Pt. Ravishankar Shukla University

Raipur – 492010, Chhattisgarh

CBS – ENTRANCE SCREENING TEST- 2026

(CBS – EST–2026)

Information Brochure & Syllabus

Entrance Test for Admission to

Center for Basic Sciences

Pt. Ravishankar Shukla University, Raipur

Academic Session 2026–27

Center for Basic Sciences
Pt. Ravishankar Shukla University
Raipur 492010, Chhattisgarh

Introduction to CBS-EST-2026

The **Entrance Screening Test (EST)** is a mandatory examination for admission to the **Five-Year Integrated M.Sc. Program** in core subjects such as Botany, Chemistry, Mathematics, Physics and Zoology, offered by the **Center for Basic Sciences (CBS)** of Pt. Ravishankar Shukla University, Raipur 492010, Chhattisgarh.

Established in 2015 with the support of the Government of Chhattisgarh, the CBS is committed to promote excellence in scientific education and research. This Center provides high-quality education in the core subjects through distinguished faculty members working within a vibrant and research-driven academic environment. Its mission is to nurture a strong national pool of researchers capable of addressing contemporary challenges in both fundamental and applied sciences.

The Integrated M.Sc. Program follows a semester-based system with continuous assessment and a thoughtfully designed, research-oriented curriculum. Students are provided with early exposure to research, enabling them to develop analytical skills, scientific temperament, and innovative thinking from the beginning of their academic journey. CBS is equipped with state-of-the-art teaching and research laboratories, modern computational facilities, and a well-stocked library. On-campus hostel accommodation is available for both male and female students, ensuring a supportive and academically conducive environment.

All the students admitted under the free seat category in the Five-Year Integrated M. Sc. Program are eligible to receive a monthly scholarship of ₹5,000.00 only. This Center encourages participation of students in summer research projects and internships to promote hands-on scientific learning and innovation. For detailed information regarding the Integrated M.Sc. Program, courses offered, research activities, facilities, and faculty profiles, please visit: www.prsu.ac.in

Eligibility criteria for admission

Educational Qualification: Candidates seeking admission to the **Center for Basic Sciences, Pt. Ravishankar Shukla University, Raipur 492010, Chhattisgarh**, for the academic session 2026-27 must have completed Class XII (10+2) or an equivalent examination in the **Science stream**, with any combination of **Biology, Chemistry, Mathematics, and Physics**. All the applicants are compulsorily required to appear in the **CBS-EST-2026** examination.

Candidates who have already passed the Class XII examination (or its equivalent) from any recognized Board in India, as well as those appearing in the Class XII examination in 2026, are eligible to apply and appear for CBS-EST-2026. Admission shall be granted strictly on the basis of the merit list prepared from the performance in CBS-EST-2026.

To be eligible for admission, candidates must have secured **at least 60% aggregate marks** (or an equivalent grade) in the Class XII examination. For candidates belonging to the **Scheduled Caste (SC)** and **Scheduled Tribe (ST)** categories, the minimum required aggregate marks shall be **55%**.

In the cases where only letter grades are awarded, candidates must produce a certificate issued by the concerned Board specifying the equivalent percentage of marks. In the absence of such a certificate, the decision of the Admission Committee of the institution shall be final and binding.

Age limit: The age limit shall be governed by the norms of the Department of Higher Education, Government of Chhattisgarh.

Number of seats and reservations

For the academic session 2026-27, the **CBS** offers a total of **60 seats** through **CBS-EST-2026**, comprising **40 scholarship seats** (20 for PCB, and 20 for PCM), and **20 payment seats** (10 for PCB, and 10 for PCM). Reservation of scholarship seats for **SC, ST, and OBC (Non-Creamy Layer)** categories shall be in accordance with the norms of the Government of Chhattisgarh. Candidates applying under any reserved category must produce a **valid caste and domicile certificate** along with the required supporting documents at the time of counselling and admission.

CBS-EST-2026 examination

The **CBS-EST-2026** will be conducted by Pt. Ravishankar Shukla University, Raipur. Based on performances of the candidates in CBS-EST-2026, a merit list will be prepared and published on the University website (www.prsu.ac.in). Candidates shortlisted in the merit list will be invited to participate in the counseling process.

Admissions will be granted strictly in order of merit and in accordance with applicable reservation rules, until all the available seats are filled. Separate category-wise merit lists will also be published prior to the commencement of counseling.

1. **Examination rules:**
    - The duration of the examination will be **three hours**.
    - Candidates must report to the examination center at least one hour before the commencement of the examination to complete verification formalities. Entry to the examination hall will not be permitted after 30 minutes from the start of the examination under any circumstances.
    - Candidates shall **not be allowed to leave the examination hall before completion** of the

examination.

- The use of **log tables, calculators, or any electronic devices** inside the examination hall is strictly prohibited.
- Candidates **must carry** their **Admit Card** along with their **School Photo Identity Card** or any valid **Government-issued photo identification** to the examination center.
- Any candidate found using unfair means or engaging in malpractice shall **immediately be expelled from the examination hall**, and appropriate disciplinary action may be taken.

