NEET Syllabus 2025

Chemistry

Physical Chemistry

UNIT 1: SOME BASIC CONCEPTS IN CHEMISTRY

> Matter and its nature
> Dalton's atomic theory:
  - Concept of atom, molecule, element, and compound
> Laws of chemical combination
> Atomic and molecular masses
> Mole concept, molar mass
> Percentage composition
> Empirical and molecular formulae
> Chemical equations and stoichiometry

UNIT 2: ATOMIC STRUCTURE

> Nature of electromagnetic radiation, photoelectric effect
> Spectrum of the hydrogen atom
> Bohr model of a hydrogen atom:
  - Postulates
  - Derivation of the relations for the energy of the electron and radii of the different orbits
  - Limitations of Bohr's model
> Dual nature of matter, de Broglie's relationship
> Heisenberg uncertainty principle
> Elementary ideas of quantum mechanics, quantum mechanical model of the atom, its important features
> Concept of atomic orbitals as one-electron wave functions: Variation of Ψ and Ψ^2 with r for 1s and 2s orbitals
> Various quantum numbers (principal, angular momentum, and magnetic quantum numbers) and their significance
> Shapes of s, p, and d - orbitals
> Electron spin and spin quantum number
> Rules for filling electrons in orbitals:
  - Aufbau principle
  - Pauli's exclusion principle
  - Hund's rule
> Electronic configuration of elements
> Extra stability of half-filled and completely filled orbitals

UNIT 3: CHEMICAL BONDING AND MOLECULAR STRUCTURE

> Kossel - Lewis approach to chemical bond formation, the concept of ionic and covalent bonds
> Ionic Bonding:
  - Formation of ionic bonds
  - Factors affecting the formation of ionic bonds
  - Calculation of lattice enthalpy

> Covalent Bonding:
  - Concept of electronegativity
  - Fajan’s rule
  - Dipole moment
  - Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules
> Quantum mechanical approach to covalent bonding:
  - Valence bond theory – its important features
  - The concept of hybridization involving s, p, and d orbitals
  - Resonance
> Molecular Orbital Theory – Its important features. LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length, and bond energy
> Elementary idea of metallic bonding
> Hydrogen bonding and its applications

UNIT 4: CHEMICAL THERMODYNAMICS

> Fundamentals of thermodynamics:
  - System and surroundings, extensive and intensive properties
  - State functions, types of processes
> The first law of thermodynamics:
  - Concept of work, heat internal energy and enthalpy
  - Heat capacity, molar heat capacity
  - Hess’s law of constant heat summation
  - Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization, and solution
> The second law of thermodynamics:
  - Spontaneity of processes
  - ΔS of the universe and ΔG of the system as criteria for spontaneity
  - ΔG (Standard Gibbs energy change) and equilibrium constant

UNIT 5: SOLUTIONS

> Different methods for expressing the concentration of solution – molality, molarity, mole fraction, percentage (by volume and mass both)
> The vapour pressure of solutions and Raoult's Law – Ideal and non-ideal solutions
> Vapour pressure – composition, plots for ideal and non-ideal solutions
> Colligative properties of dilute solutions:
  - Relative lowering of vapour pressure
  - Depression of freezing point
  - Elevation of boiling point
  - Osmotic pressure
> Determination of molecular mass using colligative properties
> Abnormal value of molar mass, van't Hoff factor and its significance

UNIT 6: EQUILIBRIUM

> Meaning of equilibrium, the concept of dynamic equilibrium
> Equilibria involving physical processes:

- Solid–liquid, liquid – gas and solid–gas equilibria
- Henry's law

> General characteristics of equilibrium involving physical processes

> Equilibrium involving chemical processes:

- Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance
- The significance of ΔG and ΔG in chemical equilibrium
- Factors affecting equilibrium concentration, pressure, temperature, the effect of catalyst
- Le Chatelier’s principle

> Ionic equilibrium:

