

[Updated] JEE Mains 2023 Syllabus - Download PDF

As a JEE aspirant, you should know the complete syllabus of JEE Main exam. The JEE Main aspirants have to cover all the topics/ concepts of Mathematics, Physics, and Chemistry from classes 11th and 12th, which are part of the JEE Main syllabus. Along with NCERT books, aspirants can study from JEE reference books (recommended option is [IIT JEE Study Material](#)). It's also important to solve questions from past year papers of JEE Main to know what type of questions you can expect in the examination.

JEE Main 2023 - The National Testing Agency (NTA) will conduct the JEE Main 2023 exam. Joint Entrance Examination 2023 will be conducted four times in February/ March/ April and May. The authorities will release the application form of JEE Main 2023 at jeemain.nta.nic.in tentatively in November 2022. Candidates should check the JEE Main eligibility criteria beforehand.

The National Testing Agency (NTA) will conduct JEE Main 2023. This will be a national-level entrance exam to be held with the aim to shortlist the candidates for B.E/B.Tech/B.Arch/B.Planning courses in top colleges of India. A huge number of candidates appeared for the JEE Mains last year and it is expected that more candidates will be appearing for this exam in the year 2023. So, it is obvious that the competition level in the coming JEE Main exam is going to be very high.

JEE Main 2023 Overview

Examination Name	JEE Main 2023
Also popular as	JEE Mains 2023
Exam conducting authority	National Testing Agency
Courses	B.E, B.Tech, B.Arch, and B.Planning courses
Mode of application	Online
Mode of exam	Paper 1 (computer-based test) and paper 2 (computer-based test and pen and paper-based test)
Official website	https://jeemain.nta.nic.in/

JEE Main 2023 Exam Pattern

Candidates must know about the exam pattern of JEE Main 2023 exam beforehand. Knowledge of JEE Main exam pattern will help the candidates to know about the mode of examination, the number of sections, the type of questions, and more. The following table can be referred to know about the exam pattern of JEE Main 2023.

Particulars	B.Tech	B.Arch	B.Planning
Total			
Number of Questions	90 Questions	82 Questions	105 Questions
Total Marks	300 Marks	400 Marks	400 Marks
Sections	Physics, Chemistry, and Mathematics	Mathematics, Aptitude, and Drawing	Mathematics, Aptitude, and Planning
Number of Questions	30 Objective Type - Multiple Choice Questions (MCQs) + 10 Questions with answers as a numerical value, with equal weightage to Mathematics, Physics & Chemistry. Candidates will have to attempt only 5 questions out of 10 numerical value questions.	Mathematics-30 Objective Type - Multiple Choice Questions (MCQs) & 10 Questions for which answer is a numerical value. Candidates have to attempt 5 out of 10 questions with numerical value answer. Aptitude- 50 MCQs. Drawing- 2 questions	Mathematics- 20 Objective Type - Multiple Choice Questions (MCQs) & 10 Questions for which answer is numerical value. Candidates have to attempt 5 out of 10 questions with numerical value answer. Aptitude Test – 50 Objective Type - Multiple Choice Questions (MCQs). Planning Based Questions -25 Objective Type - Multiple Choice Questions (MCQs)
Number of Marks per Section	Physics- 100 Marks Chemistry- 100 Marks Mathematics- 100 Marks	Mathematics- 100 Marks Aptitude- 200 Marks Drawing- 100 Marks	Mathematics- 100 Marks Aptitude- 200 Marks Planning- 100 Marks

JEE Main 2023 Syllabus

JEE Main Syllabus Mathematics

Unit / Chapter	List of Topics
Sets, Relations and Functions	Sets and their representation: Union, intersection and complement of sets and their algebraic properties; Power set; Relation, Type of relations, equivalence relations, functions; one-one, into and onto functions, the composition of functions.
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 number, modulus and argument (or amplitude) of a complex number, square root

