Practice Final Exam

1. Calculate the mass of silver atoms in a sphere that contains 35.26 mol% silver and the rest is copper. The sphere has a radius of 6.493 inches and has a density of 9.999 g mL^{-1}.

2. Write a **balanced chemical equation** for the double replacement reaction that occurs in aqueous solution, a **total ionic equation**, and a **net ionic equation**. (Solubility rules are on the back of the periodic table.)

a. lead(II) nitrate added to ammonium phosphate.

b. rubidium oxalate added to chromium(VI) acetate

3. Write a *Lewis electron dot structure* that follows the octet rule for PO_3^{3-}. Name the *electron pair and molecular geometries*. Is this a *polar* ion?

4. Calculate the percent yield of a reaction if 0.104 L of carbon dioxide at 1.023 bar and 21.5 °C reacts with 250.0 mL of a 0.0200 M solution of calcium hydroxide and produces 0.322 g of solid calcium carbonate. The other product of the reaction is liquid water.

5. Calcium fluoride phosphate ($Ca_{10}F_2(PO_4)_6$) reacts with sulfuric acid to produce calcium dihydrogen phosphate, calcium sulfate and hydrofluoric acid. If 100.0 g of calcium fluoride phosphate reacts with 200.0 mL of 0.8934 M sulfuric acid, how many grams of calcium sulfate will be produced and what will be the molarity of the calcium dihydrogen phosphate?

6. Write ***chemical formulas or names*** for the following (2 pts each)

    a. ammonium chloride

    b. Na_3N

    c. $HCN_{(aq)}$

    d. nitrogen tribromide

    e. carbon disulfide

    f. $Ni_3(PO_3)_2$

    g. lithium oxalate

    h. $Hg_2(N_3)_2$

7. Here are the heat constants for a substance:

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Normal melting point	-15.3 °C
Normal boiling point	156.7 °C
Molar heat of fusion	165 J/g
Molar heat of vaporization	2597 J/g
Specific heat of the solid	1.22 J/g °C
Specific heat of the liquid	0.867 J/g °C
Specific heat of the vapor	0.246 J/g °C

a. Calculate the quantity of heat required to heat 5.00 g of the substance from -10.0 °C to 50.0 °C.

b. Calculate the quantity of heat required to melt 100.0 g of the substance at its normal melting point.

c. Calculate the quantity of heat required to vaporize 200.0 g of the substance at its normal boiling point.

d. Calculate the amount of heat required to change 100.0 g of the solid substance at its -50.0 °C to the vapor at its 200.0 °C.

8.   *Balance* each of the following chemical reactions

_____ $C_4H_8O_2$ + _____ $O_2 \rightarrow$ _____ CO_2 + _____ H_2O

____H_3PO_4 + ____$(NH_4)_2MoO_4$ + ____HNO_3

$\rightarrow$ ____$(NH_4)_3PO_4 \cdot 12MoO_3$ + ____NH_4NO_3 + ____H_2O
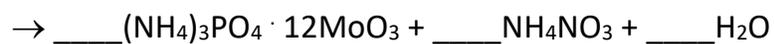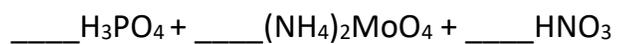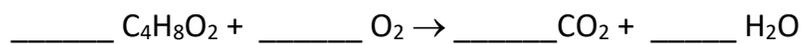
9. Write a balanced chemical equation for the reaction of sodium hydroxide reacting with phosphoric acid in a double replacement reaction. What would the *molarity of the sodium hydroxide* solution have to be if it requires 22.67 mL of the sodium hydroxide solution to completely neutralize 33.57 mL of 0.5678 M phosphoric acid solution?

10. The following reaction

$$Fe_2O_3 + 3\,C \rightarrow 2\,Fe + 3\,CO$$
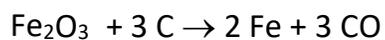
was started with 100.0 g of iron(III) oxide (formula weight = 159.7 g mol^{-1}) and 1.000 g of carbon. If the reaction produces 15.65 L of carbon monoxide gas at 42.3°C and 855.9 mmHg, what is the *percent yield*?