

NEET/JEE • CHEMISTRY • SOLUTIONS • UNIT 1.2

Expressing Concentration

HIGH

The formula every Solutions
numerical starts with.

Formula Bank



$$\text{Mass \%} = (\text{mass of component} / \text{total mass}) \times 100$$

$$\text{Volume \%} = (\text{volume of component} / \text{total volume}) \times 100$$

$$\text{ppm} = (\text{parts of component} / \text{total parts}) \times 10^6$$

$$x_i = n_i / \Sigma n$$

$$\text{Molarity (M)} = \text{mol solute} / \text{L solution}$$

$$\text{Molality (m)} = \text{mol solute} / \text{kg solvent}$$

RAT.83

ROT.68

V12.508

These six definitions are the gateway to all colligative property calculations.



Worked Example 1: Mole Fraction



Given: 20% ethylene glycol ($\text{C}_2\text{H}_6\text{O}_2$) by mass in water.

$$20 \text{ g glycol} / 62 \text{ g mol}^{-1} = 0.322 \text{ mol}$$

$$\rightarrow 80 \text{ g water} / 18 \text{ g mol}^{-1} = 4.444 \text{ mol}$$

$$\rightarrow x_{\text{glycol}} = 0.322 / (0.322 + 4.444) = 0.068$$



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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Worked Example 2: Molarity



00:28:53

Given: 5 g NaOH in 450 mL solution.

$$5 \text{ g NaOH} / 40 \text{ g mol}^{-1} = 0.125 \text{ mol}$$

$$\rightarrow \div 0.450 \text{ L}$$

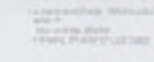
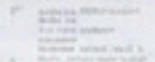
$$\rightarrow \mathbf{0.278 \text{ M}}$$

KAT.63

Iros-86

ROT.00

Y22.508



DATA	1.698
DATA	11.06
D09A5	-61.6

 **Trap: Molarity moves with temperature. Molality doesn't.**

Molarity's denominator is VOLUME (expands with heat); molality's denominator is MASS of solvent (constant with heat). Mass%, ppm, and mole fraction are also temperature-independent — only molarity isn't.

Temperature Dependence

Temperature-independent

Mass %

ppm

Mole fraction (x)

Molality (m)

Temperature-dependent

Molarity (M)



Key Takeaways

- Convert between mass%, ppm, mole fraction, molarity, molality fluently.
- Assume 100 g solution when only percentages are given.
- Flag molarity as the one temperature-dependent unit.

XKT, 63

ROS-80

KOT, 00

Y22, 608



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