	<p>of a complex number, triangle inequality, Quadratic equations in real and complex number system and their solutions Relations between roots and coefficient, nature of roots, the formation of quadratic equations with given roots.</p> <p>Matrices, algebra of matrices, type 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.</p>
Matrices and Determinants	
Permutations and Combinations	<p>The fundamental principle of counting, permutation as an arrangement and combination as section, Meaning of $P(n,r)$ and $C(n,r)$, simple applications.</p>
Mathematical Inductions	<p>Principle of Mathematical Induction and its simple applications.</p>
Binomial Theorem and it's Simple Applications	<p>Binomial theorem for a positive integral index, general term and middle term, properties of Binomial coefficients and simple applications.</p>
Sequence and Series	<p>Arithmetic and Geometric progressions, insertion of arithmetic, geometric means between two given numbers, Relation between A.M and G.M sum up to n terms of special series; S_n, S_{n2}, S_{n3}. Arithmetico-Geometric progression.</p>
Limits, Continuity and Differentiability	<p>Real – valued functions, algebra of functions, polynomials, rational, trigonometric, logarithmic and exponential functions, inverse function. 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 up to 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 normal.</p>
Integral Calculus	<p>Integral as an anti-derivative, Fundamental Integrals involving algebraic, trigonometric, exponential and logarithms functions. Integrations by substitution, by parts and by partial functions. Integration using trigonometric identities. Evaluation of simple integrals of the type $\int dx \, x^2+a^2$, $\int dx \, \sqrt{x^2 \pm a^2}$, $\int dx \, a^2-x^2$, $\int dx \, \sqrt{a^2-x^2}$, $\int dx \, ax^2+bx+c$, $\int dx \, \sqrt{ax^2+bx+c}$, $\int (px+q)dx \, ax^2+bx+c$, $\int (px+q)dx \, \sqrt{ax^2+bx+c}$, $\int \sqrt{a^2 \pm x^2} \, dx$, $\int \sqrt{x^2-a^2} \, dx$ Integral as limit of a sum. The fundamental theorem of calculus, properties of definite integrals. Evaluation of definite integrals, determining areas of the regions bounded by simple curves in standard form.</p>
Differential Equations	<p>Ordinary differential equations, their order and degree, the formation of differential equations, solution of differential</p>

	<p>equation by the method of separation of variables, solution of a homogeneous and linear differential equation of the type $dy/dx + p(x)y = q(x)$</p> <p>Cartesian system of rectangular coordinates in a plane, distance formula, sections formula, locus and its equation, translation of axes, the slope of a line, parallel and perpendicular lines, intercepts of a line on the co-ordinate axis.</p> <p>Straight line</p> <p>Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, the distance of a point from a line, equations of internal and external bisectors of angles between two lines coordinate of the centroid, orthocentre and circumcentre of a triangle, equation of the family of lines passing through the point of intersection of two lines.</p> <p>Circle, conic sections</p> <p>A standard form of equations of a circle, the general form of the equation of a circle, its radius and central, equation of a circle when the endpoints 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 conics, 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.</p> <p>Coordinates of a point in space, the distance between two points, section formula, direction ratios and direction cosines, the 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, the intersection of a line and a plane, coplanar lines.</p>
Co-ordinate Geometry	
Three Dimensional Geometry	
Vector Algebra	<p>Vectors and scalars, the addition of vectors, components of a vector in two dimensions and three-dimensional space, scalar and vector products, scalar and vector triple product.</p>
Statistics and Probability	<p>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.</p>
Trigonometry	<p>Trigonometrical identities and equations, trigonometrical functions, inverse trigonometrical functions and their properties, heights and distance.</p>
Mathematical Reasoning	<p>Statement logical operations and, or, implies, implied by, if and only if, understanding of tautology, contradiction, converse and contrapositive.</p>

JEE Main Syllabus Physics

The Physics syllabus of JEE Main contains two Section- A and B, Section – A pertains to the Theory Part having 80% weightage, while Sections – B contains practical component (Experimental Skills) having 20 % Weightage.

Section A	
Unit / Chapter	List of Topics
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 Physics quantities, dimensional analysis and its applications.
Kinematics	The 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 graph, 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.
Laws Of Motion	Force and inertia, Newton's First law of motion; Momentum, Newton's Second Law of motion, Impulses; 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.
Work, Energy and Power	Work done by a constant force and a variable force; kinetic and potential energies, work-energy theorem, power. The potential energy of spring conservation of mechanical energy, conservative and nonconservative forces; Elastic and inelastic collisions in one and two dimensions.
Rotational Motion	Centre of the mass of a two-particle system, Centre of the mass of a rigid body; Basic concepts of rotational motion; a moment of a force; torque, angular momentum, conservation of angular momentum and its applications; the moment of inertia, the 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
Gravitation	The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy; gravitational potential. Escape velocity, Orbital velocity of a satellite. Geo stationary satellites.
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

