JEE Main Syllabus 2020 for Paper 1 - BE/BTech

Below is the detailed JEE Main April 2020 Paper 1 Syllabus for three subjects - Physics, Chemistry and Mathematics. Candidates can go through the syllabus along with topic-wise weightage in each subject.

JEE Main 2020 Mathematics Syllabus

The Mathematics section of JEE Main 2020 will be of 100 marks (25 questions of 4 marks each). However, for any question answered incorrectly, one mark will be deducted. In 2019, the highest weightage in Mathematics was given to chapters like sequence and series, straight lines, 3D, Determinant, etc. Check out the detailed JEE Main April 2020 Paper 1 syllabus for Mathematics.

Units	Topics
Unit 1: Sets, relations and functions	• Sets and their representation • Union, intersection and complement of sets and their algebraic properties • Power set; Relation, Types of relations, equivalence relations, functions; One-one, into and onto functions, the composition of functions.
Unit 2: Complex numbers and quadratic equations	• Complex numbers as ordered pairs of reals, • Representation of complex numbers in the form a+ib and their representation in a plane, • Argand diagram, • algebra of complex numbers, • modulus and argument (or amplitude) of a complex number, • square root of a complex number, • triangle inequality, • Quadratic equations in real and complex number system and their solutions. • Relation between roots and co-efficients, nature of roots, formation of quadratic equations with given roots.
Unit 3: Matrices and determinants	• Matrices, • algebra of matrices, • types of matrices, • determinants and • matrices of order two and three. • Properties of determinants, • evaluation of determinants, • area of triangles using determinants. • Adjoint and evaluation of inverse of a square matrix using determinants and elementary transformations, • Test of consistency and solution of simultaneous linear equations in two or

	three variables using determinants and matrices.
Unit 4: Permutations and combinations	• Fundamental principle of counting, • permutation as an arrangement and • combination as selection, • Meaning of P (n,r) and C (n,r), • simple applications.
Unit 5: Mathematical induction	• Principle of Mathematical Induction and its simple applications
Unit 6: Binomial theorem and its simple applications	• Binomial theorem for a positive integral index, • general term and middle term, • properties of Binomial coefficients • simple applications
Unit 7: Sequences and series	• Arithmetic and Geometric progressions, • insertion of arithmetic, • geometric means between two given numbers • relation between A.M. and G.M. sum upto n terms of special series: S n, S n2, Sn3 • Arithmetic – Geometric progression
UNIT 8: Limit, continuity and differentiability	• Real – valued functions, • algebra of functions, • polynomials, • rational, • trigonometric, • logarithmic and exponential functions, • inverse functions • Graphs of simple functions • Limits, continuity and differentiability • Differentiation of the sum, difference, product and quotient of two functions • Differentiation of trigonometric, • inverse trigonometric, • logarithmic, • exponential, • composite and implicit functions • derivatives of order upto two • Rolle's and Lagrange's Mean Value Theorems • Applications of derivatives: Rate of change of quantities, monotonic – increasing and decreasing functions, • Maxima and minima of functions of one variable, • tangents and normals
Unit 9: Integral calculus	• Integral as an anti – derivative. • Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions.

	• Integration by substitution, by parts and by partial fractions. Integration using trigonometric identities.
	• Evaluation of simple integrals of the type Integral as limit of a sum. • Fundamental Theorem of Calculus. • Properties of definite integrals. • Evaluation of definite integrals, determining areas of the regions bounded by simple curves in standard form.
Unit 10: Differential equations	• Ordinary differential equations, their order and degree. • Formation of differential equations. • Solution of differential equations by the method of separation of variables, solution of homogeneous and linear differential equations of the type: dy/dx+p(x)y=q(x)
Unit 11: Co-ordinate geometry	• Cartesian system of rectangular co-ordinates 10 in a plane, • distance formula, • section formula, • locus and its equation, • translation of axes, • slope of a line, • parallel and perpendicular lines, • intercepts of a line on the coordinate axes.
	Straight lines: Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, distance of a point from a line, equations of internal and external bisectors of angles between two lines, coordinates of centroid, orthocentre and circumcentre of a triangle, equation of family of lines passing through the point of intersection of two lines.
	Circles, conic sections: Standard form of equation of a circle, general form of the equation of a circle, its radius and centre, equation of a circle when the end points of a diameter are given, points of intersection of a line and a circle with the centre at the origin and condition for a line to be tangent to a circle, equation of the tangent. Sections of cones, equations of conic sections (parabola, ellipse and hyperbola) in standard forms, condition for y = mx + c to be a tangent and point (s) of tangency.
Unit 12: Three dimensional geometry	• Coordinates of a point in space, distance between two points, section