2. **Mode of examination**: CBS-EST-2026 will be conducted in **Offline Mode**, using a printed question booklet and OMR answer sheets.

3. **Question type:** The question paper will consist of two parts: **Part A (Compulsory),** and **Part B (Optional).**
    - **Part A (Compulsory)** will include questions from **Physics and Chemistry**.
    - **Part B (Optional)** will include questions from **Mathematics** and **Biology**. Candidates must attempt only one subject in Part B, either Mathematics or Biology.

    The question paper will contain a total of **150 multiple-choice questions** (MCQs), each carrying four options with only one correct answer, distributed as follows:
    - **Physics**: 50 questions (Question Nos. 1-50)
    - **Chemistry**: 50 questions (Question Nos. 51-100)
    - **Mathematics/Biology**: 50 questions (Question Nos. 101-150)

4. Marking scheme:

Each correct answer will be awarded one mark, and the maximum marks for the examination will be 150. No marks will be awarded for unanswered questions. There shall be no negative marking for any of the questions.

5. Method of answering:

Marking more than one option for a question will be treated as an incorrect response. Candidate must select the correct answer and mark it on the OMR answer sheet by darkening the appropriate circle/bubble corresponding to the question number using a black or blue ballpoint pen only.

6. Language of the question paper:

The question paper shall be bilingual (English and Hindi). In case of any discrepancy between the English and Hindi versions of a question, the English version shall be considered final and binding.

7. Syllabus:

The syllabus for CBS-EST-2026 is primarily based on the NCERT/CBSE/Chhattisgarh Board Science curriculum for Classes XI and XII. The detailed syllabus is provided in Annexure-II.

How to apply

To apply for CBS-EST-2026, candidates can fill out the application form Online. To do so, candidates should visit **www.prsu.ac.in** or **www.prsuuniv.in.** Candidates are strongly advised to read through the detailed online application procedure available on the website.

Application Fee:

Please refer to the fee chart below.

Category	Online fee	Additional charges	Remark
General & OBC Candidates	Rs. 1000.00	Money transfer charge and Vendor's service charge	Non-refundable
SC and ST Candidates	Rs. 550.00	Money transfer charge and Vendor's service charge	Non-refundable

Mode of payment:

Application fee payment

A secure, multi-mode payment gateway is integrated with the online application portal. Applicants may pay the application fee using credit card, debit card, or internet banking facilities. Detailed, step-by-step instructions for fee payment are provided on the CBS-EST website (www.prsu.ac.in) and within the online application portal for CBS-EST-2026.

Candidates are not required to send any hard copies of documents to the CBS Office, as the application process is completely paperless. For comprehensive guidelines regarding application procedure and payment methods, candidates should refer to the Instruction Sheet available under the "How to Apply" tab on: www.prsu.ac.in or www.prsuuniv.in.

Admit card

After successfully submitting the application for CBS-EST-2026, candidates are advised to regularly visit the University website (www.prsu.ac.in) for updates regarding examination and admission-related activities.

Applicants must download their Admit Card from the CBS-EST portal by logging in with their registered credentials. Candidates are advised to preserve the Admit Card carefully, as it need to be produced during counselling and admission of shortlisted candidates.

Correspondence and Enquiries

All correspondence related to CBS-EST-2026 sent by postal mail should be addressed to:
Coordinator / Center Superintendent, CBS-EST-2026 or
Director, Center for Basic Sciences
Pt. Ravishankar Shukla University
Raipur 492 010, Chhattisgarh, India

For queries requiring a quicker response, candidates may contact the CBS-EST Helpline at: 0771-2262216, Email: cbsprsu@gmail.com

Annexure-I

Important dates

S. No.			
	Start of online application for CBS-EST-2026	:	March 20, 2026 (Friday)
1.	Closing of online application	:	April 30, 2026 (Thursday)
2.	Downloading of Admit Card begins	:	May 15, 2026 (Friday)
3.	CBS-EST-2026 examination and time	:	May 22, 2026 (Friday) 11:00 AM to 2:00 PM
4.	Display of Model Answers Key on the website	:	May 22, 2026 (Friday) at 5.30 PM
5.	Last date to receive objections -claims (with supporting document/evidence) by mail (cbsprsu@gmail.com)	:	May 24, 2026 (Sunday)
6.	Declaration of results	:	May 28, 2026 (Thursday)
7.	Counselling and Admission for UR Seats:	:	June 15, 2026 (Monday)
8.	Counselling and Admission for Reserved seats:	:	June 17, 2026 (Wednesday)
9.	Counselling and Admission for Payment Seats	:	June 19, 2026 (Friday)
10.	Beginning of the academic session	:	June 22, 2026 (Monday)

Objection (Dava-Apatti) process

- In case of any ambiguity in a question or in the answer key, candidates may submit their objections via **Email**, along with a **scanned copy of supporting evidence(s)** for proper justification.
- Objections must be sent to: **cbsprsu@gmail.com**
- The **last date and time** for submission of objections is **May 24, 2026, up to 5:00 PM**.
- Objections received after the prescribed deadline **will not be considered under any circumstances.**

Guidelines for preparation of the Merit List for the CBS-EST

1. The provisional merit list of CBS-EST-2026 shall be prepared subject to document verification and will be finalized only after satisfying the following conditions:
   a. The candidate must have secured 60% or above in Class XII or its equivalent examination (55% for SC/ST candidates).
   b. Reservation under SC/ST/OBC categories shall be applicable only to the Chhattisgarh domicile candidates possessing valid caste certificates (non-creamy layer certificate in the case of OBC candidates).
   c. If any question is deleted for any unavoidable reason, no marks shall be awarded for that question to any candidate. Such a question shall not be evaluated, as there is no

minimum qualifying score for the EST. Consequently, no recalculation of marks shall be carried out in the event of the deletion of any question.

