

# AP Chemistry

Solution Concentrations: % solutions, molarity, ppm, ppb

How are percent solutions calculated?

State the molarity formula:

New information:

$$\text{ppm} = \frac{\text{mass of component in soln}}{\text{total mass of solution}} \times 10^6 \quad \text{or mg/kg}$$

$$\text{ppb} = \frac{\text{mass of component in soln}}{\text{total mass of solution}} \times 10^9 \quad \text{or } \mu\text{g/kg}$$

Concentrations of toxins or environmental contaminants are often reported in ppm or ppb

1. A solution is prepared by dissolving 35.0 g of cesium chloride (CsCl) in 90.0 g water. Calculate the mass % of cesium chloride in the solution.
2. A solution is prepared by dissolving 125 g sucrose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>) in 135 g H<sub>2</sub>O. Calculate the mass % of sucrose in the solution.
3. How many grams of K<sub>2</sub>SO<sub>4</sub> would you need to prepare 1300 g of 7.0% K<sub>2</sub>SO<sub>4</sub> solution?
4. What is the molarity of a solution if 0.726 g of Mg(NO<sub>3</sub>)<sub>2</sub> are dissolved in water and brought to a final volume of 175 mL?

5. A sulfuric acid solution containing 316.9 g of  $\text{H}_2\text{SO}_4$  per liter of solution has a density of  $0.978 \text{ g/cm}^3$ . Calculate the mass percentage, the mole fraction and the molarity of  $\text{H}_2\text{SO}_4$  in this solution.
  
6. Commercial concentrated aqueous ammonia is 28%  $\text{NH}_3$  by mass and has a density of  $0.90 \text{ g/mL}$ . What is the molarity of this solution?
  
7. Helium gas,  $2.5 \times 10^{-4} \text{ g}$ , is dissolved in  $200.0 \text{ g}$  of water. Express this concentration in parts per million.
  
8. A  $350.0 \text{ g}$  sample of drinking water is found to contain  $41.2 \text{ mg}$   $\text{Pb}$ . What is this concentration in parts per million?
  
9. A solution of lead sulfate ( $\text{PbSO}_4$ ) contains  $0.305 \text{ g}$  of lead sulfate in  $500.0 \text{ g}$  of water. What is this concentration in ppb?
  
10. A  $850.0 \text{ g}$  sample of sea water is found to contain  $8.1 \times 10^{-3} \text{ g}$   $\text{Zn}$ . Express this concentration in ppb.