- Weak and strong electrolytes, ionization of electrolytes
- Various concepts of acids and bases (Arrhenius. Bronsted – Lowry and Lewis) and their ionization
- Acid–base equilibria (including multistage ionization) and ionization constants
- Ionization of water. pH scale
- Common ion effect, hydrolysis of salts and pH of their solutions
- The solubility of sparingly soluble salts and solubility products
- Buffer solutions

UNIT 7: REDOX REACTIONS AND ELECTROCHEMISTRY

> Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions

> Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration

> Kohlrausch’s law and its applications

> Electrochemical cells:

- Electrolytic and Galvanic cells
- Different types of electrodes, electrode potentials including standard electrode potential
- Half – cell and cell reactions, emf of a Galvanic cell and its measurement
- Nernst equation and its applications

> Relationship between cell potential and Gibbs' energy change

> Dry cell and lead accumulator

> Fuel cells

UNIT 8: CHEMICAL KINETICS

> Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure, and catalyst

> Elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units

> Differential and integral forms of zero and first–order reactions, their characteristics and half–lives

> The effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation

> Collision theory of bimolecular gaseous reactions (no derivation)

Inorganic Chemistry

UNIT 9: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

> Modern periodic law and present form of the periodic table
> s, p, d and f block elements
> Periodic trends in properties of elements:
- Atomic and ionic radii
- Ionization enthalpy
- Electron gain enthalpy
- Valence
- Oxidation states
- Chemical reactivity

UNIT 10: P- BLOCK ELEMENTS

> Group –13 to Group 18 Elements
> General Introduction:
- Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups
- Unique behaviour of the first element in each group

UNIT 11: d - and f- BLOCK ELEMENTS

> **Transition Elements**
- General introduction, electronic configuration, occurrence and characteristics
- General trends in properties of the first-row transition elements:
  - Physical properties
  - Ionization enthalpy
  - Oxidation states
  - Atomic radii
  - Colour
  - Catalytic behaviour
  - Magnetic properties
  - Complex formation
  - Interstitial compounds
  - Alloy formation
- Preparation, properties, and uses of $K_2Cr_2O_7$, and $KMnO_4$.

> **Inner Transition Elements**
- Lanthanoids:
  - Electronic configuration
  - Oxidation states
  - Lanthanoid contraction
- Actinoids:
  - Electronic configuration
  - Oxidation states

UNIT 12: CO-ORDINATION COMPOUNDS

> Introduction to coordination compounds
> Werner's theory
> Ligands, coordination number, denticity
> Chelation

> IUPAC nomenclature of mononuclear coordination compounds
> Isomerism
> Bonding:
    - Valence bond approach
    - Basic ideas of Crystal field theory
> Colour and magnetic properties
> Importance of coordination compounds (in qualitative analysis, extraction of metals and in biological systems)

Organic Chemistry

UNIT 13: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS

> Purification:
    - Crystallization
    - Sublimation
    - Distillation
    - Differential extraction
    - Chromatography – principles and their applications
> Qualitative analysis:
    - Detection of nitrogen, sulphur, phosphorus, and halogens
> Quantitative analysis (basic principles only):
    - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus
> Calculations of empirical formulae and molecular formulae
> Numerical problems in organic quantitative analysis

UNIT 14: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY

> Tetravalency of carbon: Shapes of simple molecules – hybridization (s and p)
> Classification of organic compounds based on functional groups: and those containing halogens, oxygen, nitrogen, and sulphur
> Homologous series
> Isomerism – structural and stereoisomerism
> Nomenclature (Trivial and IUPAC)
> Covalent bond fission:
    - Homolytic and heterolytic
    - Free radicals, carbocations, and carbanions
    - Stability of carbocations and free radicals, electrophiles, and nucleophiles
> Electronic displacement in a covalent bond:
    - Inductive effect, electromeric effect, resonance, and hyperconjugation
> Common types of organic reactions:
    - Substitution, addition, elimination, and rearrangement