2. For admission to the Five-Year Integrated M. Sc. Program in CBS, separate provisional merit lists shall be prepared for the PCM and PCB groups.
3. The merit list for the PCM group shall be prepared in descending order based on:
    a. Total marks obtained in CBS-EST-2026;
    b. Marks obtained in Mathematics (Q. Nos. 101-150) in CBS-EST-2026;
    c. Marks obtained in Physics (Q. Nos. 1-50) in CBS-EST-2026.
4. The merit list for the PCB group shall be prepared in descending order based on:
    a. Total marks obtained in CBS-EST-2026;
    b. Marks obtained in Biology (Q. Nos. 101-150) in CBS-EST-2026;
    c. Marks obtained in Chemistry (Q. Nos. 51-100) in CBS-EST-2026.
5. In case of a tie under Points 3 and 4, the merit rank shall be determined based on the candidate's date of birth, with the older candidate being placed higher in the rank.
6. If a tie still persists after applying Points 3, 4, and 5, the merit rank shall be determined based on the alphabetical order of the candidate's first name.
7. In case of any discrepancy or any matter not covered above, the decision of the Admission Committee shall be final and binding.

Counselling process

- **Registration Timing for Counselling:** 10:00 AM – 1:00 PM
- Candidates must bring **all the original documents** at the time of counselling, including:
    - Mark Sheets
    - Transfer Certificate (TC)
    - Migration Certificate
    - Caste and Domicile Certificate (for reserved category candidates)
    - Any other relevant documents
- Candidates are also required to carry two sets of photocopies of above listed documents.
- Candidates who will be offered admission to the CBS **are required to pay the prescribed admission fee on the same day strictly to confirm their seat**.
- The admission fee shall be as prescribed by the University from time to time.
- In addition to the regular admission fee, candidates allotted a **payment seat** are required to pay **₹20,000.00 per semester**, as applicable.

Mandatory document verification at the time of counselling

- Production of the **original Transfer Certificate (TC)** at the time of counselling is mandatory. Candidates who fail to produce the original TC shall **not be permitted to participate in the counselling process under any circumstances**, and their candidature shall be treated as incomplete.
- Candidates applying under any **reserved category** must produce the **original valid Caste Certificate** along with a **valid Domicile Certificate of Chhattisgarh** issued by the competent authority. In the absence of these original documents, the candidate shall **not be permitted to participate in the counselling process under the reserved category**.

Important instructions for the candidates

1. **Reporting at the examination center**
   Candidates must report to the examination center at the reporting time mentioned on the Admit Card. They are advised to visit the examination venue at least one day in advance to familiarize themselves with the location and avoid any inconvenience on the day of the examination.
2. **Admit card and eligibility**
   - The Admit Card is provisional and subject to verification of eligibility conditions as specified in the Information Brochure.
   - No candidate shall be permitted to enter the examination center without a valid Admit Card, original photo identification proof, and mandatory frisking.
3. **Valid photo identification**
   Candidates must carry any one original and valid Government-issued Photo ID proof, such as: PAN Card/ Driving License/ Voter ID/ Passport/ Aadhaar Card (with photograph)/ E-Aadhaar/ Ration Card/ Aadhaar Enrolment ID with photograph/ Student ID Card.
4. **Items permitted inside the examination hall**
   Candidates may carry only the following items into the examination venue:
   - Admit Card
   - One original valid Photo ID proof
   - One transparent personal water bottle
   - One blue or black ballpoint pen
   - An additional passport-size photograph (for pasting on the Attendance Sheet, if required)
5. **Items strictly prohibited**
   - No electronic devices, including mobile phones, smart watches, calculators, or any communication devices are permitted inside the examination center.
   - Candidates must not bring any other personal belongings, as there will be no facility for safekeeping. The University shall not be responsible for any loss of personal items.
6. **Stationery and conduct**
   - Candidates must bring their own stationery. Sharing or exchanging items with other candidates is strictly prohibited.
   - After completion of the examination, candidates must remain seated and wait for

instructions from the Invigilator. They will be allowed to leave the hall in an orderly manner, one at a time.

