Other units of concentration

Chart

Table of concentration measures

Frequently used standards of concentration			
Measurement	Notation	Generic formula	Typical units
Molarity	M	$\left(\frac{\text{moles solute}}{\text{liters solution}}\right)$	mol/L (or M)
Mass percentage	wt%	$\left(\frac{\text{grams solute} \times 100}{\text{grams solution}}\right)$	%
Molality	m	$\left(\frac{\text{moles solute}}{\text{kilograms solvent}}\right)$	mol/kg (or m**)
Mole fraction	χ (chi)	$\left(\frac{\text{moles solute}}{\text{moles solution}}\right)$	(decimal)

Boiling point elevation = $BP_{normal} + \Delta T$
Where $\Delta T = K_b (m)(i)$

Freezing Point Depression = $FP_{normal} - \Delta T$
Where $\Delta T = K_f (m)(i)$

Dilution equation
$MV = MV'$

Dilution Equation

- MV = MV
- Molarity (volume) $_{\text{before dilution}}$ = molarity (volume) $_{\text{after dilution}}$
- How many liters of 12 M H_2SO_4 do you need to make 1.2 L of .75 M?

Dilution Equation

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- Molarity (volume) $_{\text{before dilution}}$ = molarity (volume) $_{\text{after dilution}}$
- How many liters of 12 M H_2SO_4 do you need to make 1.2 L of .75 M?
- 12 M (V) = .75 M (1.2 L)
- V = .075 L (75 mL)

Mass Percent

- Mass percent = mass of solute x 100
- mass of solution
- Or = grams of solute x 100
- grams of solute + grams of solvent

Problem

- 35 g of NaCl is dissolved in 115 g of water, what is the mass percent? What is the molarity if the final solution has a density of 1.1 g/mL?

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- 35 g of NaCl is dissolved in 115 g of water, what is the mass percent? What is the molarity if the final solution has a density of 1.1 g/mL?
- 35 g / (35g + 115g) x 100
- 23 %
- 35 g x 1 mol/ 58.44 g= .5989 mol NaCl
- 150 g x 1mL / 1.1 g = 136.36 mL = .13636L
- M = .5989 mol / .13636 L
- M = 4.4 M

Problem

- 35 g of $Ba(NO_3)_2$ is dissolved in 165 g of solution, what is the mass percent? What is the molarity if the final solution has a density of 1.2 g/mL?

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- 35 g of $Ba(NO_3)_2$ is dissolved in 165 g of solution, what is the mass percent? What is the molarity if the final solution has a density of 1.2 g/mL?
- 35 g / (165 g) x 100
- 21 %
- 35 g x 1 mol/ 261.32 g= .1339 mol $Ba(NO_3)_2$
- 165 g x 1mL / 1.2 g = 137.5 mL = .1375 L
- M = .1339 mol / .1375 L
- M = 0.98 M

Convert

- Convert 1.2 M $CuSO_4$ solution to mass percent, if the solution has a density 1.1 g/mL.

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- Convert 1.2 M $CuSO_4$ solution to mass percent, if the solution has a density 1.1 g/mL.
- 1.2 M= 1.2 mol $CuSO_4$ / 1 L solution
- 1.2 mol x159.62 g / 1 mol =191.544 g
- 1 L = 1000 mL x 1.1 g/1 mL = 1100 g of solution
- Mass percent = 191.544 g / 1100 g x100 = 17 %