

Exercise 12.3b

Molarity & Molality

Name: _____

Date: _____ Per: _____

To find the molarity divide the number of moles of solute by the volume of solution in liters:

$$\frac{\text{moles solute}}{\text{volume solution (L)}} = \text{molarity}$$

To work backward from a molarity to find the number of moles of solute or volume of solution, write the molarity as a ratio (molarity/1 L) and use proportions:

Example: Find the moles of solute needed to make 4.00 L of a 3.50 M solution.

$$\frac{3.50 \text{ mol}}{1 \text{ L}} = \frac{x}{4.00 \text{ L}}$$

DIRECTIONS: Calculate the following:

- The molarity of 0.560 moles of NaOH in 250. ml of solution.
- The moles of solute needed to make 300. ml of a 4.00 M solution.
- The volume of a 4.00 M solution in which 2.00 moles of solute are dissolved.
- The molarity of 0.060 moles of $\text{HC}_2\text{H}_3\text{O}_2$ in 19.0 ml of solution.
- The molarity of 80.0 g of NaOH dissolved in 500. ml of solution.
- The molarity of 3.01×10^{23} formula units of NaCl dissolved in 250. ml of solution.
- The mass of KOH needed to make 1.50 L of a 0.100 M solution.
- The mass of BaCl_2 needed to make 0.250 L of a 0.100 M solution.
- The moles of solute needed to make 200. ml of a 1.20 M solution.
- The mass of NaOH needed to make 2.50 L of a 0.100 M solution.

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Molality (*m*)

To find the molality divide the number of moles of solute by the mass of solvent in kilograms:

$$\frac{\text{moles solute}}{\text{mass solvent (kg)}} = \text{molality}$$

DIRECTIONS: Calculate the following:

11. The molality of 4.00 mol of NaCl dissolved in 2000. g H₂O.
12. The moles of solute needed to make a 3.50 *m* solution using 4.00 kg of solvent.
13. The mass of solvent needed to make a 3.40 *m* solution using 1.50 moles of solute.
14. The mass of KCl needed to make a 2.00 *m* solution using 4.50 kg of solvent.
15. The molality of 117 g of NaCl in 1200. mL of water.
16. The molarity of 316 g of MgBr₂ in 859 mL of solution.
17. The molarity of 4.67 g of Ca(C₂H₃O₂)₂ in 465 mL of solution.
18. The molality of 199 g of NiBr₂ in 599 g of water.
19. The molality of 9.87 x 10⁻³ g of AgClO₂ in 0.333 kg of water.
20. The percentage by volume of 3.00 mL of solute in 28.0 mL solution.
21. The mass of solute in 375 g of a 20.0% solution.
22. The molality of 75.0 g of NaOH in 3.40 kg of water.