Note: X axis: 1 to 10 marked in Chapter-wise analysis refers to years starting from 2010 ranging till 2019 where 1 stands for 2010, 2 stands for 2011 … and 10 stands for 2019. Y axis: No. of Questions

Chemistry

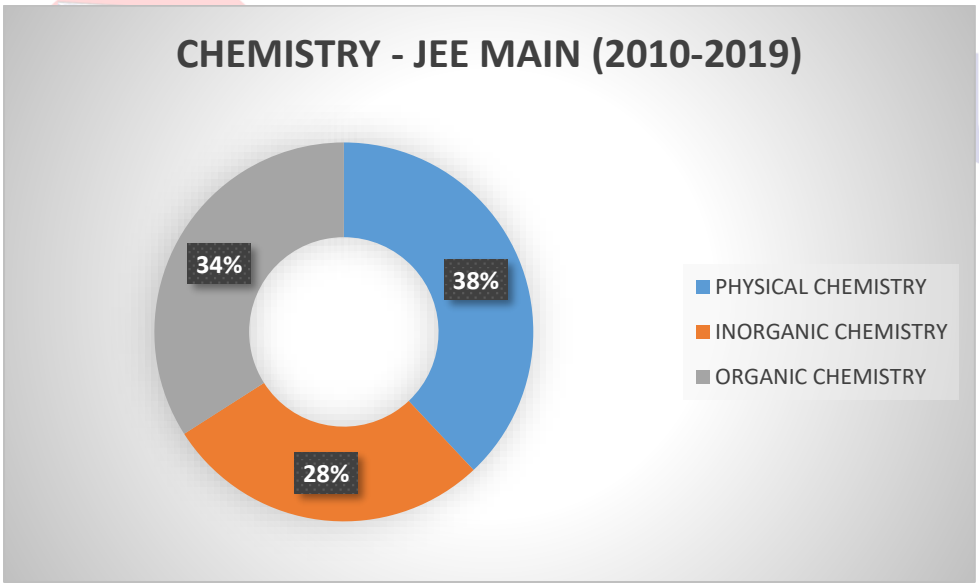
Chemistry is a subject that is a unique mixture of calculation oriented problem solving i.e., Physical Chemistry; reasoning oriented problem solving i.e., Organic Chemistry and finally problem solving based on trends and memorization i.e., Inorganic Chemistry. Physical Chemistry has been the most dominating with 38% closely followed by Organic Chemistry with 34%. Inorganic Chemistry takes up a meagre 34%.

Some of the most important chapters that more or less appear every year in Chemistry are: Stoichiometry, Thermodynamics & Thermochemistry, Electrochemistry, Chemical Bonding, P-Block, Transition Elements & Coordination Chemistry, GOC, Carbohydrate, Amino Acids & Polymers. The exact distribution can be seen in the graph present below.

The 3 units of Chemistry are:

1. Physical Chemistry
2. Inorganic Chemistry
3. Organic Chemistry

The graph below shows the mark distribution of the subjects:



The chart below shows the mark distribution of the subjects across the years:

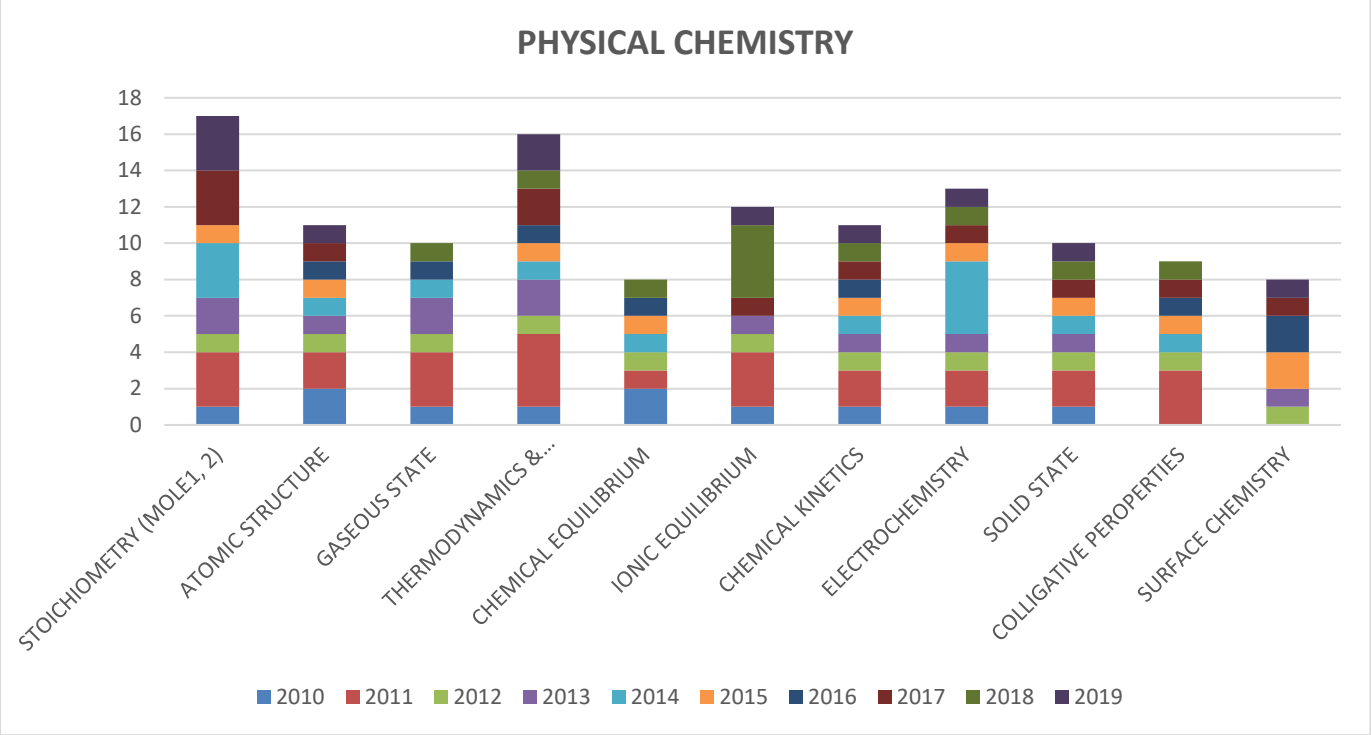
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
	30	60	30	30	30	30	30	30	30	29	329
PHYSICAL CHEMISTRY											**125**
STOICHIOMETRY (MOLE1, 2)	1	3	1	2	3	1	0	3	0	3	17
ATOMIC STRUCTURE	2	2	1	1	1	1	1	1	0	1	11
GASEOUS STATE	1	3	1	2	1	0	1	0	1	0	10
THERMODYNAMICS & THERMOCHEMISTRY	1	4	1	2	1	1	1	2	1	2	16

CHEMICAL EQUILIBRIUM	2	1	1	0	1	1	1	0	1	0	8
IONIC EQUILIBRIUM	1	3	1	1	0	0	0	1	4	1	12
CHEMICAL KINETICS	1	2	1	1	1	1	1	1	1	1	11
ELECTROCHEMISTRY	1	2	1	1	4	1	0	1	1	1	13
SOLID STATE	1	2	1	1	1	1	0	1	1	1	10
COLLIGATIVE PEROPERTIES	0	3	1	0	1	1	1	1	1	0	9
SURFACE CHEMISTRY	0	0	1	1	0	2	2	1	0	1	8
INORGANIC CHEMISTRY											**92**
PERIODIC TABLE & PERIODICITY IN PROPERTIES	2	1	1	1	0	1	1	1	0	1	9
CHEMICAL BONDING	3	5	2	4	2	2	2	2	4	1	27
P-BLOCK	0	4	0	1	1	3	1	1	2	1	14
S-BLOCK	0	2	1	0	0	1	1	1	0	1	7
HYDROGEN & ITS COMPOUNDS	0	0	1	0	0	0	1	0	0	1	3
TRANSITION ELEMENTS & COORDINATION CHEMISTRY	3	4	1	1	1	1	2	1	2	1	17
METALLURGY	0	0	1	0	0	1	1	0	1	1	5
D-BLOCK & F-BLOCK	0	2	1	2	2	1	2	0	0	0	10
ORGANIC CHEMISTRY											**112**
GENERAL ORGANIC CHEMISTRY-I (GOC)	2	0	1	0	0	1	0	1	0	0	5
GENERAL ORGANIC CHEMISTRY-II	0	3	0	3	1	0	2	0	2	1	12
QUALITATIVE ANALYSIS	3	0	0	0	0	1	1	1	0	0	6
PRACTICAL ORGANIC CHEMISTRY (POC)	0	2	1	1	1	3	2	0	1	1	12
HYDROCARBONS	0	3	0	0	1	0	3	1	1	1	10
ALKYL HALIDES	0	0	0	1	1	1	0	5	2	1	11
ALCOHOLS AND ETHERS (REACTION MECHANISM)	0	1	3	0	1	1	0	0	0	1	7
ALDEHYDES AND KETONES	2	1	0	0	0	0	0	0	0	1	4
AROMATIC COMPOUND	1	3	2	0	1	1	0	1	2	1	12
CARBOXYLIC ACID & THEIR DERIVATIVES	0	1	0	3	1	0	0	0	0	0	5
AMINES	1	0	2	0	1	0	0	0	0	0	4
CARBOHYDRATES, AMINO ACIDS & POLYMERS	2	3	1	1	2	2	2	2	1	3	19
ENVIRONMENTAL CHEMISTRY	0	0	1	0	0	0	1	1	1	1	5

UNIT 1 - PHYSICAL CHEMISTRY

Physical Chemistry is the unit with the highest weightage among all of chemistry and is a very calculation oriented unit. The fundamentals are required to be coupled with formulas to be able to score well. Alongside, practice and revision are even more important because it requires speed to solve problems by recognizing patterns quickly. Some of the important chapters in this unit are Stoichiometry, Thermodynamics & Thermochemistry, Electrochemistry,

and Equilibrium, specifically Ionic Equilibrium. Atomic Structure has close resemblance with Atomic Physics and thus is naturally important. A total of 125 questions have been asked between 2010 and 2019.



Y axis: Number of Questions

SYLLABUS

PART 1: SOME BASIC CONCEPTS IN CHEMISTRY

- Matter and its nature, Dalton's atomic theory: Concept of atom, molecule, element and compound: Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures.
- S.I.Units, dimensional analysis: Laws of chemical combination
- Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae: Chemical equations and stoichiometry.

PART 2: STATES OF MATTER

- Classification of matter into solid, liquid and gaseous states.
- Gaseous State: Measurable properties of gases: Gas laws - Boyle's law, Charle's law.
- Graham's law of diffusion.
- Avogadro's law, Dalton's law of partial pressure
- Concept of Absolute scale of temperature
- Ideal gas equation
- Kinetic theory of gases (only postulates)
- Concept of average, root mean square and most probable velocities
- Real gases, deviation from Ideal behaviour, compressibility factor and van der Waals equation.
- Liquid State: Properties of liquids - vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only).
- Solid State: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea)

- Bragg's Law and its applications: Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, an imperfection in solids
- Electrical and magnetic properties.

