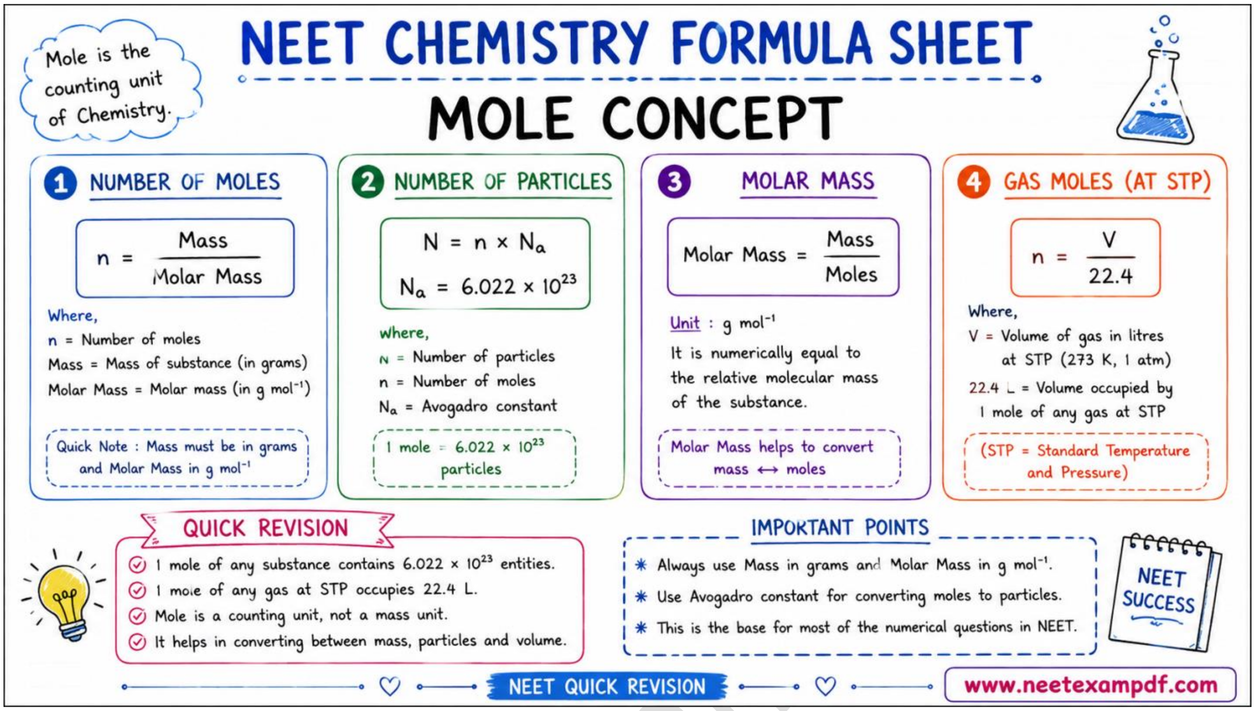

Mole is the counting unit of Chemistry.

NEET CHEMISTRY FORMULA SHEET

MOLE CONCEPT

1 NUMBER OF MOLES

$$n = \frac{\text{Mass}}{\text{Molar Mass}}$$

Where,

n = Number of moles

Mass = Mass of substance (in grams)

Molar Mass = Molar mass (in g mol^{-1})

Quick Note : Mass must be in grams and Molar Mass in g mol^{-1}

2 NUMBER OF PARTICLES

$$N = n \times N_a$$

$$N_a = 6.022 \times 10^{23}$$

where,

N = Number of particles

n = Number of moles

N_a = Avogadro constant

1 mole = 6.022×10^{23} particles

3 MOLAR MASS

$$\text{Molar Mass} = \frac{\text{Mass}}{\text{Moles}}$$

Unit : g mol^{-1}

It is numerically equal to the relative molecular mass of the substance.

Molar Mass helps to convert mass ↔ moles

4 GAS MOLES (AT STP)

$$n = \frac{V}{22.4}$$

Where,

V = Volume of gas in litres at STP (273 K, 1 atm)

22.4 L = Volume occupied by 1 mole of any gas at STP

(STP = Standard Temperature and Pressure)

QUICK REVISION

- ✓ 1 mole of any substance contains 6.022×10^{23} entities.
- ✓ 1 mole of any gas at STP occupies 22.4 L.
- ✓ Mole is a counting unit, not a mass unit.
- ✓ It helps in converting between mass, particles and volume.

IMPORTANT POINTS

- ✱ Always use Mass in grams and Molar Mass in g mol^{-1}.
- ✱ Use Avogadro constant for converting moles to particles.
- ✱ This is the base for most of the numerical questions in NEET.

