Parts Per Million Problems

$$parts\_per\_million = \frac{grams\_solute}{grams\_solution} \times 1{,}000{,}000$$

1. Arsenic is toxic in very small amounts. Because it is in the same family as phosphorus, it interferes with ATP metabolism, nucleic acid synthesis, and a number of other processes. The EPA considers drinking water containing arsenic above 0.010 ppm to be unfit to drink. Currently 56 million people in 25 states drink water with concentrations of As above this level!

   a) Given tap water at the 0.010 ppm limit, how much arsenic would be in a 1 kg sample of tap water?
   b) A sample of well water contains 0.005 grams in 3500 g of tap water. Is this water fit to drink?

2. Dioxin is a non-polar compound that is highly toxic. The EPA has set a limit of 0.000005 ppm in drinking water. A sample of water contains 1 mg of dioxin in 10 kg of solution. Is the water safe to drink?

Concentration of Dilute Solutions: Parts per Million

Parts per Million = (grams solute / grams solution) x 1,000,000

1. Barium Sulfate is listed as insoluble on the solubility tables. It does, however, dissolve to a small extent. Its solubility at 50°C is 0.00034 g in 100 g of water.
   a) calculate the molarity of the solution. Assume that 100 g = 100 ml solution.
   b) express the concentration in parts per million
   c) Why would ppm be a better way to express concentration than molarity in this case?

2. Arsenic is a poisonous element that contaminates drinking water in some industrial sites, and occurs naturally in bedrock in some places, most notably in Bangladesh. A level of 0.06 grams in 1000g of water will cause illness in a short period of time. What is the concentration in ppm?

3. General Electric will be dredging the Hudson River to remove PCBs (Polychlorinated Biphenyls) from the bottom of the river. Concentrations in river mud can exceed 0.005 grams in 100 g of water. What is the concentration in ppm?

4. The solubility of AgCl in water is 0.8 ppm at 25 °C. How many grams would be contained in a 100 g of a saturated solution of silver chloride?