

1. What is the formula for converting molality (m) to molarity (M)?

A)
$$M = \frac{m \times \text{Density of Solution}}{1 - m \times \text{Molar Mass of Solvent}}$$

B)
$$M = m \times \text{Density of Solution}$$

C)
$$M = \frac{m}{\text{Density of Solution}}$$

D) There is no simple formula; molality and molarity cannot be directly converted.

2. If the molarity of a solution is 2 M and its density is 1.2 g/mL, what is the molality of the solution?

A) 1.67 m

B) 2.5 m

C) 3.4 m

D) 4.5 m

3. Which of the following is the correct equation for calculating mole fraction (χ) of a solute in a solution?

A) $\chi = \frac{\text{Moles of Solute}}{\text{Moles of Solute} + \text{Moles of Solvent}}$

B) $\chi = \frac{\text{Mass of Solute}}{\text{Mass of Solvent}}$

C) $\chi = \frac{\text{Volume of Solute}}{\text{Volume of Solution}}$

D) $\chi = \frac{\text{Moles of Solvent}}{\text{Moles of Solute}}$

4. How would you convert mass percent (w/w) to molarity (M) if you know the density of the solution and the molar mass of the solute?

A) Use the formula:

$$M = \frac{\text{Mass Percent} \times \text{Density of Solution}}{\text{Molar Mass of Solute}}$$

B) Use the formula:

$$M = \frac{\text{Mass Percent} \times \text{Volume of Solution}}{\text{Molar Mass of Solute}}$$

C) Mass percent cannot be converted to molarity.

D) Molarity is equal to mass percent divided by the molar mass.

5. Which of the following is the formula for calculating mass percent of a solute in a solution?

A)

$$\text{Mass Percent} = \frac{\text{Mass of Solvent}}{\text{Total Mass of Solution}} \times 100$$

B)

$$\text{Mass Percent} = \frac{\text{Mass of Solute}}{\text{Total Mass of Solution}} \times 100$$

C)

$$\text{Mass Percent} = \frac{\text{Moles of Solute}}{\text{Volume of Solution}} \times 100$$

D)

$$\text{Mass Percent} = \frac{\text{Volume of Solute}}{\text{Total Volume of Solution}} \times 100$$

6. If a solution has a mass percent of 20% and the mass of the solution is 500 g, what is the mass of the solute?

A) 50 g

B) 100 g

C) 200 g

D) 400 g

7. If the mole fraction of a solute is 0.25 and the mole fraction of the solvent is 0.75, what is the molarity of the solution (assuming the volume of the solution is 1 L)?

A) 0.25 M

B) 0.75 M

C) 2 M

D) 4 M

8. What is the volume percent of a solution if 50 mL of solute is dissolved in 200 mL of solution?

A) 20%

B) 25%

C) 50%

D) 75%

9. A solution contains 5 moles of solute in 1000 g of solvent. What is the molality of the solution?

A) 0.005 m

B) 0.05 m

C) 5 m

D) 50 m

10. If a solution has a molarity of 1.5 M and the density of the solution is 1.1 g/mL, what is the molality of the solution?

A) 1.0 m

B) 1.2 m

C) 2.0 m

D) 2.5 m

11. A solution contains 40 g of NaCl dissolved in 500 mL of water. The molar mass of NaCl is 58.5 g/mol. What is the molality of the solution?

- A) 1.0 m
- B) 1.4 m
- C) 2.0 m
- D) 2.5 m

12. Which of the following is the correct formula for converting volume percent (v/v) to molarity (M), given the density of the solution and the molar mass of the solute?

A) $M = \frac{\text{Volume Percent} \times \text{Density of Solution}}{100 \times \text{Molar Mass of Solute}}$

B)

$$M = \frac{\text{Volume Percent}}{\text{Density of Solution} \times \text{Molar Mass of Solute}}$$

C) Volume percent cannot be converted directly to molarity.

D) $M = \frac{\text{Volume Percent} \times \text{Molar Mass of Solute}}{\text{Density of Solution}}$

13. A solution has a molality of 3.5 m and contains 1000 g of solvent. How many moles of solute are in the solution?

- A) 3.5 moles
- B) 35 moles
- C) 350 moles
- D) 0.35 moles

14. If the mole fraction of a solute is 0.4, what is the mole fraction of the solvent in the solution?

- A) 0.4
- B) 0.6
- C) 0.25
- D) 0.75

15. What is the mass percent of NaCl in a solution containing 50 g of NaCl dissolved in 250 g of water?

- A) 10%
- B) 15%
- C) 20%
- D) 25%

1. What is the first step in preparing a stock solution of a known concentration?

- A) Add the solute to a container and fill it with the solvent to the desired volume.
- B) Weigh the solute accurately and dissolve it in a small amount of solvent, then dilute it to the final volume.
- C) Mix the solute and solvent in a beaker and heat it until the solution becomes clear.
- D) Use a graduated cylinder to measure the required volume of solvent.

