

WBJEE Chemistry Syllabus

WBJEE Physical Chemistry Syllabus 2027

The WBJEE 2027 Physical Chemistry topics are **Classification of Elements and Periodicity in Properties, Chemical Thermodynamics, States of Matter – Solids and Gases, and many more.**

Topics	Sub-Topics
Some Basic Concepts of Chemistry	Laws of chemical combination; concept of elements, atoms and molecules; atomic and molecular masses; mole concept and molar mass; percentage composition; empirical formula; molecular formula; chemical reactions; stoichiometry; calculations based on stoichiometry; different concentration terms of solutions and related calculations.
Structure of an Atom	Bohr's model and its limitations; shells and subshells; dual nature of matter and light; de Broglie relationship; Heisenberg uncertainty principle; Schrödinger wave equation (elementary idea only); concept of orbitals; quantum numbers; shapes of s, p and d orbitals; rules for filling electrons; Aufbau principle; Pauli's exclusion principle; Hund's rule; exchange energy; electronic configuration; stability of half-filled and filled orbitals.
Classification of Elements and Periodicity in Properties	Modern periodic law; present form of periodic table; periodic trends in atomic radii, ionic radii, van der Waals' radii, ionisation enthalpy, electron gain enthalpy, electronegativity and valency; nomenclature of elements with atomic number greater than 100.
Chemical Bonding and Molecular Structure	Valence electrons; ionic bond; bond parameters; covalent bond; Lewis structures; formal charge; polar character of covalent bonds; covalent character of ionic bonds; valence bond theory; resonance; geometry of covalent molecules; VSEPR theory; hybridisation involving s, p and d orbitals; shapes of simple molecules; intermolecular interactions; dipolar interactions; London dispersion forces; van der Waals interactions; intra- and intermolecular hydrogen bonding; molecular orbital theory of homonuclear diatomic molecules.
States of Matter – Solids and Gases	Classification of solids: molecular, ionic, covalent and metallic solids; amorphous and crystalline solids; unit cells in 2D and 3D lattices; packing efficiency; calculation of density of unit cell; packing in solids; voids; number of atoms per unit cell in cubic unit cells; point defects; kinetic theory of gases; molecular speeds; Dalton's law of partial pressure; Graham's law; deviation from ideal behaviour; van der Waals' equation; liquefaction of gases; critical parameters.
Chemical Thermodynamics	Concepts of system and surroundings; types of systems; work; heat; energy; extensive and intensive properties; state functions; Zeroth law of thermodynamics; definition of temperature; first law; internal energy change; enthalpy change; enthalpy of bond dissociation, combustion, formation, atomisation, ionisation, solution and sublimation; transformation of state; Hess's law; Born-Haber cycle and applications; second law; entropy as a state function; Gibbs free-energy change; spontaneous and non-spontaneous processes; criteria for equilibrium.
Equilibrium	Equilibrium in physical and chemical processes; dynamic nature of equilibrium; law of mass action; equilibrium constant; factors affecting equilibrium; Le Chatelier's principle; ionic equilibrium; ionisation of acids and bases; strong and weak electrolytes; degree of ionisation of polybasic acids; acid strength; pH; Henderson equation; hydrolysis of salts; buffer solutions; buffer action; solubility product; common-ion effect.
Solutions	Introduction to solutions; solubility of gases in liquids; solid solutions; vapour pressure; Raoult's law; colligative properties; relative lowering of vapour pressure; elevation of boiling point; depression of

	freezing point; osmotic pressure; determination of molecular mass using colligative properties; abnormal molecular mass; van't Hoff factor; calculations involving van't Hoff factor; colloidal solution; true solutions; colloids; suspensions.
Chemical Kinetics	Rate of reaction — average and instantaneous; factors affecting reaction rate: concentration, temperature and catalyst; order and molecularity; rate law; specific rate constant; integrated rate equations; half-life for zero- and first-order reactions; Arrhenius equation; activation energy; collision theory (elementary idea, no mathematical treatment); catalysis; homogeneous and heterogeneous catalysis; enzyme catalysis.
Redox Reactions	Concept of oxidation and reduction; redox reactions; oxidation number; balancing redox reactions using loss and gain of electrons; balancing by change in oxidation number; applications of redox reactions in permanganometry and dichromatometry.
Electrochemistry	Conductance in electrolytic solutions; specific and molar conductivity; variation of conductivity with concentration; Kohlrausch's law; electrolysis; laws of electrolysis; dry cell; electrolytic cells; galvanic cells; EMF of a cell; standard electrode potential; Nernst equation and its application to chemical cells; relation between Gibbs free-energy change and cell EMF; fuel cells; Li-ion battery.