	formula, direction ratios and direction cosines, angle between two intersecting lines. • Skew lines, the shortest distance between them and its equation. • Equations of a line and a plane in different forms, intersection of a line and a plane, coplanar lines.
Unit 13: Vector algebra	• Vectors and scalars, • addition of vectors, • components of a vector in two dimensions and three dimensional space, • scalar and vector products, scalar and vector triple product.
Unit 14: Statistics and probability	**Measures of Dispersion:** Calculation of mean, median, mode of grouped and ungrouped data calculation of standard deviation, variance and mean deviation for grouped and ungrouped data. **Probability:** Probability of an event, addition and multiplication theorems of probability, Baye's theorem, probability distribution of a random variate, Bernoulli trials and Binomial distribution.
Unit 15: Trigonometry	• Trigonometrical identities and equations • Trigonometrical functions • Inverse trigonometrical functions and their properties • Heights and Distances
Unit 16: Mathematical reasoning	• Statements, logical operations and, or, implies, implied by, if and only if • Understanding of tautology, contradiction, converse and contrapositive

JEE Main Topicwise Weightage for Mathematics

Below is the previous years JEE Main weightage along with important topics asked in the exam.

Topics	No of Questions	Marks	Weightage
Quadratic Equation	1	4	3.33%
Sequences and Series	2	8	6.67%
Trigonometric Equation	1	4	3.33%
Limit	1	4	3.33%
Differentiability	1	4	3.33%
Indefinite Integration	1	4	3.33%
Definite Integration	1	4	3.33%
Differential Equation	1	4	3.33%
Area Under the Curve	1	4	3.33%
Straight Line	2	8	6.67%

Vector	1	4	3.37%
3-D	2	8	6.67%
Permutation and combination	1	4	3.33%
Probability	1	4	3.33%
Complex Number	1	4	3.33%
Binominal Theorem	1	4	3.33%
Determinant	2	8	6.67%
Tangent and Normal	1	4	3.33%
Maxima and Minima	1	4	3.33%
Statistics	1	4	3.33%
Parabola	1	4	3.33%
Ellipse	1	4	3.33%
Hyperbola	1	4	3.33%
Mathematical Reasoning	1	4	3.33%
Height & Distance	1	4	3.33%
Sets	1	4	3.33%
Total	**30**	**120**	**100%**

JEE Main 2020 Physics Syllabus

Physics is one of the major sections of JEE Main syllabus. Students have to answer around 25 questions carrying 4 marks each. JEE Main April syllabus for Physics comprises topics like Kinematics, Optics, Laws Of Motion, Rotational Motion, Gravitation, Properties Of Solids And Liquids etc. Last year, the highest weightage in Physics was given to topics like current electricity, alternating current, Rotational dynamics, Modern Physics etc. The JEE Main Physics syllabus includes two sections A and B. Section A includes Theory part with 80% weightage and section B contains practical component (experimental skills) with 20% weightage. Check out the full syllabus JEE Main April 2020 Paper 1 Syllabus for Physics below.

Units	Topics
Unit 1: Physics And Measurement	• Physics, technology and society, S I units, Fundamental and derived units • Least count, accuracy and precision of measuring instruments, • Errors in measurement, • Dimensions of Physical quantities, dimensional analysis and its applications
Unit 2: Kinematics	• Frame of reference • Motion in a straight line: Position-time graph, speed and velocity • Uniform and non-uniform motion, average speed and instantaneous velocity • Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion.

