Chemistry Cheat Sheet

PERIODIC TABLE

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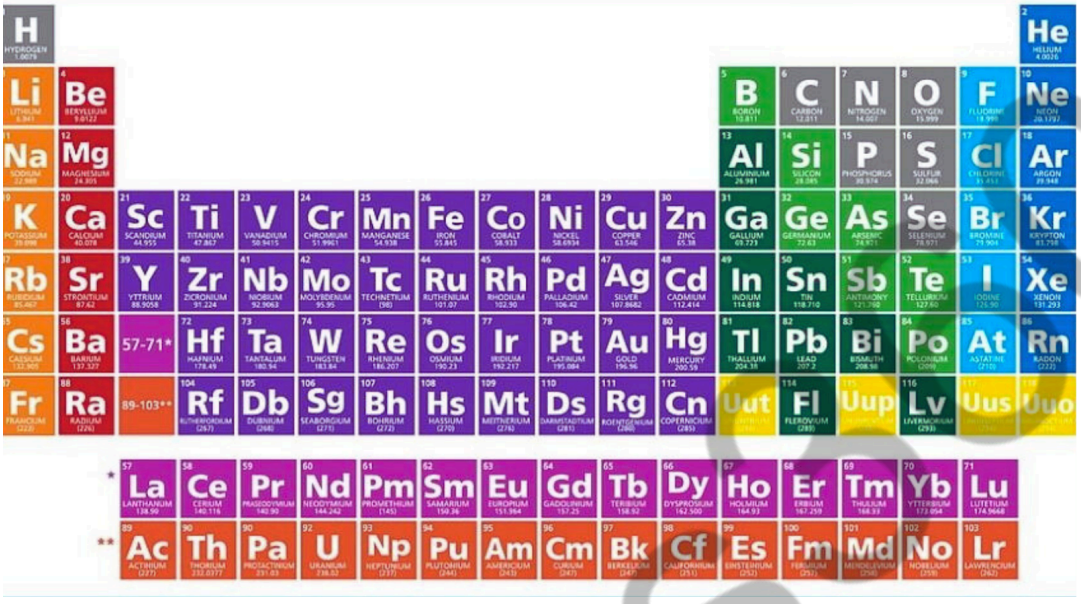

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About this eBook

Welcome to Your Ultimate Chemistry Cheat Sheet!

This eBook is your go-to guide for mastering essential chemistry concepts, especially if you're preparing for exams like NEET. Designed for quick review and efficient learning, it packs a powerful punch of information into a concise format.

What's Inside?

- **Core Chemistry Concepts:** A rapid review of fundamental principles.
- **Key Formulas & Equations:** Essential equations at your fingertips.
- **Reaction Tables:** Quick references for organic reactions.
- **Organic Chemistry**: Reactions and Mechanisms
- **Physical Chemistry:** Key Equations & Shortcuts
- **Inorganic Chemistry:** Periodic Trends & Compounds
- **Periodic trends** (atomic radius, electronegativity, ionization energy)

Benefits of Using This Cheat Sheet

- **Rapid Recall:** Quickly refresh your knowledge of key formulas and concepts.
- **Exam-Focused:** Specifically designed to help you excel in exams like NEET.
- **Problem-Solving:** Improve your speed and accuracy in solving chemistry problems.
- **Efficient Study:** Focus on the most important information for maximum impact.

Content Breakdown

- **Introduction to Chemistry:** Basic definitions and branches.
- **Physical Chemistry:** Formulas, kinetics, equilibrium, thermodynamics.
- **Organic Chemistry:** Reaction mechanisms, functional groups.
- **Inorganic Chemistry:** Periodic trends, coordination compounds.
- **Formula & Equation Summary**: A comprehensive list of essential equations.
- **Reaction Tables:** Quick reference for key organic reactions with descriptions and formulas.

How to Use This Cheat Sheet Effectively

- **Review regularly:** Use this cheat sheet for regular review sessions to reinforce your understanding.
- **Practice Problems:** Apply the formulas and concepts to practice problems to solidify your knowledge.
- **Exam Prep:** Use it as a quick reference guide during your final exam preparation.

Introduction to Chemistry

Chemistry is the study of matter and its transformations, which is crucial in understanding the world around us. From the air we breathe to the materials we use, chemistry is integral to everyday life. This eBook is designed as a cheat sheet to help students quickly review and grasp key chemistry concepts, particularly those preparing for exams like JEE and NEET.

Branches of Chemistry

Chemistry is broadly categorised into several branches:

Branch of Chemistry	Description
Organic Chemistry	Deals with carbon-based compounds.
Inorganic Chemistry	Focuses on compounds not containing carbon.
Physical Chemistry	Applies principles of physics to study chemical systems.
Analytical Chemistry	Concerned with the analysis of chemical substances.

Basic Chemistry Concepts

- **Atomic Structure:** Atoms consist of protons, neutrons, and electrons.
- **Chemical Bonding:** Involves the formation of bonds between atoms.
- **Stoichiometry:** Studies the quantitative relationships in chemical reactions.

Atomic Structure

- **Protons, Neutrons, and Electrons:** Protons and neutrons reside in the nucleus, while electrons orbit around it.
- **Atomic Number and Mass**: The Atomic number determines the element's identity, while atomic mass is the sum of protons and neutrons.

Chemical Bonding

- **Types of Bonds:** Ionic, covalent, and metallic bonds.
- **Bonding Theories:** Ionic, covalent, and metallic bonding theories explain how atoms share or transfer electrons.

Stoichiometry

- **Mole Concept:** The mole is a unit of measurement for the amount of substance.
- **Balancing Chemical Equations**: Ensures that the number of atoms of each element is the same on both sides of a chemical equation.

