TJEE 2025 Syllabus for Physics

Module Topics

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Physics and Measurement: Scope and excitement, nature of physical laws, Physics, technology, and society. Need for measurement, Units of measurement, SI units, fundamental and derived units. Accuracy and precision of measuring instruments, errors in measurement, significant figures. **Dimensional Analysis:** Dimensions of physical quantities, applications of dimensional analysis. Motion in One Dimension: Frame of reference (inertial and non-inertial), position-time graph, speed, and velocity. Uniform and nonuniform motion, average speed, instantaneous velocity, uniformly accelerated motion, velocity-time and position-time graphs, elementary concepts of differentiation and integration in motion. Vectors and Scalars: Position and displacement vectors, vector addition, subtraction, multiplication by a real number, Unit vector, Zero vector, Resolution of vectors, Scalar and Vector products, Relative velocity. Motion in Two Dimensions: Motion in a plane, cases of uniform velocity and uniform acceleration, projectile motion, uniform circular motion.

Newton's Laws of Motion: Force and inertia, Newton's first, second, and third laws of motion, impulse, law of conservation of linear momentum, applications using free body diagrams. Friction: Equilibrium of concurrent forces, static and kinetic friction, laws of friction, rolling friction. Circular Motion: Dynamics of uniform circular motion, centripetal force, motion on level and banked roads. Work, Power, and Energy: Work done by constant and variable forces, kinetic

MODULE and potential energy, work-energy theorem, power. **Conservation of Energy**: -2Potential energy of a spring, conservative and non-conservative forces, elastic and inelastic collisions in one and two dimensions, motion in a vertical circle. Center of Mass & Rotational Motion: Center of mass of two-particle system, rigid bodies, motion of the center of mass, momentum conservation. Moment of force, torque, angular momentum, conservation of angular momentum, moment of inertia, radius of gyration, parallel and perpendicular axis theorems, equilibrium of rigid bodies, rotational motion equations.

> Gravitation: Kepler's laws, universal law of gravitation. Acceleration due to gravity, variation with altitude, depth, and rotation. Gravitational potential energy, potential, escape speed, orbital velocity, geostationary satellites. Mechanical Properties of Matter: Elastic behavior, stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, rigidity modulus, Poisson's

MODULE ratio, elastic strain energy. Fluid Mechanics: Pressure due to a fluid column, Pascal's law, applications (hydraulic lift and brakes), effect of gravity on fluid pressure. Viscosity & Surface Tension: Newton's law of viscosity, Stoke's law, terminal velocity, Reynold's number, Bernoulli's theorem and applications. Cohesive and adhesive forces, surface energy, surface tension, angle of contact, capillarity.

Heat and Thermodynamics: Heat, temperature, thermal expansion of solids, **MODULE** liquids, gases, anomalous expansion of water. Specific heat capacities, -4 calorimetry, latent heat. Heat Transfer: Conduction, convection, radiation,

Black Body Radiation, absorptive and emissive power, Kirchhoff's law, Wien's displacement law, Newton's law of cooling, Stefan's law, greenhouse effect. **Thermodynamics Laws**: Zeroth law, concept of temperature. First law of thermodynamics, thermodynamic processes (isothermal, adiabatic, isobaric, isochoric), work done in processes. **Second Law of Thermodynamics**: Reversible and irreversible processes, heat engine, Carnot's engine, efficiency. **Kinetic Theory of Gases**: Ideal gas laws, equation of state, kinetic energy, pressure concept, degrees of freedom, equipartition of energy, mean free path, Avogadro's number.

Oscillations and Waves: Periodic motion, displacement as a function of time, periodic functions, SHM equation, phase, mechanical energy in SHM, time period of a simple pendulum, oscillations of a spring. **Types of Oscillations**:

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Free, forced, and damped oscillations, resonance. **Wave Motion**: Longitudinal and transverse waves, speed, progressive wave equation, relation between particle and wave velocity, superposition principle, reflection, standing waves, harmonics in strings and pipes, beats, Doppler effect in sound.

Electrostatics: Frictional electricity, charge conservation, Coulomb's law, forces between charges, dielectric constant, superposition principle, continuous charge distribution. **Electric Field & Potential**: Electric field, field due to a point charge, field lines, electric dipole, torque on a dipole, dipole potential

MODULE energy. Gauss's Law: Applications to infinite wire, plane sheet, thin spherical shell (inside and outside). Electric Potential & Capacitance: Potential for a point charge, dipole, system of charges, equipotential surfaces, electrostatic potential energy, conductors, dielectrics, polarization, capacitors, series and parallel combinations, parallel plate capacitor (with and without dielectric), stored energy, Van de Graaff generator.

Current Electricity: Flow of charge, drift velocity, mobility, Ohm's law, V-I characteristics, resistance, resistivity, conductivity, carbon resistors, series and parallel combinations, temperature dependence of resistance, internal resistance of a cell, EMF, potential difference, secondary cell. **Circuits & Measurement**: Kirchhoff's laws, Wheatstone bridge, metre bridge, potentiometer principle, measuring potential difference, EMF comparison, internal resistance

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measurement. Magnetism: Magnetic field, Oersted's experiment, Biot-Savart's law (application to circular loops). Ampere's Law & Applications: Infinitely long wire, solenoids, toroids, force on a moving charge in electric and magnetic fields, Cyclotron. Magnetic Force & Devices: Force on current-carrying conductor, parallel conductors, torque on a current loop, moving coil galvanometer, current and voltage sensitivity, galvanometer conversion to ammeter and voltmeter.

