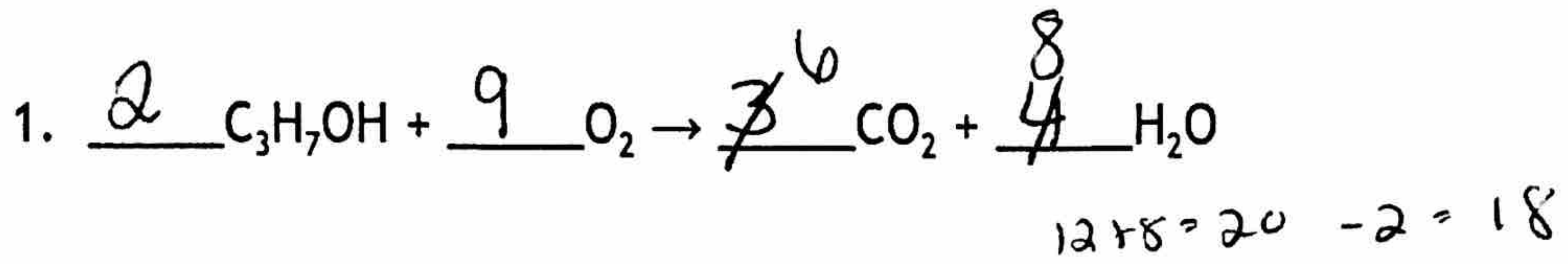


HONORS CHEMISTRY: Unit 5 Moles & Stoichiometry Test Review



a. What is the mole ratio of oxygen to carbon dioxide?
 $9 : 6$ *coefficients in balanced reaction*

b. How many moles of carbon dioxide are produced when 4.6 mol of oxygen react?

Start: 4.6 mol O_2
 end: mol CO_2

$$\frac{4.6 \text{ mol O}_2}{9 \text{ mol O}_2} \times \frac{6 \text{ mol CO}_2}{6 \text{ mol CO}_2} = 3.1 \text{ mol CO}_2$$

c. How many molecules of $\text{C}_3\text{H}_7\text{OH}$ will react with 4.6 L of oxygen?

Start: 4.6 L O_2
 end: molecules $\text{C}_3\text{H}_7\text{OH}$

4.6 L O_2	1 mol O_2	2 mol $\text{C}_3\text{H}_7\text{OH}$	6.022×10^{23} molecules $\text{C}_3\text{H}_7\text{OH}$
22.4 L O_2	9 mol O_2	1 mol $\text{C}_3\text{H}_7\text{OH}$	2.7×10^{22} molecules $\text{C}_3\text{H}_7\text{OH}$

2. Lithium nitride reacts with water to form ammonia (NH_3) and lithium hydroxide.



a. How many grams of lithium nitride will react with 40.0 g of water?

Start: 40.0 g H_2O
 end: g Li_3N

$$\frac{40.0 \text{ g H}_2\text{O}}{18.016 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol H}_2\text{O}}{3 \text{ mol H}_2\text{O}} \times \frac{1 \text{ mol Li}_3\text{N}}{1 \text{ mol Li}_3\text{N}} = 25.8 \text{ g Li}_3\text{N}$$

b. What mass of lithium hydroxide is produced from 6.75 mol of lithium nitride?

Start: 6.75 mol Li_3N
 end: g LiOH

$$\frac{6.75 \text{ mol Li}_3\text{N}}{1 \text{ mol Li}_3\text{N}} \times \frac{3 \text{ mol LiOH}}{1 \text{ mol Li}_3\text{N}} \times \frac{23.949 \text{ g LiOH}}{1 \text{ mol LiOH}} = 485 \text{ g LiOH}$$

3. A student made 75.94 g of magnesium chloride by reacting 30.00g of Magnesium with 60.00g of hydrochloric acid. actual yield

a. Write the balanced equation.