7. **Entry and exit rules**
   - No candidate will be allowed to enter the examination hall after 30 minutes from the commencement of the examination.
   - No candidate shall be permitted to leave the examination hall before the conclusion of the examination.
8. **Dress code and frisking**
   Candidates whose religion or customs require specific attire are advised to report early to allow sufficient time for proper security checking and mandatory frisking.
9. **Unfair means**
   Any candidate found adopting unfair means or engaging in malpractice shall be liable to immediate disqualification and disciplinary action as per University rules.
10. **Updates and communication**
    Candidates are advised to regularly check the University website (www.prsu.ac.in), their registered email ID including Spam folder, and mobile number for important updates and notifications related to CBS-EST-2026.
11. **Helpdesk**
    For any clarification or assistance, candidates may contact:
    ✉ Email: cbsprsu@gmail.com
    ✆ Helpline: 0771-2262216

Annexure-II

SYLLABUS FOR CBS-EST-2026

Center for Basic Sciences

Pt. Ravishankar Shukla University
Raipur 492010, Chhattisgarh

Biology

Cell Biology

Cell theory and cells as unit of life. Basic concepts of biomolecules – Proteins, Carbohydrates, Lipids, Nucleic acids. Tools and techniques of cell studies - use of microscope and calibration (microscopy), elements of microscope. Biomembranes - transport mechanism, cellular respiration. Cell organelles - structure and functions. Discovery and structure of DNA, processes of replication, transcription, genetic code and translation. Principles of the basic techniques in molecular biology. Enzymes- catalysis, kinetics, activation energy, competitive and non-competitive inhibition.

Genetics and Evolution

Fundamentals of genetics and evolution. Evidences and theories of organic evolution. Organization of the heredity material in chromosomes. Equational division. Reduction division. Mitosis and meiosis compared and contrasted. Significance of meiosis. Mendel's laws of inheritance. Discovery of linkage, sex-linked inheritance. Crossing-over, stage at which crossing-over occurs. Neurospora genetics. Mutation - discovery, types of Mutation and Mutations in diploids. Role of mutations in evolution. Elaboration of Mendel's laws of inheritance. Monohybrid or Dihybrid crosses. Human genetics - human chromosomes, sex-determination, sex-linked inheritance.

Ecology

Physical and biological factors influencing organisms. Food chains, pyramids of numbers and biomass. Biological equilibrium. Interspecific associations. Bio-diversity. Flora and fauna. Basics of microbial systems, Ecosystems.

Humans and Environment

Soil, rainfall and temperature with reference to natural resources. Our natural resources - their uses and abuses. Environmental pollution and preventive measures. Biodiversity and conservation.

Biotechnology

Principles of recombinant DNA technology. Applications of biotechnology.

Biology of Animal systems

Digestive System - Modes of nutrition. Different vitamin compounds and their deficiencies. Structure of alimentary canal and associated glands, digestive enzymes and gastrointestinal hormones. Absorption of products of digestion, peristalsis, balanced diet.

Respiratory System - Gaseous exchange in animals. Structure of respiratory organs, mechanism of breathing, gaseous transport, tissue respiration.

Circulatory System - Open and closed systems. Functions of blood and 1ymph. Microscopic structure of blood and blood vessels. Structures and working of heart. Distribution of arteries and veins. Circulation of blood coagulation. Blood groups.

Excretory System - Elimination of nitrogenous waste. Osmoconformers and osmoregulators. Structure and function of kidney tubules. Arrangement of excretory organs.

Nervous System - General account of brain, spinal cord and nerves. Reflex actions (simple and conditioned). Sense organs (eye and ear).

Reproductive System - Sexual and asexual reproduction. General arrangement and functions of reproductive organs.

Developmental Biology - Basic features of development in animals. Types of eggs, fertilization, cleavage, blastula. Stem cells- definition, types, uses, advantages and disadvantages, induced pluripotent stem cells. Different hormones and their roles.

Diversity of Animal Life — Principles of classification, binomial nomenclature. General classification of animal phyla up to classes (invertebrates) and upto sub-classes / order (vertebrates), General characters of fishes, amphibians, reptiles, birds and mammals.

Immunology - Basics of immune mechanisms and diseases- active and passive immunity, T and B cell responses, antigen presentation, principles of vaccination, monoclonal antibodies and their uses, immunology of AIDS.

Biology of Plant systems

Anatomy and Physiology of Plants - Meristems. Plant growth and development. Internal and external regulators of growth and development in plant. Plant reproduction. Internal structure of root, stem, secondary growth and leaves. Xylem and Phloem - their cell elements and functions. Internal structure of dicot and monocot leaves. Photosynthesis - history, importance, factors and mechanism, stomatal mechanism, transpiration and respiration. Comparative study of dicot and monocot anatomy. Absorption and cellwater relations, transport of water and minerals, tropic and turgor movements. Significance of life-cycles with special reference to alternation of generations as exemplified in Funaria, Selaginella and Pinus (no structural details). Plant hormones.

Systematics - Principles of classical and new systematics. Binomial nomenclature. Familiarity with taxa. Plant breeding and tissue culture.

Chemistry

Physical Chemistry

Measurements in chemistry: SI units for fundamental quantities, significant figures in calculations.

Mole concept: Avogadro number and mole concept, molar masses, mole fraction, molarity, molality, percent composition, stoichiometry. Equivalent weight and normality. Calculations based on mole concept and stoichiometry of different reactions. Oxidation-reduction reactions.