NEET SUCCESS

NEET QUICK REVISION

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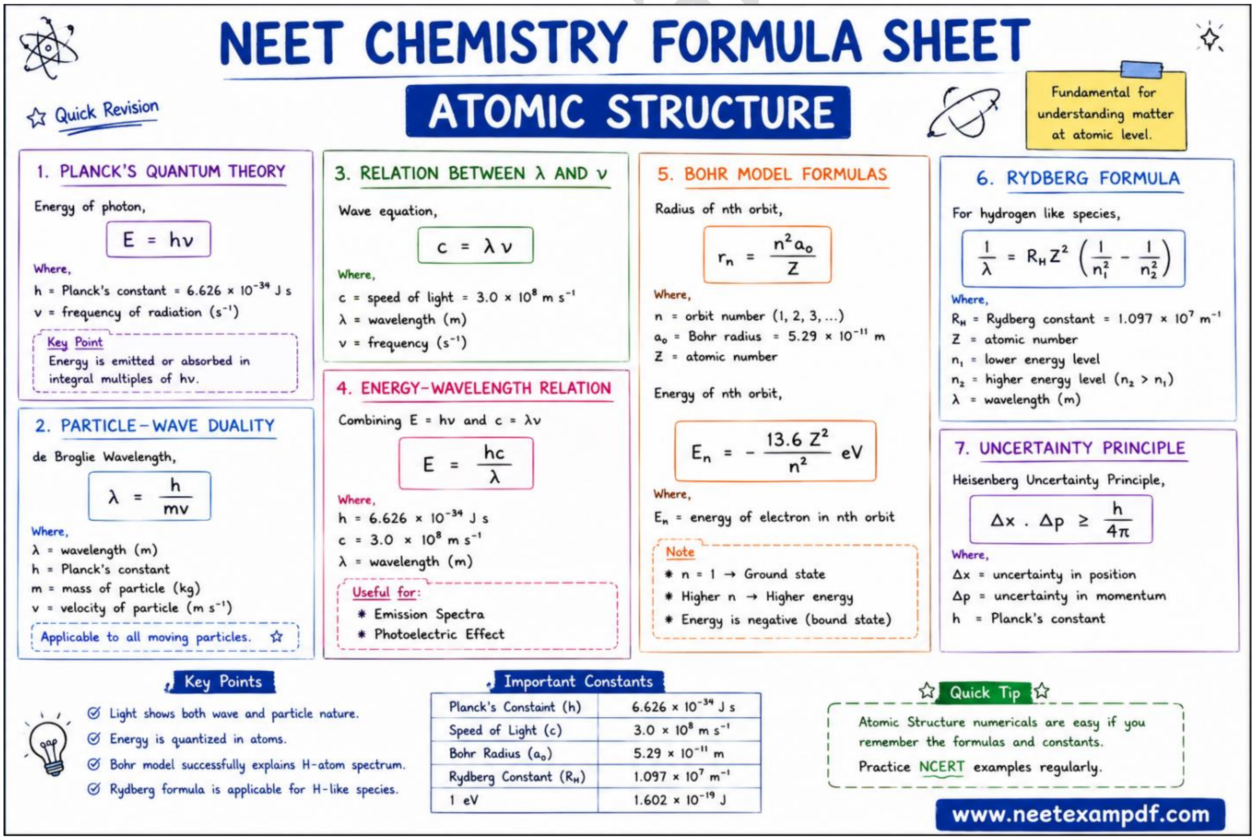

NEET CHEMISTRY FORMULA SHEET

ATOMIC STRUCTURE

☆ Quick Revision

Fundamental for understanding matter at atomic level.

1. PLANCK'S QUANTUM THEORY

Energy of photon,

$$E = h\nu$$

Where,

h = Planck's constant = 6.626×10^{-34} J s

ν = frequency of radiation (s^{-1})

Key Point

Energy is emitted or absorbed in integral multiples of $h\nu$.

2. PARTICLE-WAVE DUALITY

de Broglie Wavelength,

$$\lambda = \frac{h}{mv}$$

Where,

λ = wavelength (m)

h = Planck's constant

m = mass of particle (kg)

v = velocity of particle (m s^{-1})

Applicable to all moving particles. ☆

3. RELATION BETWEEN λ AND ν

Wave equation,

$$c = \lambda \nu$$

Where,

c = speed of light = 3.0×10^{8} m s^{-1}

λ = wavelength (m)

ν = frequency (s^{-1})

4. ENERGY-WAVELENGTH RELATION

Combining $E = h\nu$ and $c = \lambda\nu$

$$E = \frac{hc}{\lambda}$$

Where,

$h = 6.626 \times 10^{-34}$ J s

$c = 3.0 \times 10^{8}$ m s^{-1}

λ = wavelength (m)

Useful for:

- ✱ Emission Spectra
- ✱ Photoelectric Effect

5. BOHR MODEL FORMULAS

Radius of nth orbit,

$$r_n = \frac{n^2 a_0}{Z}$$

Where,

n = orbit number (1, 2, 3, ...)

a_0 = Bohr radius = 5.29×10^{-11} m

Z = atomic number

Energy of nth orbit,

$$E_n = -\frac{13.6\, Z^2}{n^2}\ \text{eV}$$

Where,

E_n = energy of electron in nth orbit

Note

- ✱ $n = 1$ → Ground state
- ✱ Higher n → Higher energy
- ✱ Energy is negative (bound state)

6. RYDBERG FORMULA

For hydrogen like species,

$$\frac{1}{\lambda} = R_H Z^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

Where,

R_H = Rydberg constant = 1.097×10^{7} m^{-1}

Z = atomic number

n_1 = lower energy level

n_2 = higher energy level ($n_2 > n_1$)

λ = wavelength (m)

7. UNCERTAINTY PRINCIPLE

Heisenberg Uncertainty Principle,

$$\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$$

Where,

Δx = uncertainty in position

Δp = uncertainty in momentum

h = Planck's constant

Key Points

- ✓ Light shows both wave and particle nature.
- ✓ Energy is quantized in atoms.
- ✓ Bohr model successfully explains H-atom spectrum.
- ✓ Rydberg formula is applicable for H-like species.

Important Constants

Planck's Constaint (h)	6.626×10^{-34} J s
Speed of Light (c)	3.0×10^{8} m s^{-1}
Bohr Radius (a_0)	5.29×10^{-11} m
Rydberg Constant (R_H)	1.097×10^{7} m^{-1}
1 eV	1.602×10^{-19} J

☆ Quick Tip ☆

Atomic Structure numericals are easy if you remember the formulas and constants.