b. What is the limiting reactant? HCl Excess reactant? Mg

$$\frac{30.00\text{g Mg}}{24.31\text{g Mg}} \times \frac{1\text{ mol Mg}}{1\text{ mol Mg}} = 1.234\text{ mol Mg}$$

$$1.234 - x = 0$$

$$\frac{60.00\text{g HCl}}{36.458\text{g HCl}} \times \frac{1\text{ mol HCl}}{1\text{ mol HCl}} = 1.646\text{ mol HCl}$$

$$x = 1.234$$

	Mg	$+ 2\text{HCl}$	\rightarrow	MgCl_2	$+ \text{H}_2$	
I	1.234	1.646		0	0	
C	$-x$	$-2x$		$+x$	$+x$	
E	0.411	0		0.8230	0.8230	

$$1.646 - 2x = 0$$

$$\frac{1.646}{2} = \frac{2x}{2}$$

$$x = 0.8230$$

c. What is the percent yield?

$$\frac{0.8230\text{ mol MgCl}_2 \times 95.21\text{ g MgCl}_2}{1\text{ mol MgCl}_2} = 78.36\text{ g MgCl}_2$$

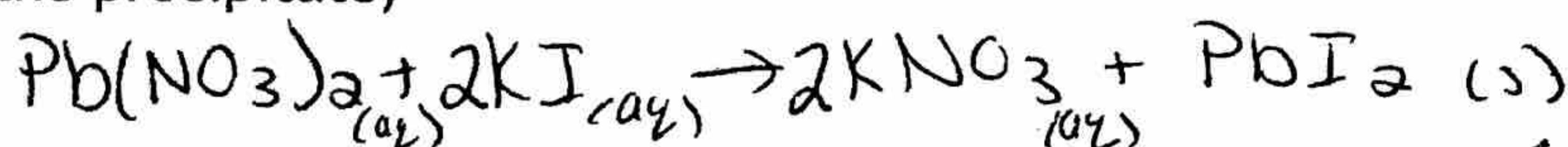
$$\% \text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100 = \frac{75.94\text{g}}{78.36\text{g}} \times 100 = 96.91\%$$

d. Determine the amount of excess reactant remaining. (grams)

$$\frac{0.411\text{ mol Mg}}{24.31\text{ g Mg}} \times \frac{1\text{ mol Mg}}{1\text{ mol Mg}} = 9.99\text{ g Mg}$$

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4. A student reacts 2.00g of Lead (II) nitrate with 4.00g of potassium iodide. How much product in grams should she expect to collect? (Write a balanced reaction and determine the precipitate)



I	0.00604	0.0241	0	0
C	-x	-2x	+2x	+x
E	0	0.0118	0.01208	0.00604

$$\frac{2.00 \text{ g Pb}(\text{NO}_3)_2}{331.2 \text{ g}} \times 1 \text{ mol} = 0.00604 \text{ mol}$$

$$\frac{4.00 \text{ g KI}}{166 \text{ g KI}} \times 1 \text{ mol KI} = 0.0241 \text{ mol}$$

$$\begin{array}{l} 0.00604 - x = 0 \\ x = 0.00604 \end{array} \quad \begin{array}{l} 0.0241 - 2x = 0 \\ x = 0.01205 \end{array}$$

$$\frac{0.00604 \text{ mol PbI}_2}{1 \text{ mol PbI}_2} \times 461 \text{ g PbI}_2 = 2.78 \text{ g PbI}_2$$

5. Find the percentage of nitrogen in ammonium nitrate, an important source of nitrogen in fertilizers. NH_4NO_3

$$\frac{28.02}{80.052} \times 100 = 35.00\%$$

Name the following compounds and give the percent composition of each element.

