# AP Chemistry

## Chapter 1 Matter and Measurement: Practice Problems

Name: _____ Date: _____ Period: ___

1. Which of the following describe a chemical change, and which a physical change?
   a. Sheep are sheared and the wool is spun into yarn.
   b. A cake is baked from a mixture of flour, baking powder, sugar, eggs, shortening, and milk.
   c. Milk turns sour when left out of the refrigerator for many hours.
   d. Silkworms feed on mulberry leaves and produce silk.
   e. An overgrown lawn is manicured by mowing it with a lawn mower.

2. Which of the following mixtures are homogeneous and which are heterogeneous?
   a. gasoline b. raisin pudding c. Italian salad dressing d. a cola drink

3. During the 1840s and 1850s, Carl Wunderlich first recognized fever as a symptom of disease and found that the average of a large number of human temperature measurements was 37°C. What is the equivalent Fahrenheit temperature? Modern measurements show the average normal body temperature to be 98.2°F. What is the equivalent Celsius temperature?

4. The furlong is a unit used in horse racing, and the units; chain and link are used in surveying land. There are 8 furlongs in 1 mi, 10 chains in 1 furlong, and 100 links in 1 chain. Calculate the length of 1 link, in inches. (1 mi = 5280 ft)

5. In its exploration of the asteroid Eros, the spacecraft NEAR Shoemaker entered an orbit at about 50km from the center of Eros. In this orbit, the spacecraft had an orbital velocity of about 3.0m/s. What is this velocity in kilometers per hour? In feet per minute?

6. How many significant figures are there in each of the following measured quantities?
   a. 8008m b. 0.00075s c. 0.049300g d. $6.02 \times 10^5$m
   e. $4.200 \times 10^5$s f. 0.1050°C

7. Perform the indicated operations, and give answers with the proper number of significant figures.
   a. 36.5m – 2.16m + 3.452m
   b. 151g + 4.16g – 0.0220g
   c. 15.44mL – 9.1mL + 105mL
   d. 12.52cm + 5.1cm – 3.18cm – 12.02cm

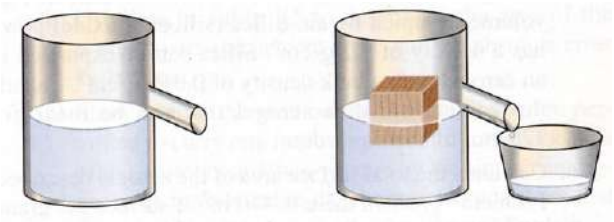
8. Perform the indicated operations, and give answers with the proper number of significant figures.
   a. 73.0mm x 1.340mm x (25.31mm – 1.6mm)
   b. (33.58cm x 1.007cm) / 0.00705g
   c. (418.7mm x 31.8mm) / (19.27mg – 18.98mg)
   d. $(2.023\text{g} - 1.8 \times 10^{-3}\text{g}) / 1.05 \times 10^4$mL

9. A 5.79mg piece of gold ($d = 19.3\text{g/cm}^3$) is hammered into gold leaf of uniform thickness with an area of $44.6\text{cm}^2$. What is the thickness of the gold leaf?

10. A box with a square base measuring 0.80m on each side and having a height of 1.20m is filled with 3.2kg of expanded polystyrene packing material. What is the bulk density, in grams per cubic centimeter, of the packing material? (the bulk density includes the air between the pieces of polystyrene foam.)

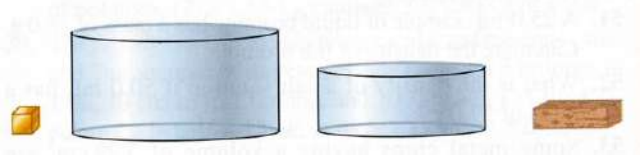
11. Which of the following items would be most difficult to lift onto the back of a pickup truck: (1) a 100-lb bag of potatoes, (2) a 15-gal plastic bottle filled with water, (3) a 3.0-L flask filled with mercury ($d = 13.6 g/cm^3$)?

12. The container pictured below on the left is filled with water at 20°C, just to the overflow spout. A cube of wood with edges of 1.0in is floated on the water, and 10.8mL of water is collected as shown on the right. Calculate the density of the wood, and express your result with the maximum number of significant figures permitted in this experiment.



13. Aerogels consist of a solid framework with most of their volume occupied by air. Silica (silicon dioxide) powder has a density of $2.2 g/cm^3$. Silica can be expanded into an aerogel with a bulk density of $0.015 g/cm^3$. Calculate the volume of silica aerogel that can be made form $125 cm^3$ of silica powder.

14. The two vessels shown are completely filled with water. A brass cube 2.0cm on edge is gently placed on the water in the vessel on the left, and a rectangular block of cork 5.0cm x 4.0cm x 2.0cm on the water in the vessel on the right. The density of brass is $8.40 g/cm^3$ and that of cork is $0.22 g/cm^3$. From which vessel will the greater volume of water overflow?



15. On July 23, 1983, Air Canada Flight 143 required 22,300kg of jet fuel to fly from Montreal to Edmonton. The density of jet fuel is 0.803g/mL, or 1.77lb/L. The plane had 7682L of fuel on board in Montreal. The ground crew there multiplied the 7682L by the factor 1.77 (without units) and concluded that they needed an additional 8703kg or 4916L of fuel for the trip to Edmonton. They added 5000L. On its flight, the plane ran out of fuel and safely crash-landed near Winnipeg, hundreds of kilometers short of its destination. What mistake did the ground crew make? How much fuel should they have added before takeoff?

16. In an article on contamination near an abandoned lead smelter, a major metropolitan newspaper stated that "the federal government has reduced the amount of lead that is considered safe by a factor of four. Now, a blood level of as little as 10 milligrams per 10 liters is enough to call for "prompt intervention." The actual maximum safe level is 10 micrograms per deciliter (10μg/dL). Use unit conversions to show whether or not the two quantities are the same. If not, how might the reporter have come up with the "10 milligrams per 10 liters" value?