	<p>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.</p>
Thermodynamics	<p>Thermal equilibrium, zeroth law of thermodynamics, the concept of temperature. Heat, work and internal energy. The first law of thermodynamics. The second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency.</p>
Kinetic theory of gases	<p>Equation of state of a perfect gas, work done on compressing a gas, Kinetic theory of gases - assumptions, the 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.</p>
Oscillations and Waves	<p>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.</p> <p>Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, a reflection of waves. Standing waves in strings and organpipes, fundamental mode and harmonics. Beats. Doppler Effect in sound.</p>
Electrostatics	<p>Electric charges: Conservation of charge. Coulomb's law-forces between two point charges, forces between multiple charges: superposition principle and continuous charge distribution.</p> <p>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.</p> <p>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.</p> <p>Conductors and insulators. Dielectrics and electric polarization, capacitor, the combination of capacitors in series and parallel, capacitance of a parallel plate capacitor</p>

	<p>with and without dielectric medium between the plates. Energy stored in a capacitor.</p> <p>Electric current. Drift velocity. Ohm's law. Electrical resistance. Resistances of different materials. V-I characteristics of Ohmic and non-ohmic conductors. Electrical energy and power. Electrical resistivity. Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance.</p>
Current Electricity	<p>Electric Cell and its Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel. Kirchhoff's laws and their applications. Wheatstone bridge. Metre Bridge. Potentiometer - principle and its applications.</p> <p>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.</p>
Magnetic effects of current and magnetism	<p>Force on a current-carrying conductor in a uniform magnetic field. The force between two parallel current carrying conductors definition of ampere. Torque experienced by a current loop in a uniform magnetic field: Moving coil galvanometer, its current sensitivity and conversion to ammeter and voltmeter.</p> <p>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 ferromagnetic substances. Magnetic susceptibility and permeability. Hysteresis. Electromagnets and permanent magnets.</p>
Electromagnetic induction and alternating currents	<p>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.</p>
Electromagnetic Waves	<p>Electromagnetic waves and their characteristics, Transverse nature of electromagnetic waves, Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet. X-rays. Gamma rays), Applications of e.m. waves.</p>
Optics	<p>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.</p> <p>Wave optics: wavefront and Huygens' principle. Laws of reflection and refraction using Huygens principle.</p>

Dual Nature of Matter and Radiation	Interference, Young's double-slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarization, plane-polarized light: Brewster's law, uses of plane-polarized light and Polaroid. 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. DavissonGermer experiment.
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.
Electronic Devices	Semiconductors; semiconductor diode: 1- V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED. the 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.
Communication Systems	Propagation of electromagnetic waves in the atmosphere; Sky and space wave propagation. Need for modulation. Amplitude and Frequency Modulation, Bandwidth of signals. the bandwidth of Transmission medium, Basic Elements of a Communication System (Block Diagram only).

Section B

Unit / Chapter

List of Topics

Experimental Skills	<p>Familiarity with the basic approach and observations of the experiments and activities:</p> <ol style="list-style-type: none"> 1. Vernier callipers-its use to measure the internal and external diameter and depth of a vessel. 2. Screw gauge-its use to determine thickness/ diameter of thin sheet/wire. 3. Simple Pendulum-dissipation of energy by plotting a graph between the square of amplitude and time. 4. Metre Scale - the mass of a given object by principle of moments. 5. Young's modulus of elasticity of the material of a metallic wire. 6. Surface tension of water by capillary rise and effect of detergents, 7. Co-efficient of Viscosity of a given viscous liquid by
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- measuring terminal velocity of a given spherical body,
8. Plotting a cooling curve for the relationship between the temperature of a hot body and time.
 9. Speed of sound in air at room temperature using a resonance tube,
 10. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
 11. The resistivity of the material of a given wire using metre bridge.
 12. The resistance of a given wire using Ohm's law.
 13. Potentiometer. Comparison of emf of two primary cells.
 - ii. Determination of internal resistance of a cell.
 14. Resistance and figure of merit of a galvanometer by half deflection method.
 15. The focal length of; (i) Convex mirror (ii) Concave mirror, and (ii) Convex lens, using the parallax method.
 16. The plot of the angle of deviation vs angle of incidence for a triangular prism.
 17. Refractive index of a glass slab using a travelling microscope.
 18. Characteristic curves of a p-n junction diode in forward and reverse bias.
 19. Characteristic curves of a Zener diode and finding reverse break down voltage.
 20. Characteristic curves of a transistor and finding current gain and voltage gain.
 21. Identification of Diode. LED, Transistor. IC. Resistor. A capacitor from a mixed collection of such items.
 22. Using a multimeter to: (i) Identify the base of a transistor (ii) Distinguish between NPN and PNP type transistor (iii) See the unidirectional of current in case of a diode and an LED. (iv) Check the correctness or otherwise of a given electronic component (diode, transistor or IC)