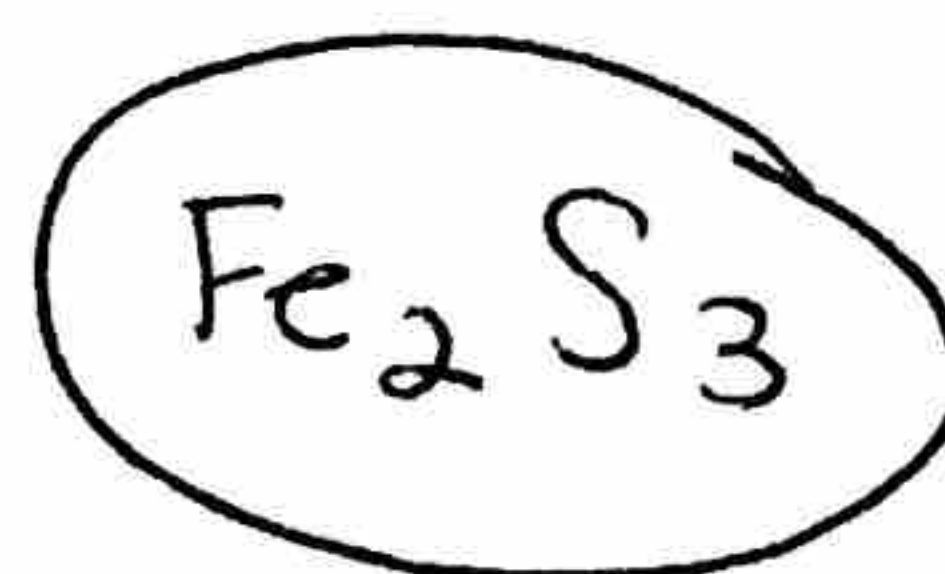
6. Fe_2O_3 Name: Iron (III) oxide %Fe = 69.94%
 159.7 Fe $\frac{111.7}{159.7} \times 100 = 69.94\%$ } $\frac{48}{159.7} \times 100$
 %O = 30.06%

7. Ag_2O Name: Silver oxide %Ag = 93.10%
 231.74 Ag $\frac{215.74}{231.74} \times 100 = 93.10\%$ } $\frac{16}{231.74} \times 100$
 %O = 6.90%

8. Na_2SO_4 Name: Sodium sulfate %Na = 32.37%
 142.05 Na $\frac{45.98}{142.05} \times 100 = 32.37\%$ %S = 22.58%
 %O = 45.07%
 $\frac{32.07}{142.05} \times 100 = 22.58\%$ $\frac{64}{142} \times 100 = 45.07\%$

9. What is the empirical formula of a compound that contains 53.73 % Fe and 46.27 % S?

$$\frac{53.73 \text{ g Fe}}{55.85 \text{ g Fe}} \times \frac{1 \text{ mol Fe}}{1} = 0.9620 / 0.9620 = 1 \times 2$$



$$\frac{46.27 \text{ g S}}{32.07 \text{ g S}} \times \frac{1 \text{ mol S}}{1} = 1.443 / 0.9620 = 1.5 \times 2$$

10. What is the empirical formula of a compound that contains 63.1 % Mn and 36.9 % S?

$$\frac{63.1 \text{ g Mn}}{54.94 \text{ g Mn}} \times \frac{1 \text{ mol Mn}}{1} = 1.149 / 1.149 = 1$$