TJEE 2025 Chemistry Syllabus

Module	Topics	Subtopics
Module – 1	Some Basic Concepts of Chemistry	General Introduction, Importance and Scope of Chemistry, Historical Approach to Particulate Nature of Matter, Laws of Chemical Combination, Dalton's Atomic Theory, Atomic and Molecular Masses, Mole Concept and Molar Mass, Percentage

Module	Topics	Subtopics
		Composition, Empirical and Molecular Formula, Chemical Reactions, Stoichiometry, Calculations Based on Stoichiometry
Module – 2	Structure of Atom	Discovery of Electron, Proton and Neutron; Atomic Number, Isotopes and Isobars, Rutherford's Model and its Limitations, Bohr's Model and its Limitations, Concept of Shells and Sub-shells, Dual Nature of Matter and Light, de Broglie's Relationship, Heisenberg Uncertainty Principle, Concept of Orbitals, Quantum Numbers, Shapes of s, p, and d Orbitals, Rules for Filling Electrons in Orbitals (Aufbau Principle, Pauli Exclusion Principle, Hund's Rule), Electronic Configuration of Atoms, Stability of Half-filled and Completely Filled Orbitals
	Classification of Elements and Periodicity in Properties	Significance of Classification, Brief History of Periodic Table Development, Modern Periodic Law and Present Form of Periodic Table, Periodic Trends in Atomic Radii, Ionic Radii, Ionization Enthalpy, Electron Gain Enthalpy, Electronegativity, Valence, Nomenclature of Elements with Atomic Number > 100
	Chemical Bonding and Molecular Structure	Valence Electrons, Ionic Bond, Bond Parameters, Covalent Bond, Born-Haber Cycle, Lewis Structure, Polar Character of Covalent Bond, Covalent Character of Ionic Bond, Valence Bond Theory, Resonance, Geometry of Covalent Molecules, VSEPR Theory, Concept of Hybridization (s, p, d Orbitals), Molecular Orbital Theory of Homonuclear Diatomic Molecules, Hydrogen Bond
	Chemical Thermodynamics	Concepts of System and Surroundings, Types of Systems, Work, Heat, Energy, Extensive and Intensive Properties, State Functions, First Law of Thermodynamics (ΔU and ΔH), Hess's Law, Enthalpy of Bond Dissociation, Combustion, Formation, Atomization, Sublimation, Phase Transformation, Ionization, Solution, Introduction to Entropy, Gibbs Energy Change, Spontaneity and Equilibrium, Second and Third Laws of Thermodynamics
	Chemical Kinetics	Rate of Reaction (Average & Instantaneous), Factors Affecting Reaction Rate (Concentration, Temperature, Catalyst), Order and Molecularity of Reaction, Rate Law and Specific Rate Constant, Integrated Rate Equations and Half-Life (Zero and First Order), Collision Theory (Elementary Idea), Activation Energy, Arrhenius Equation
Module – 3	States of Matter: Gases and Liquids	Three States of Matter, Intermolecular Interactions, Types of Bonding, Melting & Boiling Points, Gas Laws (Boyle's Law, Charles' Law, Gay Lussac's Law, Avogadro's Law), Ideal Behaviour, Empirical Derivation of Gas Equation, Avogadro's Number, Ideal Gas Equation, Deviation from Ideal Behaviour, Liquefaction of Gases, Critical Temperature, Kinetic Energy & Molecular Speeds, Liquid

Module	Topics	Subtopics
		State (Vapour Pressure, Viscosity, Surface Tension - Qualitative Idea)

TJEE 2025 Mathematics Syllabus

Module	Topics	Subtopics
Module – 1	Sets	Sets and Their Representations, Empty Set, Finite & Infinite Sets, Equal Sets, Subsets of the Set of Real Numbers (Intervals & Notations), Power Set, Universal Set, Venn Diagrams, Operations on Sets (Union, Intersection, Difference, Complement), Properties of Complement Sets, Simple Problems on Union & Intersection (Max. Three Sets)
	Relations & Mapping	Ordered Pairs, Cartesian Product of Sets, Number of Elements in Cartesian Product of Two Finite Sets, Cartesian Product of Reals (up to R × R × R), Different Types of Relations, Pictorial Diagrams, Domain, Co- domain, Range of a Relation, Functions as a Special Kind of Relation, Pictorial Representation of Functions, Real-Valued Functions of Real Variables, Graphs of Functions, Sum, Difference, Product, and Quotients of Functions
Module – 2	Sequence and Series	Arithmetic Progression (A.P), Arithmetic Mean (A.M), Geometric Progression (G.P), Geometric Mean (G.M), Sum of n Terms of A.P & G.P, Relation between A.M. & G.M of Two Real Numbers, Arithmetic, Geometric & Arithmetico-Geometric Series, Sum to n Terms of Special Series Σn , Σn ² , Σn ³ , Infinite G.P & Its Sum
	Complex Numbers	Complex Numbers as Ordered Pair of Reals, Representation in the Form a + ib , Polar Form & Conjugate, Argand Diagram, Algebra of Complex Numbers, Modulus & Argument, Square & Cube Root of Complex Numbers, Triangle Inequality, Simple Problems
	Quadratic Equations	Rational, Irrational & Complex Roots, Relation between Roots & Coefficients, Nature of Roots, Formation of Quadratic Equations, Symmetric Functions of Roots, Quadratic Expressions, Maximum & Minimum Values, Simple Applications
	Permutations & Combinations	Fundamental Theorem of Counting, Permutations (Arrangements), Combinations (Selections), Permutation & Combination of Like & Unlike Things, Circular Permutations Excluded, Simple Applications
Module – 3	Binomial Theorem	Binomial Theorem for Positive Integral Indices, General & Middle Term, Term Independent of x , Greatest Term in Binomial Expansion, Simple Applications