CHEM 101—General Chemistry
Exam #1
23 October 2002

Name _____

1. (10 points) Write the chemical formula of the compound resulting from the reaction of silicon with nitrogen.

2. (10 points) Give the correct name of the compound Cr_2S_5.

3. (10 points) Match the element with its classification in the Periodic Table:

   __ Bromine   a. alkaline earth metal

   __ Gold   b. alkali metal

   __ Krypton   c. halogen

   __ Sodium   d. noble gas

   __ Strontium   e. transition metal

4. (10 points) A "copper" penny is actually composed primarily of zinc: pennies are 97.3% zinc and only 2.7% copper. If a penny weighs 2.564 g, determine its volume.

   $\rho_{Cu} = 8.92$ g mL^{-1} $\rho_{Zn} = 7.14$ g mL^{-1}.

5. (10 points) A sulfur atom has a radius of 1.85 Å and a mass of 5.325 x 10^{-26} kg. What volume is occupied by 3.092 moles of sulfur. ($V_{sphere} = 4/3 \, \pi r^3$)

6. (20 points) Butane burns with oxygen to form CO_2 and H_2O by the reaction:

$$2 C_4H_{10} + 13 O_2 \rightarrow 8 CO_2 + 10 H_2O$$
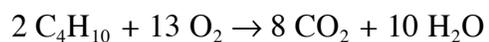
If the mass of carbon in the CO_2 product is 4.016 g, determine the mass of butane burned.

7. (20 points) Serotonin is a compound that conducts nerve impulses in the brain. Elemental analysis of serotonin shows that it contains 68.2% C by mass, 6.86% H by mass, 15.9% N by mass, and 9.08% O by mass. Determine the empirical formula of serotonin.

8. (20 points) 128.04 g copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$) is dissolved in 2.50 L water. Determine the concentration of the final solution. (Assume addition of solute does not change volume of water.)

9. (20 points) Concentrated sulfuric acid is 95.0% by weight H_2SO_4 in water. What volume of concentrated sulfuric acid must be diluted to make 5.00 L of solution that is 6 M H_2SO_4?

10. (20 points) A graduated cylinder weighs 45.80 g when empty. The cylinder initially contains 42.0 mL water. A piece of lead is added bringing the total volume to 67.4 mL and the total mass to 396.5 g. Determine the density of lead.

$\rho_{H2O} = 0.99707$ g mL^{-1}