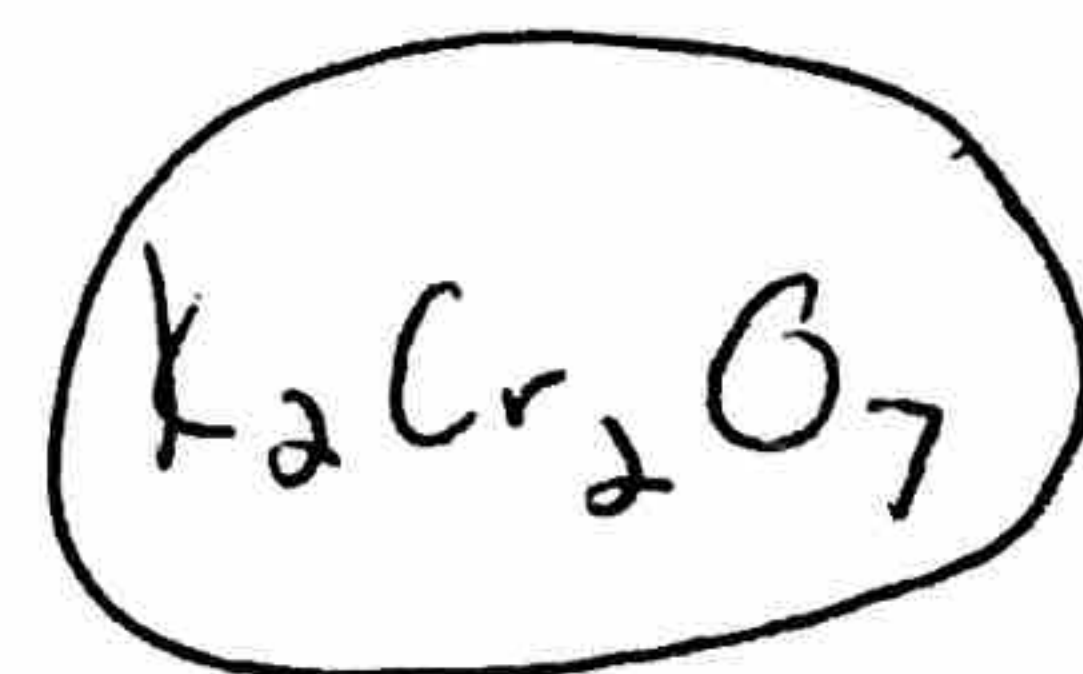
$$\frac{36.9 \text{ g S}}{32.07 \text{ g S}} \times \frac{1 \text{ mol S}}{1} = 1.151 / 1.149 = 1$$

11. What is the empirical formula of a compound that contains 26.6 % K, 35.4 % Cr, and 38.0 % O?

$$\frac{26.6 \text{ g K}}{39.01 \text{ g K}} \times \frac{1 \text{ mol K}}{1} = 0.6819 / 0.6809 = 1 \times 2 = 2$$

$$\frac{35.4 \text{ g Cr}}{51.99 \text{ g Cr}} \times \frac{1 \text{ mol Cr}}{1} = 0.6809 / 0.6809 = 1 \times 2 = 2$$

$$\frac{38.0 \text{ g O}}{16.00 \text{ g O}} \times \frac{1 \text{ mol O}}{1} = 2.375 / 0.6809 = 3.5 \times 2 = 7$$



12. An organic compound is found to contain 92.25 % carbon and 7.75 % hydrogen. If the molecular mass is 78, calculate:

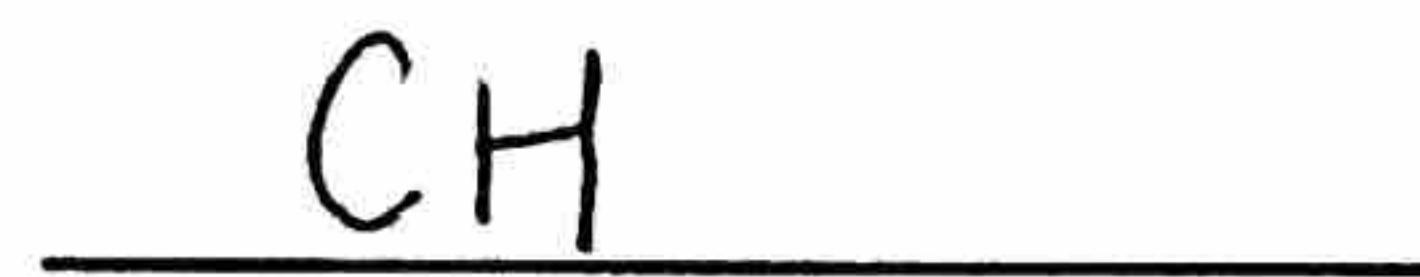
The empirical formula =

$$\frac{92.25 \text{ g C}}{12.01 \text{ g C}} \times \frac{1 \text{ mol C}}{1} = 7.681 / 7.681 = 1$$

$$\frac{7.75 \text{ g H}}{1.008 \text{ g H}} \times \frac{1 \text{ mol H}}{1} = 7.688 / 7.681 = 1$$