Physical Chemistry: Important Formulas, Reaction Kinetics, Equilibrium Expressions, and Thermodynamics Shortcuts

Physical chemistry is a branch of chemistry that deals with matter's physical properties and behavior concerning chemical reactions. It encompasses mathematical formulations and principles to explain chemical systems. Below is an elaborate guide on important formulas in physical chemistry, including reaction kinetics, equilibrium expressions, and thermodynamic shortcuts.

Importance of Physical Chemistry

Physical chemistry is essential for understanding the quantitative aspects of chemical reactions. It provides tools to calculate reaction rates, energy changes, and equilibrium constants, making it crucial for industrial processes, environmental studies, and material science. In the NEET exam, physical

chemistry is particularly important because it tests problem-solving skills through numerical questions based on theoretical concepts.

Physical Chemistry in the NEET Exam

In NEET, physical chemistry constitutes a significant portion of the chemistry section. Approximately 40% of the chemistry questions are derived from this domain. The following chapters are key to NEET preparation:

1. Reaction Kinetics

Reaction kinetics focuses on the rate at which chemical reactions occur and the factors influencing these rates.

Key Formulas

Some key formulas which will help the students gain more understanding are:

Concept	Equation	Description
Rate Law	$\text{Rate} = k[\text{A}]^m[\text{B}]^n$	General rate law for a chemical reaction, where k is the rate constant, $[\text{A}]$ and $[\text{B}]$ are reactant concentrations, and m and n are reaction orders.
Zero Order Integrated Rate Law	$[\text{A}]_t = [\text{A}]_0 - kt$	Integrated rate law for zero-order reactions, where $[\text{A}]_t$ is the concentration at time t, $[\text{A}]_0$ is the initial concentration, and k is the rate constant.
First Order Integrated Rate Law	$[\text{A}]_t = [\text{A}]_0 e^{-kt}$ or $\ln[\text{A}]_t = \ln[\text{A}]_0 - kt$	Integrated rate law for first-order reactions.
Second Order Integrated Rate Law	$\frac{1}{[\text{A}]_t} = \frac{1}{[\text{A}]_0} + kt$	Integrated rate law for second-order reactions (specific form).
Arrhenius Equation	$k = Ae^{-\frac{E_a}{RT}}$	Relates the rate constant k to temperature, where E_a is the activation energy, R is the gas constant, T is the temperature in Kelvin, and A is the pre-exponential factor.
Half-life for First-Order Reactions	$t_{1/2} = \frac{\ln 2}{k}$	The time required for the concentration of a reactant to decrease by half in a first-order reaction.

Physical Chemistry Formulas

Some important formulas are given below:

Equation	Description	Formula
Ideal Gas Law	Relates pressure, volume, and temperature of gases.	$PV = nRT$
Equilibrium Constant Expression	Describes the ratio of products to reactants at equilibrium.	$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$
Gibbs Free Energy Change	Determines the spontaneity of reactions.	$\Delta G = \Delta H - T\Delta S$

Summary of Rate Laws

Order	Rate Law	Integrated Form	Half-life Formula
Zero	$\text{Rate} = k$	$[A]_t = [A]_0 - kt$	$t_{1/2} = \frac{[A]_0}{2k}$
First	$\text{Rate} = k[A]$	$[A]_t = [A]_0 e^{-kt}$	$t_{1/2} = \frac{\ln 2}{k}$
Second	$\text{Rate} = k[A]^2$	$\frac{1}{[A]_t} = \frac{1}{[A]_0} + kt$	$t_{1/2} = \frac{1}{k[A]_0}$

2. Chemical Equilibrium

Chemical equilibrium occurs when the forward and reverse reaction rates are equal.

Key Formulas

Some key formulas are mentioned below:

Concept	Equation	Description
Equilibrium Constant (K_c)	$K_c = \frac{[\text{C}]^c[\text{D}]^d}{[\text{A}]^a[\text{B}]^b}$	For a reaction $a\text{A} + b\text{B} \rightleftharpoons c\text{C} + d\text{D}$, where K_c is the equilibrium constant.
Relation Between K_p and K_c	$K_p = K_c(RT)^{\Delta n}$	For gaseous reactions, where R is the gas constant, and Δn is the change in moles of gas.
Reaction Quotient (Q)	$Q = \frac{[\text{C}]^c[\text{D}]^d}{[\text{A}]^a[\text{B}]^b}$	At any point in the reaction, use to compare with K_c to determine reaction direction.

Le Chatelier's Principle	-	States that changes in concentration, pressure, or temperature shift the equilibrium to counteract the change.

3. Thermodynamics

Thermodynamics deals with energy changes during chemical reactions.

Key Formulas

Some key formulas are mentioned below:

Concept	Equation	Description
First Law of Thermodynamics	$\Delta U = q + w$	Energy conservation, where q is the heat exchanged and w is the work done.
Enthalpy (ΔH)	$Q_p = \Delta H$	At constant pressure, where Q_p is the heat exchanged at constant pressure.
Gibbs Free Energy (ΔG)	$\Delta G = \Delta H - T\Delta S$	Determines the spontaneity of a reaction, where ΔH is the enthalpy change, T is the temperature, and ΔS is the entropy change.
Conditions for Spontaneity	-	If $\Delta G < 0$, the reaction is spontaneous. If $\Delta G > 0$, the reaction is non-spontaneous.
Relation Between Gibbs Free Energy and Equilibrium Constant	$\Delta G = \Delta H - T\Delta S$	At equilibrium, this equation applies. However, the relation to the equilibrium constant is given by $\Delta G = -RT \ln K$.
Entropy (ΔS)	$dS = \frac{1}{T} q_{\text{rev}}$	Entropy change for reversible processes, where q_{rev} is the reversible heat exchanged.
Heat Capacity	-	At constant volume (C_v) or pressure (C_p), for ideal gases:

4. Thermodynamic Shortcuts

Some Shortcut Rules for Calculations are:

1. **For exothermic reactions** ($\Delta H^\circ < 0$), increasing temperature shifts equilibrium toward reactants.