JEE Main Syllabus Chemistry

Section A - Physical Chemistry

Unit / Chapter

List of Topics

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.

	<p>Classification of matter into solid, liquid and gaseous states.</p> <p>Gaseous State:</p> <p>Measurable properties of gases: Gas laws - Boyle's law, Charles'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.</p>
States of Matter	<p>Liquid State:</p> <p>Properties of liquids - vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only).</p> <p>Solid State:</p> <p>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, an imperfection in solids; Electrical and magnetic properties.</p> <p>Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of the hydrogen atom. Bohr model of a hydrogen atom - its 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 mechanics, the 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 and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.</p>
Atomic Structure	<p>Kossel - Lewis approach to chemical bond formation, the concept of ionic and covalent bonds.</p> <p>Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.</p>
Chemical bonding and molecular structure	<p>Covalent Bonding: Concept of electronegativity. Fajan's rule, dipole moment: Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.</p> <p>Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p and d orbitals; Resonance.</p>

Chemical
Thermodynamics

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.

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.

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 - a relative lowering of vapour pressure, depression of freezing point, the 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.

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 (K_p and K_c) 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.

Redox reactions and electrochemistry	<p>Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions.</p> <p>Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration: Kohlrausch's law and its applications.</p> <p>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.</p>
Chemical Kinetics	<p>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).</p>
Surface Chemistry	<p>Adsorption- Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions.</p> <p>Catalysis - Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis and its mechanism.</p> <p>Colloidal state- distinction among true solutions, colloids and suspensions, classification of colloids - lyophilic, lyophobic; multimolecular, macromolecular and associated colloids (micelles), preparation and properties of colloids - Tyndall effect, Brownian movement, electrophoresis, dialysis, coagulation and flocculation: Emulsions and their characteristics.</p>

Section B - Inorganic Chemistry

Unit / Chapter	List of Topics
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 and chemical reactivity.
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.
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; Classification of hydrides - ionic, covalent and interstitial; Hydrogen as a fuel.
S-block elements (Alkali and Alkaline Earth Metals)	<p>Group -1 and 2 Elements</p> <p>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.</p> <p>Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide and sodium hydrogen carbonate; Industrial uses of lime, limestone. Plaster of Paris and cement: Biological significance of Na, K, Mg and Ca.</p>
P-block elements	<p>Group -13 to Group 18 Elements</p> <p>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.</p> <p>Groupwise study of the p - block elements</p> <p>Group -13</p> <p>Preparation, properties and uses of boron and aluminium; Structure, properties and uses of borax, boric acid, diborane, boron trifluoride, aluminium chloride and alums.</p> <p>Group -14</p> <p>The tendency for catenation; Structure, properties and uses of Allotropes and oxides of carbon, silicon tetrachloride, silicates, zeolites and silicones.</p> <p>Group -15</p> <p>Properties and uses of nitrogen and phosphorus; Allotropic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl_3, PCl_5); Structures of oxides and oxoacids of nitrogen and phosphorus.</p> <p>Group -16</p> <p>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.</p> <p>Group-17</p> <p>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.</p> <p>Group-18</p> <p>Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.</p>

d and f block elements	<p>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 $KMnO_4$.</p> <p>Inner Transition Elements Lanthanoids - Electronic configuration, oxidation states and lanthanoid contraction. Actinoids - Electronic configuration and oxidation states.</p>
Co-ordination compounds	<p>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).</p>
Environmental Chemistry	<p>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 the 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.</p>