UNIT 15: HYDROCARBONS

> Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties, and reactions
> Alkanes:
    - Conformations: Sawhorse and Newman projections (of ethane)
    - Mechanism of halogenation of alkanes
> Alkenes:
    - Geometrical isomerism

- Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect)
- Ozonolysis and polymerization

> Alkynes:

- Acidic character
- Addition of hydrogen, halogens, water, and hydrogen halides
- Polymerization

> Aromatic hydrocarbons:

- Nomenclature, benzene – structure and aromaticity
- Mechanism of electrophilic substitution: halogenation, nitration
- Friedel – Craft's alkylation and acylation
- Directive influence of the functional group in mono-substituted benzene

UNIT 16: ORGANIC COMPOUNDS CONTAINING HALOGENS

> General methods of preparation, properties, and reactions

> Nature of C–X bond

> Mechanisms of substitution reactions

> Uses; Environmental effects of chloroform, iodoform freons, and DDT

UNIT 17: ORGANIC COMPOUNDS CONTAINING OXYGEN

> General methods of preparation, properties, reactions, and uses.

> **ALCOHOLS, PHENOLS, AND ETHERS**

- Alcohols: Identification of primary, secondary, and tertiary alcohols; mechanism of dehydration
- Phenols: Acidic nature, electrophilic substitution reactions: halogenation, nitration and sulphonation. Reimer – Tiemann reaction
- Ethers: Structure

> **Aldehyde and Ketones:**

- Nature of carbonyl group
- Nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones
- Important reactions such as – Nucleophilic addition reactions (addition of HCN, NH3, and its derivatives), Grignard reagent
- Oxidation: reduction (Wolf Kishner and Clemmensen)
- The acidity of –hydrogen
- Aldol condensation, Cannizzaro reaction
- Haloform reaction
- Chemical tests to distinguish between aldehydes and Ketones.

> **Carboxylic Acids:**

- Acidic strength and factors affecting it

UNIT 18: ORGANIC COMPOUNDS CONTAINING NITROGEN

> General methods of preparation, properties, reactions, and uses

> Amines:

- Nomenclature, classification structure, basic character
- Identification of primary, secondary, and tertiary amines and their basic character

> Diazonium Salts: Importance in synthetic organic chemistry

UNIT 19: BIOMOLECULES

> General introduction and importance of biomolecules

> **CARBOHYDRATES:**
  - Classification; aldoses and ketoses
  - Monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose, and maltose)

> **PROTEINS:**
  - Elementary Idea of –amino acids, peptide bond, polypeptides
  - Proteins: primary, secondary, tertiary, and quaternary structure (qualitative idea only)
  - Denaturation of proteins, enzymes

> **VITAMINS:** Classification and functions

> **NUCLEIC ACIDS:** Chemical constitution of DNA and RNA. Biological functions of nucleic acids

> Hormones (General introduction)

UNIT 20: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY

> Detection of extra elements (Nitrogen, Sulphur, halogens) in organic compounds

> Detection of the following functional groups:
  - hydroxyl (alcoholic and phenolic)
  - carbonyl (aldehyde and ketones)
  - carboxyl
  - amino groups in organic compounds

> The chemistry involved in the preparation of the following:
  - Inorganic compounds; Mohr’s salt, potash alum
  - Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform

> The chemistry involved in the titrimetric exercises:
  - Acids, bases and the use of indicators, oxalic-acid vs KMnO4, Mohr’s salt vs KMnO4

> Chemical principles involved in the qualitative salt analysis:
  - Cations – Pb2+, Cu2+, Al3+, Fe3+, Zn2+, Ni2+, Ca2+, Ba2+, Mg2+, NH4+
  - Anions– CO32–, S2–, SO42–, NO3–, NO2–, Cl–, Br–, I– (Insoluble salts excluded)

> Chemical principles involved in the following experiments:
  1. Enthalpy of solution of CuSO4
  2. Enthalpy of neutralization of strong acid and strong base.
  3. Preparation of lyophilic and lyophobic sols.
  4. Kinetic study of the reaction of iodide ions with hydrogen peroxide at room temperature.