	• Scalars and Vectors, Vector addition and Subtraction, Zero Vector, Scalar and Vector products, Unit Vector, Resolution of a Vector • Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion
Unit 3: Laws Of Motion	• Force and Inertia, • Newton's First Law of motion; Momentum, Newton's Second Law of motion; Impulse; Newton's Third Law of motion. • Law of conservation of linear momentum and its applications, Equilibrium of concurrent forces.
	Static and Kinetic friction, laws of friction, rolling friction
	Dynamics of uniform circular motion: Centripetal force and its applications.
Unit 4: Work, Energy And Power	Work done by a constant force and a variable force; kinetic and potential energies, work energy theorem, power.
	Potential energy of a spring, conservation of mechanical energy, conservative and non-conservative forces; Elastic and inelastic collisions in one and two dimensions.
Unit 5: Rotational Motion	• Centre of mass of a two-particle system, Centre of mass of a rigid body; Basic concepts of rotational motion; moment of a force, torque, angular momentum, conservation of angular momentum and its applications; moment of inertia, radius of gyration. • Values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. • Rigid body rotation, equations of rotational motion.
Unit 6: Gravitation	• The universal law of gravitation. • Acceleration due to gravity and its variation with altitude and depth. • Kepler's laws of planetary motion. • Gravitational potential energy; gravitational potential. • Escape velocity. • Orbital velocity of a satellite. Geo-stationary satellites.
Unit 7: Properties Of Solids And Liquids	• Elastic behaviour, Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, modulus of rigidity.

	• Pressure due to a fluid column; Pascal's law and its applications. • Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's principle and its applications. • Surface energy and surface tension, angle of contact, application of surface tension – drops, bubbles and capillary rise. • Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. • Heat transfer-conduction, convection and radiation, Newton's law of cooling.
Unit 8: Thermodynamics	• Thermal equilibrium, zeroth law of thermodynamics, concept of temperature. • Heat, work and internal energy. • First law of thermodynamics. • Second law of thermodynamics: reversible and irreversible processes. • Carnot engine and its efficiency.
Unit 9: Kinetic Theory Of Gases	• Equation of state of a perfect gas, work done on compressing a gas. • Kinetic theory of gases – assumptions, concept of pressure. • Kinetic energy and temperature: rms speed of gas molecules; Degrees of freedom, Law of equipartition of energy, applications to specific heat capacities of gases; Mean free path, Avogadro's number.
Unit 10: Oscillations And Waves	**Periodic motion** – period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M.) and its equation; phase; oscillations of a spring - restoring force and force constant; energy in S.H.M. – kinetic and potential energies; Simple pendulum – derivation of expression for its time period; Free, forced and damped oscillations, resonance
	Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, Standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect in sound
Unit 11: Electrostatics	**Electric charges:** Conservation of charge, Coulomb's law-forces between two point charges, forces between multiple charges;

	superposition principle and continuous charge distribution.
	Electric field: Electric field due to a point charge, Electric field lines, Electric dipole, Electric field due to a dipole, Torque on a dipole in a uniform electric field. -Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electric potential and its calculation for a point charge, electric dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two point charges in an electrostatic field. -Conductors and insulators, Dielectrics and electric polarization, capacitor, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, Energy stored in a capacitor.
Unit 12: Currrent Electricity	• Electric current, Drift velocity, Ohm's law, Electrical resistance, Resistances of different materials, V-I characteristics of Ohmic and nonohmic conductors, Electrical energy and power, Electrical resistivity, Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance. • Electric Cell and its Internal resistance, potential difference and emf of a cell, combination of cells in series and in parallel. • Kirchhoff's laws and their applications. • Wheatstone bridge, Metre bridge. • Potentiometer – principle and its applications.
Unit 13: Magnetic Effects Of Current And Magnetism	• Biot – Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields. Cyclotron. • Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; Moving coil

