

Name: _____

Instructions: Follow the directions for each section. Be sure to use the proper number of significant figures and units wherever appropriate. You have the full class period to complete the exam.

Section 1: Answer each of the questions below.

1. (5 pts) Describe some of qualities of metals and non-metals. Give an example of both a metal and a non-metal.

2. (10 pts) An object has dimensions of 1.05cm x 2045mm x 3.4×10^{-2} m. It has a mass of 0.467kg. What is its density in g/cm^3 ?

3. (12 pts) Consider a 1.45×10^{-4} g sample of potassium permanganate.
 - a. What is the mass percentage of each element?
 - b. How many moles are present?
 - c. How many molecules are present?
 - d. How many oxygen atoms are present?

4. (8 points) What is the sodium ion concentration when 100.0mL of 0.250M sodium sulfate is added to 50.0mL of 0.15M sodium nitrate?
5. (15 points) A 1.505g sample containing iron(III)oxide reacted with excess nitric acid to make iron(III)nitrate and water. When the reaction was completed 3.751g of iron(III)nitrate was collected.
- What is the balanced chemical reaction?
 - What is the percent purity of the iron(III)oxide sample? (What is the percent of iron(III)oxide in that sample?)
 - What mass of water was generated in this reaction?

Section 2: Answer two of the following three questions. Be absolutely clear about which questions you are answering. Draw an 'X' through the question that you do not want graded.

6. (10 points) A compound contains only carbon, hydrogen and oxygen. Combustion of 10.68mg of that sample produces 16.01mg of carbon dioxide and 4.37mg of water. The molar mass of the compound is 176.1g/mole. What is the empirical and molecular formula for the compound?
7. (10 points) Caffeine has a molecular mass of 194.19g/mole. If it is 49.48%C, 5.19% H, 28.86% N, and the rest is oxygen, then what is the empirical and molecular formula for caffeine?
8. (10 points) What mass of sodium dichromate is needed to make 500.0mL of a 2.00×10^{-3} M solution of sodium dichromate. If 20.0mL of that solution is diluted to a final volume of 250.0mL, what is the new concentration?

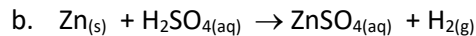
Section 3: Answer two of the following three questions. Be absolutely clear about which questions you are answering. Draw an 'X' through the question that you do not want graded.

9. (10 points) Predict the products, and write the balanced molecular and net ionic equations for both of the following combinations.

a. Ammonium sulfate + barium nitrate \rightarrow

b. Silver nitrate + sodium carbonate \rightarrow

10. (10 points) In the reactions below, determine the elements that are being oxidized and reduced, and the species that are the oxidizing agents and reducing agents.



11. (10 points) The density of gold is 19.42 g/cm^3 . Give the density in pounds per ft^3 .

NOTE: $1 \text{ kg} = 2.2046 \text{ pounds}$ and $1 \text{ in} = 2.54 \text{ cm}$. Both of these conversions are exact.

Constants and Givens

$$T_K = T_C + 273.15$$

$$T_C = \frac{5}{9}(T_F - 32)$$

Avogadro's Number = 6.022×10^{23}

Solubility Rules

| Ions | Statement | Exceptions |
|--|---|---|
| $\text{Li}^+, \text{Na}^+, \text{K}^+, \text{NH}_4^+$ | Group 1A and ammonium compounds are soluble | N/A |
| NO_3^- | Nitrates are soluble | N/A |
| $\text{Cl}^-, \text{Br}^-, \text{I}^-$ | Most chlorides, bromides, and iodides are soluble | $\text{Ag}^+, \text{Pb}^{2+}, \text{Hg}_2^{2+}$ |
| SO_4^{2-} | Most sulfates are soluble | $\text{Ca}^{2+}, \text{Sr}^{2+}, \text{Ba}^{2+}, \text{Ag}^+, \text{Pb}^{2+}, \text{Hg}_2^{2+}$ |
| $\text{S}^{2-}, \text{CO}_3^{2-}, \text{CrO}_4^{2-}, \text{PO}_4^{3-}$ | Only slightly insoluble or insoluble | Group 1 Cations |