2. **For endothermic reactions** ($\Delta H^\circ > 0$), increasing temperature shifts equilibrium toward products.
3. Use standard enthalpy values to approximate heat changes in bond-breaking and bond-forming processes.

Important Equations in Physical Chemistry

Some important equations in physical chemistry:

Concept	Equation	Description
Ideal Gas Law	$PV = nRT$	Relates pressure (P), volume (V), number of moles (n), gas constant (R), and temperature (T) for ideal gases.
Van der Waals Equation	$\left(P + \frac{n^2a}{V^2}\right)(V - nb) = nRT$	For real gases, where a and b are constants specific to each gas, accounting for molecular interactions and volume.
Nernst Equation	$E = E^\circ - \frac{RT}{nF}\ln Q$	For electrochemical cells, where E is the cell potential, E° is the standard cell potential, n is the number of electrons transferred, and F is Faraday's constant.

Quick revision notes:

Below are some short notes for quick revision:

Thermodynamics

- **Laws of Thermodynamics:** The First, second, and third laws describe energy transformations.
- **Gibbs Free Energy:** Determines spontaneity of reactions with $\Delta G = \Delta H - T\Delta S$.

Kinetics

- **Rate Equation**: Describes the rate of chemical reactions with $\text{Rate} = k[A]^m[B]^n$.
- **Catalysts and Activation Energy**: Catalysts speed up reactions by lowering activation energy.

Equilibrium

- **Equilibrium Constant Expression:** $K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$ describes the ratio of products to reactants.
- **Le Chatelier's Principle:** Describes how changes in concentration, temperature, or pressure affect equilibrium.

Preparation Strategy for Physical Chemistry

Some preparation tips from experts are:

1. **Master Formulae:**

Memorize key formulas for thermodynamics, kinetics, and equilibrium.

Practice applying these formulas to solve numerical problems.

2. **Focus on NCERT:**

   Thoroughly study NCERT textbooks, as most NEET questions are based on them.

3. **Practice Numericals Regularly:**

   Solve previous years' NEET questions to improve speed and accuracy.

4. **Understand Concepts:**

   Avoid rote learning; focus on understanding the derivations and applications of formulas.

5. **Use Revision Notes**

   Create concise notes summarizing important formulas and concepts for quick revision.

Organic Chemistry: Key Reaction Mechanisms

Organic chemistry is the study of carbon-containing compounds and their structures, properties, reactions, and mechanisms. It forms a bridge between inorganic chemistry and biochemistry due to its relevance in biological systems. Organic chemistry revolves around understanding how molecules interact, transform, and form new compounds.

Importance of Organic Chemistry

Organic chemistry is crucial for understanding biochemical processes such as respiration and photosynthesis. It also plays a vital role in pharmaceuticals, polymers, agrochemicals, and materials science. In NEET, organic chemistry tests conceptual clarity in reaction mechanisms and functional group transformations.

Organic Chemistry in the NEET Exam

Organic chemistry constitutes approximately 40% of the NEET chemistry section. The following topics are essential. Three fundamental reaction mechanisms- Substitution, Elimination, and Addition —are the cornerstone of organic synthesis.

1. Substitution Reactions

In substitution reactions, one atom or group in a molecule is replaced by another atom or group. These reactions are classified into nucleophilic substitution (SN1 and SN2) and electrophilic substitution.

Nucleophilic Substitution

Nucleophilic substitution reactions involve the replacement of a leaving group by a nucleophile. These reactions are categorized into SN1 and SN2 mechanisms based on their reaction pathways.

Mechanism	**Equation**	**Description**
SN2	$CH_3Br + OH^- \rightarrow CH_3OH + Br^-$	Single-step process where the nucleophile attacks the

		electrophilic carbon, displacing the leaving group.
SN1	$(CH_3)_3CBr + H_2O \rightarrow (CH_3)_3COH + HBr$	Two-step process involving a carbocation intermediate.

Elimination Reactions

Elimination reactions involve the removal of atoms or groups from adjacent carbon atoms, resulting in the formation of a double or triple bond. These reactions are classified into E1 and E2 mechanisms.

Mechanism	Equation	Description
E2	$CH_3\text{-}CH_2\text{-}Br + OH^- \rightarrow CH_2 = CH_2 + H_2O + Br^-$	Single-step process where the base removes a proton and the leaving group departs simultaneously.
E1	$CH_3\text{-}CH_2\text{-}Br \rightarrow CH_2 = CH_2 + HBr$	Two-step process involving a carbocation intermediate.

Addition Reactions

Additional reactions involve the breaking of a π-bond (double or triple bond) to add new groups to the molecule. These reactions are classified into electrophilic addition, nucleophilic addition, and free radical addition.

Type	Equation	Description
Electrophilic Addition	$CH_2 = CH_2 + HBr \rightarrow CH_3\text{-}CH_2Br$	Typically occurs in alkenes or alkynes with an electrophile reacting with the π-bond.
Nucleophilic Addition	$HCHO + CN^- \rightarrow HOCHCN^-$	Commonly occurs in carbonyl compounds (aldehydes or ketones).

Summary Table

Reaction Type	Key Feature	Example Reaction
Substitution	Replacement of one group by another	$CH_3Br + OH^- \rightarrow CH_3OH + Br^-$
Elimination	Removal of atoms to form π-bonds	$CH_3\text{-}CH_2\text{-}Br + OH^- \rightarrow CH_2 = CH_2 + H_2O + Br^-$
Addition	Breaking π-bonds to add new groups	$CH_2 = CH_2 + HBr \rightarrow CH_3\text{-}CH_2Br$

This systematic approach to substitution, elimination, and addition reactions provides a foundation for understanding complex organic transformations essential for synthesis and analysis in organic chemistry.