Gaseous and liquid states: Absolute scale of temperature. Gas laws, ideal gas equation, real gases and deviation from ideality, liquefaction of gases, van der Waals equation. Kinetic theory of gases; average, root mean square and most probable velocities and their relation with temperature. Law of partial pressures. Vapour pressure. Diffusion of gases.

Atomic structure and chemical bonding: Bohr model, spectrum of hydrogen atom, quantum numbers. Wave particle duality, de Broglie hypothesis. Uncertainty principle. Orbitals and quantum numbers; shapes and energy of s, p and d orbitals. Electronic configurations of elements (up to atomic number 36), filling of orbitals - Aufbau principle. Pauli's exclusion principle and Hund's rule. Hybridization involving s, p and d orbitals. Atomic orbital overlap and chemical bonds; ionic, covalent and coordinate bonds; bond parameters. Orbital energy diagrams for homo-nuclear diatomic species. Lewis structures. Hydrogen bond. Polarity in molecules, dipole moment (qualitative aspects). VSEPR theory and shapes of molecules. Valence Bond Theory. Molecular orbital theory of homo-nuclear diatomic molecules (qualitative idea).

Thermodynamics: Thermodynamic states. First law of thermodynamics. Internal energy, work and heat, pressure-volume work. Enthalpy and enthalpy change, Hess's law, heat of - reaction, fusion and vapourization. Second law of thermodynamics, entropy, free energy, criterion of spontaneity.

Chemical equilibrium: Laws of chemical Equilibrium, law of mass action. Equilibrium constant – factors affecting equilibrium constant and its applications. Le Chatelier's principle - effect of concentration, temperature and pressure. Significance of ΔG and ΔG^o in chemical equilibrium. Relationship of K and ΔG. Ionic equilibrium. Acids and bases (Bronsted and Lewis concepts), salts. Ka, Kb, Kw, degree of dissociation, pH and their relationships. Solubility product, common ion effect. Hydrolysis of salts. Buffer solutions.

Electrochemistry: Redox reactions and electrode potential, Electrochemical cells, Galvanic cells and cell reactions. Standard electrode potential. Nernst equation and its relation to ΔG and K. Electrochemical series, emf of galvanic cells. Electrolysis and Faraday's laws of electrolysis. Electrolytic conductance, specific, equivalent and molar conductivity, Kohlrausch's law. Concentration cells. Batteries (primary and secondary), fuel cells, corrosion.

Chemical kinetics: Rates of chemical reactions. Order of reaction, rate constant. First order and pseudo first order reactions. Factors affecting rate of reaction – concentration, temperature (Arrhenius equation), catalyst.

Solid state: Classification of solids, amorphous and crystalline solids, crystalline state, crystal lattice and unit cells; seven crystal systems (cell parameters a, b, c, α, β, γ), close packed structure of solids (cubic), packing in fcc, bcc and hcp lattices. Packing efficiency, nearest neighbours, ionic radii. Simple ionic

compounds, Imperfection in solids, point defects. Electrical and magnetic properties, band theory of metals.

Solutions: Solution of solid and gas in liquid. Concentration of solution. Ideal and nonideal solutions. Colligative properties. Vapour pressure of solution, Raoult's law. Molecular weight determination from lowering of vapour pressure, elevation of boiling point and depression of freezing point. Abnormal molecular mass, vant Hoff factor. Osmosis – Osmotic pressure, reverse osmosis.

Surface chemistry:
(a) Adsorption – Physisorption and chemisorptions. Factors affecting adsorption of gases on solids. Adsorption isotherm. Catalysis – homogeneous and heterogeneous, Activity and selectivity. Enzyme catalysis.
(b) Colloidal state – Types, preparation and properties of colloids. Tyndall effect, 13 Brownian movement, electrophoresis, coagulation. Application of colloids. Micelles.

Inorganic Chemistry

Classification of elements and periodicity in properties: Modern periodic table, classification of elements, periodic trends in properties of elements – valence, oxidation state, atomic/ionic radius, ionization energy, electron gain energy, electronegativity, valency, chemical reactivity. Diagonal relationship. Anomalous behaviours of Li, Be, B, C.

Hydrogen: Isotopes, preparation, isolation, properties and uses. Hydrides – ionic, covalent and interstitial. Properties of water and heavy water. Hydrogen peroxide – Preparation, structure, reactions, uses. Hydrogen as fuel cell.

s- Block elements (Alkali and alkaline earth elements) – General characteristics and trends in properties.
(a) Group 1: Preparation, properties and reactions of alkali metals with emphasis on chemistry of Na and K and their compounds - oxides, peroxides, hydroxides, carbonates, bicarbonates, chlorides and sulphates. Uses.
(b) Group 2: Preparation, properties and reactions alkaline earth metals with emphasis on the chemistry of Mg and Ca and their compounds - oxides, peroxides, hydroxides, carbonates, bicarbonates, chlorides and sulphates. Uses.

