Extra Practice: Dimensional Analysis
-ordered from simpler to more difficult-

1. A farmer trades 2 cows for 7 goats. At this rate, how many goats can he get for 10 cows?

2. One mole of oxygen contains 6.02×10^{23} molecules. How many oxygen molecules are in 5.55 moles of oxygen gas?

3. One molecule of sulfur contains 8 sulfur atoms. How many sulfur molecules can be made from 104 sulfur atoms?

4. If one mole of gas has a volume of 22.4 L, how many moles are there in 25.0 L of gas?

5. A quiet sound exerts a pressure of 4.00×10^{-8} kPa (kPa = kilopascals, a pressure unit). What is this pressure measured in atmospheres if 1 atmosphere = 101.3 kPa?

6. A large nugget of naturally occurring silver metal has a mass of 3.20×10^{4} troy ounces. What is the mass in kilograms if 1 troy ounce is equivalent to 0.0311 kg?

7. A reaction is essentially complete in 5.0×10^{-4} s. If one millisecond (1ms) equals 10^{-3} s, how many milliseconds does the reaction take?

8. If 1 mole of octane produces 5450 kJ of heat when burned, how many moles of octane must be burned to produce 15,100 kJ of heat?

9. Our fingers can detect movement of 0.05 micron. If 1000 microns is 1 mm, what is this movement expressed in millimeters (mm)?

10. If concentrated hydrochloric acid has a concentration of 11.7 moles/L, what volume (in L) of hydrochloric acid is required in order to have 0.0358 mole of hydrochloric acid?

11. An old barometer hanging on the wall of a mountain hut has a reading of 27.0 inches of mercury. 1 inch of mercury equals 0.0334 atm ("atmospheres") and 1 atm = 101.3 kPa ("kilopascals"), what is the pressure reading of the barometer in kPa?

12. Sugar costs $0.98/kg. 1 metric ton = 1000 kg. How many metric tons ("t") of sugar can you buy for $1550?

13. Solve the following using the fact that beakers cost $8.40 per dozen.
   a. Harry drops 3 dozen beakers. How much will Harry's chemistry teacher charge him?

   b. Harry breaks another batch of beakers and is charged $13.30, what was the number of beakers that he broke? (give the actual number, not how many dozen!)

14. In a primitive society, the following exchange rates exist:
1 fot = 5 vum,   2 sop = 3 tuz,   4 bef = 3 tuz,   9 fot = 2 bef.
(a) A man has 4.0 sop and wants to convert all of it into vum. How many vum will he get?

(b) A woman needs to pay for some food costing 12.0 sop. She has only fot in her purse. How many fot should she pay?

15. How many centimeters are there in 5.00 yards?

16. Light travels at a rate of 3.00×10^8 m/s. It takes light 8.3 min to travel from the surface of the sun to the earth. What is the distance from the sun to the earth in kilometers?

17. If 1 L of granite has a mass of 5.50 kg, what is the mass in grams of 5.00 mL of granite?

18. Barite is an additive to drilling mud. Its density is 4.48 g/cm^3. What is the volume in m^3 of a 9.20 kg sample of barite?

19. Your parents are buying you a used car. Gas mileage is a major concern, as you will be buying the gas with your own money. Which car will you choose: the white domestic that gets 31 miles to the gallon, or the red import that gets 15 kilometers to the liter?

20. Typically, the thickest hair on the human body is a male moustache. The hair is not tubular, but rather strap-like, with a maximum thickness of 0.30 mm.

    a. What is this thickness in micrometers?

    b. What is this thickness in kilometers?