- **Key Reaction Mechanisms:** Substitution, elimination, and addition reactions.
- **Functional Groups:** Alcohols, aldehydes, ketones, and carboxylic acids influence reactivity.

Preparation Strategy for Organic Chemistry

Some preparation tips from experts are:

1. **Understand Reaction Mechanisms:**

   Focus on key mechanisms such as electrophilic substitution or nucleophilic addition.

2. **Memorise Named Reactions:**

   Learn important reactions like Aldol condensation or Cannizzaro reaction with their mechanisms.

3. **Practice Functional Group Conversions:**

   Solve problems involving multi-step synthesis pathways.

4. **Use Mnemonics for Functional Groups:**

   Example: **"Eat Apples And Keep Calm"** (Ethanol → Aldehyde → Acid → Ketone → Carboxylic acid).

5. **Solve Mock Tests Regularly:**

   Attempt organic-specific tests to improve accuracy in identifying reaction products or intermediates.

Organic Chemistry Formulas

Some important Key Reaction Mechanisms are given below:

Topic	Description	Formula
SN1 Rate Equation	Rate of SN1 reaction.	$\text{Rate} = k[\text{substrate}]$
SN2 Rate Equation	Rate of SN2 reaction.	$\text{Rate} = k[\text{substrate}][\text{nucleophile}]$
E1 Rate Equation	Rate of E1 reaction.	$\text{Rate} = k[\text{substrate}]$
E2 Rate Equation	Rate of E2 reaction.	$\text{Rate} = k[\text{substrate}][\text{base}]$

Inorganic Chemistry

Inorganic chemistry is a core branch of chemistry that focuses on the study of compounds that do not contain carbon-hydrogen (C-H) bonds. These compounds include minerals, metals, nonmetals, salts, acids, bases, and coordination complexes. The field is essential for understanding the properties, structures, and reactions of elements and their compounds, which are fundamental to various scientific and industrial applications.

Importance of Inorganic Chemistry

Inorganic chemistry plays a pivotal role in numerous fields:

- **Materials Science**: It aids in developing advanced materials like semiconductors, ceramics, and superconductors.
- **Catalysis**: Inorganic compounds act as catalysts in industrial processes (e.g., the Haber process for ammonia synthesis).
- **Biochemistry**: Metal ions and inorganic molecules are critical in biological systems (e.g., hemoglobin with iron).
- **Environmental Science**: It helps understand pollution control mechanisms and the chemical behavior of natural resources.
- **Medicine**: Many drugs and diagnostic agents are based on inorganic compounds (e.g., cisplatin for cancer treatment).

Inorganic Chemistry in the NEET Exam

The National Eligibility cum Entrance Test (NEET), a crucial exam for medical aspirants in India, emphasises inorganic chemistry due to its conceptual clarity and direct application. Inorganic chemistry constitutes about 40% of the chemistry section in NEET, making it a significant scoring area. The syllabus includes:

1. **Classification of Elements and Periodicity in Properties:**
    - Covers periodic trends such as atomic radius, ionization energy, electronegativity, and electron affinity.
    - Helps to understand how these trends influence chemical reactivity.
2. **P-Block Elements:**
    - Focuses on elements from groups 13 to 18.
    - Includes properties, reactions, and uses of compounds like oxides, halides, and acids.
3. **d- and f-Block Elements:**

- Discusses transition metals (d-block) and lanthanides/actinides (f-block).
- Explores their variable oxidation states, magnetic properties, and catalytic behavior.

4. **Coordination Compounds:**
    - Covers complex compounds formed by metal ions with ligands.
    - Includes topics like Werner's theory, isomerism, bonding theories (crystal field theory), and biological importance.

Preparation Strategy for NEET Inorganic Chemistry

To excel in NEET inorganic chemistry:

1. Master Periodic Trends:
2. Focus on Conceptual Clarity:
3. Use Mnemonics for Memorization:
4. Practice Mock Tests:
5. Understand Coordination Chemistry:

Inorganic Chemistry Formulas

Some important Trends and Formulas are given below:

Equation	Description	Formula
Ionic Bond Formation	Energy change during ionic bond formation.	$\Delta E = \frac{e^2}{4\pi\epsilon_0 r}$
Coordination Compound Stability	Factors affecting stability of coordination compounds.	$K = \frac{[\text{complex}]}{[\text{metal}][\text{ligand}]}$

Learn geometries based on coordination numbers:

Coordination Number	Geometry
2	Linear
4	Tetrahedral/Square Planar
6	Octahedral

Periodic Trends: Atomic Radius, Electronegativity, and Ionization Energy Trends

Periodic trends are essential patterns observed in the periodic table that help predict various properties of elements, including atomic radius, electronegativity, and ionization energy. These trends are crucial for understanding the chemical behavior and physical properties of elements.

Atomic Radius Trends

- **Definition**: The atomic radius is the distance from the nucleus to the outermost electron shell of an atom.

- **Trend Across a Period:** Atomic radius decreases as you move from left to right across a period. This decrease is due to the increase in effective nuclear charge, which pulls electrons closer to the nucleus.
- **Trend Down a Group**: The Atomic radius increases as you move down a group. This increase occurs because additional electron shells are added, which increases the distance between the nucleus and the outermost electrons.

Electronegativity Trends

- **Definition**: Electronegativity is a measure of an atom's ability to attract electrons in a covalent bond.
- **Trend Across a Period:** Electronegativity increases from left to right across a period. This increase is due to the rise in effective nuclear charge, which enhances the atom's ability to attract electrons.
- **Trend Down a Group:** Electronegativity decreases down a group. The addition of electron shells reduces the influence of the nucleus on the outer electrons, leading to a decrease in electronegativity.