Practice NCERT examples regularly.

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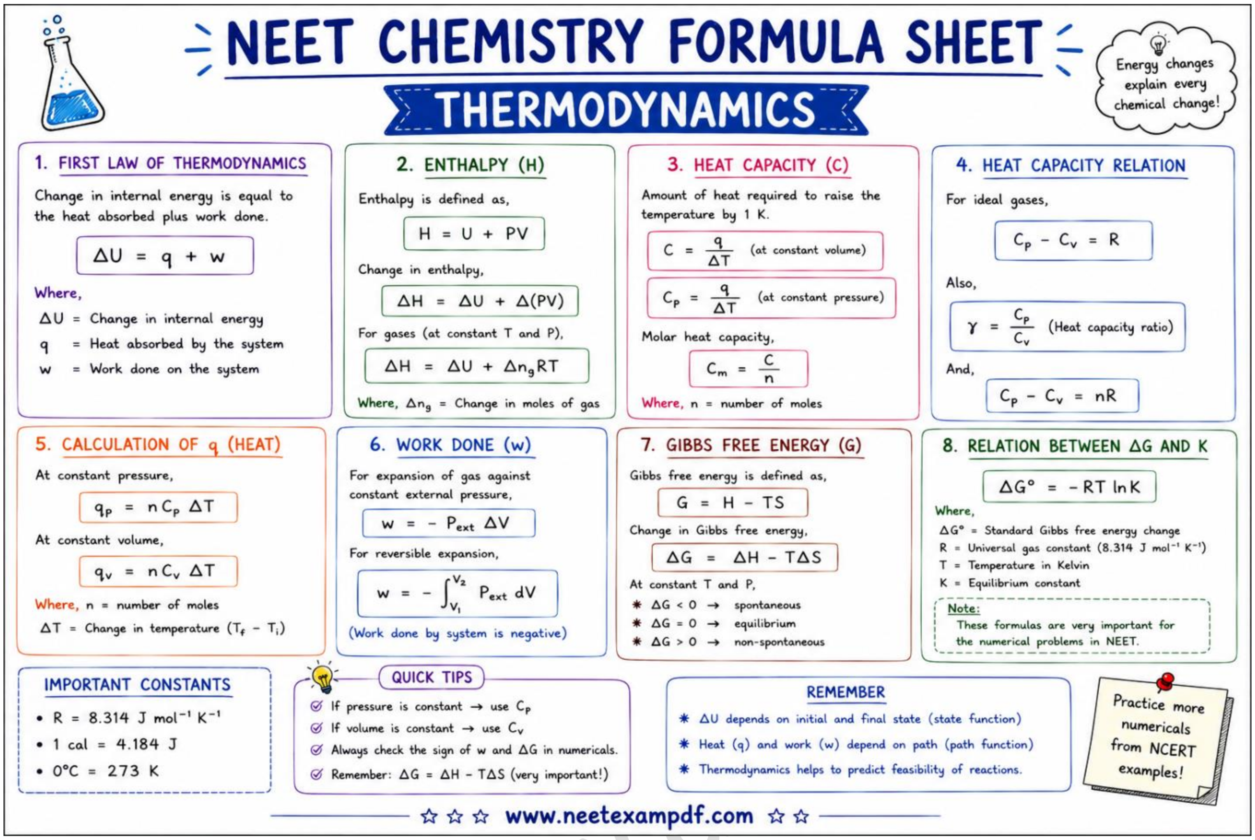

NEET CHEMISTRY FORMULA SHEET

THERMODYNAMICS

Energy changes explain every chemical change!

1. FIRST LAW OF THERMODYNAMICS

Change in internal energy is equal to the heat absorbed plus work done.

$$\boxed{\Delta U = q + w}$$

Where,

ΔU = Change in internal energy

q = Heat absorbed by the system

w = Work done on the system

2. ENTHALPY (H)

Enthalpy is defined as,

$$\boxed{H = U + PV}$$

Change in enthalpy,

$$\boxed{\Delta H = \Delta U + \Delta(PV)}$$

For gases (at constant T and P),

$$\boxed{\Delta H = \Delta U + \Delta n_g RT}$$

Where, Δn_g = Change in moles of gas

3. HEAT CAPACITY (C)

Amount of heat required to raise the temperature by 1 K.

$$\boxed{C = \frac{q}{\Delta T} \quad \text{(at constant volume)}}$$

$$\boxed{C_p = \frac{q}{\Delta T} \quad \text{(at constant pressure)}}$$

Molar heat capacity,

$$\boxed{C_m = \frac{C}{n}}$$

Where, n = number of moles

4. HEAT CAPACITY RELATION

For ideal gases,

$$\boxed{C_p - C_v = R}$$

Also,

$$\boxed{\gamma = \frac{C_p}{C_v} \quad \text{(Heat capacity ratio)}}$$

And,

$$\boxed{C_p - C_v = nR}$$

5. CALCULATION OF q (HEAT)

At constant pressure,

$$\boxed{q_p = n C_p \Delta T}$$

At constant volume,

$$\boxed{q_v = n C_v \Delta T}$$

Where, n = number of moles

ΔT = Change in temperature ($T_f - T_i$)

6. WORK DONE (w)

For expansion of gas against constant external pressure,

$$\boxed{w = -P_{ext} \Delta V}$$

For reversible expansion,

$$\boxed{w = -\int_{V_1}^{V_2} P_{ext}\, dV}$$

(Work done by system is negative)

7. GIBBS FREE ENERGY (G)

Gibbs free energy is defined as,

$$\boxed{G = H - TS}$$

Change in Gibbs free energy,

$$\boxed{\Delta G = \Delta H - T\Delta S}$$

At constant T and P,

- $\Delta G < 0$ → spontaneous
- $\Delta G = 0$ → equilibrium
- $\Delta G > 0$ → non-spontaneous

8. RELATION BETWEEN ΔG AND K

$$\boxed{\Delta G^\circ = -RT \ln K}$$

Where,

ΔG° = Standard Gibbs free energy change

R = Universal gas constant ($8.314\ J\ mol^{-1}\ K^{-1}$)

T = Temperature in Kelvin

K = Equilibrium constant

Note: These formulas are very important for the numerical problems in NEET.