PART 3: ATOMIC STRUCTURE

- 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 □ and □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.

PART 4: CHEMICAL THERMODYNAMICS

- 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; □S of the universe and □G of the system as criteria for spontaneity. □G□ (Standard Gibbs energy change) and equilibrium constant.

PART 5: 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.

PART 6: 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 (Kp and Kc) and their significance, the significance of ?G and ?G? 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.

PART 7: REDOX REACTIONS AND ELECTROCHEMISTRY

- Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions.
- Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration: Kohlrausch's law and its applications.
- Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half - cell and cell reactions, emf of a Galvanic cell and its measurement: Nernst equation and its applications
- Relationship between cell potential and Gibbs' energy change: Dry cell and lead accumulator
- Fuel cells.

PART 8: CHEMICAL KINETICS

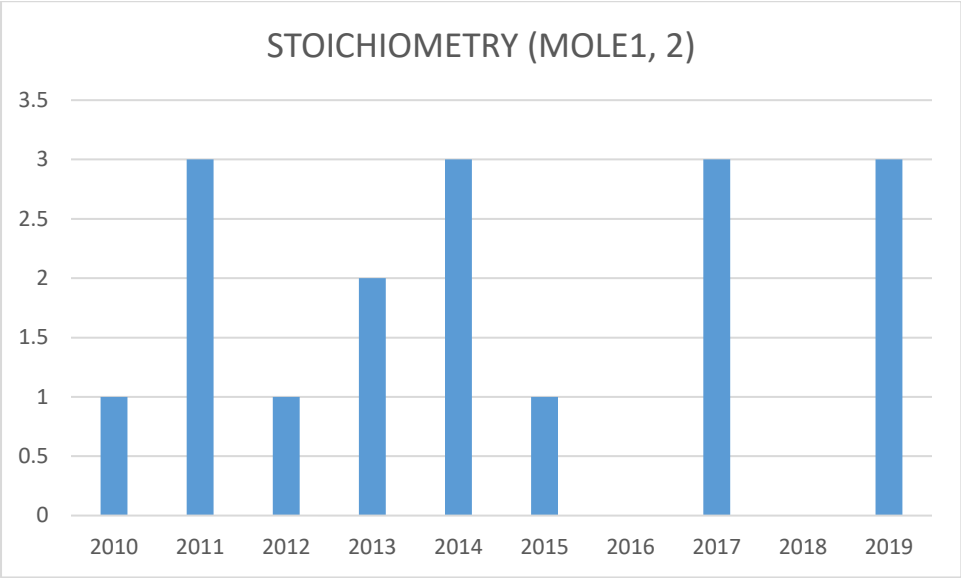
- Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst
- Elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, 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).

PART 9: SURFACE CHEMISTRY

- Adsorption- Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions.
- Catalysis - Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis and its mechanism.
- 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.

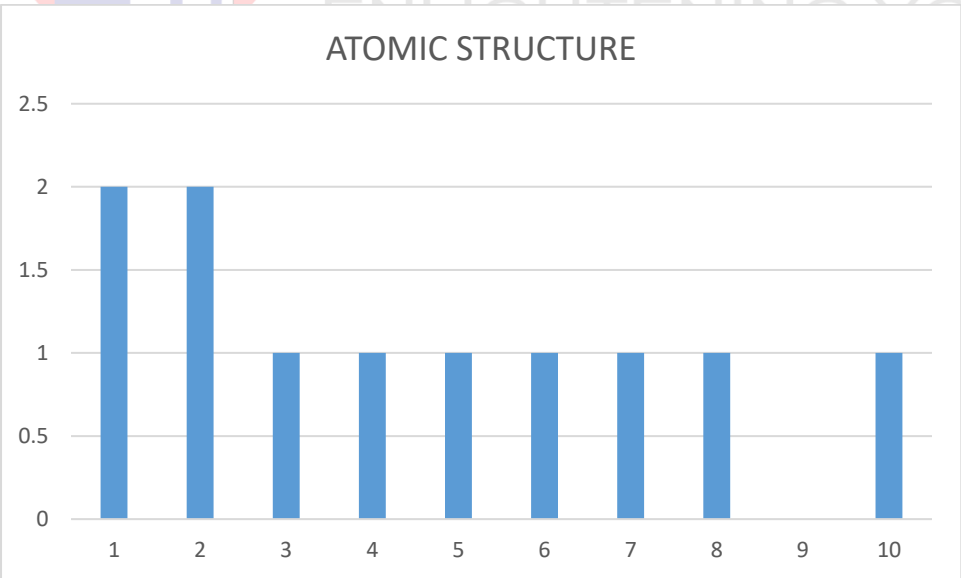
CHAPTERWISE ANALYSIS

1. Stoichiometry



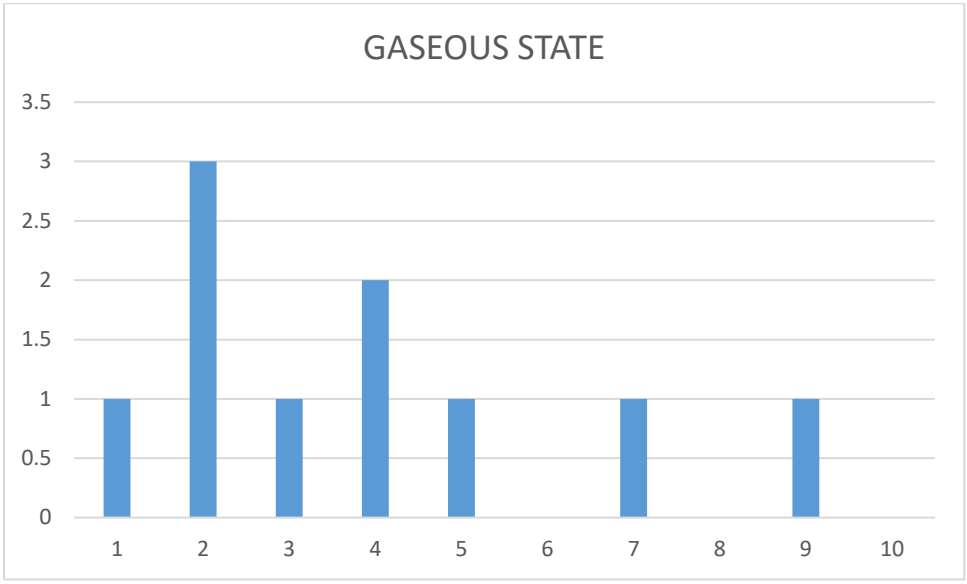
With 17 questions asked in the previous 10 years, it is a topic that attracts a fair amount of questions. This is a must complete chapter. Get comfortable with the world of moles and distinguishing between molar mass and normal mass.

2. Atomic Structure



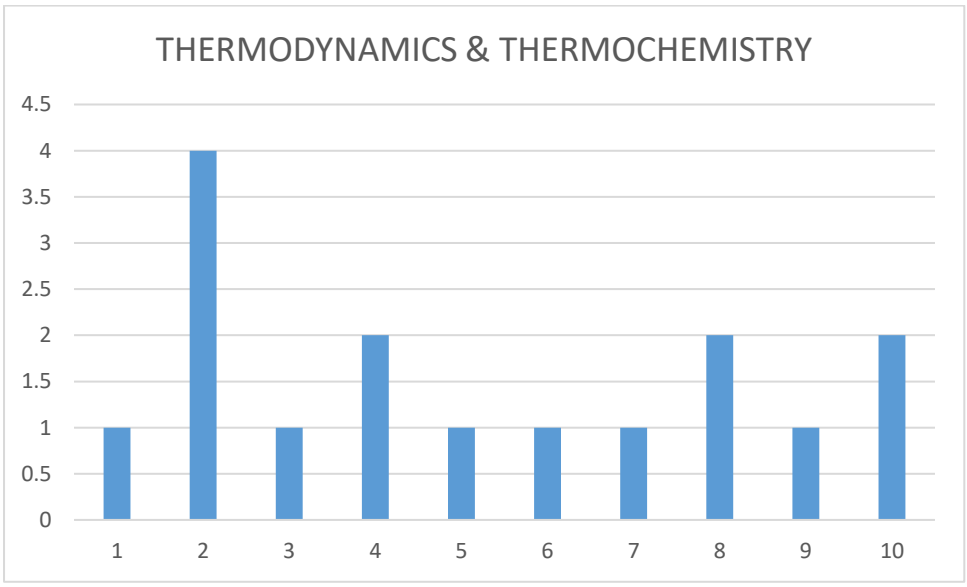
Like mentioned, this has resemblance with Atomic Physics and with 1 question appearing uniformly every year, this is a must do chapter as well. Working with different atomic models and problems related to Bohr's model, Heisenberg's uncertainty principle, aufbau principle, pauli's exclusion principle and other quantum mechanics principles are common.

3. Gaseous State



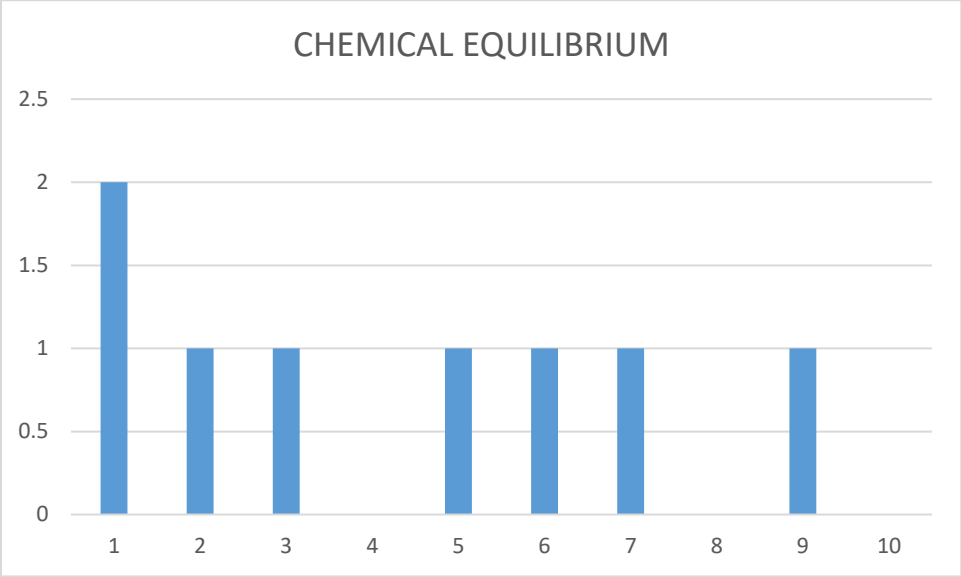
With 10 questions in 10 years, it is a moderately important chapter. Avogadro's law, Dalton's law of partial pressure, graham's law of diffusion, boyle's law, charle's law ,various velocities and ideal gas are important topics.