p- Block elements: General characteristics and trends in properties.
(a) Group 13: Chemistry of Boron and its compounds - borax, boric acid and diborane.
(b) Group 14, 15 and 16: Chemistry of carbon, sulphur, nitrogen and phosphorus. Allotropy. Chemistry of oxides and oxyacids of these elements. Phosphines, phosphorus chlorides, ammonia, peroxide and ozone; silicones, silicon tetrachloride and silicates.
(c) Group 17: Chemistry of halogens, chemistry of chlorine in detail. Interhalogen compounds. HX and oxyacids of halogens.
(d) Group 18: Isolation, properties and reactions of inert gases with emphasis on chemistry of Xenon.

d-Block elements: (Mainly 3d elements) General characteristics and trends in properties. Variable oxidation states and their stabilities, colour (excluding the details of electronic transitions) and calculation of spin-only magnetic moment. Catalytic properties. Interstitial compounds, alloy formation. Preparation and properties of potassium dichromate and permanganate.

f- Block elements: (mainly lanthanides) General characteristics and trends in properties. Variable oxidation states. Lanthanide contraction and its consequences. Coordination compounds: Nomenclature of

mononuclear coordination compounds. Isomerism. Hybridization and geometries of mononuclear coordination compounds. Magnetic properties. Werner's theory, VBT, CFT.

Metals and metallurgy: Occurrence of metals. General methods of extraction involving chemical principles – thermodynamic, electrochemical and redox principles. General operation stages involved in metallurgical operation. Metallurgy of p-block element (emphasis on Al). Metallurgy of Fe-triad (more emphasis on Fe metallurgy). Metallurgy of coinage metals (Cu, Ag with more emphasis on Cu). Refining.

Organic Chemistry

Basic concepts: Representation of organic compounds. Hybridisations of carbon. Sigma and pi-bonds. Shapes of simple organic molecules. Inductive effect, electromeric effect, resonance effect, hyperconjugation. Keto-enol tautomerism. Determination of empirical and molecular formulae (only combustion method). Hydrogen bond - definition and effect on physical properties of alcohols and carboxylic acids. Acidity and basicity of 14 organic acids and bases. Methods of purification of compounds.

Reactive intermediates: Homolytic and heterolytic bond cleavages. Formation, structure and stability of - carbocation, carbanion and free radical.

Isomerism: Structural and stereoisomerism. Geometrical isomerism. Chirality. Enatiomers. Optical isomerism of compounds containing up to two asymmetric centres, (R, S and E, Z nomenclature excluded). Racemic mixture. Conformations of ethane and butane (Newman projections).

Nomenclature: IUPAC nomenclature of simple organic compounds (only hydrocarbons, mono- functional and bi-functional compounds), including benzene derivatives. . Alkanes: Preparation, properties and reactions. Idea of homologous series Combustion and halogenation of alkanes. Mechanism of photohalogenation. Wurtz reaction.

Alkenes and Alkynes: Preparation, properties and reactions of alkenes and alkynes. Isomerization. Acidity of alkynes. Acid catalysed hydration of alkenes and alkynes (excluding the stereochemistry), Reactions of alkenes with $KMnO_4$, sulphuric acid. Reduction of alkenes and alkynes. Preparation of alkenes and alkynes by elimination reactions (excluding stereochemistry). Electrophilic addition reactions of alkenes with X2, HX, HOX and H_2O (X=halogen). Makownikoff rule. Peroxide effect. Polymerization of alkenes. Addition reactions of alkynes. Metal acetylides. Ozonolysis

Aromatic compounds: Aromaticity. Huckel theory of aromaticity. Structure of benzene. Isomerism in substituted benzenes. Electrophilic substitution reaction on benzeneGeneral mechanism. Orientating influence of substituents in electrophilic substitution reaction of monosubstituted benzenes. Electrophilic substitution reactions of benzene and substituted benzenes - halogenation, nitration, sulphonation, Friedel-Crafts alkylation and acylation (No mechanism).

Haloalkanes (Alkyl halides): Preparation from alkanes, alcohols, olefins. Grignard reagents and their reaction with aldehydes/ketones/esters/nitriles. Nucleophilic substitution reactions of alkyl halides with different nucleophilic species. SN1 and SN2 reactions with mechanism. Halogen exchange reaction. Polyhalogen compounds.

Haloarenes: Nucleophilic aromatic substitution in haloarenes and substituted haloarenes (excluding Benzyne mechanism and Cine substitution).

Alcohols: Preparation from – olefins, alkyl halides, carboxylic acids, aldehydes/ketones. Hydroboration reaction. Dehydration, oxidation to aldehydes and ketones. Reaction with sodium, phosphorus halides, $ZnCl_2$/ HX, H_2SO_4. Identification of p-, sec- and tertalcohols. Uses of methanol and ethanol. Phenols: Preparation of phenol from halobenzene, cumene and benzene sulphonic acid. Acidity. Reactions of phenols - halogenation, nitration, sulphonation, with Zn. Reimer-Tieman reaction, Kolbe reaction.

Ethers: Preparation by Williamson's Synthesis, dehydration of alcohols. Reaction with H_2O, HX.

