Concentration

$$\frac{20\ g\ C_6H_{12}O_6}{1\ L\ H_2O} = 20\ g/L$$

$$\frac{10\ g\ C_6H_{12}O_6}{2\ L\ H_2O} = 5\ g/L$$

mass : unit is grams

Volume : unit is L

concentration : unit is g/L

Sugar = solute

H_2O = solvent

Solute is what dissolves in the solvent.

Molarity: the unit used in chemistry to describe concentration.

$$M = \frac{c}{v}$$

M = molarity in $\frac{mol}{L}$

c = # moles of solute

V = volume in litres

e.g. 10 mol of NaOH dissolved in a 2 L solution of NaOH, what is the molarity?

$c = 10\ mol$

$V = 2\ L$

$$M = \frac{c}{v} = \frac{10\ mol}{2\ L} = 5\ mol/L$$

OR 5 M

↑ reads as "5 molar solution"

e.g. 200g of NaOH are dissolved (in water) in a $v = 4\ L$ solution. ($NaOH_{(aq)}$)

↑ convert to moles.

$$200\ g\ NaOH \times \frac{1\ mol}{40.0\ g}$$

← molar mass of NaOH

Na : 22.99
O : 16.00
H : 1.01
40.0 g

$= 5\ mol\ NaOH$

moles of NaOH dissolved in the solution

$$c = \frac{n}{v} = \frac{5\ mol}{4\ L} = 1.25\ mol/L$$

$= 1.25\ M$

↑ total volume of solution

e.g. If 2.3 mol NaOH are dissolved in 460 mL ($\div 1000 = 0.460$ L) of solution, what is the molarity?

$$M = \frac{c}{v} = \frac{2.3\text{ mol}}{0.460\text{ L}} = 5\ \frac{\text{mol}}{\text{L}}$$

OR 5M

e.g. If 500 g $C_6H_{12}O_6$ (convert to moles) are dissolved in 1500 mL (convert to L: $\div 1000$, move decimal back 3 times: 1.5 L) of solution, find the molarity.

$$500\text{ g} \times \frac{1\text{ mol}}{180.18\text{ g}} = 2.7\text{ mol}$$

$$\frac{2.7\text{ mol}}{1.5\text{ L}} = 1.8\ \frac{\text{mol}}{\text{L}} \quad \text{OR } 1.8\text{M}$$

Green: 1–10, 22, 23

① $$\text{Molarity} = \frac{\#\text{ mol}}{\#\text{ L}}$$

$$M = \frac{\text{mol}}{\text{L}}$$

$$M = \frac{2\text{ mol}}{5\text{ L}} = 0.4\ \frac{\text{mol}}{\text{L}}$$

②
$$300\text{ mL} \times \frac{1\text{ L}}{1000\text{ mL}} = .3\text{ L} = \text{Volume (v)}$$

$$M = \frac{\text{mol}}{\text{L}} = \frac{0.073\text{ mol}}{0.3\text{ L}} = 0.24\ \frac{\text{mol}}{\text{L}}$$

③ 10.0 g $NaNO_3$ → convert to moles

$$10.0\text{ g} \times \frac{1\text{ mol}}{85\text{ g}} = 0.1176\text{ mol}$$

(85 g: Molar mass)

$$\text{Molarity} = \frac{0.1176\text{ mol}}{0.5\text{ L}}$$

$$= 0.24\ \frac{\text{mol}}{\text{L}}$$

4. $\text{Molarity} = \frac{3.4\ \text{mol}}{2.0\ \text{L}} = 1.7\ \frac{\text{mol}}{\text{L}}$

5. $\text{Molarity} = \frac{2.6\ \text{mol}}{0.8\ \text{L}} = 3.25\ \frac{\text{mol}}{\text{L}}$

6. $750\ \text{g}\ C_{12}H_{22}O_{11} \times \frac{1\ \text{mol}}{342.34\ \text{g}} = 2.19\ \text{mol}$

↑ molar mass

$\text{Molarity} = \frac{2.19\ \text{mol}}{0.75\ \text{L}} = 2.92\ \frac{\text{mol}}{\text{L}}$

7. $50.0\,g\ NaCl \times \frac{1\,mol}{58.44\,g} = 0.8556\,mol$

$$Molarity = \frac{0.8556\,mol}{1.2\,L} = 0.71\,\frac{mol}{L}$$

8. $100\,g\ NaOH \times \frac{1\,mol}{40\,g} = 2.5\,mol$

$$Molarity = \frac{2.5\,mol}{0.5\,L} = 5\,\frac{mol}{L}$$

9. $2000\,g\ AgCl \times \frac{1\,mol}{143.32} = 13.95\,mol$

$$\text{Molarity} = \frac{13.95\,mol}{6\,L} = 2.33\,\frac{mol}{L}$$

10. $23\,g\ NaCl \times \frac{1\,mol}{58.44\,g} = 0.39\,mol$

$$\text{Molarity} = \frac{0.39\,mol}{0.060\,L} = 6.56\,\frac{mol}{L}$$

(22)

1 : $4\,g\ CaBr_2 \times \frac{1\,mol}{199.88\,g} = 0.02\ mol$

$\frac{0.02\,mol}{.2\,L} =$ 1: $0.1\ \frac{Mol}{L}$

2 : $\frac{4\,mol}{20\,L} =$ 2: $0.2\ \frac{mol}{L}$

3 : $20\,g\,CaBr_2 \times \frac{1\,mol}{199.88\,g} = 0.1\ mol$

$\frac{0.1\,mol}{2\,L} =$ 3: $0.05\ \frac{mol}{L}$

ANS : Soln no 2