4. Thermodynamics & Thermochemistry



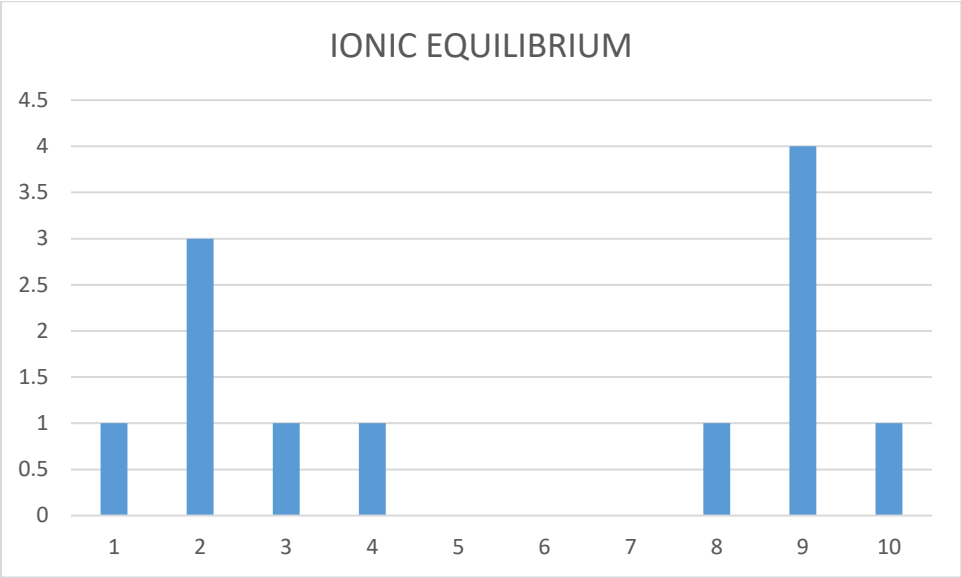
With 16 questions in the past years and at least 1 question appearing every year, it is an important chapter. Add to that the fact that it has resemblance with thermodynamics from physics. Understanding of enthalpy, hess's law, internal energy, graphs, spontaneity and standard gibbs energy change constant will be very useful.

5. Chemical Equilibrium



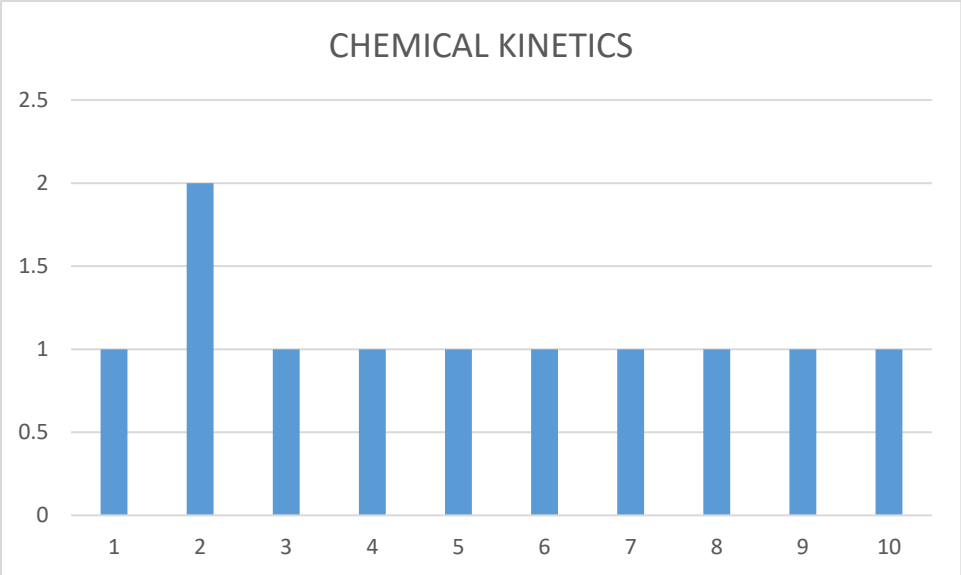
With 8 questions in 10 years, this chapter is however not very difficult and should be covered. Equilibrium constants, effects of catalyst, pressure, temperature and Le-Chatelier's principle govern the chapter.

6. Ionic Equilibrium



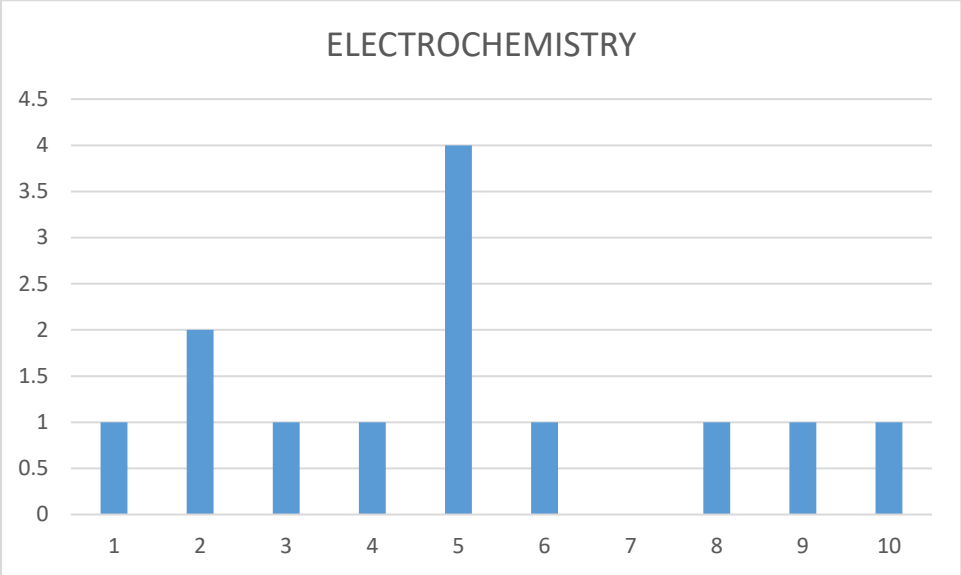
Although 12 questions have been asked in all these years, no questions were asked from 2014 to 2016. However, recent years have seen a spike in the number of questions and with 2018 seeing 4 questions, it becomes a very important chapter. Electrolytes, concepts of acid and base, equilibrium, pH scale, common ion effect, hydrolysis, solubility and buffer solutions are the important topics from this chapter.

7. Chemical Kinetics



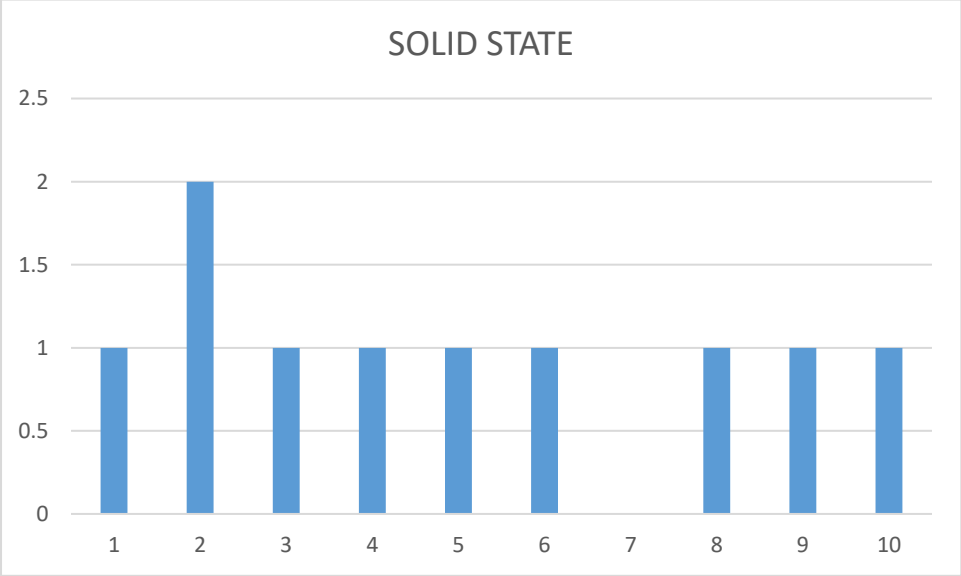
With 11 questions, this is a very consistent chapter with exactly 1 question every year. It is a must complete chapter. Rate of a chemical reaction, affecting faction, order and molecularity, rate law, different orders of reaction, half life, Arrhenius theory, activation energy and collision theory and some of the important topics.

8. Electrochemistry - Redox Reaction



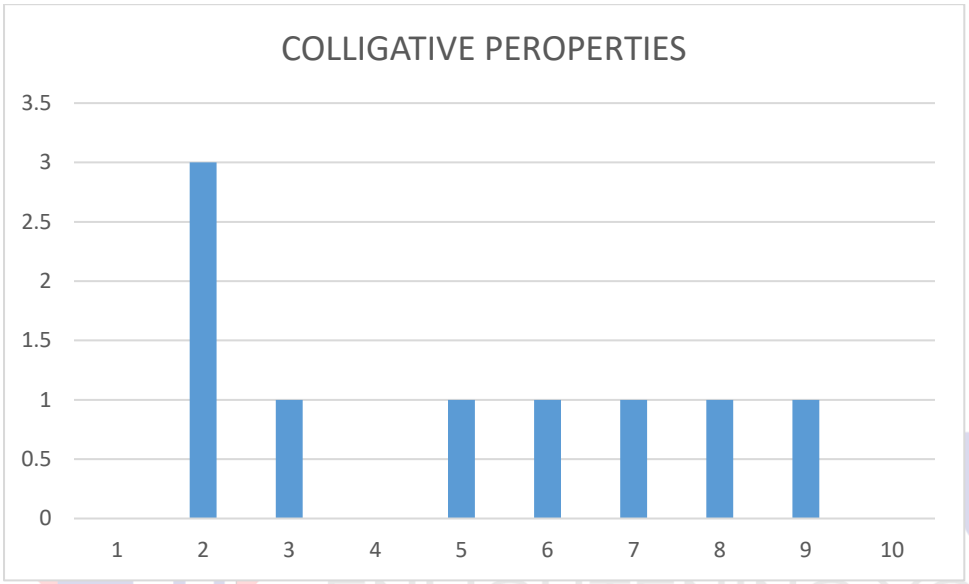
This is an important chapter as well. With 13 questions between 2010 and 2019, this chapter involves quite a bit of calculation. All the topics mentioned in the syllabus are important and should be covered.