The empirical formula mass =

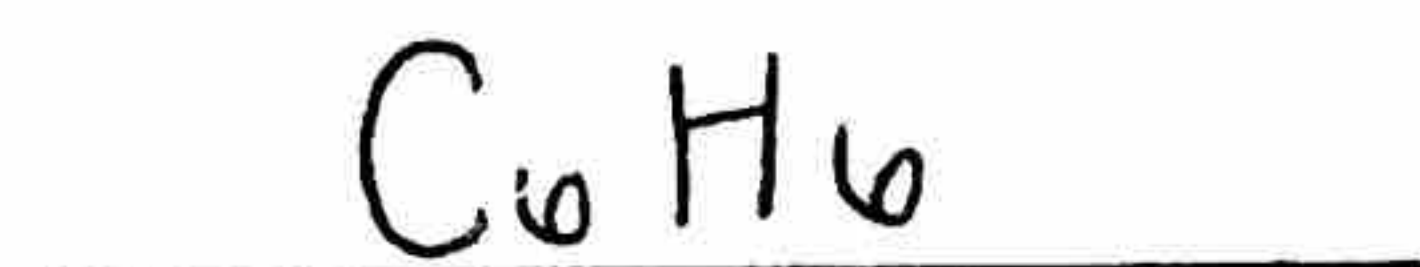
$$(12.01) + (1.008)$$



13.018 g/mol

The molecular formula =

$$\frac{78 \text{ g/mol}}{13.018 \text{ g/mol}} = 6 \quad \text{CH} \times 6$$



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13. In an experiment, a student gently heated a hydrated $\text{CuSO}_4 \cdot x \text{H}_2\text{O}$ to remove the water. The following data was recorded:

Mass of empty crucible (same as evaporating dish)	19.82 g	hydrate: 1.72 g
Mass of crucible & contents before heating	21.54 g	salt: 1.12 g
Mass of crucible & contents after heating	20.94 g	water: 0.60 g

a. Determine the formula of the hydrate.

$$\frac{1.12 \text{ g CuSO}_4}{159.62 \text{ g CuSO}_4} \times \frac{1 \text{ mol CuSO}_4}{1 \text{ mol CuSO}_4} = 0.007017 / 0.007017 = 1$$

$$\frac{0.60 \text{ g H}_2\text{O}}{18.016 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 0.0333 / 0.007017 = 4.7 \rightarrow 5$$

- b. The formula of the hydrate =
- c. What is the name of the hydrate?
- d. What is the percent of water in the hydrate

$\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$
copper (II) sulfate pentahydrate

$$\frac{5(18.016)}{159.62 + (5 \times 18.016)} \times 100 \rightarrow \frac{90.08}{249.7} \times 100 = 36.08\%$$

14. In an experiment, barium chloride ___ hydrate was heated to remove water. The following data was obtained:

	BaCl_2	hydrate: 1.387 g
Mass of empty crucible	20.286 g	salt: 1.175 g
Mass of crucible & contents before heating	21.673 g	water: 0.212 g
Mass of crucible & contents after heating	21.461 g	

a. Determine the formula of the hydrate.

$$\frac{1.175 \text{ g BaCl}_2}{208.28 \text{ g BaCl}_2} \times \frac{1 \text{ mol BaCl}_2}{1 \text{ mol BaCl}_2} = 0.00564 / 0.00564 = 1$$

$$\frac{0.212 \text{ g H}_2\text{O}}{18.016 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 0.01177 / 0.00564 = 2$$

- b. The formula of the hydrate =
- c. What is the name of the hydrate?
- d. What is the percent of water in the hydrate

$\text{BaCl}_2 \cdot 2 \text{H}_2\text{O}$
Barium chloride dihydrate

$$\frac{2(18.016)}{208.28 + (2 \times 18.016)} \times 100 \rightarrow \frac{36.032}{244.312} \times 100 = 14.75\%$$

Name: _____

Date: _____

Class Pd. _____

Review Material on THIS test !!

