HChem Problems: Density and related problem-solving

Use dimensional analysis to solve the following problems on loose-leaf.
- ✓ Be sure to use unit labels throughout the problem.
- ✓ You should round off answers to the correct number of significant figures – consider only measured values, not well-known definitions, "constants", or facts.
- ✓ If you are having difficulty with unit conversions, refer to your notes for prefix definitions.
- ✓ **Remember that "per" means "equals", and that densities are expressed in terms of 1 cm^3 or 1 ml. Therefore, a density of 0.680 g/cm^3 should be thought of as "0.680 g = 1 cm^3".**
  When you use a density term as a conversion factor, write it to have a true numerator and a true denominator. You need to think of the "/" as "over". So, for a density of 0.680g/cm^3…

  …write $\dfrac{\textbf{0.680 g}}{\textbf{1 cm}^3}$ or $\dfrac{\textbf{1 cm}^3}{\textbf{0.680 g}}$ (depending on what you want to cancel)

1. An unknown liquid has a mass of 30.6 g and a volume of 52.3 ml. What is the density of the liquid?

2.   The density of gold is 19.3 g/cm^3. What is the mass of 11.3 cm^3 of gold?.

3. A chain bracelet is found. It looks as though it is made either of gold or of copper. The bracelet has a mass of 45.00 g. When it is submerged into a graduated cylinder of water, the volume of the water rises from 9.2 ml to 11.7 ml. Is the bracelet more likely to be gold or copper? Explain

4. The density of silver is 10.5 g/cm^3. What is the volume of a piece of silver having a mass of 31.50 g?

5. The density of ice is 0.917 g/cm^3. What is the volume of 52.35 g of ice?
  (Why does ice float on water?)

6.   A cube of aluminum has a mass of 42.18 grams. The density of aluminum is 2.7 g/cm^3. Determine the volume of the cube. What is the length of each side?

7. The density of gold is 19.3 g/cm^3. The density of sand is 2.5 g/cm^3. What volume of sand would have the same mass as a gold icon with a volume of 1.0 dm^3? (If Indiana Jones had figured this out, he might have gotten away with the gold statue after all. But then we wouldn't have had the pleasure of Raiders of the Lost Ark!)

8. The density of gold is 19.3 g/cm^3.   196.97 grams of gold contain 6.02 x 10^{23} atoms of gold. (Chemists call this quantity "1 mole".) What is the mass of 1 atom of gold?   What is the volume of 1 atom of gold?

9. What is the mass, in kilograms, of 14.0 L of gasoline? The density of gasoline is 0.680 g/cm^3.