	galvanometer, its current sensitivity and conversion to ammeter and voltmeter. • Current loop as a magnetic dipole and its magnetic dipole moment. Bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro- magnetic substances. • Magnetic susceptibility and permeability, Hysteresis, Electromagnets and permanent magnets.
Unit 14: Electromagnetic Induction And Alternating Currents	• Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. • Self and mutual inductance. • Alternating currents, peak and rms value of alternating current/ voltage; reactance and impedance; LCR series circuit, resonance; Quality factor, power in AC circuits, wattless current. • AC generator and transformer.
Unit 15: Electromagnetic Waves	• Electromagnetic waves and their characteristics. Transverse nature of electromagnetic waves. • Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, Xrays, gamma rays). • Applications of e.m. waves.
Unit 16: Optics	Reflection and refraction of light at plane and spherical surfaces, mirror formula, Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification, Power of a Lens, Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers. **Wave optics** • wavefront and Huygens' principle, Laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width. • Diffraction due to a single slit, width of central maximum. • Resolving power of microscopes and astronomical telescopes, Polarisation, plane polarized light; Brewster's law, uses of plane polarized light and Polaroids.
Unit 17: Dual Nature Of Matter And radiation	• Dual nature of radiation.

	• Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light. • Matter waves-wave nature of particle, de Broglie relation. • Davisson-Germer experiment.
Unit 18: Atoms And Nuclei	• Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. • Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. • Radioactivity-alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.
Unit 19: Electronic Devices	• Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED, photodiode, solar cell and Zener diode; Zener diode as a voltage regulator. • Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). • Transistor as a switch.
Unit 20: Communication Systems	• Propagation of electromagnetic waves in the atmosphere; Sky and space wave propagation, • Need for modulation, • Amplitude and Frequency Modulation, • Bandwidth of signals, • Bandwidth of Transmission medium, • Basic Elements of a Communication System (Block Diagram only).

JEE Main Topicwise Weightage for Physics

Below is the previous years JEE Main physics topics, number of questions asked and marks distribution in the exam.

Topics	No of Questions	Marks	Weightage
Electrostatics	1	4	3.33%
Current Electricity	3	12	10.00%
Capacitor	1	4	3.33%
Magnetic Effect of Current & Magnetism	2	8	6.67%

Alternating Current	2	8	6.67%
KTG & Thermodynamics	2	8	6.67%
SHM	1	4	3.33%
Sound Waves	1	4	3.33%
KInematics	1	4	3.33%
Work Power Energy	1	4	3.33%
Kinematics	1	4	3.33%
Laws of motion	1	4	3.33%
Work,Power and Energy	1	4	6.67%
Centre Of Mass	2	8	6.67%
Rotational Dynamics	2	8	6.67%
Modern Physics	2	8	6.67%
NLM	1	4	3.33%
Elasticity	1	4	3.33%
Wave Optics	2	8	6.67%
Error	1	4	3.33%
Circular Motion	1	4	3.33%
Electromagnetic Waves	1	4	3.33%
Semiconductors	1	4	3.33%
Communication System	1	4	3.33%
Total	**30**	**120**	**100%**

JEE Main 2020 Chemistry Syllabus

The chemistry section of JEE Main comprises numerical as well as theoretical questions. In JEE Main 2019, Chemical Bonding in Organic Chemistry, Halogen Derivative in Organic Chemistry and Ionic Equilibrium etc were given the highest weightage. The entire chemistry syllabus in JEE Main is spread over three sections.

- Physical Chemistry
- Organic Chemistry
- Inorganic Chemistry

Take a look at JEE Main January 2020 Paper 1 Syllabus for Chemistry below.

Units	Topics
Section A: Physical Chemistry	
Unit 1: Some Basic Concepts In Chemistry	• Matter and its nature, Dalton's atomic theory • Concept of atom, molecule, element and compound • Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis • Laws of chemical combination • Atomic and molecular masses, mole concept, molar mass, percentage

	composition, empirical and molecular formulae • Chemical equations and stoichiometry
Unit 2: States Of Matter	Classification of matter into solid, liquid and gaseous states.
	• Gaseous State: Measurable properties of gases • Gas laws – Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure • Concept of Absolute scale of temperature; Ideal gas equation • Kinetic theory of gases (only postulates) • Concept of average, root mean square and most probable velocities • Real gases, deviation from Ideal behaviour, compressibility factor and van der Waals equation
	Liquid State: Properties of liquids – vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only).
	• Solid State: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea) • Bragg's Law and its applications • Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids • Electrical, magnetic and dielectric properties
Unit 3: Atomic Structure	• Thomson and Rutherford atomic models and their limitations • Nature of electromagnetic radiation, photoelectric effect • Spectrum of hydrogen atom, Bohr model of hydrogen atom – its postulates, derivation of the relations for 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 atom, its important features, concept of atomic orbitals as one electron wave functions