IMPORTANT CONSTANTS

- $R = 8.314\ J\ mol^{-1}\ K^{-1}$
- $1\ cal = 4.184\ J$
- 0°C = 273 K

QUICK TIPS

- ☑ If pressure is constant → use C_p
- ☑ If volume is constant → use C_v
- ☑ Always check the sign of w and ΔG in numericals.
- ☑ Remember: $\Delta G = \Delta H - T\Delta S$ (very important!)

REMEMBER

- ΔU depends on initial and final state (state function)
- Heat (q) and work (w) depend on path (path function)
- Thermodynamics helps to predict feasibility of reactions.

Practice more numericals from NCERT examples!

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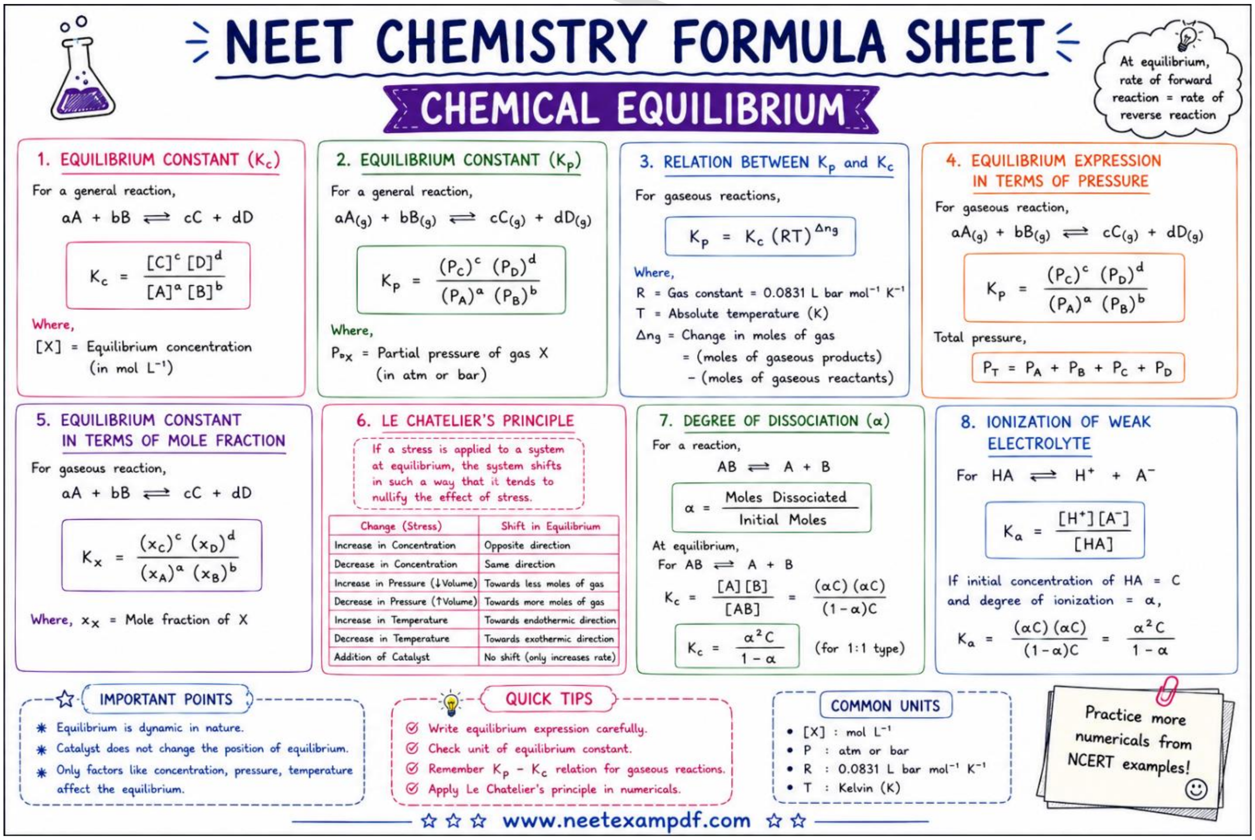

NEET CHEMISTRY FORMULA SHEET

CHEMICAL EQUILIBRIUM

At equilibrium, rate of forward reaction = rate of reverse reaction

1. EQUILIBRIUM CONSTANT (K_c)

For a general reaction,

$$aA + bB \rightleftharpoons cC + dD$$

$$\boxed{K_c = \frac{[C]^c [D]^d}{[A]^a [B]^b}}$$

Where,

$[X]$ = Equilibrium concentration (in $mol\ L^{-1}$)

2. EQUILIBRIUM CONSTANT (K_p)

For a general reaction,

$$aA_{(g)} + bB_{(g)} \rightleftharpoons cC_{(g)} + dD_{(g)}$$

$$\boxed{K_p = \frac{(P_C)^c (P_D)^d}{(P_A)^a (P_B)^b}}$$

Where,

P_{x} = Partial pressure of gas X (in atm or bar)

