empirical formula for the following compounds:



EF

In this first example, we are starting with mass data and will get a simple (x:1) atom ratio. We are given information about how much carbon and how much hydrogen there is in a particular sample. Specifically 6.0 grams of methane contains 4.5 grams of carbon and 1.5 grams of hydrogen.

$$4.5 \text{ g C} / 6 \times 100 = 75\% \quad 75 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} = 6.24 / 6.24 = 1$$

$$1.5 \text{ g H} / 6 \times 100 = 25\% \quad 25 \text{ g H} \times \frac{1 \text{ mol H}}{1.01 \text{ g H}} = 24.75 / 6.24 = 4$$

CH₄

MF from EF

The ratio of C:H:O has been found to be 1:2:1, thus the empirical formula is: CH₂O. Again, as a reminder, this is the simplest formula for the compound, and not necessarily the molecular formula. Suppose we know that the molecular weight of this compound is 180 g/mol. With this information, the molecular formula may be determined. The formula weight of the empirical formula is 30 g/mol.

Mole conversions

$$\left. \begin{array}{l} \text{C} = 12.01 \\ \text{H} = 2 \times 1.01 \\ \text{O} = 16.00 \end{array} \right\} 30.03 \text{ g/mol}$$

$$\frac{180}{30.03} = 6 \quad \text{C}_6\text{H}_{12}\text{O}_6$$

1. How many moles of magnesium is 3.01×10^{22} atoms of magnesium?

$$3.01 \times 10^{22} \text{ atoms Mg} \times \frac{1 \text{ mol Mg}}{6.022 \times 10^{23} \text{ atoms Mg}} = 0.05 \text{ mol Mg}$$

2. How many molecules are there in 4.00 moles of glucose, C₆H₁₂O₆?

$$4.00 \text{ mol C}_6\text{H}_{12}\text{O}_6 \times \frac{6.022 \times 10^{23} \text{ molecules C}_6\text{H}_{12}\text{O}_6}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6} = 2.41 \times 10^{24} \text{ molecules C}_6\text{H}_{12}\text{O}_6$$

3. How many moles are 1.20×10^{25} atoms of phosphorous?

$$1.20 \times 10^{25} \text{ atoms P} \times \frac{1 \text{ mol P}}{6.022 \times 10^{23} \text{ atoms P}} = 19.93 \text{ mol P}$$

4. How many atoms are in 0.750 moles of zinc?

$$0.750 \text{ mol Zn} \times \frac{6.022 \times 10^{23} \text{ atoms Zn}}{1 \text{ mol Zn}} = 4.52 \times 10^{23} \text{ atoms Zn}$$

5. How many molecules are in 0.400 moles of N₂O₅?

$$0.400 \text{ moles N}_2\text{O}_5 \times \frac{6.022 \times 10^{23} \text{ molec. N}_2\text{O}_5}{1 \text{ mol N}_2\text{O}_5} = 2.41 \times 10^{23} \text{ molecules N}_2\text{O}_5$$

Mole-Mass Conversions

1. How many moles in 28 grams of CO₂?

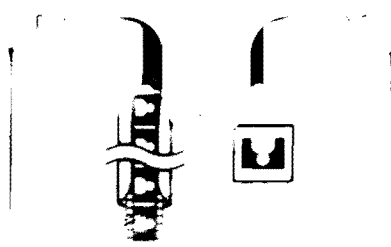
$$28 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g CO}_2} = 0.64 \text{ mol CO}_2$$

2. What is the mass of 5 moles of Fe₂O₃?

$$5 \text{ mol Fe}_2\text{O}_3 \times \frac{159.70 \text{ g Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} = 798.5 \text{ g Fe}_2\text{O}_3$$

3. Find the number of moles of argon in 452 g of argon.

$$452 \text{ g Ar} \times \frac{1 \text{ mol Ar}}{39.95 \text{ g Ar}} = 11.31 \text{ mol Ar}$$



4. Find the grams in 1.26×10^{-4} mol of $\text{HC}_2\text{H}_3\text{O}_2$.

$$1.26 \times 10^{-4} \text{ mol HC}_2\text{H}_3\text{O}_2 \times \frac{60.06 \text{ g HC}_2\text{H}_3\text{O}_2}{1 \text{ mol HC}_2\text{H}_3\text{O}_2} = 0.008$$

5. Find the mass in 2.6 mol of lithium bromide.

$$2.6 \text{ mol LiBr} \times \frac{86.84 \text{ g LiBr}}{1 \text{ mol LiBr}} = 225.78 \text{ g LiBr}$$

6. Find the mass in grams of 2.00×10^{23} molecules of F_2 . 12.624 g

$$2.00 \times 10^{23} \text{ molec. F}_2 \times \frac{1 \text{ mol F}_2}{6.022 \times 10^{23} \text{ molecules F}_2} \times \frac{38.00 \text{ g F}_2}{1 \text{ mol F}_2} = 12.62 \text{ g F}_2$$

7. Find the mass, in grams, of 1.00×10^{23} molecules of N_2 .

$$1.00 \times 10^{23} \text{ molec N}_2 \times \frac{1 \text{ mol N}_2}{6.022 \times 10^{23} \text{ molec. N}_2} \times \frac{28.02 \text{ g N}_2}{1 \text{ mol N}_2} = 4.65 \text{ g N}_2$$

8. How many particles are there in 1.43 g of a molecular compound with a gram

molecular mass of 233 g? $1.43 \text{ g} \times \frac{1 \text{ mol X}}{233 \text{ g X}} \times \frac{6.022 \times 10^{23} \text{ particles X}}{1 \text{ mol X}} = 3.70 \times 10^{21} \text{ particles}$

Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. It is marketed by G.D. Searle as *Nutra Sweet*. The molecular formula of aspartame is $\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$.

a) Calculate the gram-formula-mass of aspartame.

$$294.34 \text{ g/mol}$$

b) How many moles of molecules are in 10 g of aspartame?

$$10 \text{ g aspartame} \times \frac{1 \text{ mol Aspartame}}{294.34 \text{ g Aspartame}} = 0.33 \text{ mol Aspartame}$$

c) What is the mass in grams of 1.56 moles of aspartame?

$$1.56 \text{ mol Aspartame} \times \frac{294.34 \text{ g Aspartame}}{1 \text{ mol Aspartame}} = 459.17 \text{ g}$$

d) How many molecules are in 5 g of aspartame?

$$5 \text{ g Aspartame} \times \frac{1 \text{ mol Aspartame}}{294.34 \text{ g Aspartame}} \times \frac{6.022 \times 10^{23} \text{ molecules Aspartame}}{1 \text{ mol Aspartame}} = 1.02 \times 10^{22} \text{ molecules}$$

no e) How many atoms of nitrogen are in 1.2 grams of aspartame?