2. When preparing a dilute solution from a stock solution, which of the following formulas is used?

A) $C_1V_1 = C_2V_2$

B) $C_1 + V_1 = C_2 + V_2$

C) $C_1V_2 = C_2V_1$

D) $C_1V_1 = C_2 + V_2$

3. Which of the following is true when preparing a dilute solution from a concentrated stock solution?

- A) The volume of the stock solution used is smaller than the final volume of the dilute solution.
- B) The concentration of the stock solution is lower than that of the dilute solution.
- C) The amount of solute in the stock solution is different from the amount of solute in the dilute solution.
- D) The volume of the stock solution is always equal to the volume of the dilute solution.

4. To prepare 500 mL of a 0.1 M NaCl solution from a 1.0 M stock solution, what volume of the stock solution is needed?

- A) 50 mL
- B) 100 mL
- C) 200 mL
- D) 500 mL

5. If you need to prepare 250 mL of a 2 M solution of HCl from a 10 M stock solution, how much of the stock solution is required?

- A) 50 mL
- B) 25 mL
- C) 5 mL
- D) 100 mL

1. How would you prepare 200.0 mL of a 0.866 M KOH solution, starting with a 5.07 M stock solution?

- A) Use the dilution formula: $M_1 V_1 = M_2 V_2$, so $V_1 = \frac{M_2 V_2}{M_1}$.
- B) Use the dilution formula: $M_1 V_1 = M_2 V_2$, so $V_1 = \frac{M_1 V_2}{M_2}$.
- C) Use the dilution formula: $M_1 V_1 = M_2 V_2$, so $V_1 = \frac{M_2 V_1}{M_1}$.
- D) Use the dilution formula: $M_1 V_1 = M_2 V_2$, so $V_1 = \frac{M_1 V_2}{M_2}$.

2. What is the key difference between a dilute solution and an unsaturated solution?

- A) A dilute solution contains a small amount of solute, and an unsaturated solution contains more solute than the solvent can dissolve.
- B) A dilute solution contains a small amount of solute, and an unsaturated solution contains less solute than the solvent can dissolve.
- C) A dilute solution contains a large amount of solute, and an unsaturated solution contains the maximum amount of solute.
- D) A dilute solution and an unsaturated solution are the same thing.

3. To prepare 100 mL of a 0.1 M sucrose solution from a 1.0 M sucrose stock solution, what volume of the stock solution would you need to use?

- A) 10 mL
- B) 1 mL
- C) 90 mL
- D) 100 mL

4. How would you prepare 100 mL of a 0.1 M NaCl solution?

- A) Dissolve 5.8 g of NaCl in water.
- B) Dissolve 0.58 g of NaCl in water.
- C) Dilute 1 M NaCl solution by adding 10 mL of it to water.
- D) Use a stock solution of 0.5 M NaCl and dilute.

5. To prepare a 0.25 M NaCl solution, which of the following is correct for preparing 100 mL?

- A) Use 1.5 g of NaCl and dilute with water to 100 mL.
- B) Use 3.0 g of NaCl and dilute with water to 100 mL.
- C) Use 2.92 g of NaCl and dilute with water to 100 mL.
- D) Use 5.84 g of NaCl and dilute with water to 100 mL.

6. What is the molarity of a 98% (w/w) H_2SO_4 solution, given the density is 1.84 g/mL? (Molar mass of H_2SO_4 = 98 g/mol)

- A) 18.0 M
- B) 20.0 M
- C) 17.0 M
- D) 21.0 M

7. How would you prepare 100 mL of 0.1 M H_2SO_4 from a stock solution of 98% (w/w) H_2SO_4 , given its density is 1.84 g/mL?

- A) Dilute 18.4 mL of the 98% H_2SO_4 stock solution with water to 100 mL.
- B) Dilute 20 mL of the 98% H_2SO_4 stock solution with water to 100 mL.
- C) Dilute 15.4 mL of the 98% H_2SO_4 stock solution with water to 100 mL.
- D) Dilute 5 mL of the 98% H_2SO_4 stock solution with water to 100 mL.