3. RELATION BETWEEN K_p and K_c

For gaseous reactions,

$$\boxed{K_p = K_c (RT)^{\Delta ng}}$$

Where,

R = Gas constant = $0.0831\ L\ bar\ mol^{-1}\ K^{-1}$

T = Absolute temperature (K)

Δng = Change in moles of gas = (moles of gaseous products) − (moles of gaseous reactants)

4. EQUILIBRIUM EXPRESSION IN TERMS OF PRESSURE

For gaseous reaction,

$$aA_{(g)} + bB_{(g)} \rightleftharpoons cC_{(g)} + dD_{(g)}$$

$$\boxed{K_p = \frac{(P_C)^c (P_D)^d}{(P_A)^a (P_B)^b}}$$

Total pressure,

$$\boxed{P_T = P_A + P_B + P_C + P_D}$$

5. EQUILIBRIUM CONSTANT IN TERMS OF MOLE FRACTION

For gaseous reaction,

$$aA + bB \rightleftharpoons cC + dD$$

$$\boxed{K_x = \frac{(x_C)^c (x_D)^d}{(x_A)^a (x_B)^b}}$$

Where, x_X = Mole fraction of X

6. LE CHATELIER'S PRINCIPLE

If a stress is applied to a system at equilibrium, the system shifts in such a way that it tends to nullify the effect of stress.

Change (Stress)	Shift in Equilibrium
Increase in Concentration	Opposite direction
Decrease in Concentration	Same direction
Increase in Pressure (↓Volume)	Towards less moles of gas
Decrease in Pressure (↑Volume)	Towards more moles of gas
Increase in Temperature	Towards endothermic direction
Decrease in Temperature	Towards exothermic direction
Addition of Catalyst	No shift (only increases rate)

7. DEGREE OF DISSOCIATION (α)

For a reaction,

$$AB \rightleftharpoons A + B$$

$$\boxed{\alpha = \frac{\text{Moles Dissociated}}{\text{Initial Moles}}}$$

At equilibrium,

For $AB \rightleftharpoons A + B$

$$K_c = \frac{[A][B]}{[AB]} = \frac{(\alpha C)(\alpha C)}{(1-\alpha)C}$$

$$\boxed{K_c = \frac{\alpha^2 C}{1-\alpha}} \quad \text{(for 1:1 type)}$$

8. IONIZATION OF WEAK ELECTROLYTE

For $HA \rightleftharpoons H^+ + A^-$

$$\boxed{K_a = \frac{[H^+][A^-]}{[HA]}}$$

If initial concentration of HA = C and degree of ionization = α,

$$K_a = \frac{(\alpha C)(\alpha C)}{(1-\alpha)C} = \frac{\alpha^2 C}{1-\alpha}$$

IMPORTANT POINTS

- Equilibrium is dynamic in nature.
- Catalyst does not change the position of equilibrium.
- Only factors like concentration, pressure, temperature affect the equilibrium.

QUICK TIPS

- ☑ Write equilibrium expression carefully.
- ☑ Check unit of equilibrium constant.
- ☑ Remember $K_p - K_c$ relation for gaseous reactions.
- ☑ Apply Le Chatelier's principle in numericals.

COMMON UNITS

- $[X]$: $mol\ L^{-1}$
- P : atm or bar
- R : $0.0831\ L\ bar\ mol^{-1}\ K^{-1}$
- T : Kelvin (K)

Practice more numericals from NCERT examples! ☺

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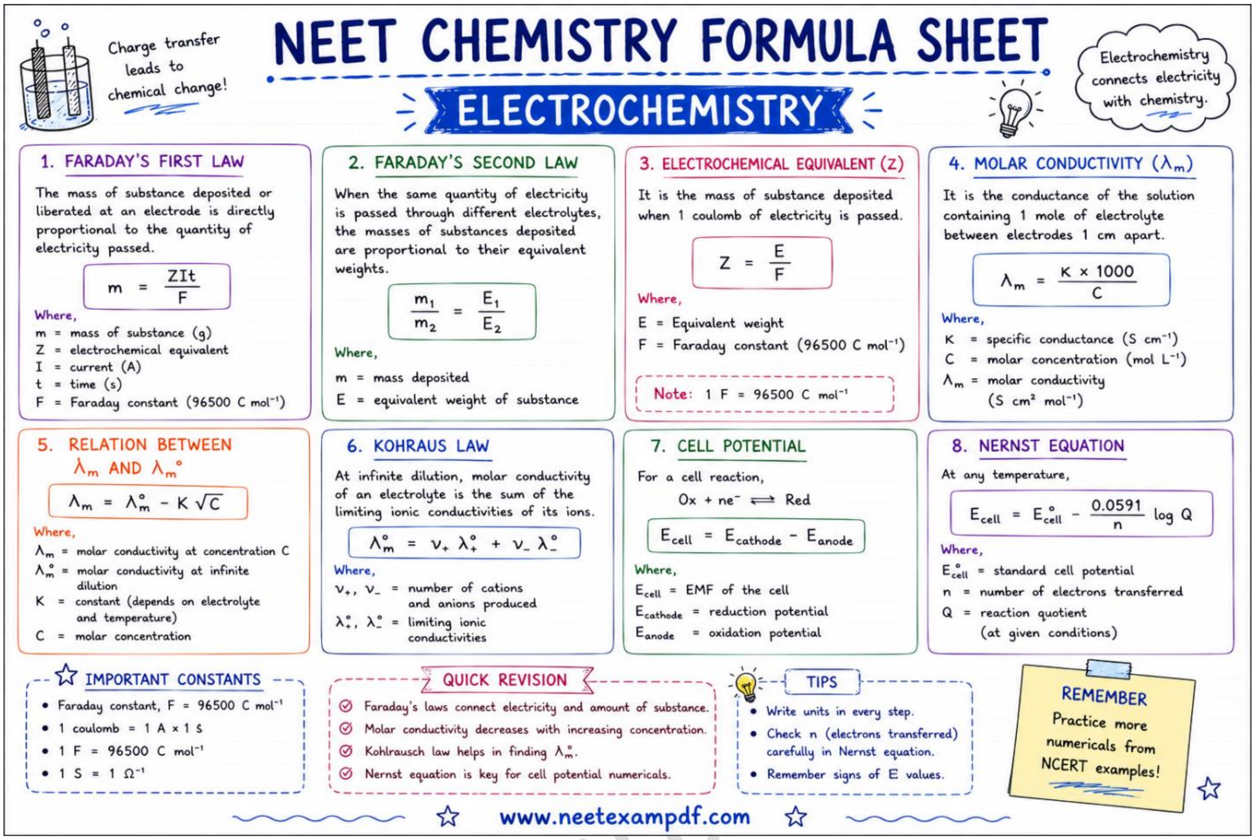

