

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: $1 \text{ cm}^3 = 1 \text{ mL}$, **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. $\text{Cu}(\text{NH}_3)_6\text{Cl}_2$ 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/cm^3 . What volume of the compound is required?
5. Make the following temperature conversions:
 - a. 370. K to $^\circ\text{C}$
 - b. $16 \text{ }^\circ\text{C}$ to K
 - c. $40 \text{ }^\circ\text{C}$ 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 ($1 \text{ nm} = 1 \times 10^{-9} \text{ m}$) or in picometers ($1 \text{ pm} = 1 \times 10^{-12} \text{ m}$). However, the angstrom (\AA) is sometimes used, where $1 \text{ \AA} = 1 \times 10^{-10} \text{ m}$. If the distance between the Pt atom and the N atom in the cancer chemotherapy drug cisplatin is 1.97 \AA , 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, CCl_4 , a liquid compound, has a density of 1.58 g/cm^3 . If you place a piece of a plastic soda bottle ($d = 1.37 \text{ g/cm}^3$) and a piece of aluminum ($d = 2.70 \text{ g/cm}^3$) in liquid CCl_4 , 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. $9.10 \times 10^{-31} \text{ g}$
 - d. $1.0 \times 10^{21} \text{ atoms}$
 - e. 3650. km

12. Carry out the following calculation and report the answer to the correct number of significant figures.
- $$(22.71 - 2.3) \left[\frac{9.322 \times 10^3}{103.10 - 92.2} \right]$$
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 × 10⁴ 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?

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 cm³, 0.25 L, 2.5 x 10⁻⁴ m³, 0.25 dm³
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 x 10⁴
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