9. Solid State



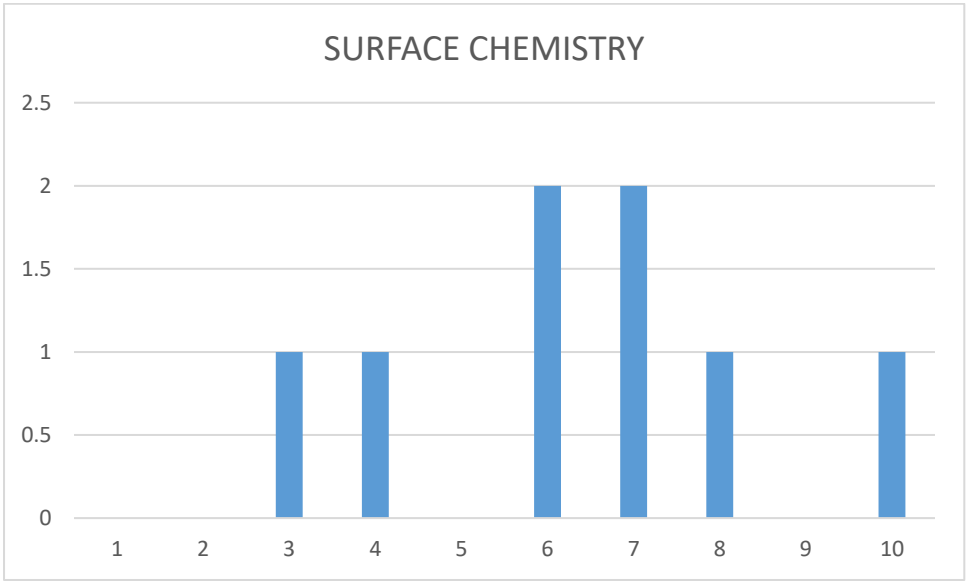
Another consistent chapter with 10 questions. This is a very simple chapter which requires very simple calculation of unit cells. This is a mark fetching chapter and with the simplicity associated, it should be covered without fail.

10. Colligative Properties



With 9 questions, it is a moderately important chapter. Methods for expressing concentration, raoult's law, vapour pressure, vant hoff factor, determination of molecular mass and colligative properties with change in temperature and pressure and important topics.

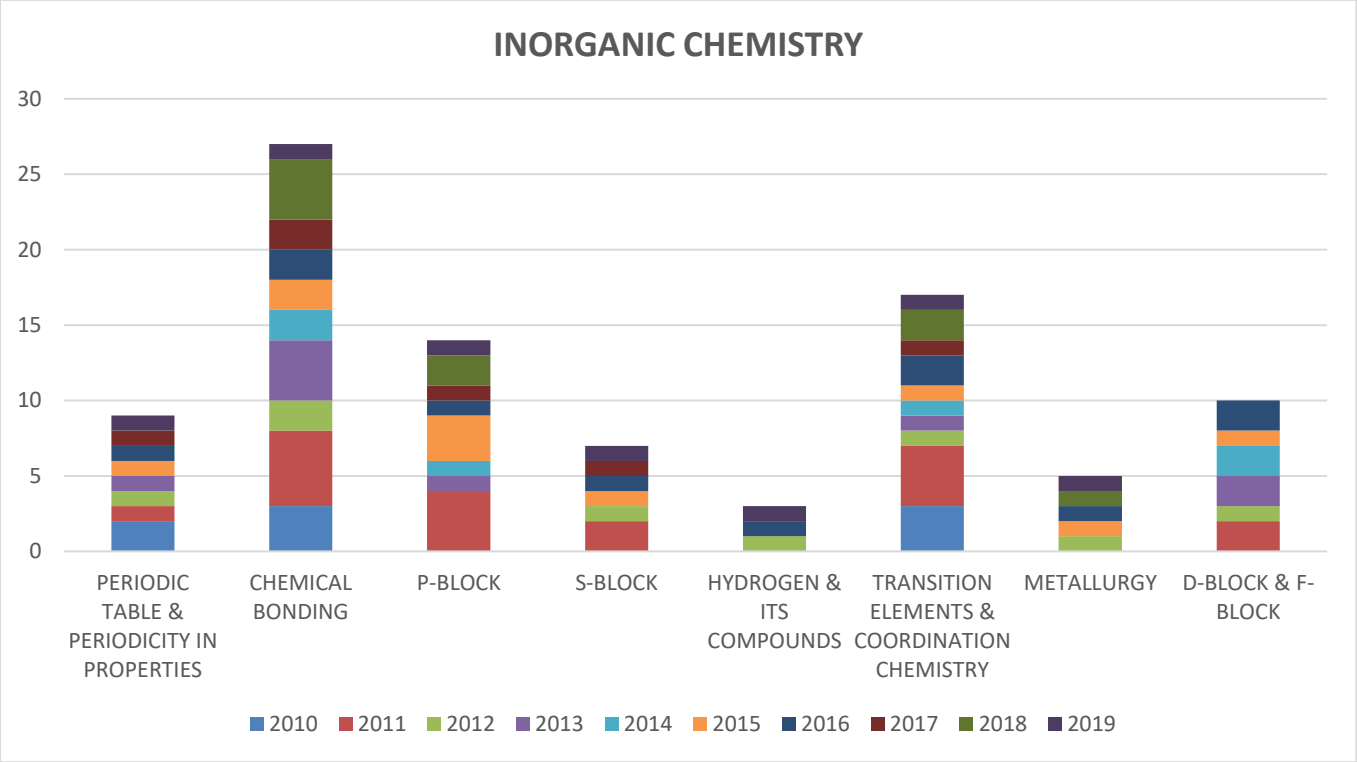
11. Surface Chemistry



Surface chemistry appears here and there and sometimes totally absent. However, this is a simple chapter as well and all topics should be covered without any exclusion to score good marks.

UNIT 2 - INORGANIC CHEMISTRY

Inorganic Chemistry has seen 92 questions in the past 10 years. It can be a scoring unit if NCERT is properly covered. Basic trends and patterns become very important to score well in this chapter. Chemical Bonding is the heavyweight chapter which has a huge weightage of 30% in the whole unit. The other important chapters are P-Block and Transition Elements and Coordination Chemistry. Periodic Table is the basic chapter that must be covered without fail and different parts of the periodic table are further studied in detail in each chapter. Chemical Bonding gives insight into a lot of reactions. However, some facts are empirical and thus need to be just memorized without a solid reasoning. The various blocks constitute of preparation, properties and structures. This will require good revision tactics. It is important to not spend too much time on topics with low weightage because that time can be allotted to practicing other chapters.



SYLLABUS

PART 1: CHEMICAL BONDING AND MOLECULAR STRUCTURE

- Kossel - Lewis approach to chemical bond formation, the concept of ionic and covalent bonds.
- Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.
- Covalent Bonding: Concept of electronegativity. Fajan's rule, dipole moment: Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.
- Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p and d orbitals; Resonance.
- Molecular Orbital Theory - Its important features.

- LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length and bond energy.
- Elementary idea of metallic bonding.
- Hydrogen bonding and its applications

PART 2: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

- Modem periodic law and present form of the periodic table, s, p. d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

PART 3: 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.

PART 4: 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.

PART 5: S -BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)

- Group -1 and 2 Elements, General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships.
- Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide and sodium hydrogen carbonate
- Industrial uses of lime, limestone. Plaster of Paris and cement: Biological significance of Na, K, Mg and Ca.

PART 6: P- BLOCK ELEMENTS (Group -13 to Group 18 Elements)

- General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group.
- Groupwise study of the p - block elements Group -13, Preparation, properties and uses of boron and aluminium, Structure, properties and uses of borax, boric acid, diborane, boron trifluoride, aluminium chloride and alums.
- Group -14: The tendency for catenation; Structure, properties and uses of Allotropes and oxides of carbon, silicon tetrachloride, silicates, zeolites and silicones.
- Group -15: Properties and uses of nitrogen and phosphorus; Allotrophic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl3. PCl5); Structures of oxides and oxoacids of nitrogen and phosphorus.

- Group -16: Preparation, properties, structures and uses of ozone: Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.
- Group-17: Preparation, properties and uses of hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens.
- Group-18: Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.

PART 7: d - and f- BLOCK ELEMENTS

- Transition Elements: General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation; Preparation, properties and uses of $K_2Cr_2O_7$, and $KMnO_4$.
- Inner Transition Elements: Lanthanoids - Electronic configuration, oxidation states and lanthanoid contraction. Actinoids - Electronic configuration and oxidation states.

PART 8: CO-ORDINATION COMPOUNDS

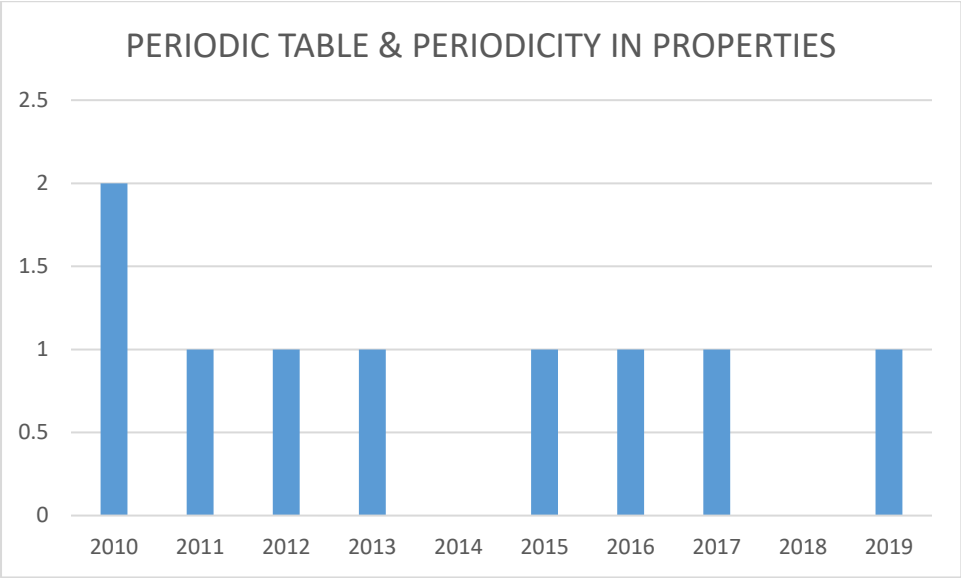
- Introduction to co-ordination compounds.
- Werner's theory; ligands, co-ordination number, denticity. Chelation
- IUPAC nomenclature of mononuclear co-ordination compounds, isomerism
- Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties
- Importance of co-ordination compounds (in qualitative analysis, extraction of metals and in biological systems).

PART 9: ENVIRONMENTAL CHEMISTRY

- Environmental pollution - Atmospheric, water and soil.
- Atmospheric pollution - Tropospheric and Stratospheric
- Tropospheric pollutants - Gaseous pollutants: Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention
- Greenhouse effect and Global warming: Acid rain
- Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention.
- Stratospheric pollution- Formation and breakdown of ozone, depletion of 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.