Charge transfer leads to chemical change!

NEET CHEMISTRY FORMULA SHEET

ELECTROCHEMISTRY

Electrochemistry connects electricity with chemistry.

1. FARADAY'S FIRST LAW

The mass of substance deposited or liberated at an electrode is directly proportional to the quantity of electricity passed.

$$\boxed{m = \frac{ZIt}{F}}$$

Where,

m = mass of substance (g)
Z = electrochemical equivalent
I = current (A)
t = time (s)
F = Faraday constant (96500 C mol^{-1})

2. FARADAY'S SECOND LAW

When the same quantity of electricity is passed through different electrolytes, the masses of substances deposited are proportional to their equivalent weights.

$$\boxed{\frac{m_1}{m_2} = \frac{E_1}{E_2}}$$

Where,

m = mass deposited
E = equivalent weight of substance

3. ELECTROCHEMICAL EQUIVALENT (Z)

It is the mass of substance deposited when 1 coulomb of electricity is passed.

$$\boxed{Z = \frac{E}{F}}$$

Where,

E = Equivalent weight
F = Faraday constant (96500 C mol^{-1})

Note: 1 F = 96500 C mol^{-1}

4. MOLAR CONDUCTIVITY (λ_m)

It is the conductance of the solution containing 1 mole of electrolyte between electrodes 1 cm apart.

$$\boxed{\Lambda_m = \frac{K \times 1000}{C}}$$

Where,

K = specific conductance (S cm^{-1})
C = molar concentration (mol L^{-1})
Λ_m = molar conductivity (S cm^2 mol^{-1})

5. RELATION BETWEEN λ_m AND λ_m°

$$\boxed{\Lambda_m = \Lambda_m^\circ - K\sqrt{C}}$$

Where,

Λ_m = molar conductivity at concentration C
Λ_m° = molar conductivity at infinite dilution
K = constant (depends on electrolyte and temperature)
C = molar concentration

6. KOHRAUS LAW

At infinite dilution, molar conductivity of an electrolyte is the sum of the limiting ionic conductivities of its ions.

$$\boxed{\Lambda_m^\circ = \nu_+ \lambda_+^\circ + \nu_- \lambda_-^\circ}$$

Where,

ν_+, ν_- = number of cations and anions produced
$\lambda_+^\circ, \lambda_-^\circ$ = limiting ionic conductivities

7. CELL POTENTIAL

For a cell reaction,

$$Ox + ne^- \rightleftharpoons Red$$

$$\boxed{E_{cell} = E_{cathode} - E_{anode}}$$

Where,

E_{cell} = EMF of the cell
$E_{cathode}$ = reduction potential
E_{anode} = oxidation potential

8. NERNST EQUATION

At any temperature,

$$\boxed{E_{cell} = E_{cell}^\circ - \frac{0.0591}{n} \log Q}$$

Where,

E_{cell}° = standard cell potential
n = number of electrons transferred
Q = reaction quotient (at given conditions)

☆ IMPORTANT CONSTANTS

- Faraday constant, F = 96500 C mol^{-1}
- 1 coulomb = 1 A × 1 s
- 1 F = 96500 C mol^{-1}
- 1 S = 1 Ω^{-1}

QUICK REVISION

- ✓ Faraday's laws connect electricity and amount of substance.
- ✓ Molar conductivity decreases with increasing concentration.
- ✓ Kohlrausch law helps in finding Λ_m°.
- ✓ Nernst equation is key for cell potential numericals.

TIPS

- Write units in every step.
- Check n (electrons transferred) carefully in Nernst equation.
- Remember signs of E values.

REMEMBER
Practice more numericals from NCERT examples!

