

*Directions: Answer all questions on a separate sheet of paper. Show all work for calculations and circle your final answer (written in scientific notation). SHOW UNITS, e.g. m, g, cm<sup>3</sup>, L, etc. The key to success in chemistry is learning how to keep track of units and treating them algebraically. For example,  $cm \times cm = cm^2$ , and  $cm \div cm = 1$ .*

1. The mass of an empty fish tank is 10.0kg, and it measures 1.00m  $\times$  0.50m  $\times$  0.30m. What is the mass of the fish tank after you fill it with water?
2. Oxygen and Hydrogen react to make water:  $2H_2 + O_2 \rightarrow 2H_2O$   
If 70.44g of oxygen reacts with Hydrogen and produces 79.24g of water, then how many grams of Oxygen and Hydrogen are in 150ml of water?
3. If 1.000L of methanol (CH<sub>4</sub>O) is added to 1.000L of water, each measured separately, the final volume is 1945ml at 20°C. The density of methanol is  $7.92 \times 10^{-1} \text{ g/cm}^3$ . What is the density of the new mixture in  $\text{kg/m}^3$ ?
4. The density of copper is  $8.96\text{g/cm}^3$ . What is the mass of a copper cylinder with a diameter of 2.50cm and a length of 8.80cm?
5. 70/30 brass is a mixture of copper and zinc, so in a 100.0g sample 70.0g is copper and 30.0g is zinc. Approximately 2.35dL of 70/30 brass is needed to cast a trumpet. If the density of 70/30 brass is  $8.530\text{g/cm}^3$ , then what is the mass of zinc in the instrument?
6. How many zinc atoms are in 257.3 grams of zinc?
7. What is the mass (in kilograms) of a block of iron if it is made of  $7.55 \times 10^{28}$  iron atoms?
8. The density of helium gas is 0.179g/L at standard temperature and pressure. How many He atoms are in one cubic meter of helium gas?
9.  $2.5 \times 10^{25}$  copper atoms are stretched into the shape of a wire. How long is the wire if its diameter is 0.64mm?
10. If you counted by 1 every second, then how many years would it take to count to a mole?  
(Avogadro's number =  $6.02 \times 10^{23}$  of anything)