Ionization Energy Trends

- **Definition**: Ionization energy is the energy required to remove an electron from an atom or ion.
- **Trend Across a Period:** Ionization energy generally increases from left to right across a period. This increase is due to the decrease in atomic radius and the rise in effective nuclear charge, making it harder to remove electrons.
- **Trend Down a Group**: Ionization energy decreases down a group. The increase in atomic radius and the shielding effect of additional electron shells reduce the effective nuclear charge experienced by outer electrons, making it easier to remove them.

Summary of Trends

The summary is mentioned below:

Property	**Trend Across a Period**	**Trend Down a Group**
Atomic Radius	Decreases	Increases
Electronegativity	Increases	Decreases
Ionization Energy	Generally Increases	Decreases

Coordination Compounds: Structures and Properties

Coordination compounds are complex molecules composed of a central metal atom or ion bonded to one or more ligands. These compounds exhibit unique structures and properties that are influenced by the nature of the metal and the ligands involved.

Structures of Coordination Compounds

- **Monodentate Ligands:** These ligands bind to the metal center through a single atom, such as ammonia (NH_3) or water (H_2O).
- **Polydentate Ligands:** These ligands bind to the metal center through multiple atoms, such as ethylenediamine (en) or EDTA.

- **Coordination Number:** The number of ligands attached to the central metal atom, which can vary depending on the metal's size and electronic configuration.
- **Geometry**: The arrangement of ligands around the metal center, which can be octahedral, tetrahedral, square planar, etc.

Properties of Coordination Compounds

- **Colour**: Many coordination compounds exhibit vibrant colors due to the presence of unpaired electrons in the d orbitals of the metal ion.
- **Magnetic Properties**: The magnetic behavior of coordination compounds depends on the number of unpaired electrons in the metal ion.
- **Stability**: The stability of coordination compounds is influenced by factors such as the nature of the ligands, the coordination number, and the metal-ligand bond strength.
- **Biological Importance**: Coordination compounds play crucial roles in biological systems, such as in enzymes and proteins, where metal ions are often coordinated to ligands.

Examples of Coordination Compounds

Some examples of coordination compounds are mentioned below:

Compound	**Formula**	**Coordination Number**	**Geometry**
Tetraamminecopper(II)	$[Cu(NH_3)_4]^2+$	4	Square Planar
Hexaaquairon(III)	$[Fe(H_2O)_6]^3+$	6	Octahedral
Tetrachloroplatinate(II)	$[PtCl_4]^{2-}$	4	Square Planar

Understanding both periodic trends and the properties of coordination compounds is essential for predicting and explaining the chemical behavior of elements and their complexes. These concepts form the foundation of inorganic chemistry and have numerous applications in fields such as materials science, catalysis, and biochemistry.

Formula & Equation Summary

Common Chemistry Formulas are listed below:

Formula Name	**Description**	**Formula**
Ideal Gas Law	Relates pressure, volume, and temperature of an ideal gas.	$PV = nRT$
Avogadro's Law	The volume of a gas is proportional to the number of moles at constant pressure and temperature.	$V \propto n$

Boyle's Law	The volume of a gas is inversely proportional to pressure at constant temperature and moles.	$P \propto \frac{1}{V}$
Charles's Law	The volume of a gas is directly proportional to temperature at constant pressure and moles.	$V \propto T$
Gay-Lussac's Law	The pressure of a gas is directly proportional to temperature at constant volume and moles.	$P \propto T$
Arrhenius Equation	Relates the rate constant of a reaction to temperature.	$k = Ae^{-\frac{E_a}{RT}}$
Henderson-Hasselbalch Equation	Calculates pH of a buffer solution.	$\mathrm{pH} = \mathrm{p}K_a + \log\left(\frac{[\mathrm{A}^-]}{[\mathrm{HA}]}\right)$
Beer-Lambert Law	Relates absorbance of light by a solution to concentration and path length.	$A = \epsilon bc$
Nernst Equation	Relates electrode potential to concentration of ions.	$E = E^\circ - \frac{RT}{nF}\ln(Q)$
Equilibrium Constant Expression	Relates concentrations of reactants and products at equilibrium.	$K = \frac{[\text{products}]}{[\text{reactants}]}$

Reaction Tables

Organic Chemistry Reactions are listed below:

Reaction Name	Description	Formula
Grignard Reaction	Formation of Grignard reagents from alkyl halides and magnesium, used for adding alkyl groups to carbonyl compounds.	$\mathrm{R-X + Mg \rightarrow R-Mg-X}$