	• 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 and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.
Unit 4: Chemical Bonding And Molecular Strucure	Kossel – Lewis approach to chemical bond formation, 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, 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, concept of bond order, bond length and bond energy.
Unit 5: Chemical Thermodynamics	Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes.
	• 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 • Second law of thermodynamics • Spontaneity of processes

	• DS of the universe and DG of the system as criteria for spontaneity, Dgo (Standard Gibbs energy change) and equilibrium constant
Unit 6: Solutions	• Different methods for expressing concentration of solution – molality, molarity, mole fraction, percentage (by volume and mass both), 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 and osmotic pressure • Determination of molecular mass using colligative properties; Abnormal value of molar mass, van't Hoff factor and its significance
Unit 7: Equilibrium	Meaning of equilibrium, concept of dynamic equilibrium.
	• Equilibria involving physical processes: Solid -liquid, liquid – gas and solid – gas equilibria, Henry's law, general characterics of equilibrium involving physical processes. • Equilibria involving chemical processes: Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance, significance of DG and DGo in chemical equilibria, factors affecting equilibrium concentration, pressure, temperature, 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, solubility of sparingly soluble salts and solubility products, buffer solutions.
Unit 8: Redox Reactions And Electrochemistry	Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions.
	Eectrolytic and metallic conduction, conductance in electrolytic solutions, specific and 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 9 : 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 ofzero and first-order reactions, their characteristics and half-lives, effect of temperature on rate of reactions – Arrhenius theory, activation energy and its calculation, collision theory of bimolecular gaseous reactions (no derivation).
Unit 10: Surface Chemistry	Adsorption- Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids – Freundlich and Langmuir adsorption isotherms, adsorption from solutions.
	• Colloidal state- distinction among true solutions, colloids and suspensions, classification of colloids – lyophilic, lyophobic • multi molecular, macromolecular and associated colloids (micelles), preparation and properties of colloids – Tyndall effect, Brownian movement, electrophoresis, dialysis, coagulation and flocculation • Emulsions and their characteristics
Section B: Inorganic Chemistry	
Unit 11: Classificaton Of Elements And Periodicity In Properties	Modem 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 and chemical reactivity.

Unit 12: General Principles And Processes Of Isolation Of Metals	Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals – concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al, Cu, Zn and Fe; Thermodynamic and electrochemical principles involved in the extraction of metals.
Unit 13: Hydrogen	• Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen • Physical and chemical properties of water and heavy water • Structure, preparation, reactions and uses of hydrogen peroxide • Hydrogen as a fuel
Unit 14: S – Block Elements (Alkali And Alkaline Earth Metals)	Group – 1 and 2 Elements: General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships.
	Preparation and properties of some important compounds – sodium carbonate and sodium hydroxide; Industrial uses of lime, limestone, Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.
Unit 15: 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.
	Groupwise study of the p – block elements • Group – 13: Preparation, properties and uses of boron and aluminium; properties of boric acid, diborane, boron trifluoride, aluminium chloride and alums. • Group – 14: Allotropes of carbon, tendency for catenation; Structure & properties of silicates, and zeolites. • Group – 15: Properties and uses of nitrogen and phosphorus; Allotrophic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl3, PCl5); Structures of oxides and oxoacids of phosphorus. • Group – 16: Preparation, properties, structures and uses of ozone; Allotropic forms of sulphur; Preparation,

	properties, structures and uses of sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur. • Group – 17: Preparation, properties and uses of hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens. • Group –18**:** Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.
UNIT 16: 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 K2 Cr2 O7 and KMnO4 .
	Inner Transition Elements: Lanthanoids – Electronic configuration, oxidation states and lanthanoid contraction.
	Actinoids – Electronic configuration and oxidation states.
Unit 17: Co-Ordination Compounds	• Introduction to co-ordination compounds, Werner's theory • ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism • Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of co-ordination compounds (in qualitative analysis, extraction of metals and in biological systems).
Unit 18: Environmental Chemistry	• Environmental pollution – Atmospheric, water and soil. • Atmospheric pollution – Tropospheric and Stratospheric • Tropospheric pollutants – Gaseous pollutants: Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention; Greenhouse effect and Global warming; Acid rain; • Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention.

