Redox reaction

No. of equivalents, equivalent mass, normality

Equivalent concept → reaction dependent
↳ reaction doesn't need to be balanced

Reaction → Balanced → use mole concept
Reaction → Unbalanced → Balance it → Mole concept
Reaction → Unbalanced → Calculate n_f → eq. concept

No. of equivalent → no. of moles × n-factor

$E = \frac{\text{Molar mass}}{n_f}$

$\boxed{\text{Normality} = \text{Molarity} \times n_f}$

n_f: is calculated for 1 mole only; No. of e^- transferred per mole

$\boxed{E = \frac{\text{Molar mass}}{\text{Total no. of } [H^+/OH^-] \text{ replacable or to be replaced}}}$

$\boxed{N = \text{no. of equivalent}/V}$

Redox reaction

it is basically transfer of e^-

$A \xrightarrow{e^-} B$

$A \to A^+$ oxidised [R.A.]

$B \to B^-$ reduced [O.A.]

Law of equivalence

equivalent of acid = equivalent of base

$MnO_4 \xrightarrow{\text{acidic}} Mn^{2+}$

$MnO_4 \xrightarrow{\text{Basic}} MnO_4^{2-}$

$MnO_4 \xrightarrow{\text{Neutral}} MnO_2$

Calculation of n-factor for different type of redox reaction-

↳ SIMPLE REDOX

O.A. + R.A. ⟶ reduced form of O.A. + oxidised form of R.A.

↳ COMBINED REDOX

$KMnO_4 + FeC_2O_4 \longrightarrow Mn^{2+} + Fe^{3+} + CO_2$

$n_f = 5$ $n_f = 3$ $n_f = 5$ $n_f = 1$ $n_f = 1$

↳ SELF DECOMPOSITION REACTION

$SO_3 \longrightarrow SO_2 + \frac{1}{2}O_2$ (oxidised, reduced)

In a single molecule, one element will undergo oxi^n & other one is reduced

$\boxed{n_f = n \text{ Reduction}}$

↳ DISPROPORTIONATION REACTION

$H_2O_2^{-1} \longrightarrow H_2O^{-2} + \frac{1}{2}O_2^{0}$

same element gets oxidised as well as reduced

$\boxed{n_f = \frac{n_O \times n_R}{n_O + n_R}}$

$3MnO_4^- \longrightarrow 2Mn^{2+} + Mn^{4+}$

only for rea^n in which same element gets reduced in 2 diff. stages

$\boxed{n = \frac{\text{total charge}}{\text{total item}} = \frac{2(7-2)+1(7-4)}{3}}$

→ if oxidised → combined redox

Balancing of chemical reaction

→ Calculate n-factor of oxidising agent & reducing agent.

→ Cross multiply with the simplest ratio of n-f

→ Balance atoms undergoing oxidation & reduction.

→ To Balance O & H

Acidic medium: O → comes from H_2O; H → from H^+

Basic medium: O → comes from OH^-; H → from H_2O