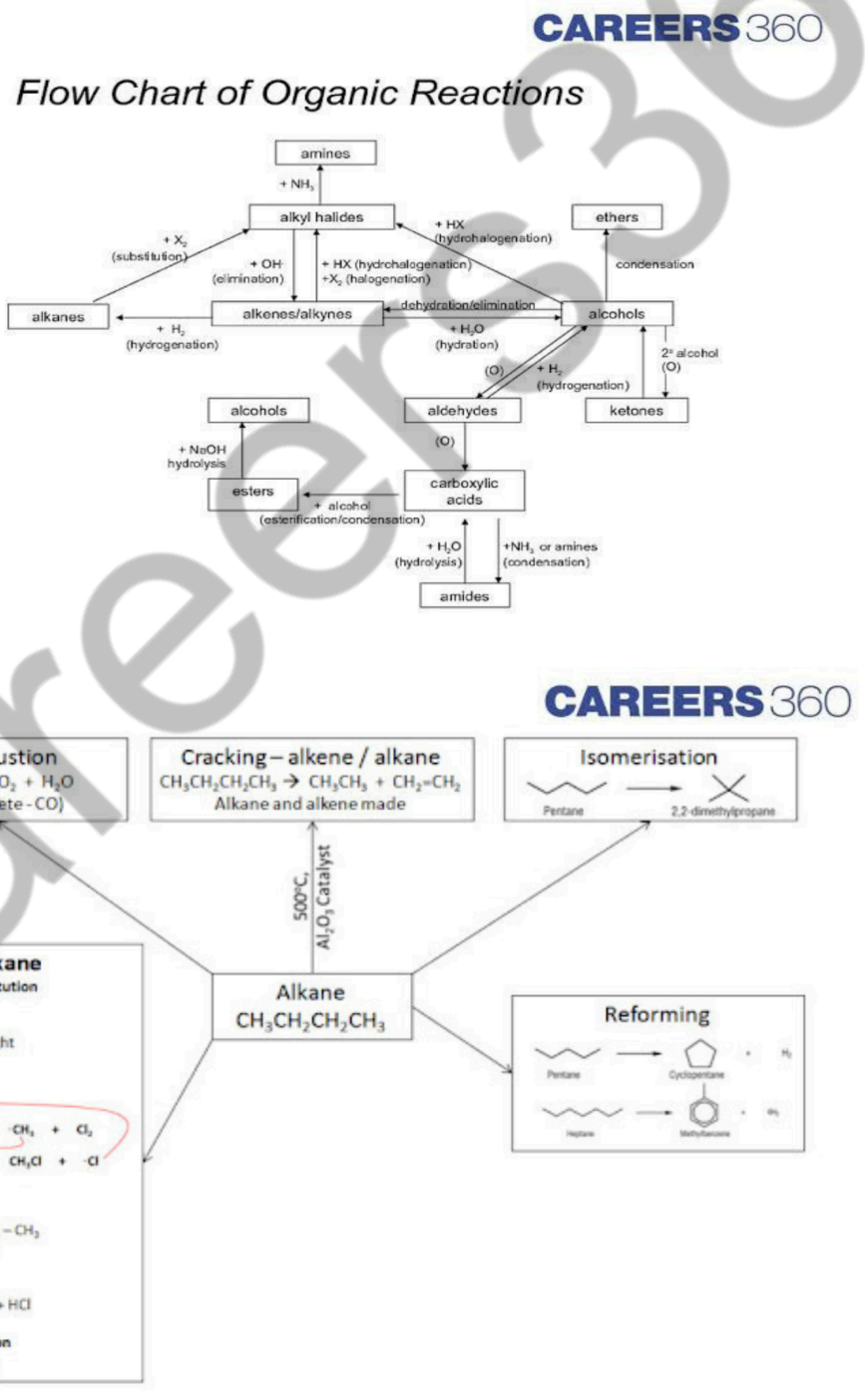
Wittig Reaction	Conversion of aldehydes or ketones to alkenes using phosphorus ylides.	$R_1CHO + Ph_3P=CHR_2 \rightarrow R_1CH=CHR_2 + Ph_3PO$
Diels-Alder Reaction	Cycloaddition between a diene and a dienophile to form a cyclohexene.	$CH_2=CH-CH=CH_2 + CH_2=CX \rightarrow$ cyclohexene derivatives
Friedel-Crafts Alkylation	Introduction of alkyl groups into an aromatic ring using an alkyl halide and a Lewis acid catalyst.	$C_6H_5H + R-Cl + AlCl_3 \rightarrow C_6H_5R + HCl$
Friedel-Crafts Acylation	Introduction of acyl groups into an aromatic ring using an acyl chloride and a Lewis acid catalyst.	$C_6H_5H + RCO-Cl + AlCl_3 \rightarrow C_6H_5CO-R + HCl$
Cannizzaro Reaction	Disproportionation of aldehydes without an alpha hydrogen to form an alcohol and a carboxylic acid.	$2RCHO \rightarrow RCH_2OH + RCOOH$
Gattermann-Koch Reaction	Formylation of aromatic compounds using carbon monoxide and hydrogen chloride.	$C_6H_5H + CO + HCl \rightarrow C_6H_5CHO + H_2O$
Sandmeyer Reaction	Replacement of the diazo group in an aryl diazonium salt with a halogen or cyanide.	$C_6H_5N_2^+ + CuX \rightarrow C_6H_5X + N_2 + Cu^+$
Balz-Schiemann Reaction	Conversion of aryl diazonium salts to aryl fluorides	$C_6H_5N_2^+ + BF_4^- \rightarrow C_6H_5F + N_2 + BF_3OH^-$

	using fluoroboric acid.	
Etard Reaction	Oxidation of toluene to benzaldehyde using chromyl chloride.	$C_6H_5CH_3 + CrO_2Cl_2 \rightarrow C_6H_5CHO + Cr^{3+}$

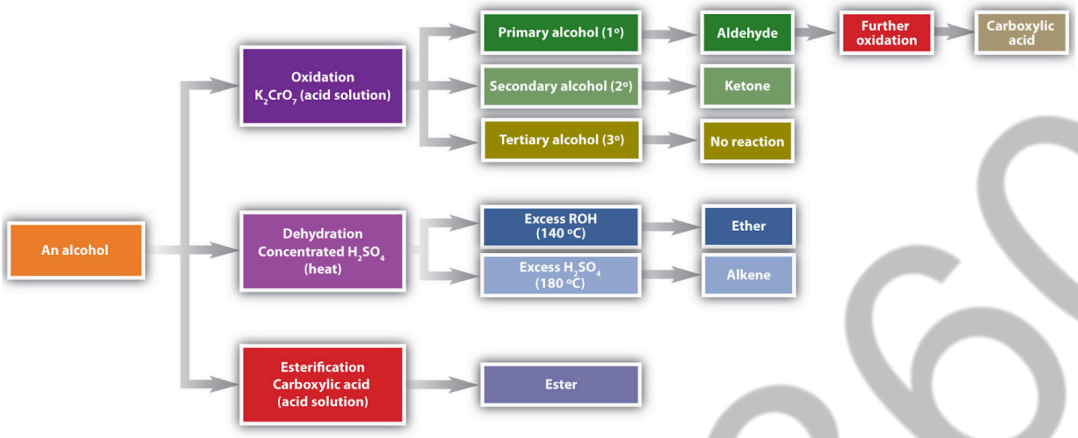
Flowcharts for Organic Reaction Mechanisms