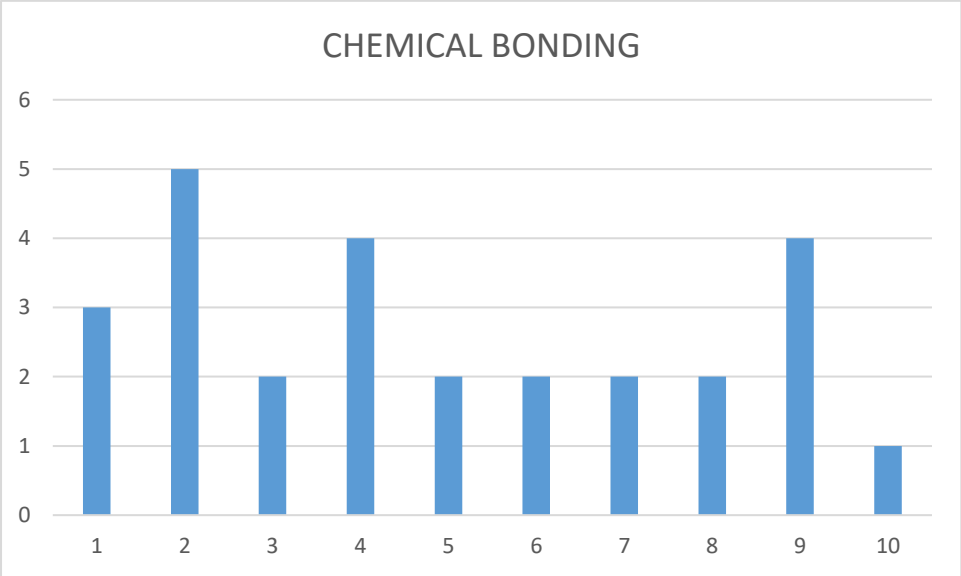
CHAPTERWISE ANALYSIS

1. Period Table & Periodicity



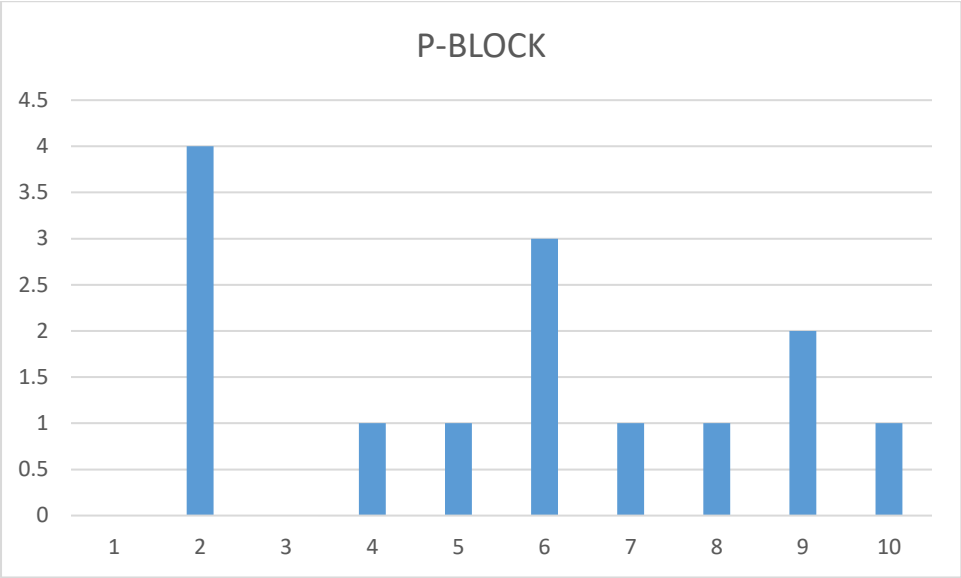
This is a chapter that has to be covered before touching any other aspect of Inorganic Chemistry. The evolution of periodic table and various trends of different blocks must be studied. Although 9 questions have been directly asked, its importance is paramount.

2. Chemical Bonding



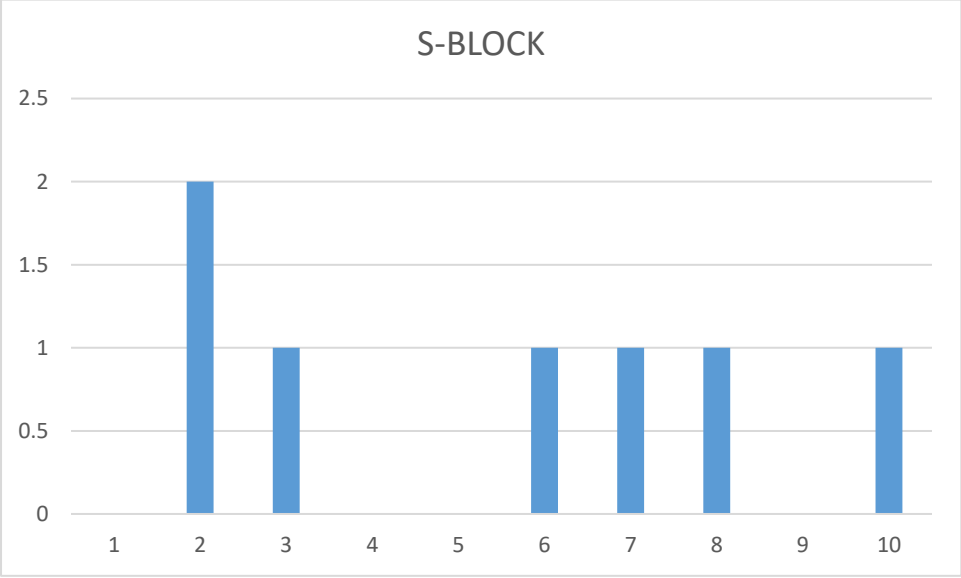
This is the king of all chapters. With a whopping 27 questions in all the years, it won't be wrong to expect around at least 2 questions. All the concepts are important are in this chapter.

3. P-Block



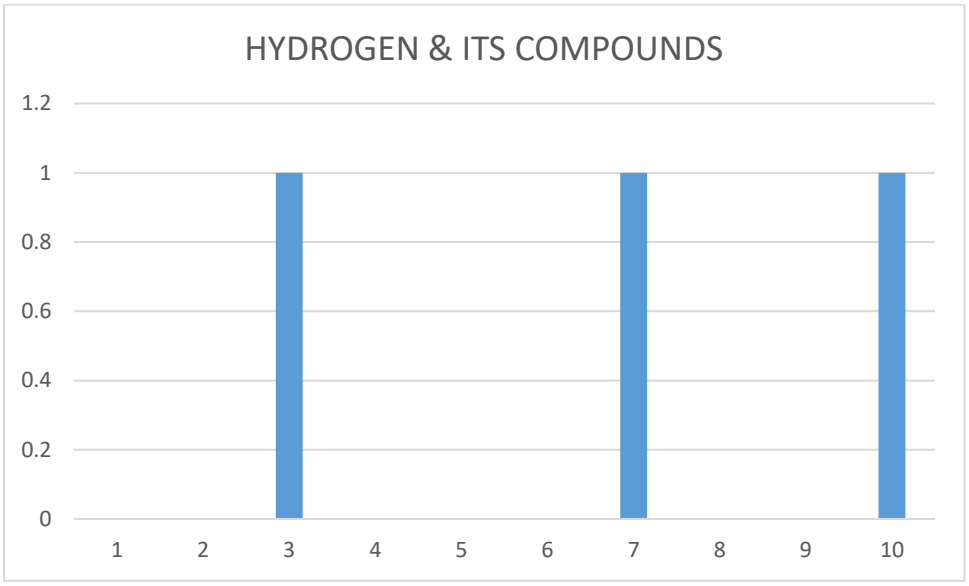
It is the second most important block with 14 questions in 10 years and should be prioritized for completed while aiming for various blocks.

4. S-Block



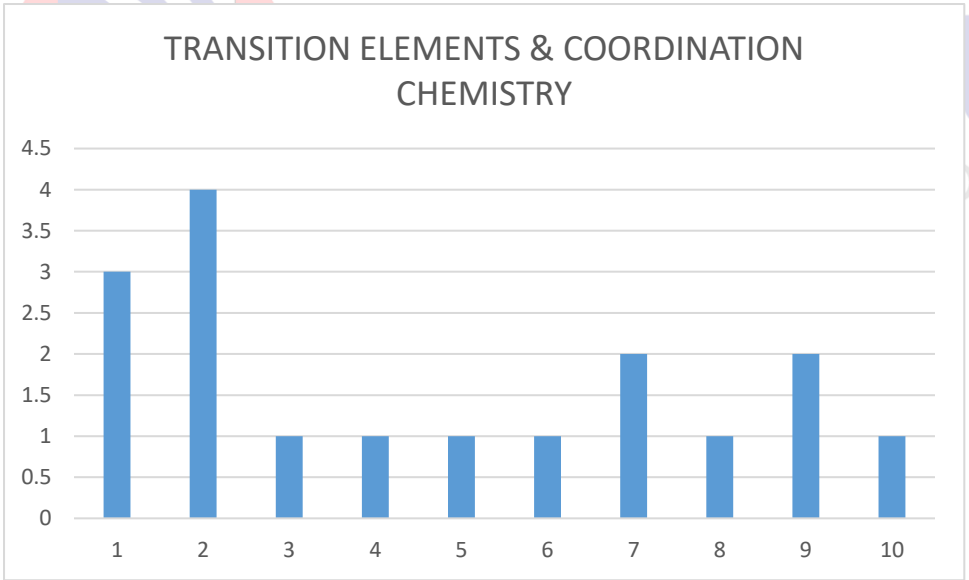
With just 7 questions, this chapter can be left as a second priority to be completed only after p-block, d-block and transition elements.

5. Hydrogen & Compounds



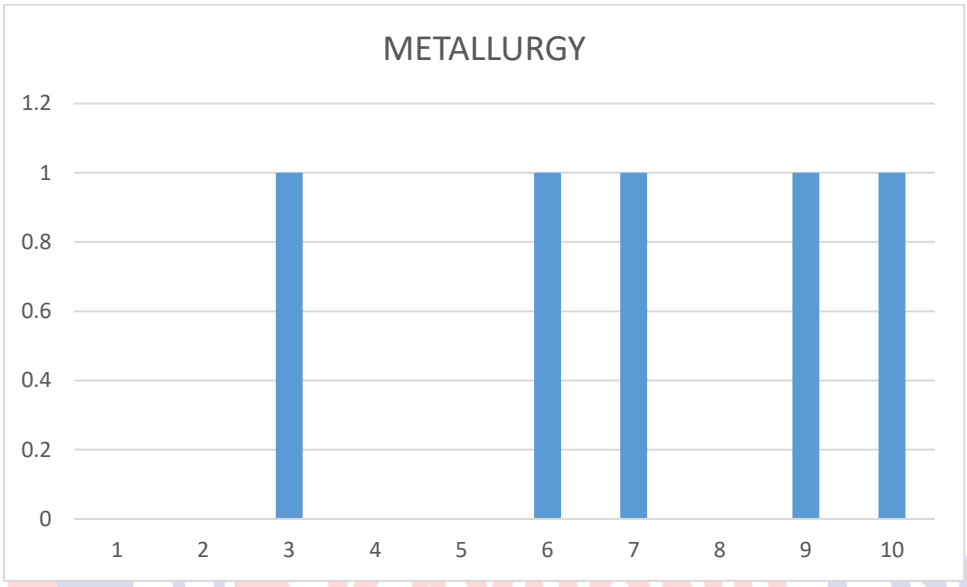
With a meagre 3 question, this chapter should be the last priority and can be left if there is not enough time available for preparation.

