

Chemistry 20 - Unit 2 - Concentration (AGAIN)

Name: _____

You may find the following formulas useful:

$$m = Mn$$

Molar concentration = MOLARITY!

Molar concentration is the number of moles of the substance contained in 1L of solution. The units for molarity is mol/L. The formula for concentration is:

$$C = \frac{n}{V}$$

C = concentration in mol/L

n = moles

V = volume in Litres

Molarity has 4 different ways of showing units.

- The unit symbol for mol/L is M
- M is stated as Molar
- Molar concentration is denoted as [...]
- mol/L = M = [] = molarity

1) If a 1.0 L solution contains 2.5 mol of NaCl, what is the molar concentration?

$$C = \frac{n}{V} = \frac{2.5 \text{ mol}}{1.0 \text{ L}} = 2.5 \frac{\text{mol}}{\text{L}} = \boxed{2.5 \text{ M}}$$

2) What mass of NaOH is contained in 3.50 L of 0.200 M NaOH?

$$C = \frac{n}{V} \rightarrow n = CV = 0.200 \text{ M} \cdot 3.50 \text{ L} = 0.700 \text{ mol}$$

$$m = Mn = 40.00 \frac{\text{g}}{\text{mol}} \cdot 0.700 \text{ mol} = \boxed{28.0 \text{ g}}$$

3) What is the molarity of pure sulphuric acid, H₂SO₄, having a density of 1.839 g/mL?

$$C = \frac{n}{V} = \frac{d}{M} = \frac{1.839 \frac{\text{g}}{\text{mL}}}{98.09 \frac{\text{g}}{\text{mol}}} = \boxed{18.75 \text{ M}} \quad \frac{1.839 \text{ g}}{1 \text{ mL}} = \frac{1.839 \text{ g}}{0.001 \text{ L}}$$

$$d = \frac{m}{V} = \frac{Mn}{V} \rightarrow \frac{d}{M} = \frac{n}{V} = C$$

$$m = Mn$$

- 4) What is the molarity of the CaCl_2 in a solution made by dissolving and diluting 15.00 g of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ to 500.0 mL?

Note: When $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ dissolves in water it turns into CaCl_2 with equal number of moles therefore $[\text{CaCl}_2] = [\text{CaCl}_2 \cdot 6\text{H}_2\text{O}]$

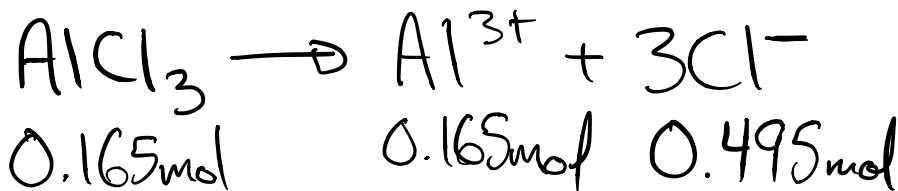
$$C = \frac{n}{V} = \frac{n_{\text{CaCl}_2 \cdot 6\text{H}_2\text{O}}}{0.5000\text{L}} = \frac{0.06846\text{ mol}}{0.5000\text{L}} = 0.1369\text{M}$$

$$n_{\text{CaCl}_2 \cdot 6\text{H}_2\text{O}} = \frac{m}{M} = \frac{15.00\text{g}}{219.10\text{g/mol}} = 0.06846\text{ mol}$$

$$[\text{CaCl}_2 \cdot 6\text{H}_2\text{O}] = 0.1369\text{M}$$

$$\therefore [\text{CaCl}_2] = 0.1369\text{M}$$

- 5) Find the molar concentration of each of the ions in a solution that contains 0.165 moles of aluminum chloride in 820 mL? (Note: Use the dissociation equation first, and use ratios for the concentration of all ions)



$$[\text{Al}^{3+}] = \frac{0.165\text{ mol}}{0.820\text{L}} = 0.201\text{M}$$

$$[\text{Cl}^-] = \frac{0.495\text{ mol}}{0.820\text{L}} = 0.604\text{M}$$

Alternate Answer to 3

You want the units $\frac{\text{mol}}{\text{L}}$

You have density $1.839 \frac{\text{g}}{\text{mL}}$

$$\# \frac{\text{mol}}{\text{L}} = \frac{1.839 \text{g}}{1 \text{mL}} \times \frac{1000 \text{mL}}{1 \text{L}} \times \frac{1 \text{mol}}{98.09 \text{g}} = \boxed{18.75 \text{M}}$$

want mol
want Litres
changed to litres
changed to moles