Some flowcharts for your better understanding are given below:

1. Reaction Mechanism



2. Reaction of alcohols



Memory Aids & Mnemonics

Mnemonics for Chemistry are given in the table below:

Name	Description	Mnemonic
Group 14 Elements	Mnemonic for Group 14 elements: Carbon, Silicon, Germanium, Tin, Lead.	Crazy Scientists Go To Party.
Group 15 Elements	Mnemonic for Group 15 elements: Nitrogen, Phosphorus, Arsenic, Antimony, Bismuth.	Nice People Always Say Bye.
Group 16 Elements	Mnemonic for Group 16 elements: Oxygen, Sulfur, Selenium, Tellurium, Polonium.	Oh, See Sally Teach Physics.
Group 17 Elements	Mnemonic for Group 17 elements: Fluorine, Chlorine, Bromine, Iodine, Astatine.	Father Christmas Brought In Aunts.
s-Block Elements	Mnemonic for s-block elements: Hydrogen, Helium, Lithium, Beryllium, etc.	Here's Hello, Large Boats Need More Kids.

Orbital Sequence	Mnemonic for the sequence of atomic orbitals: s, p, d, f, g, h, i, k.	Silly People Do Funny Games Hiding In Kitchens.
CHON Elements	Mnemonic for the four most common elements in living organisms: Carbon, Hydrogen, Oxygen, Nitrogen.	Carbon, Hydrogen, Oxygen, Nitrogen.
Alkali Metals	Mnemonic for alkali metals: Lithium, Sodium, Potassium, Rubidium, Caesium.	Lions Say Please Remember Caution.
Alkaline Earth Metals	Mnemonic for alkaline earth metals: Magnesium, Calcium, Strontium, Barium.	My Cat Says Bye.
Transition Metals	Mnemonic for some transition metals: Scandium, Titanium, Vanadium, Chromium.	Scary Tigers Visit Castles.

Exam Strategies

Some exam tips which will help you to study better:

Tip	**Description**
Time Management	Allocate time based on question difficulty.
Common Pitfalls	Avoid misinterpreting reaction conditions or neglecting units.
Quick Verification	Use dimensional analysis to check units.

Stoichiometry Calculations

- **Mole Ratios:** Used to calculate amounts of reactants and products.
- **Limiting Reactants:** Determines the maximum yield of a reaction.

Chemical Equilibrium

- **Equilibrium Constant:** $K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$.
- **Le Chatelier's Principle:** Describes how changes in concentration, temperature, or pressure affect equilibrium.

Thermodynamic Processes

- **Adiabatic, Isothermal, Isobaric, and Isochoric Processes:** Each process involves different conditions of heat transfer and work.

Electrochemistry

- **Electrochemical Cells**: Devices that convert chemical energy into electrical energy.
- **Cell Potential**: $E_{\text{cell}} = E_{\text{red}} - E_{\text{ox}}$.

Organic Reaction Mechanisms

- **Substitution Reactions**: SN1 and SN2 reactions involve the replacement of a functional group.
- **Elimination Reactions**: E1 and E2 reactions involve the removal of a leaving group and a hydrogen atom.

Inorganic Reaction Mechanisms

- **Acid-Base Reactions:** Involves the transfer of protons.
- **Redox Reactions:** Involves the transfer of electrons.

Periodic Trends

- **Atomic Radius**: Generally decreases across a period and increases down a group.
- **Electronegativity**: Generally increases across a period and decreases down a group.

Coordination Chemistry

- **Coordination Compounds:** Structures and properties of coordination compounds.
- **Ligand Field Theory**: Explains the splitting of d orbitals in metal complexes.

Analytical Chemistry Techniques

- **Spectroscopy**: Techniques like IR, NMR, and UV-Vis spectroscopy.
- **Chromatography**: Techniques like GC and HPLC.

Environmental Chemistry

- **Pollution**: Air, water, and soil pollution.
- **Green Chemistry**: Principles and practices for reducing environmental impact.

Biochemistry

- **Biomolecules**: Carbohydrates, proteins, lipids, and nucleic acids.
- **Metabolic Pathways**: Glycolysis, Krebs cycle, and electron transport chain.

Advanced Topics in Chemistry

- **Quantum Mechanics**: This applies to understanding atomic and molecular structures.
- **Nanotechnology**: Involves the manipulation of matter on a nanoscale.

Chemistry is a vast and dynamic field with ongoing research and applications. Understanding its core concepts and mechanisms is crucial for advancing in various scientific and technological fields.

Chemistry for NEET 2025

We have compiled a detailed list of Chemistry topics for NEET to help students prepare effectively. The syllabus is divided into three main branches: Physical Chemistry, Inorganic Chemistry, and Organic Chemistry. These topics are carefully selected to cover both theoretical concepts and practical applications, ensuring a strong foundation. Each branch is further broken down into key areas that are high-scoring and frequently tested in the exam. This organized approach makes it easier for students to focus on important topics and revise efficiently according to the latest NTA syllabus.

