Concentration

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Concentration = the amount of solute compared to solvent or solution

Amount of solute – mass measured in grams



Amount of solvent

Mass measured in grams

or

Volume measured in milliliters or liters

Qualitative Descriptions

Concentrated - large amount of solute compared to the amount of solvent

Example - concentrated orange juice

 Dilute - small amount of solute compared to the amount of solvent

O Example - weak coffee

Quantitative Descriptions

Concentration

 $Concentration = \frac{Mass of Solute (g)}{Volume of Solvent or Solution (mL)}$

Percent by Mass

Percent mass =

$\frac{Mass (Solute)}{Mass (Solution)} \times 100\%$

Percent by Volume

 $Percent volume = \frac{Volume (Solute)}{Volume (Solution)} \times 100\%$

Parts per Million

 $ppm = \frac{Mass(Solute)}{Mass(Solution)} \times 1,000,000 ppm$

Concentration Problems

What is the concentration of salt in a 20.0 mL solution containing 18.3 g of dissolved NaCl?

• **Procedure:** Divide the mass of the solute by the volume of the solvent or the solution.

18.3 g

 $= 0.915 \, \text{s/ml}$

Concentration

Percent by Mass Problems

What is the percent by mass of ethanol in a solution containing 2.3 g of ethanol (C₂H₅OH) dissolved in 10.0 g of water?

Step 1: Find the mass of the solution
10.0 g + 2.3 g = 12.3 g

Percent mass

• Step 2: Divide the mass of the solute by the mass of the solution and multiply by 100 %

× 100% = 19%

Percent by Volume Problems

What is the percent by volume of glycerine in a solution containing 18.2 mL of glycerine ($C_3H_6O_3$) dissolved in 85.0 mL of water?

Step 1: Find the volume of the solution
18.2 mL + 85.0 mL = 103.2 mL

Percent volume

• Step 2: Divide the volume of the solute by the volume of the solution and multiply by 100 %

18.2 mL 103.2 mL

× 100% = 17.6 %

Parts per Million Problems

About 0.0035 g of hydrogen sulfide are dissolved in 10.0 g of water. Express this in parts per million.

Step 1: Find the mass of the solution
10.0 g + 0.0035 g = 10.0035 g

0.0035 g

Step 2: Divide the mass of the solute by the mass of the solution and multiply by 1,000,000 ppm.

× 1,000,000 ppm = 350 ppm