6. Transition Elements & Coordination Chemistry



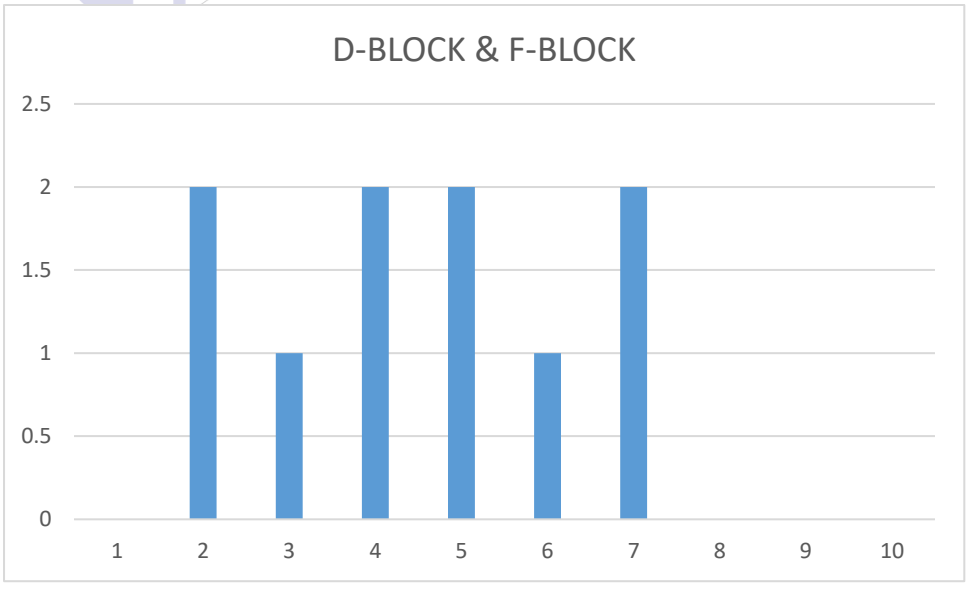
This is the most important chapter among all the blocks with 17 questions in 10 years. This shouldn't be excluded at any cost.

7. Metallurgy - Extraction of Metals



With just 5 questions and a chapter that requires a fair bit of time, it should be upto the student to prepare for it or not. If there's not enough time, extraction of important elements can be covered.

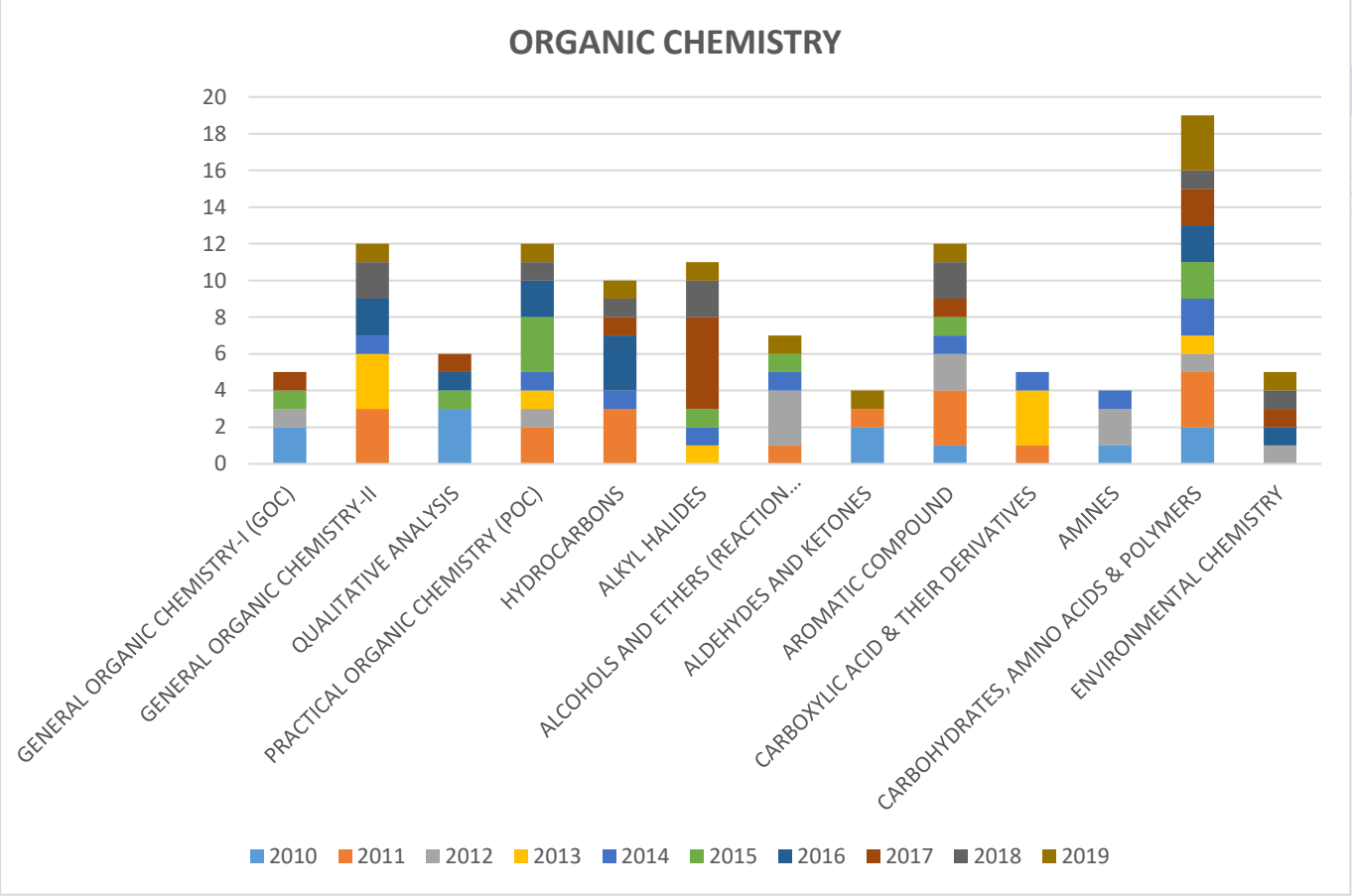
8. D-Block & F-Block



Despite of 10 questions, this chapter hasn't seen question in the past 3 years and should be prepared alongside transition elements.

UNIT 3 - ORGANIC CHEMISTRY

There is no entering into organic chemistry without knowing the General Organic Chemistry and that's a fact. The basic mechanisms and reactions follow up in every chapter but that requires you to know some fundamental reasoning. Unlike inorganic chemistry, here the reaction mechanisms have a pattern. The quantity might get overwhelming over time but is nonetheless useful in the long run. **Naming reactions are the crown jewels of Organic Chemistry.** Over the past 10 years, 112 questions have been asked from this unit. Some of the important chapters from this unit are: Amino Acids & Polymers, GOC, POC, Hydrocarbons, Alkyl Halides and Aromatic Compounds. Environmental chemistry might turn out to be an easy scoring chapter but owing to its low weightage, it should be prepared at the end.



Y axis: Number of Questions

SYLLABUS

PART 1: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS

- Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications.
- Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens.
- Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus.
- Calculations of empirical formula and molecular formulae: Numerical problems in organic quantitative analysis

PART 2: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY

- Tetravalency of carbon: Shapes of simple molecules - hybridization (s and p): Classification of organic compounds based on functional groups: and those containing halogens, oxygen, nitrogen and sulphur; Homologous series: Isomerism - structural and stereoisomerism.
- Nomenclature (Trivial and IUPAC)
- Covalent bond fission - Homolytic and heterolytic: free radicals, carbocations and carbanions; stability of carbocations and free radicals, electrophiles and nucleophiles.
- Electronic displacement in a covalent bond
- Inductive effect, electromeric effect, resonance and hyperconjugation.
- Common types of organic reactions- Substitution, addition, elimination and rearrangement.

PART 3: HYDROCARBONS

- Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.
- Alkanes - Conformations: Sawhorse and Newman projections (of ethane): Mechanism of halogenation of alkanes.
- Alkenes - Geometrical isomerism: Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect): Ozonolysis and polymerization.
- Alkynes - Acidic character: Addition of hydrogen, halogens, water and hydrogen halides: Polymerization.
- Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity: Mechanism of electrophilic substitution: halogenation, nitration.
- Friedel - Craft's alkylation and acylation, directive influence of the functional group in mono-substituted benzene.

PART 4: ORGANIC COMPOUNDS CONTAINING HALOGENS

- General methods of preparation, properties and reactions; Nature of C-X bond; Mechanisms of substitution reactions. Uses; Environmental effects of chloroform, iodoform freons and DDT.

PART 5: ORGANIC COMPOUNDS CONTAINING OXYGEN

- General methods of preparation, properties, reactions and uses.
- Alcohols: Identification of primary, secondary and tertiary alcohols: mechanism of dehydration.
- Phenols: Acidic nature, electrophilic substitution reactions: halogenation. nitration and sulphonation. Reimer - Tiemann reaction.
- Ethers: Structure.
- Aldehyde and Ketones: Nature of carbonyl group; Nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones; Important reactions such as - Nucleophilic addition reactions (addition of HCN. NH3, and its derivatives), Grignard reagent; oxidation: reduction (Wolf Kishner and Clemmensen); the acidity

of α-hydrogen, aldol condensation, Cannizzaro reaction. Haloform reaction, Chemical tests to distinguish between aldehydes and Ketones.

- Carboxylic Acids: Acidic strength and factors affecting it

PART 6: ORGANIC COMPOUNDS CONTAINING NITROGEN

- General methods of preparation. Properties, reactions and uses.
- Amines: Nomenclature, classification structure, basic character and identification of primary, secondary and tertiary amines and their basic character.
- Diazonium Salts: Importance in synthetic organic chemistry.

PART 7: POLYMERS

- General introduction and classification of polymers, general methods of polymerization, - Addition and condensation, copolymerization.
- Natural and synthetic, rubber and vulcanization, some important polymers with emphasis on their monomers and uses– polythene, nylon, polyester and bakelite.

PART 8: BIOMOLECULES

- General introduction and importance of biomolecules.
- CARBOHYDRATES - Classification; aldoses and ketoses: monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).
- PROTEINS - Elementary Idea of □-amino acids, peptide bond, polypeptides. Proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.
- VITAMINS – Classification and functions.
- NUCLEIC ACIDS – Chemical constitution of DNA and RNA. Biological functions of nucleic acids.