Law of Conservation of Mass <http://tinyurl.com/ofb9qqq>

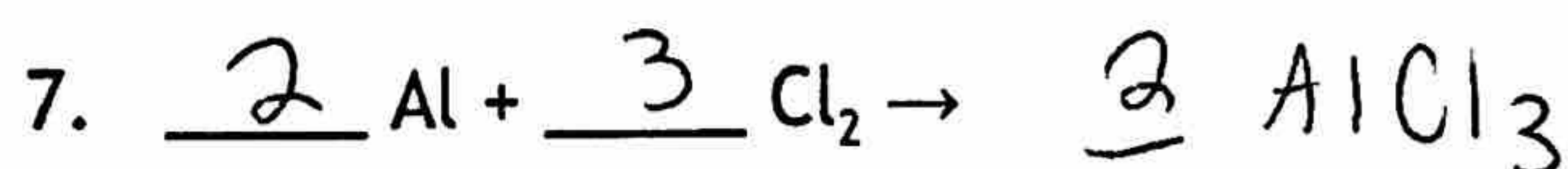
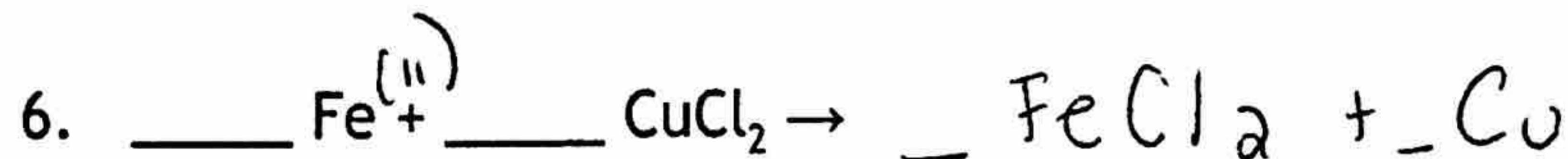
1. What is the Law of Conservation of Mass:

The law of conservation of mass tells us that mass cannot be created or destroyed

2. How is the Law of Conservation of Mass applied to written chemical reactions?

To obey the law of conservation of mass we balance chemical reaction to make sure there are the same # of each type of atom on both the reactant and product side.

Predicting Products of Chemical Reactions: <https://www.youtube.com/watch?v=P0jG2TjLyGI>

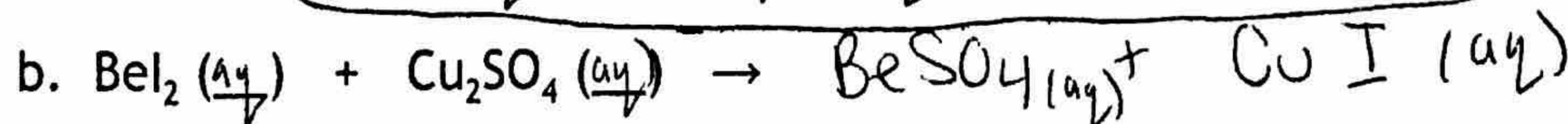
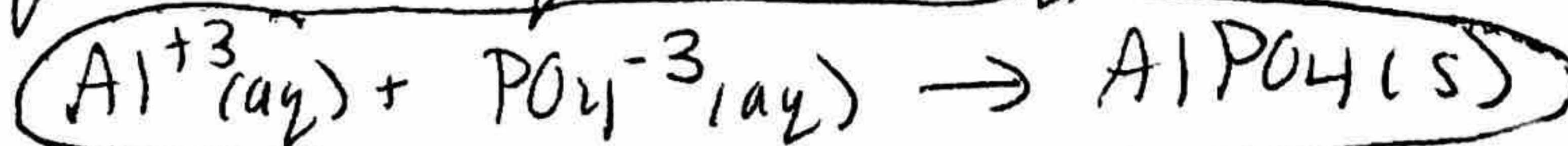
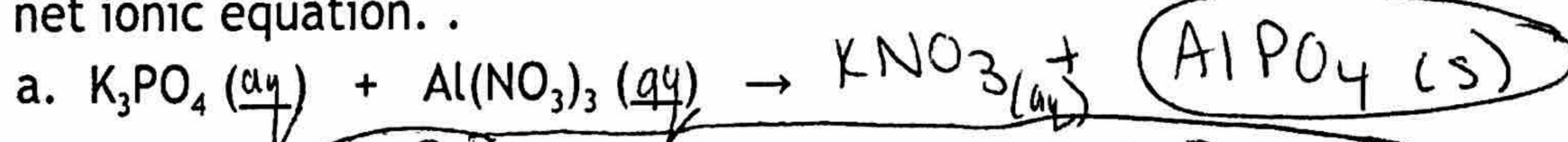


