

SOLUTION CONCENTRATION	MOLARITY (M)
DEFINITION	Molarity is the number of moles of solute per liter of solution. This unit of solution strength is often referred to as " molar ," or just capital M . The molarity of a solution is calculated by taking the moles of solute and dividing by the liters of solution.
EQUATIONS	$\text{Molarity (M)} = \frac{\text{Moles of Solute}}{\text{Liters of Solution}}$ <p>In many problems the amount of solvent will be given in grams so another useful equation in solving molarity problems is:</p> $\text{grams} = (\text{M})(\text{GMM})(\text{V})$ <p>M = (molarity) in moles/Liter GMM = (molecular mass) in grams/mol V = (volume) in Liters of solution grams = (mass of solute) in grams</p>
GUIDELINES	Remember that the letter M means moles/liter. Use a common set of units in problem solving. The equations above can be solved for any of the variable through algebraic rearrangement. Four (4) variables mean you can write four equations etc.
EXAMPLES	<p>1. What is the molarity of a solution containing 1.4 moles of acetic acid ($\text{HC}_2\text{H}_3\text{O}_2$) in 250 mL of solution?</p> $M = \frac{\text{moles of solute}}{\text{liters of solution}}$ $M = \frac{1.4 \text{ moles}}{0.250 \text{ L}} = 5.6 \text{ M}$ <p>2. What is the molarity of a solution made by dissolving 2.00 g of potassium chlorate (KClO_3) in enough water to make 150 mL of solution?</p> $\text{grams} = (\text{M})(\text{GMM})(\text{V})$ $M = \frac{\text{grams}}{(\text{GMM})(\text{V})}$ $M = \frac{2.00 \text{ g}}{(122.5 \frac{\text{g}}{\text{mole}})(0.150 \text{ L})} = 0.11 \text{ M}$ <p>3. How many grams of potassium hydroxide are required to prepare 600 mL of a 0.450 M KOH solution?</p> $\text{grams} = (\text{M})(\text{GMM})(\text{V})$ $\text{grams} = (0.450 \frac{\text{moles}}{\text{L}})(56.1 \frac{\text{g}}{\text{mole}})(0.600 \text{ L}) = 15.15 \text{ g}$

A. Calculate the molarity of the following solutions:

_____ 1. 48 g LiOH dissolved in 1.0 L of solution.

_____ 2. 180 g MgSO₄ dissolved in 1.5 L of solution.

_____ 3. 400.5 g AlCl₃ dissolved in 750 mL of solution.

_____ 4. 490 g H₂SO₄ dissolved in 1500 mL of solution.

_____ 5. 140 g KOH dissolved in 2.5 L of solution

_____ 6. 132 g (NH₄)₂SO₄ dissolved in 250 mL of solution.

_____ 7. 94.5 g Zn(NO₃)₂ dissolved in 1.0 L of solution.

_____ 8. 2.0 g NaOH dissolved in 500 mL of solution.

_____ 9. 24.0 g HC₂H₃O₂ dissolved in 2.0 L of solution.

_____ 10. 6.5 g KCN dissolved in 300 mL of solution.

B. Determine the number of moles of solute present in:

_____ 11. 500 mL of a 1.5 M solution

_____ 12. 2.5 L of a .5 M solution

_____ 13. 15.0 cm³ of a 5 M solution.

_____ 14. 50.0 mL of a .750 M solution.

_____ 15. 1.25 dm³ of a 1.0 M solution.

C. Calculate the number of grams necessary to prepare the following solutions:

_____ 16. 1 L of 2.0 M NaOH

_____ 17. 500 mL of 0.25 M KOH

_____ 18. 250 cm³ of 0.5 M H₂SO₄

_____ 19. 5.0 L of 1.0 M hydrochloric acid

_____ 20. 1.5 L of 0.1 M nitric acid.