CH 221 Practice Problem Set #1

This is a **practice problem set** and not the actual graded problem set that you will turn in for credit. Answers to each problem can be found at the end of this assignment.

Covering: Chapter One and Chapter Guide One

Important Tables and/or Constants: 1 cm³ = 1 mL, 273.15 (temperature)

- 1. Give the name of each of the following elements: C, U, Tc, Si, Ne, Ir
- 2. Give the symbol for each of the following elements: Argon, Potassium, Radon, Lead, Bismuth, Helium
- 3. In each of the following pairs, decide which is an element and which is a compound:
 - a. Cu(NH₃)₆Cl₂ and Cu
 - b. zinc and zinc(II) sulfide
 - c. carbon and methane
- 4. A chemist needs 2.00 g of a liquid compound with a density of 0.718 g/cm³. What volume of the compound is required?
- 5. Make the following temperature conversions:
 - a. 370. K to °C
 - b. 16 °C to K
 - c. $40 \degree C$ to K
- 6. A typical laboratory beaker has a volume of 250. mL. What is its volume in cubic centimeters? In liters? In cubic meters? In cubic decimeters?
- 7. Molecular distances are usually given in nanometers $(1 \text{ nm} = 1 \text{ x } 10^{-9} \text{ m})$ or in picometers $(1 \text{ pm} = 1 \text{ x } 10^{-12} \text{ m})$. However, the angstrom (Å) is sometimes used, where $1 \text{ Å} = 1 \text{ x } 10^{-10} \text{ m}$. If the distance between the Pt atom and the N atom in the cancer chemotherapy drug cisplatin is 1.97 Å, what is this distance in nanometers? In picometers?
- 8. The platinum-containing cancer drug cisplatin contains 65.0% platinum. If you have 1.53 g of the compound, what mass of platinum (in grams) is contained in this sample?
- 9. You can identify a metal by carefully determining its density (*d*). An unknown piece of metal, with a mass of 2.361 g, is 2.35 cm long, 1.34 cm wide, and 1.05 mm thick. Which of the following is this element?
 - a. Nickel, $d = 8.90 \text{ g/cm}^3$
 - b. Titanium, $d = 4.50 \text{ g/cm}^3$
 - c. Zinc, $d = 7.13 \text{ g/cm}^3$
 - d. Tin, $d = 7.23 \text{ g/cm}^3$
- 10. Carbon tetrachloride, CCl₄, a liquid compound, has a density of 1.58 g/cm³. If you place a piece of a plastic soda bottle (d = 1.37 g/cm³) and a piece of aluminum (d = 2.70 g/cm³) in liquid CCl₄, will the plastic and aluminum float or sink?
- 11. Give the number of significant figures in each of the following numbers:
 - a. 0.546 s
 - b. 1583.3 mL
 - c. 9.10 x 10-31 g
 - d. 1.0 x 1021 atoms
 - e. 3650. km

12. Carry out the following calculation and report the answer to the correct number of significant

(22.71-2.3)	9.322 $\times 10^3$
	103.10 - 92.2

figures.

- 13. The aluminum in a package containing 75 ft² of kitchen foil weighs approximately 12 ounces. Aluminum has a density of 2.70 g/cm³. What is the approximate thickness of the aluminum foil in millimeters? (1 oz = 28.4 g)
- 14. In July 1983, an Air Canada Boeing 767 ran out of fuel over central Canada on a trip from Montreal to Edmonton. (The plane glided safely to a landing at an abandoned airstrip.) The pilots knew that 22,300 kg of fuel were required for the trip, and they knew that 7682 L of fuel were already in the tank. The ground crew added 4916 L of fuel, which was only about one fifth of what was required. The crew members used a factor of 1.77 for the fuel density—the problem is that 1.77 has units of *pounds* per liter and not *kilograms* per liter! What is the fuel density in units of kg/L? What mass of fuel should have been loaded? (1 lb = 453.6 g.)
- 15. About two centuries ago, Benjamin Franklin showed that 1 teaspoon of oil would cover about 0.50 acre of still water. If you know that 1.0 x 10^4 m² = 2.47 acres, and that there is approximately 5.0 cm³ in a teaspoon, what is the thickness of the layer of oil?
- 16. The anesthetic procaine hydrochloride is often used to deaden pain during dental surgery. The compound is packaged as a 10.% solution (by mass; d = 1.0 g/mL) in water. If your dentist injects 0.50 mL of the solution, what mass of procaine hydrochloride (in milligrams) is injected?
- 17. The solder once used by plumbers to fasten copper pipes together consists of 67% lead and 33% tin by mass. What is the mass of lead in a 250 g block of solder?
- 18. Give the number of significant figures in each of the following numbers:
 - a. 0.00546 g
 - b. 1600 mL
 - c. 2.300 x 10⁻⁴ g
 - d. 2.34 x 10⁹ atoms
 - e. 400. km
- 19. When you heat popcorn, it pops because it loses water explosively. Assume a kernel of corn with a mass of 0.125 g has a mass of only 0.106 g after popping.
 - a. What percentage of its mass did the kernel lose on popping?
 - b. Popcorn is sold by the pound in the United States. Using 0.125 g as the average mass of a popcorn kernel, how many kernels are there in a pound of popcorn? [*helpful conversion:* 1 lb = 453.6 g]
- 20. The fluoridation of city water supplies has been practiced in the United States in many major cities for several decades. It is accomplished by continuously adding sodium fluoride to water as it comes from a reservoir. Assume you live in a medium-sized city of 150,000 people and that 660 L (170 gal) of water is consumed per person per day. What mass of sodium fluoride (in kilograms) must be added to the water supply each year (365 days) to have the required fluoride concentration of 1 ppm (part per million) that is, 1 kilogram of fluoride per 1 million kilograms of water? (Sodium fluoride is 45.0% fluoride, and water has a density of 1.00 g/cm³.)

Answers to the Practice Problem Set:

- 1. Carbon, Uranium, Technetium, Silicon, Neon, Iridium
- 2. Ar, K, Rn, Pb, Bi, He
- 3. a) compound, element b) element, compound c) element, compound
- 4. 2.79 mL
- 5. a) 97 °C b) 289 K c) 310 K
- 6. 250 cm^3 , 0.25 L, $2.5 \text{ x} 10^{-4} \text{ m}^3$, 0.25 dm^3
- 7. 0.197 nm, 197 pm
- 8. 0.995 g Pt
- 9. zinc
- 10. The plastic will float, the metal will sink.
- 11. a) 3 b) 5 c) 3 d) 2 e) 4
- $12.\,1.75 \ge 10^4$
- 13.1.8 x 10⁻² mm
- 14.0.803 kg/L; 12,200 kg (15,200 L) additional fuel needed
- 15.2.5 x 10⁻⁷ cm
- 16. 50. mg procaine hydrochloride
- 17. 170 g Pb
- 18. a. 3 b. 2 c. 4 d. 3 e. 3
- 19. a. 15% (15.2% depending on method used) b. 3630 kernels
- 20. 8.0 x 10^4 kg NaF per year