PART 9: CHEMISTRY IN EVERYDAY LIFE

- Chemicals in Medicines - Analgesics, tranquillizers, antiseptics, disinfectants, antimicrobials, anti-fertility drugs, antibiotics, antacids. Anti-histamines - their meaning and common examples.
- Chemicals in food - Preservatives, artificial sweetening agents - common examples.
- Cleansing Agents - Soaps and detergents, cleansing action

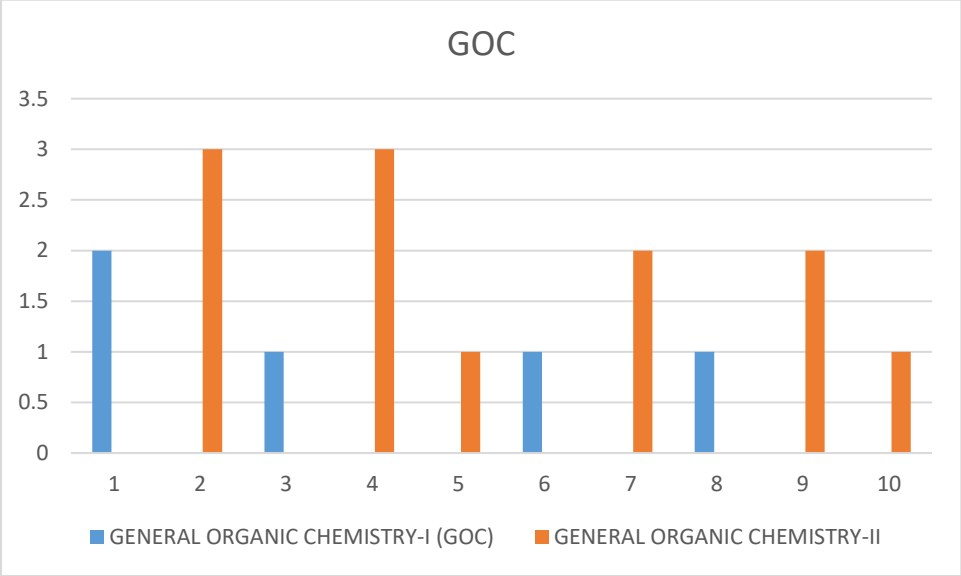
PART 10: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY

- 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.
- The chemistry involved in the preparation of the following: Inorganic compounds; Mohr's salt, potash alum. Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.
- The chemistry involved in the titrimetric exercises – Acids, bases and the use of indicators, oxalic-acid vs KMnO4, Mohr's salt vs KMnO4
- Chemical principles involved in the qualitative salt analysts: Cations – Pb2+, Cu2+, Al3+, Fe3+, Zn2+, Ni2+, Ca2+, Ba2+, Mg2+, NH4+. Anions- CO_2^-, S^{2-},SO_2^-, NO_3^-, NO_2^-, Cl^- , Br^-, I^- (Insoluble salts excluded).
- Chemical principles involved in the following experiments:
  1. Enthalpy of solution of CuSO4
  2. Enthalpy of neutralization of strong acid and strong base.

3. Preparation of lyophilic and lyophobic sols
4. Kinetic study of the reaction of iodide ion with hydrogen peroxide at room temperature.

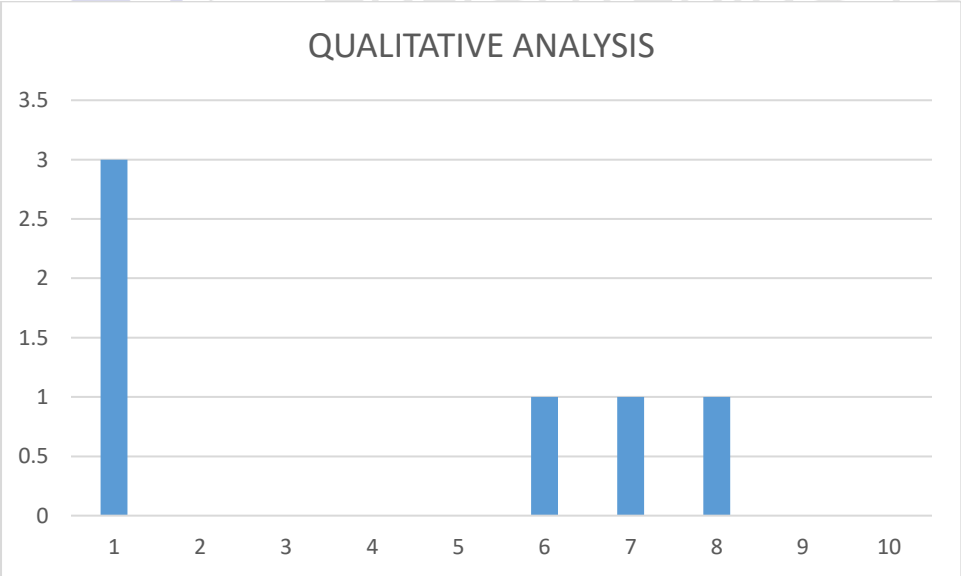
CHAPTERWISE ANALYSIS

1. General Organic Chemistry



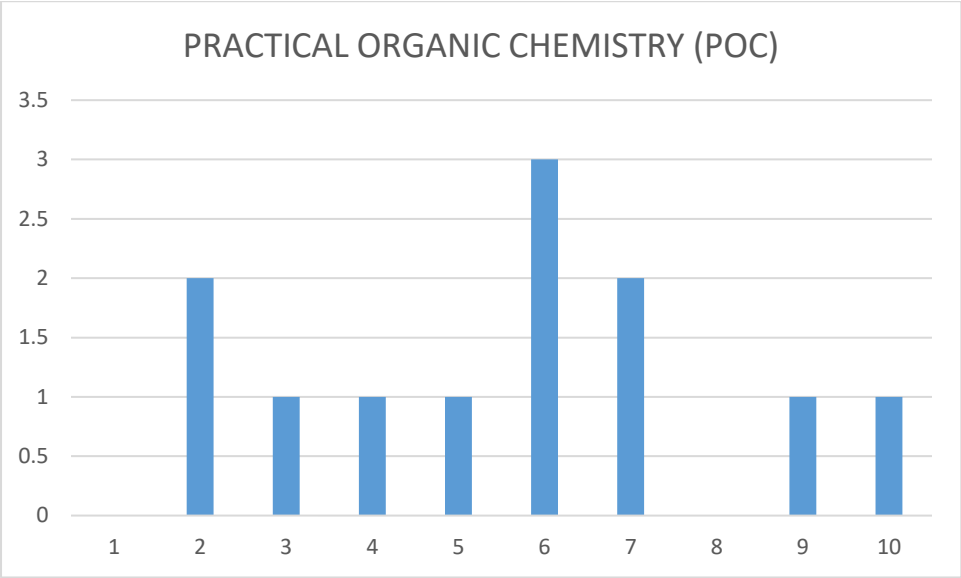
With a total of 17 questions in 10 years, it is the fundamental chapter to enter into organic chemistry. A must complete chapter by any standard.

2. Qualitative Analysis



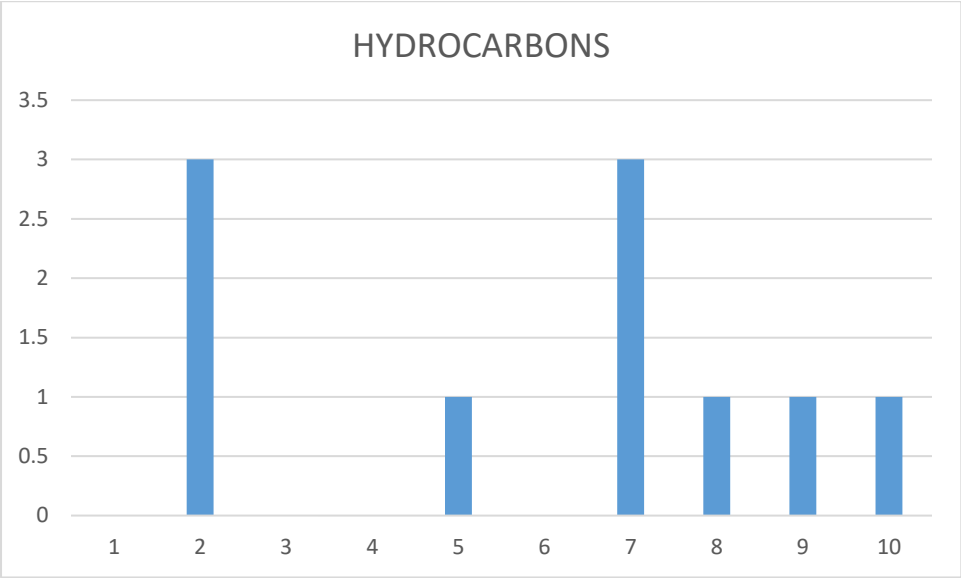
With just 3 questions in the last 9 years, this chapter can be kept as the last priority.

3. Practical Organic Chemistry



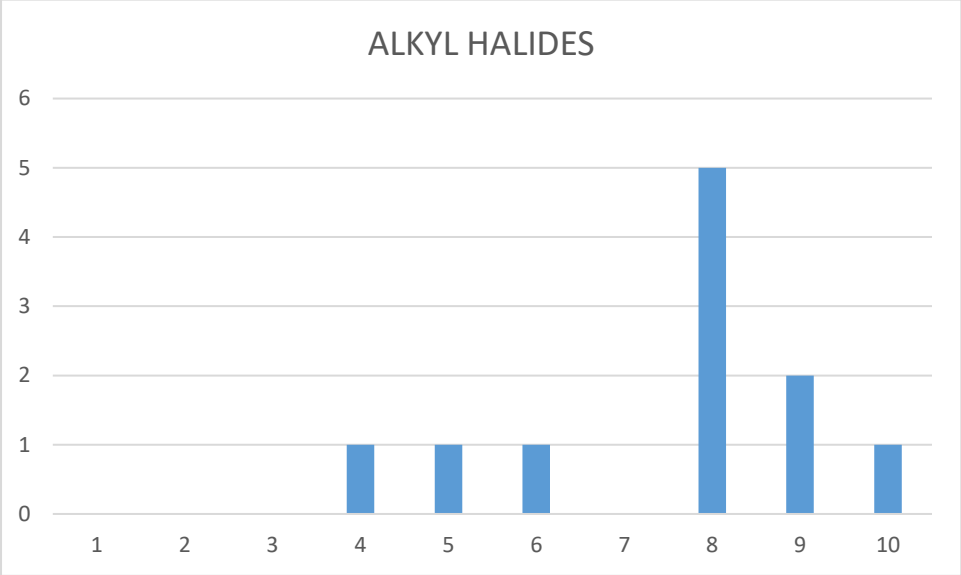
It is easy to understand the chapter if a good amount of practical classes have been undertaken. Otherwise memorizing the output colours become difficult. With 12 questions in 10 years, this chapter should be prepared mandatorily.