Branch	**Topics**	**Links**
Physical Chemistry	Mole Concept, Thermodynamics, Chemical Kinetics, Equilibrium, Electrochemistry	[Study here]
Inorganic Chemistry	Periodic Table, Chemical Bonding, Coordination Compounds, p-Block Elements	[Study here]
Organic Chemistry	Hydrocarbons, Alcohols and Phenols, Aldehydes and Ketones, Biomolecules	[Study here]
Atomic Structure	Quantum Numbers, Atomic Models, Electron Configuration	[Study here]
Chemical Bonding	VSEPR Theory, Hybridization, Molecular Orbital Theory	[Study here]
States of Matter	Gaseous State, Liquid State, Solid State	[Study here]
Thermodynamics	Laws of Thermodynamics, Enthalpy, Entropy	[Study here]
Chemical Kinetics	Rate of Reaction, Arrhenius Equation	[Study here]
Electrochemistry	Nernst Equation, Galvanic Cells, Electrolysis	[Study here]
Solutions	Raoult's Law and Colligative Properties	[Study here]
Surface Chemistry	Adsorption, Catalysis	[Study here]
Coordination Compounds	Ligands, Crystal Field Theory	[Study here]
p-Block Elements	Group 13-18 Elements	[Study here]
d-Block and f-Block Elements	Transition Metals, Lanthanides and Actinides	[Study here]
Hydrocarbons	Alkanes, Alkenes, Alkynes	[Study here]

Alcohols and Phenols	Preparation and Properties	[Study here]
Aldehydes and Ketones	Reactions like Aldol Condensation	[Study here]
Biomolecules	Carbohydrates, Proteins, Nucleic Acids	[Study here]

Other Useful Resources

Some useful resources for the preparation of NEET are listed below:

NEET 2025: Ultimate 60-Day Study Plan – Crack NEET in 2 Months, Even with Zero Prep! Ebook Download

Are you aiming to crack NEET 2025 but feel overwhelmed by the syllabus and time constraints? Don't worry! We've got you covered with the Ultimate 60-Day Study Plan, designed to help you succeed even if you're starting from zero preparation. This comprehensive plan, available as a free PDF download from Careers360, provides a structured approach to covering Biology, Physics, and Chemistry effectively. Get daily schedules, weekly goals, and expert strategies to maximise your study efficiency. Whether you're looking to strengthen your foundation or refine your existing knowledge, this plan will guide you towards success in just two months!

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Take your NEET Biology preparation to the next level with our Biology Mind Maps Ebook for NEET 2025. Designed to simplify complex concepts, this mind map collection covers all key topics—Botany and Zoology. Visualize and retain information on topics like Human Physiology, Genetics & Evolution, and Ecology, ensuring you're well-prepared to ace the exam. Refine your knowledge, improve recall, and build confidence with this comprehensive mind map guide.

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Download Now and Sharpen Your Chemistry Concepts Now!

Most Scoring Concepts for NEET (As Per Latest NTA Syllabus) - Ebook Download

Get ahead in your NEET preparation with our Most Scoring Concepts for NEET ebook, designed based on the latest NTA syllabus. This comprehensive guide highlights high-weightage topics in biology, physics, and Chemistry that can significantly boost your score. With clear explanations, expert tips, and strategies to focus on key chapters, this ebook is a must-have for every NEET aspirant. Start mastering the concepts that matter the most and maximise your chances of success!

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your problem-solving skills. Get a head start in your preparation by learning from the past to conquer the future.

Download Now and Master Previous Years' Papers!

Botany Mock Test for NEET 2025 - Ebook Download

Boost your NEET 2025 preparation with our Botany Mock Test Ebook, designed to help you master the plant biology section. This ebook includes a full-length mock test covering crucial topics like Plant Physiology, Plant Reproduction, Cell Biology, and Genetics. The questions are aligned with the latest NEET exam pattern, allowing you to practice under real exam conditions and improve both speed and accuracy.

Whether you need to reinforce key concepts or fine-tune your problem-solving skills, this mock test provides the perfect practice tool to assess your preparation and identify areas for improvement. Strengthen your foundation in Botany and get ready to score higher in the NEET exam.

Download the Ebook and Enhance Your Botany Preparation!

Zoology Mock Test for NEET 2025 - Ebook Download

Prepare to excel in the Zoology section of NEET 2025 with our Zoology Mock Test Ebook! This mock test is designed to cover all critical zoology topics, including Human Physiology, Reproductive Health, Genetics, Evolution, and Animal Kingdom. With a diverse set of questions, this ebook helps you evaluate your understanding, improve your speed, and refine your answering strategy.

Simulating the real exam pattern, this mock test offers a blend of conceptual, factual, and analytical questions, ensuring comprehensive practice. By tackling these well-structured questions, you can enhance your problem-solving skills, boost your confidence, and perform your best in the actual exam.

Download the Ebook and Sharpen Your Zoology Skills for NEET 2025!

NEET Mock Test Biology 2025 - Ebook Download

Prepare for NEET 2025 with our Biology Mock Test Ebook, curated to simulate the real exam experience. This ebook includes a full-length mock test covering all crucial topics like Genetics, Ecology, Human Physiology, and Plant Reproduction. With a range of conceptual and application-based questions, this mock test will help you assess your preparation, improve your time management, and identify areas that need more focus. Stay ahead of the competition and enhance your performance in NEET Biology with this strategic resource.

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Ace the Biology section of NEET 2025 with our Genetics and Evolution PYQs Ebook! This meticulously crafted PDF features over 100 previous years' questions, each accompanied by detailed

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Crack the toughest section of NEET 2025 with our Physics Mock Test Ebook. This ebook offers a comprehensive mock test that covers critical areas such as Mechanics, Thermodynamics, Electrostatics, and Optics. With a mix of numerical problems, theoretical questions, and tricky concepts, this test will challenge your understanding and help you get exam-ready. Perfect your problem-solving techniques and practice time-efficient methods with this tailored physics mock test.

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Dear Aspirants,

Wishing you all the best as you prepare to step into the NEET 2025 examination hall. Your dedication and hard work have brought you here, and now it's time to let your confidence shine. Trust in the preparation you've done with this Ebook, stay calm and approach each question with the clarity you've gained over your journey.

Go forward with confidence, and may you achieve the success you deserve. We believe in you and can't wait to see you succeed.

Best of luck and shine bright, future Doctors!