What is Molarity and Molality?

Worksheet

Molarity (M) = moles of solute liters of solution. Molality (m) = moles of solute kilograms of solvent. Molarity changes with temperature; molality is temperature-independent.

M = n / V

Questions

1. What is the molarity of a solution with 0.5 mol solute in 500 mL?

A) 0.5 mol/L
B) 1 mol/L
C) 0.25 mol/L
D) 2 mol/L

2. Molarity depends on which variable?

A) Temperature only
B) Pressure only
C) Volume of solution
D) Mass of solvent

3. A 3 mol/kg molality solution means

A) 3 mol per liter
B) 3 kg per mol
C) 3 mol in 1 kg solvent
D) 3 L per mole

4. Which unit is independent of temperature?

A) Molarity M
B) Molality m
C) Both equally
D) Neither

5. How many moles of NaCl are dissolved in 2 L of a 1.5 M solution?

6. What is the molality of 4 mol of glucose dissolved in 1.5 kg of water?

7. Calculate molarity: 0.8 mol of KCl in 400 mL of solution.

8. Define: Define molarity.

9. Define: Define molality.

10. Define: Why is molality better for colligative properties?

Answer Key

1. B) 1 mol/L - M = 0.5 mol 0.5 L = 1 mol/L
2. C) Volume of solution - M = n/V, so it directly depends on volume. Volume changes with temperature.
3. C) 3 mol in 1 kg solvent - Molality = moles of solute per kilogram of solvent.
4. B) Molality m - Molality uses mass (kg) which doesn't change with temperature, unlike volume (L).
5. n = M V n = 1.5 mol/L 2 L n = 3 mol NaCl
6. m = n / kg of solvent m = 4 mol / 1.5 kg m = 2.67 mol/kg
7. Convert mL to L: 400 mL = 0.4 L M = 0.8 mol / 0.4 L M = 2 mol/L
8. Molarity (M) = moles of solute per liter of total solution.
9. Molality (m) = moles of solute per kilogram of solvent.
10. Because it doesn't change with temperature, unlike molarity.