WBJEE Organic Chemistry Syllabus 2027

The WBJEE Organic Chemistry topics include **Hydrocarbons, Alcohols, Phenols and Ethers, Cyanides and Isocyanides, and many more.**

Topics	Sub-Topics
Some Basic Principles	General introduction; classification of organic compounds; IUPAC nomenclature; electronic displacement in covalent bonds; inductive effect; resonance; hyperconjugation; homolytic and heterolytic fission; free radicals; carbocations; carbanions; electrophiles; nucleophiles; elementary idea of addition, elimination and substitution reactions.
Hydrocarbons	Classification of hydrocarbons. Alkanes: nomenclature, isomerism, conformations of ethane, physical properties up to 6 carbons, halogenation, free-radical mechanism, combustion and pyrolysis. Alkenes: nomenclature, double-bond structure of ethene, geometrical isomerism, physical properties up to 3 carbons, preparation; addition of hydrogen, halogens, water and hydrogen halides; Markovnikov's addition; peroxide effect; ozonolysis; oxidation; electrophilic-addition mechanism. Alkynes: nomenclature; triple-bond structure of ethyne; physical and chemical properties up to 3 carbons; preparation; addition of hydrogen, halogens, hydrogen halides and water. Aromatic hydrocarbons: introduction; IUPAC nomenclature; benzene; resonance; Hückel's rule; aromaticity; electrophilic substitution mechanism; nitration; sulphonation; halogenation; Friedel-Crafts alkylation and acylation.
Haloalkanes and Haloarenes	Haloalkanes: nomenclature; nature of C–X bond; physical and chemical properties; mechanism of substitution reactions; stability of carbocations; R/S and D/L configurations; uses and environmental effects of dichloromethane, trichloromethane, tetrachloromethane, iodoform and freons. Haloarenes: nature of C–X bond; substitution reaction; directive influence of halogen for monosubstituted compounds; stability of carbocations; uses and environmental effects of DDT.
Alcohols, Phenols and Ethers	Alcohols: nomenclature; methods of preparation; physical and chemical properties of primary alcohols; identification of primary, secondary and tertiary alcohols; mechanism of dehydration; uses of methanol and ethanol. Phenols: nomenclature; preparation; physical and chemical properties; acidic nature; electrophilic substitution reactions; uses of phenolic compounds. Ethers: nomenclature; preparation; physical and chemical properties; uses.

Aldehydes, Ketones and Carboxylic Acids – Aldehydes & Ketones	Nomenclature; nature of carbonyl group; methods of preparation; physical and chemical properties; mechanism of nucleophilic addition; reactivity of alpha hydrogen in aldehydes; uses.
Aldehydes, Ketones and Carboxylic Acids – Carboxylic Acids	Nomenclature; acidic nature; methods of preparation; physical and chemical properties; uses.
Organic Compounds Containing Nitrogen – Nitro Compounds	General methods of preparation; reduction reactions of nitro compounds.
Organic Compounds Containing Nitrogen – Amines	Nomenclature; classification; structure; methods of preparation; physical and chemical properties; uses; identification of primary, secondary and tertiary amines.
Cyanides and Isocyanides	Nomenclature; structure; methods of preparation; chemical reactions - hydrolysis and reduction reactions only.
Diazonium Salts	Preparation of diazonium salts; chemical reactions; importance in synthetic organic chemistry.
Biomolecules – Carbohydrates	Classification into aldoses and ketoses; monosaccharides - glucose and fructose; D/L configuration; oligosaccharides - sucrose; polysaccharides - starch and cellulose.
Biomolecules – Proteins	Elementary idea of α -amino acids; zwitterionic structures; peptide bonds; polypeptides; structure of proteins - primary structure only; denaturation of proteins; enzymes.
Biomolecules – Nucleic Acids	DNA and RNA - introduction and basic concepts.
Polymers	Classification into natural and synthetic polymers; methods of polymerisation - addition and condensation; copolymerisation; important polymers: polythene, nylon, polyesters, Bakelite and rubber; biodegradable and non-biodegradable polymers.