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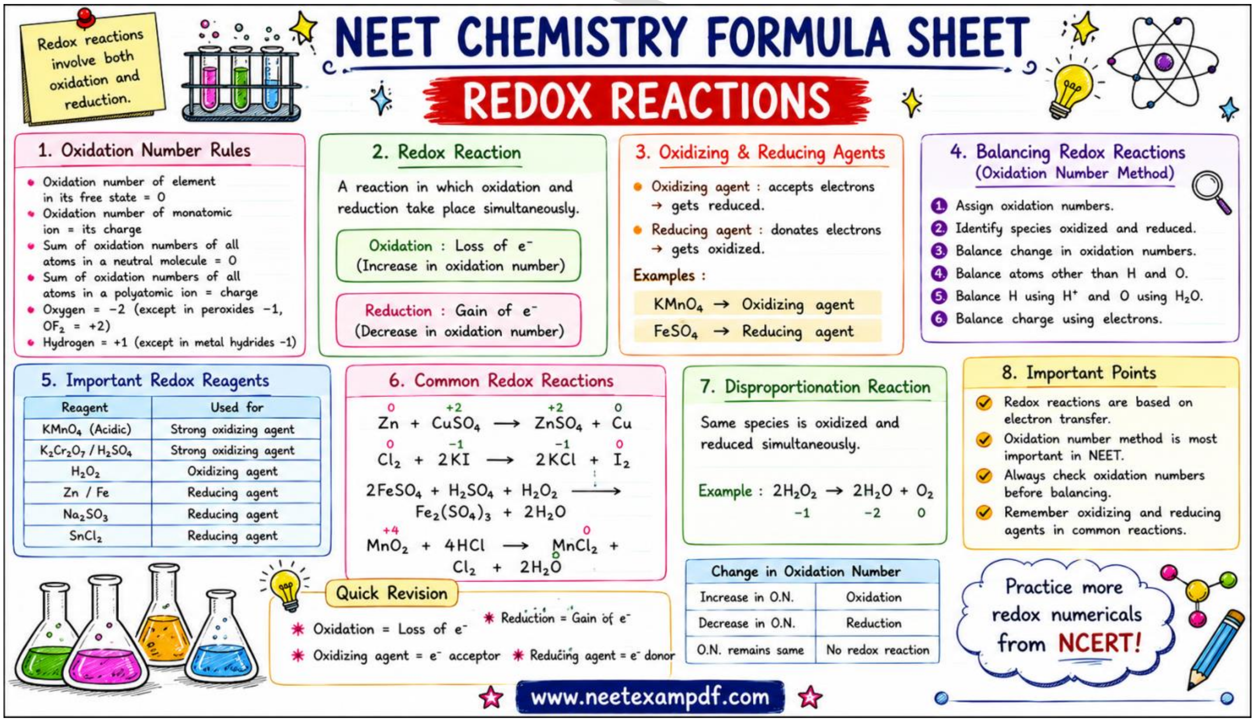

Redox reactions involve both oxidation and reduction.

NEET CHEMISTRY FORMULA SHEET

REDOX REACTIONS

1. Oxidation Number Rules

- Oxidation number of element in its free state = 0
- Oxidation number of monatomic ion = its charge
- Sum of oxidation numbers of all atoms in a neutral molecule = 0
- Sum of oxidation numbers of all atoms in a polyatomic ion = charge
- Oxygen = −2 (except in peroxides −1, OF_2 = +2)
- Hydrogen = +1 (except in metal hydrides −1)

2. Redox Reaction

A reaction in which oxidation and reduction take place simultaneously.

Oxidation : Loss of e^-
(Increase in oxidation number)

Reduction : Gain of e^-
(Decrease in oxidation number)

3. Oxidizing & Reducing Agents

- **Oxidizing agent** : accepts electrons → gets reduced.
- **Reducing agent** : donates electrons → gets oxidized.

Examples :

$KMnO_4$ → Oxidizing agent
$FeSO_4$ → Reducing agent

4. Balancing Redox Reactions (Oxidation Number Method)

1. Assign oxidation numbers.
2. Identify species oxidized and reduced.
3. Balance change in oxidation numbers.
4. Balance atoms other than H and O.
5. Balance H using H^+ and O using H_2O.
6. Balance charge using electrons.

5. Important Redox Reagents

Reagent	Used for
$KMnO_4$ (Acidic)	Strong oxidizing agent
$K_2Cr_2O_7 / H_2SO_4$	Strong oxidizing agent
H_2O_2	Oxidizing agent
Zn / Fe	Reducing agent
Na_2SO_3	Reducing agent
$SnCl_2$	Reducing agent

6. Common Redox Reactions

$$\overset{0}{Zn} + \overset{+2}{Cu}SO_4 \longrightarrow \overset{+2}{Zn}SO_4 + \overset{0}{Cu}$$

$$\overset{0}{Cl_2} + 2K\overset{-1}{I} \longrightarrow 2K\overset{-1}{Cl} + \overset{0}{I_2}$$

$$2FeSO_4 + H_2SO_4 + H_2O_2 \longrightarrow Fe_2(SO_4)_3 + 2H_2O$$

$$\overset{+4}{Mn}O_2 + 4HCl \longrightarrow \overset{0}{Mn}Cl_2 + Cl_2 + 2H_2O$$

7. Disproportionation Reaction

Same species is oxidized and reduced simultaneously.

Example : $2H_2\overset{-1}{O_2} \rightarrow 2H_2\overset{-2}{O} + \overset{0}{O_2}$

8. Important Points

- ✓ Redox reactions are based on electron transfer.
- ✓ Oxidation number method is most important in NEET.
- ✓ Always check oxidation numbers before balancing.
- ✓ Remember oxidizing and reducing agents in common reactions.

Quick Revision

- ✱ Oxidation = Loss of e^-
- ✱ Reduction = Gain of e^-
- ✱ Oxidizing agent = e^- acceptor
- ✱ Reducing agent = e^- donor

Change in Oxidation Number	
Increase in O.N.	Oxidation
Decrease in O.N.	Reduction
O.N. remains same	No redox reaction

Practice more redox numericals from NCERT!