Section C - Organic Chemistry

Unit / Chapter

List of Topics

Purification and characterisation of organic compounds	<p>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.</p>
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Some basic principles of organic chemistry	<p>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)</p> <p>Covalent bond fission - Homolytic and heterolytic: free radicals, carbocations and carbanions; stability of carbocations and free radicals, electrophiles and nucleophiles.</p> <p>Electronic displacement in a covalent bond - Inductive effect, electromeric effect, resonance and hyperconjugation.</p> <p>Common types of organic reactions Substitution, addition, elimination and rearrangement.</p>
Hydrocarbons	<p>Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.</p> <p>Alkanes - Conformations: Sawhorse and Newman projections (of ethane): Mechanism of halogenation of alkanes.</p> <p>Alkenes - Geometrical isomerism: Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect): Ozonolysis and polymerization.</p> <p>Alkynes - Acidic character: Addition of hydrogen, halogens, water and hydrogen halides: Polymerization.</p> <p>Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity: Mechanism of electrophilic substitution: halogenation, nitration.</p> <p>Friedel - Craft's alkylation and acylation, directive influence of the functional group in mono-substituted benzene.</p>
Organic compounds containing halogens	<p>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.</p> <p>General methods of preparation, properties, reactions and uses.</p>
Organic compounds containing oxygen	<p>Alcohols, Phenols AND Ethers</p> <p>Alcohols: Identification of primary, secondary and tertiary alcohols: mechanism of dehydration.</p> <p>Phenols: Acidic nature, electrophilic substitution reactions: halogenation. nitration and sulphonation. Reimer - Tiemann reaction.</p> <p>Ethers: Structure.</p> <p>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, NH_3, and its derivatives), Grignard reagent; oxidation: reduction (Wolf Kishner and Clemmensen); the acidity of α-hydrogen. aldol</p>

	<p>condensation, Cannizzaro reaction. Haloform reaction, Chemical tests to distinguish between aldehydes and Ketones.</p> <p>Carboxylic Acids</p> <p>Acidic strength and factors affecting it.</p> <p>General methods of preparation. Properties, reactions and uses.</p>
Organic compounds containing nitrogen	<p>Amines: Nomenclature, classification structure, basic character and identification of primary, secondary and tertiary amines and their basic character.</p> <p>Diazonium Salts: Importance in synthetic organic chemistry.</p>
Polymers	<p>General introduction and classification of polymers, general methods of polymerization, - Addition and condensation, copolymerization.</p> <p>Natural and synthetic, rubber and vulcanization, some important polymers with emphasis on their monomers and uses – polythene, nylon, polyester and bakelite.</p>
Biomolecules	<p>General introduction and importance of biomolecules.</p> <p>CARBOHYDRATES - Classification; aldoses and ketoses: monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).</p> <p>Proteins - Elementary Idea of α-amino acids, peptide bond, polypeptides. Proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.</p> <p>Vitamins – Classification and functions.</p> <p>Nucleic Acids – Chemical constitution of DNA and RNA. Biological functions of nucleic acids.</p>
Chemistry in everyday life	<p>Chemicals in Medicines - Analgesics, tranquillizers, antiseptics, disinfectants, antimicrobials, anti-fertility drugs, antibiotics, antacids. Anti-histamines - their meaning and common examples.</p> <p>Chemicals in food - Preservatives, artificial sweetening agents - common examples.</p> <p>Cleansing Agents - Soaps and detergents, cleansing action.</p> <p>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 and amino groups in organic compounds.</p>
Principles related to Practical Chemistry	<p>The chemistry involved in the preparation of the following: Inorganic compounds; Mohr's salt, potash alum.</p> <p>Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.</p> <p>The chemistry involved in the titrimetric exercises – Acids, bases and the use of indicators, oxalic-acid vs KMnO_4, Mohr's salt vs KMnO_4.</p> <p>Chemical principles involved in the qualitative salt analysts:</p>

Cations – Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} , Zn^{2+} , Ni^{2+} , Ca^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+

Anions- CO_3^{2-} , S^{2-} , SO_4^{2-} , NO_3^- , NO_2^- , Cl^- , Br^- , I^- (Insoluble salts excluded).

Chemical principles involved in the following experiments:

1. Enthalpy of solution of CuSO_4
2. Enthalpy of neutralization of strong acid and strong base.
3. Preparation of lyophilic and lyophobic.
4. Kinetic study of the reaction of iodide ion with hydrogen peroxide at room temperature.