WBJEE Inorganic Chemistry Syllabus 2027

The WBJEE 2027 Inorganic Chemistry topic list consists of **p-Block Elements, d- and f-Block Elements, Coordination Compounds, etc.**

Topics	Sub-Topics
s-Block Elements (Groups 1 & 2)	Electronic configuration; occurrence; trends in properties such as ionisation enthalpy, atomic and ionic radii; chemical reactivity with oxygen, water, hydrogen and halogens; hydrides - ionic, covalent and interstitial; hydrogen peroxide - preparation, properties, structure and uses; hydrogen as a fuel; biological importance of Na, K, Mg and Ca.
p-Block Elements – General & Group 13	General introduction to p-block elements; electronic configuration; occurrence; variation in properties; oxidation states; trends in chemical reactivity. Group 13: Boron — physical and chemical properties of compounds; boron oxides; boric acid; borates; inorganic graphite. Aluminium: reactions with acids and alkalis.
p-Block Elements – Group 14	Carbon: catenation; allotropic forms; nanocarbon; graphene; physical and chemical properties of CO and CO ₂ . Silicon: compounds and important uses; silicon tetrachloride - structure, preparation, hydrolysis and reduction; silicates - structure of open-chain silicates and construction of ions; uses of zeolites.

p-Block Elements – Group 15	General introduction; electronic configuration; occurrence; oxidation states; structure and reactions of NH_3 , HNO_3 and NCl_3 ; structures of nitrogen oxides; phosphorus - allotropes (white and red); preparation and properties of phosphine; phosphorus halides PCl_3 and PCl_5 ; oxoacids of phosphorus - elementary idea.
p-Block Elements – Group 16	General introduction; electronic configuration; occurrence; oxidation states. Oxygen: classification of oxides; preparation and properties of ozone. Sulphur: rhombic and monoclinic allotropes; properties and uses of sulphur oxides, oxoacids and peracids.
p-Block Elements – Group 17	General introduction; electronic configuration; oxidation states; occurrence; trends in physical and chemical properties; halogen compounds; preparation, structure and uses of oxides and oxoacids of halogens; interhalogen compounds; elementary idea of pseudohalogens and polyhalides.
p-Block Elements – Group 18	General introduction; electronic configuration; occurrence and uses of noble gases; preparation, structure and chemical reactions.
d- and f-Block Elements – Transition Metals	General introduction; electronic configuration; occurrence; characteristics of transition metals; general trends in first-row transition metals — ionic radii, ionisation enthalpy, oxidation states, colour, catalytic properties and magnetic properties.
d- and f-Block Elements – Lanthanoids	Electronic configuration; oxidation states; chemical reactivity; lanthanoid contraction and its consequences; uses.
d- and f-Block Elements – Actinoids	Electronic configuration; oxidation states; comparison with lanthanoids; uses.
Coordination Compounds	Introduction; ligands; classification of ligands based on denticity and field strength; coordination number; colour; magnetic properties; IUPAC nomenclature of mononuclear coordination compounds; EAN rule; bonding - Werner's theory, VBT and CFT, CFSE; structural isomerism; stereoisomerism; importance of coordination compounds in qualitative analysis, extraction of metals and biological systems.

WBJEE Environmental Chemistry Syllabus 2027

The WBJEE exam syllabus 2027 Environmental Chemistry paper includes **Qualitative & Quantitative Analysis and Environmental Chemistry**.

Topics	Sub-Topics
Environmental Chemistry	Environmental pollution - air, water and soil pollution; causes and effects; primary and secondary pollutants solid and liquid pollutants; chemical reactions in the atmosphere; smog; pollution due to industrial wastes; solid-waste management - elementary idea; SPM; RSPM; green chemistry as an alternative tool for reducing pollution; water preservation and protection; strategies for controlling environmental pollution
Qualitative & Quantitative Analysis	Detection of special elements N, S and halogens in organic compounds by Lassaigne's test; identification of functional groups - primary aromatic amine, aldehyde, ketone, carboxylic acid and unsaturation; calculation based on acid-base and redox titrations; dichromatometry and permanganometry; detection of water-soluble, non-interfering acid and basic radicals by dry and wet tests.