Imperial TC

*JEE Advanced 2024 Detailed Syllabus, Pattern, and Marks Scheme*

1. Physics

Class 11:

* Physical World and Measurement: Units and measurements, physical quantities, SI units.
* Kinematics: Motion in a straight line and plane, velocity, acceleration, equations of motion.
* Laws of Motion: Newton’s laws, friction, dynamics of uniform circular motion.
* Work, Energy, and Power: Work-energy theorem, potential and kinetic energy, conservation of energy.
* Motion of System of Particles and Rigid Body: Center of mass, torque, angular momentum.
* Gravitation: Kepler’s laws, gravitational potential energy, escape velocity, satellite motion.
* Properties of Bulk Matter: Elasticity, viscosity, surface tension, fluid dynamics, thermal properties.
* Thermodynamics: Heat, temperature, laws of thermodynamics, isothermal and adiabatic processes.
* Behavior of Perfect Gas and Kinetic Theory: Gas laws, kinetic energy, degrees of freedom.
* Oscillations and Waves: Simple harmonic motion, wave motion, sound waves, Doppler effect.

Class 12:

* Electrostatics: Electric charge, Coulomb's law, electric field, electric dipole, Gauss's law.
* Current Electricity: Ohm’s law, resistivity, series and parallel circuits, Kirchhoff’s laws.
* Magnetic Effects of Current and Magnetism: Biot-Savart law, Ampere’s law, magnetic dipole, earth’s magnetism.
* Electromagnetic Induction and Alternating Currents: Faraday’s laws, Lenz’s law, AC generator, transformers.
* Electromagnetic Waves: Electromagnetic spectrum, properties, uses.
* Optics: Reflection, refraction, lens formula, wave optics, diffraction, polarization.
* Dual Nature of Radiation and Matter: Photoelectric effect, de Broglie waves.
* Atoms and Nuclei: Atomic models, nuclear fission, fusion, radioactivity.
* Electronic Devices: Semiconductors, diodes, transistors, logic gates.

2. Chemistry

Class 11:

* Some Basic Concepts of Chemistry: Moles, stoichiometry, concentration units.
* Structure of Atom: Quantum mechanical model, Bohr’s model, electron configurations.
* Classification of Elements and Periodicity: Periodic table trends (atomic size, ionization energy, etc.).
* Chemical Bonding and Molecular Structure: Covalent, ionic bonds, VSEPR theory, hybridization.
* States of Matter: Gases, liquids, kinetic molecular theory.
* Thermodynamics: First law of thermodynamics, enthalpy, entropy, Gibbs free energy.
* Equilibrium: Dynamic equilibrium, Le Chatelier’s principle, acids and bases, solubility product.
* Redox Reactions: Oxidation, reduction, balancing redox reactions.
* Hydrogen: Occurrence, isotopes, properties, uses.
* The s-Block Elements: Alkali and alkaline earth metals, properties, compounds.
* The p-Block Elements: Group 13-18 elements, properties and compounds.
* Organic Chemistry – Some Basic Principles: Hybridization, isomerism, nomenclature.
* Hydrocarbons: Alkanes, alkenes, alkynes, aromatic hydrocarbons.
* Environmental Chemistry: Pollution, air, water, soil pollutants.

Class 12:

* Solid State: Types of solids, crystal lattice, packing efficiency.
* Solutions: Types, solubility, Raoult’s law, colligative properties.
* Electrochemistry: Conductance, cell potential, Nernst equation, electrolysis.
* Chemical Kinetics: Rate laws, order of reaction, activation energy.
* Surface Chemistry: Adsorption, catalysis, colloids.
* General Principles and Processes of Isolation of Elements: Metallurgy, refining.
* The p-Block Elements: Group 15-18 elements.
* The d- and f-Block Elements: Transition elements, lanthanides, actinides.
* Coordination Compounds: Ligands, coordination number, isomerism.
* Haloalkanes and Haloarenes: Preparation, properties, reactions.
* Alcohols, Phenols, and Ethers: Structures, nomenclature, preparation, and reactions.
* Aldehydes, Ketones, and Carboxylic Acids: Nucleophilic addition, preparation, properties.
* Amines: Classification, preparation, properties, and reactions.
* Biomolecules: Carbohydrates, proteins, nucleic acids, enzymes.
* Polymers: Classification, types, properties, uses.
* Chemistry in Everyday Life: Drugs, food additives, detergents.

3. Biology

Class 11:

* Diversity in Living World: Classification of living organisms, biological nomenclature, five kingdoms.
* Structural Organization in Animals and Plants: Tissue types in plants and animals, anatomy.
* Cell Structure and Function: Prokaryotic, eukaryotic cells, cell organelles, cell cycle, and division.
* Plant Physiology: Photosynthesis, respiration, transport in plants, plant growth hormones.
* Human Physiology: Digestive, respiratory, circulatory, excretory, nervous, muscular, and endocrine systems.

Class 12:

* Reproduction: Human reproduction, reproductive health, sexual reproduction in flowering plants.
* Genetics and Evolution: Mendel’s laws, DNA structure, gene expression, evolution theories.
* Biology and Human Welfare: Human diseases, immunity, biotechnology in medicine, microbes in human welfare.
* Biotechnology and Its Applications: Genetic engineering, gene therapy, agricultural applications.
* Ecology and Environment: Ecosystems, biodiversity, conservation, environmental issues, population ecology.

Exam Pattern

* Total Questions: 180
	+ Physics: 45 questions
	+ Chemistry: 45 questions
	+ Biology: 90 questions (Botany & Zoology)
* Types of Questions: Multiple Choice Questions (MCQs)
* Total Marks: 720
* Marking Scheme:
	+ +4 marks for each correct answer
	+ -1 mark for each incorrect answer
	+ 0 marks for unattempted questions

Marks Distribution

| Subject | Number of Questions | Marks per Question | Total Marks |
| --- | --- | --- | --- |
| Physics | 45 | 4 | 180 |
| Chemistry | 45 | 4 | 180 |
| Biology | 90 | 4 | 360 |
| Total | 180 |  | 720 |

Key Points

* Duration: 3 hours
* Medium: English, Hindi, and regional languages (varies by state)
* Eligibility: Candidates must have completed Class 12 with Physics, Chemistry, and Biology/Mathematics.

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