Chemistry 202: Quiz #1

1. Which of the following has the largest molar mass?

   a) sodium nitrate
   b) sodium hydroxide
   c) sodium carbonate
   d) sodium bicarbonate
   e) sodium chloride

2. A metallic oxide has a molar mass of 94.2 g/mol. What is the identity of the metal?

   a) Na b) K c) Mg d) Fe e) More information is needed.

3. The hydrocarbon propane (C_3H_8) combusts with oxygen gas to form carbon dioxide and water. Suppose you mix equal masses of propane and oxygen to completion and obtain 100.0 g of carbon dioxide. Determine the **initial total mass** of the reaction mixture.

   a) 66.79 g b) 154.6 g c) 204.1 g d) 242.4 g e) 320.0 g

4. A 4.00-g sample of a binary compound reacts with oxygen gas to form 1.80 g of water. Assuming that water is the only hydrogen containing product, which of the following could be part of the compound?

   a) B b) C c) N d) O e) F

5. Under the influence of heat, potassium chlorate ($KClO_3$) decomposes to form potassium chloride and oxygen gas. You have a 15.00 g mixture of potassium chlorate and potassium chloride. After heating this mixture to completion, you record the mass to be 12.54 g. Determine the percent by mass of potassium chlorate in the original mixture.

   a) 16.40% b) 41.87% c) 62.81% d) 83.60% e) 94.21%

6. What volume of a 0.05*M* NaCl must be added to 250.0 mL of a 0.1000 *M* calcium chloride solution to make a solution that has a chloride ion concentration of 0.0800 *M*?

   a) 166.7 mL b) 250.0 mL c) 500.0 mL d) 1.000 L e) 1.1000 L

7. Mixing aqueous solutions of lead(II) nitrate and potassium iodide results in the formation of a beautiful yellow solid. Consider mixing 150.0 mL of 0.1250*M* of lead(II) nitrate with 150.0 mL of 0.1250*M* potassium iodide. Determine the concentration of the lead(II) ion after the reaction is complete.

   a) 0 *M* b) 0.01563*M* c) 0.03125 *M* d) 0.06250*M* e) 0.1250*M*

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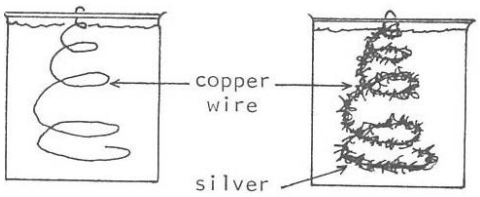
8. A classic chemistry demonstration is called "The Silver Tree" (we will see this in Chemistry 204 when we study redox reactions) in which copper metal reacts with silver nitrate and the products are silver metal and copper(II) nitrate. In this demonstration, a copper wire is coiled into a triangular tree shape and placed in an aqueous solution of silver nitrate. Over time, silver comes out of solution and is attached to the copper wire, so the "silver tree" is actually copper wire coated in silver metal:



You place a 10.00 g copper wire in 100.0 mL of a 1.000*M* $AgNO_3$ solution.

a. Assume you left this set-up overnight and the reaction went to completion. Determine the mass of the silver tree (assume all of the silver formed "sticks" to the tree). Show and explain all work.

b. Suppose instead you let the reaction occur for several minutes and carefully remove the silver tree from the solution so that no silver metal falls off of the copper wire. Suppose as well that you are able to allow all of the solution to drip from the tree into the beaker (so that the final volume is still 100.0 mL) until the silver tree is dry. You carefully measure the mass of the silver tree and find that it is 12.216 g.

For this problem:

- Determine the concentrations of Ag^+, Cu^{2+}, and NO_3^- (in units of molarity) left in the beaker.
- Determine the mass of the copper and the mass of silver on the tree.
- Show that mass is conserved in the reaction.

Show and explain all work.

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KEY:

MC: 1. c, 2. b, 3. d, 4. e, 5. b, 6. d, 7. c

8. See videos, lectures, and the textbook. For part a. **Mass of silver tree = 17.61 g**. For part b, **mass Cu: 9.075 g, mass Ag: 3.141 g**, **$[Ag^+] = 0.7089M$**, **$[Cu^{2+}] = 0.1456M$**, **$[NO_3^-] = 1.00M$**.