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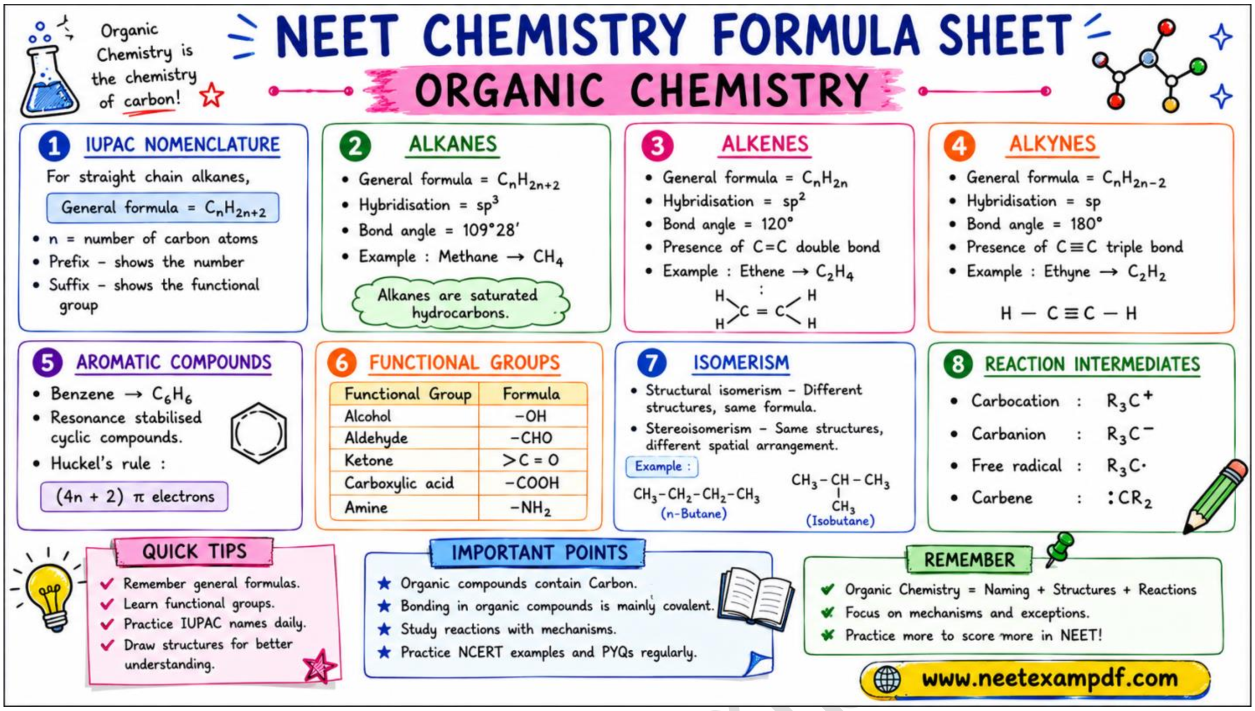

Organic Chemistry is the chemistry of carbon!

NEET CHEMISTRY FORMULA SHEET

ORGANIC CHEMISTRY

1 IUPAC NOMENCLATURE

For straight chain alkanes,

General formula = C_nH_{2n+2}

- n = number of carbon atoms
- Prefix – shows the number
- Suffix – shows the functional group

2 ALKANES

- General formula = C_nH_{2n+2}
- Hybridisation = sp^3
- Bond angle = 109°28′
- Example : Methane → CH_4

Alkanes are saturated hydrocarbons.

3 ALKENES

- General formula = C_nH_{2n}
- Hybridisation = sp^2
- Bond angle = 120°
- Presence of C=C double bond
- Example : Ethene → C_2H_4

$$H_2C = CH_2$$

4 ALKYNES

- General formula = C_nH_{2n-2}
- Hybridisation = sp
- Bond angle = 180°
- Presence of C≡C triple bond
- Example : Ethyne → C_2H_2

$$H - C \equiv C - H$$

5 AROMATIC COMPOUNDS

- Benzene → C_6H_6
- Resonance stabilised cyclic compounds.
- Huckel's rule :

(4n + 2) π electrons

6 FUNCTIONAL GROUPS

Functional Group	Formula
Alcohol	–OH
Aldehyde	–CHO
Ketone	>C = O
Carboxylic acid	–COOH
Amine	$-NH_2$

7 ISOMERISM

- Structural isomerism – Different structures, same formula.
- Stereoisomerism – Same structures, different spatial arrangement.

Example :

$CH_3-CH_2-CH_2-CH_3$ (n-Butane)

$$\underset{\displaystyle CH_3}{CH_3-\overset{}{\underset{|}{C}H}-CH_3}$$

(Isobutane)

8 REACTION INTERMEDIATES

- Carbocation : R_3C^+
- Carbanion : R_3C^-
- Free radical : $R_3C\cdot$
- Carbene : $:CR_2$

QUICK TIPS

- ✓ Remember general formulas.
- ✓ Learn functional groups.
- ✓ Practice IUPAC names daily.
- ✓ Draw structures for better understanding.

IMPORTANT POINTS

- ★ Organic compounds contain Carbon.
- ★ Bonding in organic compounds is mainly covalent.
- ★ Study reactions with mechanisms.
- ★ Practice NCERT examples and PYQs regularly.

REMEMBER

- ✓ Organic Chemistry = Naming + Structures + Reactions
- ✓ Focus on mechanisms and exceptions.
- ✓ Practice more to score more in NEET!

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