

Solutions

a homogeneous mixture

solute - substance that gets dissolved

solvent - substance that does the dissolving

Ex) Coffee

solute - coffee
solvent - water

Ex) Sugar H₂O

solute - sugar
solvent - water

Ex) Stainless Steel

solute - carbon
solvent - iron

- Factors that Affect How Fast Dissolution Occurs

1) Temperature

(A) For solid solutes ↑ Temp ↑ rate

(B) For gas solute ↓ Temp ↑ rate

2) Stirring ↑ rate by increasing contact b/w solute & solvent

3) Surface Area ↑ surface area ↑ rate



Quantifying Solution Concentration

Molarity (M)

$$\text{Molarity} = \frac{\text{moles of solute (mol)}}{\text{Volume of solution (L)}}$$

$$M = \frac{n}{V}$$

Ex) what is the molarity of a solution made from 2.00 mol of NaOH dissolved in 500. mL of solution?

$$M = ?$$

$$n = 2.00 \text{ mol}$$

$$V = 500. \text{ mL} = .500 \text{ L}$$

$$M = \frac{2.00 \text{ mol}}{500 \text{ L}} = 4.00 \text{ mol/L}$$

or
4.00 M

Ex) what is the molarity when 60.0 g of NaOH dissolved in .500 L of solution?

$$M = ?$$

$$n = \frac{60.0 \text{ g}}{40.00 \text{ g/mol}} = 1.50 \text{ mol}$$

$$V = .500 \text{ L}$$

$$M = \frac{1.50 \text{ mol}}{.500 \text{ L}}$$

$$M = 3.00 \text{ mol/L or } 3.00 \text{ M}$$

Ex) How many moles of sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) were dissolved to make .750 L of a .8000 molar solution? How many grams is that?

$$M = .8000 \text{ mol/L}$$

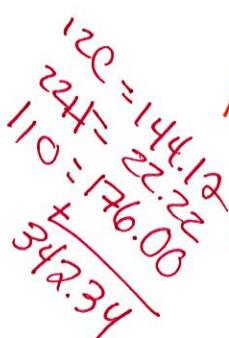
$$n = ?$$

$$V = .750 \text{ L}$$

$$n = M \cdot V = .8000 \frac{\text{mol}}{\text{L}} \times .750 \text{ L}$$

$$n = .600 \text{ mol}$$

$$m = \frac{.600 \text{ mol}}{342.34 \text{ g/mol}} = 205 \text{ g}$$



Molarity Problems Worksheet

$$M = \frac{n}{V}$$

- n = # moles
- V must be in liters (change if necessary)
- Use M or mol/L as unit for molarity

1. What is the molarity of a 0.30 liter solution containing 0.50 moles of NaCl?
2. Calculate the molarity of 0.289 moles of FeCl₃ dissolved in 120 ml of solution?
3. If a 0.075 liter solution contains 0.0877 moles of CuCO₄, what is the molarity?
4. How many moles of NaCl are present in 600. ml a 1.55 M NaCl solution?
5. How many moles of H₂SO₄ are present in 1.63 liters of a 0.954 M solution?
6. How many liters of solution are needed to make a 1.66 M solution containing 2.11 moles of KMnO₄?
7. What volume of a 0.25 M solution can be made using 0.55 moles of Ca(OH)₂?

For all of the problems below you will need to do a mole-mass conversion. Each problem will involve two steps.