Biochemical Calculations

312 BCH

Prepared by: Nojood AlTwajry
The expression of concentration of solutions is based on:
- The volume.
- Weight.
- Degree of saturation.
Here the concentrations are based on the amount of dissolved solute per unit volume.
The calculations depending on volume include:
- Molarity (M)
- Normality (N)
- Activity (a)
- Weight/Volume percent (w/v %)
- Milligram percent (mg %)
- Osmolarity
1 – Molarity

- Is the number of moles of solute per liter of solution
  \[ M = \frac{\text{no. of moles}}{\text{volume of solution in L}} \]

- Molar concentrations are usually given in square brackets
  - Example: \([H^+] = \text{molarity of hydrogen ion}\)
Examples:
- A solution of NaCl had 0.8 moles of solute in 2 liters of solution. What is its molarity?

\[
M = \frac{\text{no. of moles}}{\text{volume of solution in L}}
\]

\[
M = \frac{0.8}{2} = 0.4 \text{ molar}
\]
Examples:

How many grams of solid NaOH are required to prepare 500 ml of 0.04 M solution?

\[ M = \frac{\text{no. of moles}}{\text{volume of solution in L}} \]

500 ml = 500 ÷ 1000 = 0.5 L

\[ \text{no. of moles} = 0.04 \times 0.5 \]

\[ \text{no. of moles} = 0.02 \text{ mole} \]

\[ \text{weight in gram} = \frac{\text{no. of moles}}{\text{molecular weight (MWT)}} \]
MWT = 23 = 16 + 1 = 40
wt in grams = no. of moles × MWT
wt in grams = 0.02 × 40
wt in grams = 0.8 grams
2– Normality

Is the number of equivalents of solute per liter of solution

\[ N = \frac{\text{no. of equivalents}}{\text{volume of solution in L}} \]

\text{no. of equivalents} = \frac{\text{weight in gram}}{\text{Equivalent weight}}

\text{equivalent weight} = \frac{\text{MWT}}{n}

\( n \) = is the number of replaceable hydrogen (\( H^+ \) in acids) or hydroxyl ions (\( OH^- \) in bases) per molecule
Normality cont’rd

\( n = \) is the number of electrons gained or lost per molecule (in oxidizing or reducing agents)

\[
N = \frac{\text{no. of equivalents}}{\text{volume of solution in L}}
\]

\[
N = \frac{\text{weight in gram}}{\text{Equivalent weight}} / \text{volume of solution in L}
\]

\[
N = \frac{\text{weight in gram}}{\text{MWT} / n} / \text{volume of solution in L}
\]
Normality cont’rd

\[ N = \frac{\text{weight in gram} \times n}{\text{MWT}} \Bigg/ \text{volume of solution in L} \]

\[ M = \frac{\text{no. of moles}}{\text{volume of solution in L}} \]

\[ M = \frac{\text{weight in gram}}{\text{MWT}} \Bigg/ \text{volume of solution in L} \]

\[ N = n \times M \]