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JEE Main 2023 Books

JEE Main 2023: Best Books for Physics

Books	Author
Problems in General Physics	I.E. Irodov
Practice Book Physics for JEE Main and Advanced	DC Pandey
Physics for JEE (Main and Advanced)-Vol 1 and 2	Resnick, Halliday, Walker
Concepts of Physics -Part I	HC Verma
Concepts of Physics -Part II	HC Verma

JEE Main 2023: Best Books for Chemistry

Books	Authors
Concise Inorganic Chemistry	J.D. Lee
GRB Numerical Chemistry	P. Bahadur
Modern Approach to Chemical Calculations	R.C. Mukherjee
Concepts of Organic Chemistry	O.P Tandon
Organic Chemistry	Robert T. Morrison and Robert N. Boyd

Best Mathematics Books for JEE Main 2023

Books	Authors
Higher Algebra	Hall and Knight
Degree level Differential Calculus	A Das Gupta
Problems in Calculus of One Variable	I.A. Maron
Objective Mathematics for JEE	R.D. Sharma
Mathematics for Class 11 and 12	R.D. Sharma

JEE Main 2023 Application Form

The application form for JEE Main 2023 exam will be made available only in online mode through the official website. The candidates have to provide all the necessary educational and personal details in the application form. Please note that it will be mandatory for every candidate to enter the Aadhar Number or Aadhar Enrollment number in the application form. In addition to this, the applicant will also need to upload scanned copies of a recent passport size photograph and signature.

The candidates should download the acknowledgement page after submitting the application form and keep it safe for future reference.

Application Fee

An application form will not be considered complete unless the candidate pays the prescribed application fee. The JEE Main 2023 application fees for different categories are given below:

B.E/B.Tech or B.Arch or B.Planning

General/Gen-EWS/OBC (NCL)

In India

- Male: Rs.650/-
- Female: Rs.350/-

Outside India

- Male: Rs.3000/-
- Female: Rs.3000/-

SC/ST/PwD

In India

- Male: Rs.325/-
- Female: Rs.325/-

Outside India

- Male: Rs.1500/-
- Female: Rs.1500/-

Third Gender

- In India: Rs.325/-

- Outside India: Rs.1500/-

B.E./B. Tech & B.Arch or B.E./B. Tech & B.Planning or B.E./B. Tech, B.Arch & B.Planning or B.Arch & B.Planning

General/Gen-EWS/OBC (NCL)

In India

- Male: Rs.1300/-
- Female: Rs.650/-

Outside India

- Male: Rs.6000/-
- Female: Rs.3000/-

SC/ST/PwD

In India

- Male: Rs.650/-
- Female: Rs.650/-

Outside India

- Male: Rs.3000/-
- Female: Rs.3000/-

Third Gender

- In India: Rs.650/-
- Outside India: Rs.3000/-

Mode of payment

- The application fee can be paid via only payment gateways using the credit card, debit card or net banking.
- The applicant can also pay the application fee by cash using an e-challan at any of the ICICI, Canara and Syndicate Banks.

Tips To Crack JEE Main 2023

Cracking JEE Main 2023 is not going to be easy. However, there is still ample time left for this exam so the candidate can plan and prepare accordingly. Here, we are presenting some tips for the aspirants in order to prepare for the JEE Main exam in a better way.

Maintain a daily study plan: Regular study is the key to success for every entrance exam especially when you are aspiring for an exam such as JEE Main where the competition level will be very high. Understand the syllabus and exam patterns and thoroughly distribute your time according.

Focus more on your weakness: Regular study will help you to identify your weakness and strengths. Spend more time in rectifying your weaknesses. It is also important to keep polishing your strengths as well.

Clear Concepts: Focus on strengthening your concepts rather than remembering each and everything. Clearing basic concepts of the topic will help you in understanding other related topics as well.

Solve sample paper: Solving more and more sample papers will make you more confident in order to appear for the exam. Aspirants should always note down the time taken by them in solving each sample paper as timing is also a very important factor in order to clear the JEE main 2023 exam.

Frequently Asked Questions for JEE Mains 2023 Syllabus

Question 1: What will be the mode of JEE Mains 2023 application form?

Answer: Eligible candidates can apply for JEE Main in online mode.

Question 2: For which courses JEE Main is conducted?

Answer: You can seek admission to B.E, B.Tech, B.Arch and B.Planning courses.

Question 3: What will be the mode of JEE Main exam for engineering admission?

Answer: It will be a computer-based test