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?

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

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

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

$$m = Mn = 40.00\,g/mol \cdot 0.700\,mol = \boxed{28.0\,g}$$

3) What is the molarity of pure sulphuric acid, H_2SO_4, having a density of 1.839 g/mL?

$$C = \frac{n}{V} = \frac{d}{M} = \frac{1839\,g/L}{98.09\,g/mol} = \boxed{18.75\,M}$$

$$\frac{1.839\,g}{1\,mL} = \frac{1.839\,g}{0.001\,L}$$

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

$$m = Mn$$

4) What is the molarity of the $CaCl_2$ in a solution made by dissolving and diluting 15.00 g of $CaCl_2 \cdot 6H_2O$ to 500.0mL?

Note: When $CaCl_2 \cdot 6H_2O$ dissolves in water it turns into $CaCl_2$ with equal number of moles therefore $[CaCl_2] = [CaCl_2 \cdot 6H_2O]$

$$C = \frac{n}{V} = \frac{n_{CaCl_2 \cdot 6H_2O}}{0.5000L} = \frac{0.06846\,mol}{0.5000L} = 0.1369M$$

$$n_{CaCl_2 \cdot 6H_2O} = \frac{m}{M} = \frac{15.00g}{219.10g/mol} = 0.06846\,mol$$

$$[CaCl_2 \cdot 6H_2O] = 0.1369M$$

$$\therefore \boxed{[CaCl_2] = 0.1369M}$$

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)

$$AlCl_3 \rightarrow Al^{3+} + 3Cl^-$$

$$0.165mol \quad 0.165mol \quad 0.495mol$$

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

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

Alternate Answer to 3

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

You have density $1.839\ g/mL$

want mol

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

want Litres

changed to litres

changed to moles