Aldehydes and Ketones - Preparation of aldehydes and ketones from – Alcohols, olefins, acid chlorides, arylalkanes, nitriles, esters, Friedel-Crafts reaction. Reactions with – Alcohols, HCN, NaHSO3. Reactions- oxidation, reduction, oxime and hydrazone formation. Aldol condensation, Perkin reaction. Cannizzaro reaction. Haloform reaction. Tests to distinguish aldehydes and ketones.

Carboxylic acids - Acidity and structure-acidity relationship. Preparation of acids. Preparation of amides, acid chlorides, esters and anhydrides. ester hydrolysis. Reactions of acids with - thionyl chloride, P- halides, ammonia, alkalis, metals, halogens, reducing agents. Decarboxylation. Halogenation.

Amines - Basicity and structure-basicity relationship. Identification of p-, sec- and tertamines. Preparation of amines from - nitro compounds, nitriles, amides, haloalkanes/aromatic compounds. Reaction with – Acids, alkylating agents, acylating agents, nitrous acid. Diazotization of aromatic primary amines - Reactions of aromatic diazonium salts - azo coupling reaction, Sandmeyer and related reactions. Carbylamine reaction of p-amines.

Carbohydrate: Classification of carbohydrates. mono- and di- saccharides (glucose and sucrose). Characteristic tests. Structure of glucose. Reactions of glucose- Oxidation, reduction, hydroxylamine, HI, acetic anhydride. Cyclic structure of glucose. Structures of - Sucrose, maltose, starch and cellulose . Glycoside formation and hydrolysis of sucrose.

Amino acids and proteins: α-amino acids. General structure of peptides and proteins. Peptide bond. Characteristic tests. Separation of amino acids using physical properties. Denaturation of proteins. Enzymes.

Polymers: Classification. Homo and co-polymers, Addition and condensation polymerizations. Polythene, nylons, polyetsres, Bakelite, melamine-formaldehyde, rubber – natural and synthetic.

Mathematics

Algebra

Algebra of complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, cube roots of unity, geometric interpretations. Quadratic equations with real coefficients, relations between roots and coefficients, formation of quadratic equations with given roots, symmetric functions of roots.

Arithmetic, geometric and harmonic progressions, arithmetic, geometric and harmonic means, sums of finite arithmetic and geometric progressions, infinite geometric series, sums of squares and cubes of the first n natural numbers.

Logarithms and their properties.

Permutations and combinations, Binomial theorem for positive integral index, properties of binomial coefficients. Matrices as a rectangular array of real numbers, equality of matrices, addition, multiplication by a scalar and product of matrices, transpose of a matrix, determinant of a square matrix of order up to three, inverse of a square matrix of order up to three, properties of these matrix operations, diagonal, symmetric and skewsymmetric matrices and their properties, solutions of simultaneous linear equations in two or three variables.

Addition and multiplication rules of probability, conditional probability, Bayes Theorem, independence of events, computation of probability of events using permutations and combinations.

Trigonometry

Trigonometric functions, their periodicity and graphs, addition and subtraction formulae, formulae involving multiple and sub-multiple angles, general solution of trigonometric equations.

Relations between sides and angles of a triangle, sine rule, cosine rule, half-angle formula and the area of a triangle, inverse trigonometric functions (principal value only).

Analytical geometry

Two dimensions - Cartesian coordinates, distance between two points, section formulae, shift of origin. Equation of a straight line in various forms, angle between two lines, distance of a point from a line. Lines through the point of intersection of two given lines, equation of the bisector of the angle between two lines, concurrency of lines. Centroid, orthocentre, incentre and circumcentre of a triangle.

Equation of a circle in various forms, equations of tangent, normal and chord. Parametric equations of a circle, intersection of a circle with a straight line or a circle, equation of a circle through the points of intersection of two circles and those of a circle and a straight line.

Equations of a parabola, ellipse and hyperbola in standard form, their foci, directrices and eccentricity, parametric equations, equations of tangent and normal. Locus Problems.

Three dimensions - Direction cosines and direction ratios, equation of a straight line in space, equation of a plane, distance of a point from a plane.

Differential calculus

Real valued functions of a real variable, into, onto and one-to-one functions, sum, difference, product and quotient of two functions, composite functions, absolute value, polynomial, rational, trigonometric, exponential and logarithmic functions.

Limit and continuity of a function, limit and continuity of the sum, difference, product and quotient of two functions, L'Hospital rule for evaluation of limits of functions.

Even and odd functions, inverse of a function, continuity of composite functions, intermediate value property of continuous functions. Derivative of a function, derivative of the sum, difference, product and quotient of two functions, chain rule, derivatives of polynomial, rational, trigonometric, inverse trigonometric, exponential and logarithmic functions.

Derivatives of implicit functions, derivatives up to order two, geometrical interpretation of the derivative, tangents and normals, increasing and decreasing functions, maximum and minimum values of a function, Rolle's Theorem and Lagrange's Mean Value Theorem.

Integral calculus

Integration as the inverse process of differentiation, indefinite integrals of standard functions, definite integrals and their properties, Fundamental Theorem of Integral Calculus.

Integration by parts, integration by the methods of substitution and partial fractions, application of definite integrals to the determination of areas involving simple curves.

Formation of ordinary differential equations, solution of homogeneous differential equations, separation of variables method, linear first order differential equations.