Net Ionic Equations <http://tinyurl.com/owf6f37>

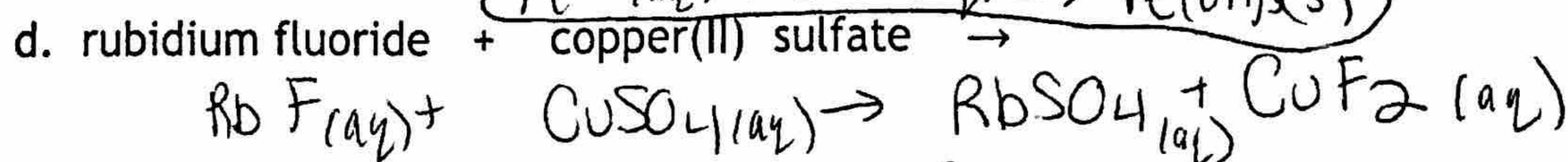
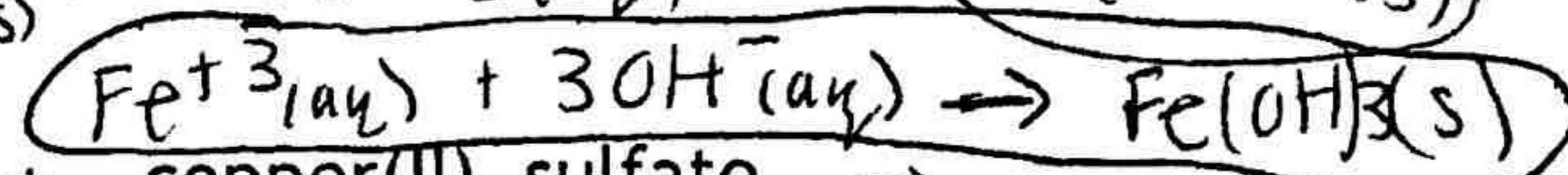
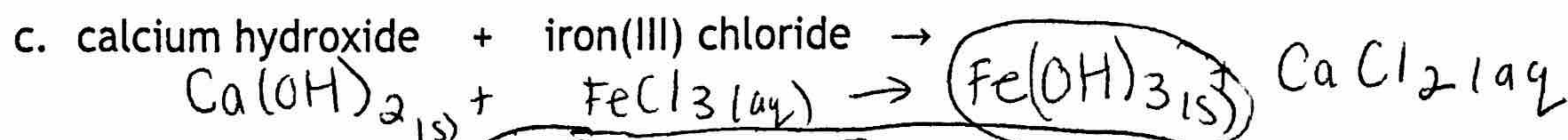
8. What 2 things must all net ionic equations have?

charges and states of matter! don't forget to balance ☺

9. For the reactions below predict the products, balance the reaction, circle the precipitate and write the net ionic equation. .



No Rxn



No Rxn