	• Stratospheric pollution- Formation and breakdown of ozone, depletion of ozone layer – its mechanism and effects. • Water Pollution – Major pollutants such as, pathogens, organic wastes and chemical pollutants; their harmful effects and prevention. • Soil pollution – Major pollutants such as: Pesticides (insecticides,. herbicides and fungicides), their harmful effects and prevention. Strategies to control environmental pollution.
Section C: Organic Chemistry	
Unit 19: Purification And Characterisation Of Organic Compounds	Purification – Crystallization, sublimation, distillation, differential extraction and 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 20: 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: – C = C – , – C h C – 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.
Unit 21: 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 (Markownikoff's 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 functional group in mono-substituted benzene.
Unit 22: 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.
Unit 23: 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 (Wolff Kishner and Clemmensen); acidity of r – hydrogen, aldol condensation, Cannizzaro reaction, Haloform reaction; Chemical tests to distinguish between aldehydes and Ketones.
Carboxylic Acids	Acidic strength and factors affecting it.
Unit 24: Organic Compounds Containing Nitrogen	• General methods of preparation, properties, reactions and uses. • Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character. • Diazonium Salts: Importance in synthetic organic chemistry.
Unit 25: Polymers	• General introduction and classification of polymers, general methods of

	polymerization-addition and condensation, copolymerization • Natural and synthetic rubber and vulcanization • some important polymers with emphasis on their monomers and uses – polythene, nylon, polyester and bakelite.
UNIT 26: Biomolecules	• General introduction and importance of biomolecules. • Carbohydrates – Classification: aldoses and ketoses; monosaccharides (glucose and fructose) and constituent monosaccharides of oligosacchorides (sucrose, lactose and maltose). • Proteins – Elementary Idea of r – 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.
UNIT 27: Chemistry in Everyday Life	Chemicals in medicines – Analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamins – their meaning and common examples.
	Chemicals in food – Preservatives, artificial sweetening agents – common examples. Cleansing agents – Soaps and detergents, cleansing action.
UNIT 28: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY	Detection of extra elements (N,S, halogens) in organic compounds; Detection of the following functional groups: hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketone), carboxyl and amino groups in organic compounds.
	• Chemistry involved in the preparation of the following: Inorganic compounds: Mohr's salt, potash alum. • Organic compounds: Acetanilide, pnitroacetanilide, aniline yellow, iodoform.
	Chemistry involved in the titrimetric excercises – 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+, AI3+, Fe3+, Zn2+, Ni2+, Ca2+, Ba2+, Mg2+, NH4+.

	Anions- CO3 2-, S2-, SO4 2-, NO2-, NO3-, CI -, Br, I. (Insoluble salts excluded).
Chemical principles involved in the following experiments:	Enthalpy of solution of CuSO4
	Enthalpy of neutralization of strong acid and strong base.
	Preparation of lyophilic and lyophobic sols.
	Kinetic study of reaction of iodide ion with hydrogen peroxide at room temperature.

JEE Main Topicwise Weightage for Chemistry

Below is JEE Main Chemistry important topics and number of questions asked in the examination.

Topics	No of Questions	Marks
Transition Elements and Coordination Chemistry	3	12
Periodic table and Representative Elements	3	12
Thermodynamics And Gaseous State	2	8
Atomic Structure	2	8
Chemical Bonding	2	8
Chemical And Ionic Equilibrium	2	8
Solid State And Surface Chemistry	2	8
Nuclear Chemistry And Environment	2	8
Mole Concept	1	4
Redox Reaction	1	4
Electrochemistry	1	4
Chemical Kinetics	1	4
Solution and Colligative Properties	1	4
General Organic Chemistry	1	4
Stereochemistry	1	4
Hydrocarbon	1	4
Alkyl Halides	1	4
Carboxylic Acid and their Derivatives	1	4
Carbohydrates, amino acid and Polymers	1	4
Aromatic Compounds	1	4