Vectors

Addition of vectors, scalar multiplication, dot and cross products, scalar triple products and their geometrical interpretations.

Physics

General: Units and dimensions, dimensional analysis. least count, significant figures. Methods of measurement (Direct, Indirect, Null) and measurement of length, time, mass, temperature, potential difference, current and resistance.

Design of some simple experiments, such as: i) Searle's method to determine Young's modulus, ii) determination of 'g' by simple pendulum, iii) speed of sound using resonance tube, iv) coefficient of friction using angle of repose, v) determination of focal length of a convex lens by plotting a graph between 'u' and 'v', vi) refractive index of material of prism using the method of minimum deviation, vii) verification of Ohm's law, viii) resistance of galvanometer using half deflection method, ix) specific heat of a liquid using calorimeter, x) I-V characteristic curve for p-n junction in forward and reverse bias.

Graphical representation and interpretation of data. Errors in the measurements and error analysis.

Mechanics: Kinematics in one and two dimensions (Cartesian coordinates only), projectiles. Uniform circular motion. Relative velocity. Newton's laws of motion. Inertial and uniformly accelerated (linear only) frames of reference. Static and dynamic friction. Kinetic and potential energy. Linear and circular simple harmonic motion. Work and power. Conservation of linear momentum and mechanical energy.

Systems of particles. Centre of mass and its motion. Centre of gravity. Impulse. Elastic and inelastic collisions.

Law of gravitation. Centripetal acceleration and centrifugal force. Gravitational potential and field. Acceleration due to gravity. Motion of planets and satellites in circular orbits. Escape velocity.

Rigid body, moment of inertia, parallel and perpendicular axes theorems, moment of inertia of uniform bodies with simple geometrical shapes. Angular momentum, Torque. Conservation of angular momentum. Dynamics of rigid bodies with fixed axis of rotation. Rolling without slipping of rings, cylinders and spheres. Equilibrium of rigid bodies. Collision of point masses with rigid bodies.

Hooke's law and stress – strain relations. Elastic limit, plastic deformation. Young's modulus, bulk and shear moduli.

Pressure in a fluid. Pascal's law. Buoyancy. Surface energy and surface tension, capillary rise. Viscosity – Stoke's and Poiseuille's law, Terminal velocity. Qualitative understanding of turbulence. Reynolds number. Streamline flow, equation of continuity. Bernoulli's theorem.

Sound and mechanical waves: Plane wave motion, longitudinal and transverse waves, superposition of waves. Progressive and stationary waves. Vibration of strings and air columns. Resonance (qualitative understanding). Beats. Speed of sound in gases. Doppler Effect.

Thermal physics: Thermal expansion of solids, liquids and gases. Calorimetry, latent heat. Heat conduction in one dimension. Elementary concepts of convection and radiation. Newton's law of cooling. Ideal gas laws. Specific heats (CV and CP for monoatomic and diatomic gases). Isothermal and adiabatic processes, bulk modulus of gases. Equivalence of heat and work. First and second law of thermodynamics and its applications (only for ideal gases). Entropy. Blackbody radiation - absorptive and emissive powers. Kirchhoff's law. Wien's displacement law, Stefan's law.

Electricity and magnetism: Coulomb's law. Electric field and potential. Electrical potential energy of a system of point charges and of electrical dipoles in a uniform electrostatic field; Electric field lines. Flux of electric field. Gauss's law and its application in simple cases, such as to find field due to infinitely long straight wire. Uniformly charged infinite plane sheet and uniformly charged thin spherical shell.

Capacitance - Calculation of capacitance with and without dielectrics. Capacitors in series and parallel. Energy stored in a capacitor.

Electric current. Ohm's law. Series and parallel arrangements of resistances and cells. Kirchhoff's laws and simple applications; Heating effect of current.

Biot-Savart's law and Ampere's law. Magnetic field near a current carrying straight wire, along the axis of a circular coil and inside a long straight solenoid. Force on a moving charge and on a current carrying wire in a uniform magnetic field.

Magnetic moment of a current loop. Effect of a uniform magnetic field on a current loop. Moving coil galvanometer, voltmeter, ammeter and their conversions.

Electromagnetic induction - Faraday's law, Lenz's law. Self and mutual inductance. RC, LR and LC circuits with and A.C. Sources.

Optics: Rectilinear propagation of light. Reflection and refraction at plane and spherical surfaces, Deviation and dispersion of light by a prism. Thin lenses. Combination of mirrors and thin lenses. Magnification. Wave nature of light - Huygen's principle, interference limited to Young's double slit experiment. Elementary idea of diffraction – Rayleigh criterion. Elementary idea of polarization – Brewster's law and the law of Malus.

Modern physics: Atomic nucleus. Alpha, beta and gamma radiations. Law of radioactive decay. Decay constant. Half-life and mean life. Binding energy and its calculation. Fission and fusion processes. Energy calculation in these processes.

Photoelectric effect. Bohr's theory of hydrogen like atoms. Characteristic and continuous X-rays, Moseley's law. de Broglie wavelength of matter waves. Heisenberg's uncertainty principle.