4. Hydrocarbons



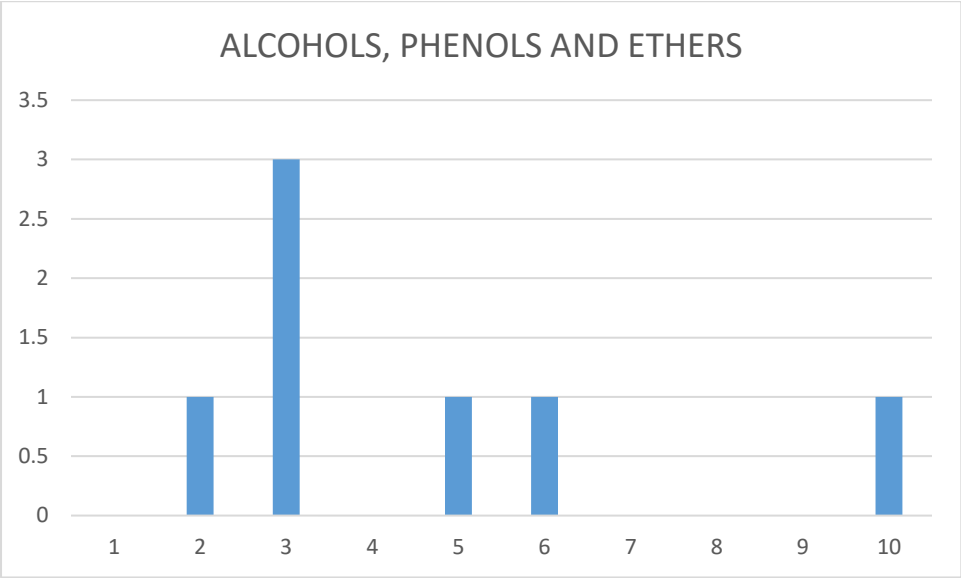
With a consistent pattern in the previous years, this is a chapter should be studied as the fundamental for aromatic compounds and understanding basic distinctions.

5. Alkyl Halides - Halogen Compounds



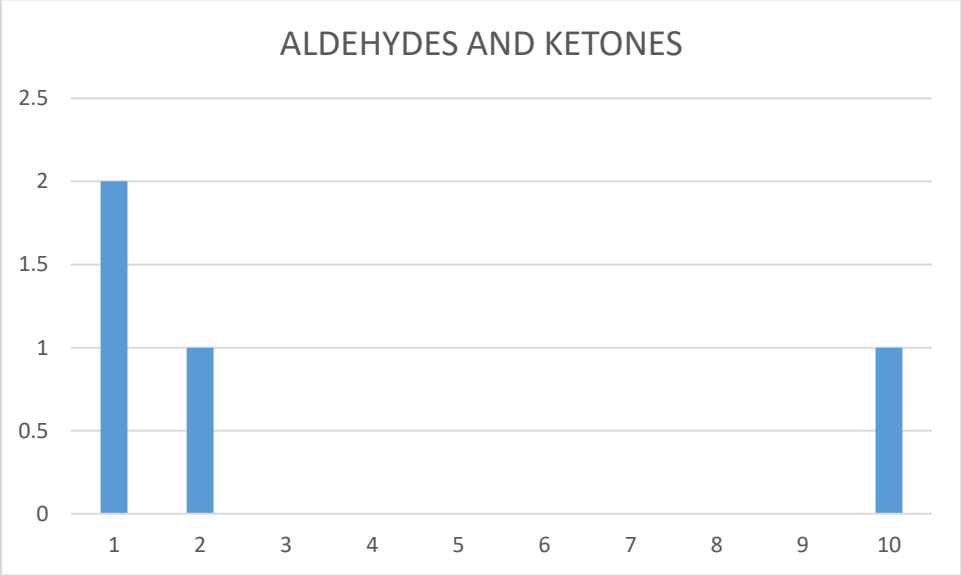
5 questions asked in 2017 makes this an unavoidable chapter. Keep this as a chapter of high priority due to the consistency in the recent years.

6. Alcohols, Phenols & Ethers



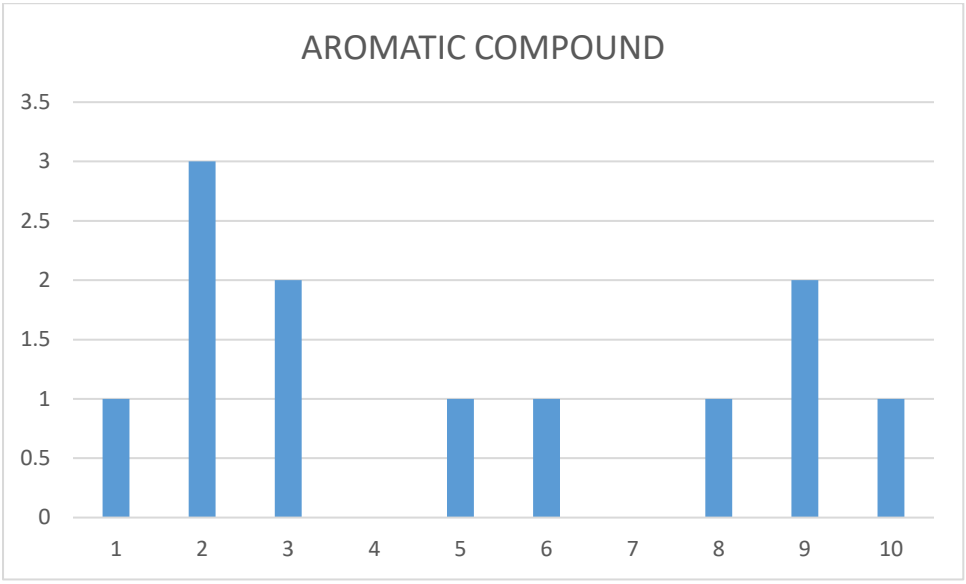
With only 3 questions asked in previous 7 years, this chapter can be kept as a second priority.

7. Aldehydes & Ketones



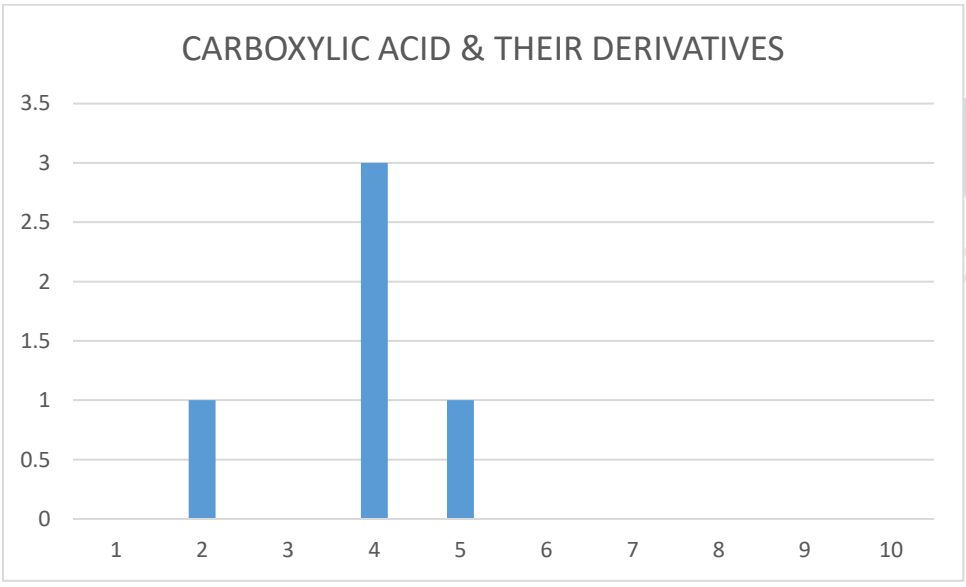
This is an important topic for JEE Advanced. However, only 1 question has been asked in previous 8 years and can be thus ignored.

8. Aromatic Compound General Organic Chemistry



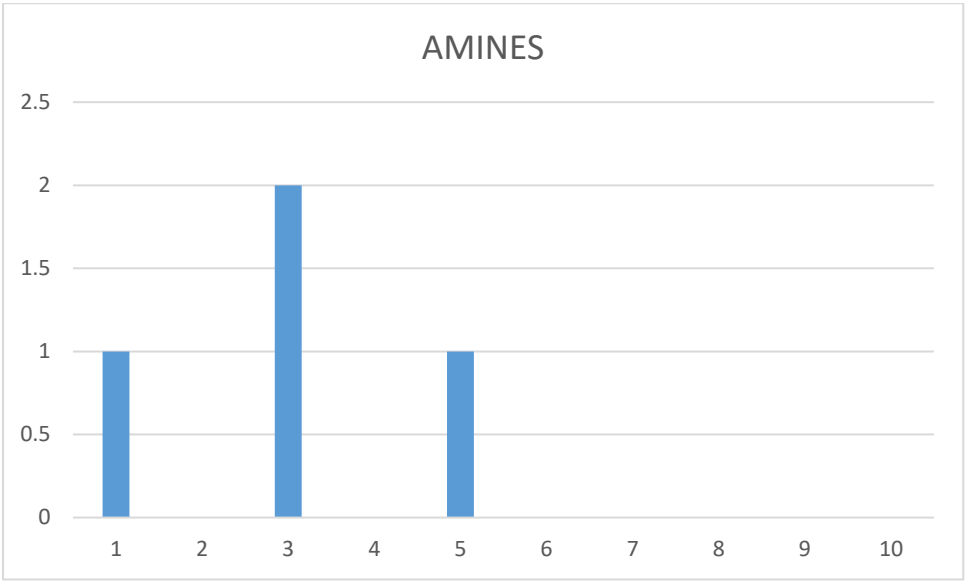
Aromatic compounds is an important chapter and should be completed without fail. It has seen 12 questions in the last 10 years.

9. Carboxylic Acid & Derivatives



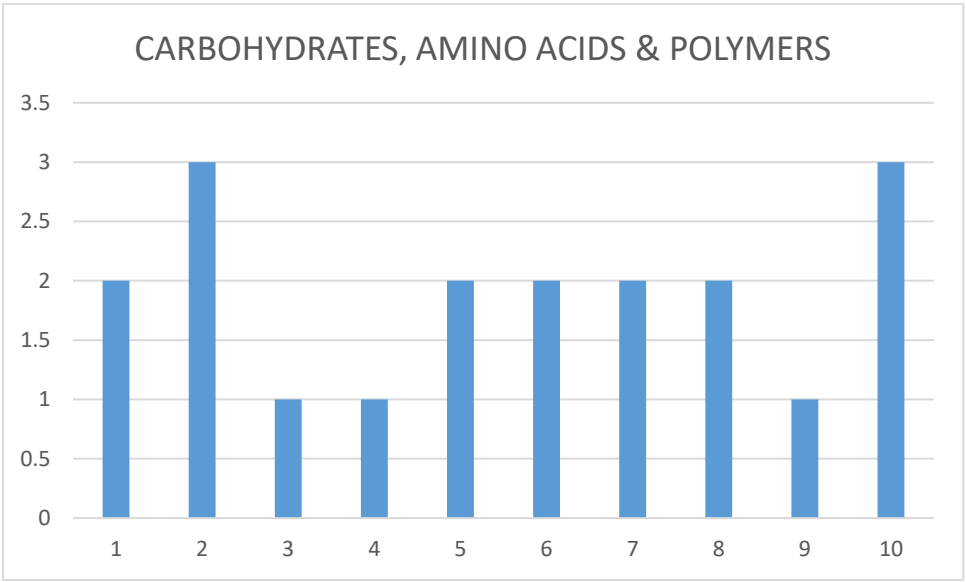
This chapter should be prepared at the end. No questions have been asked from this chapter in the last 5 years.

10. Amines (Nitrogen Compound)



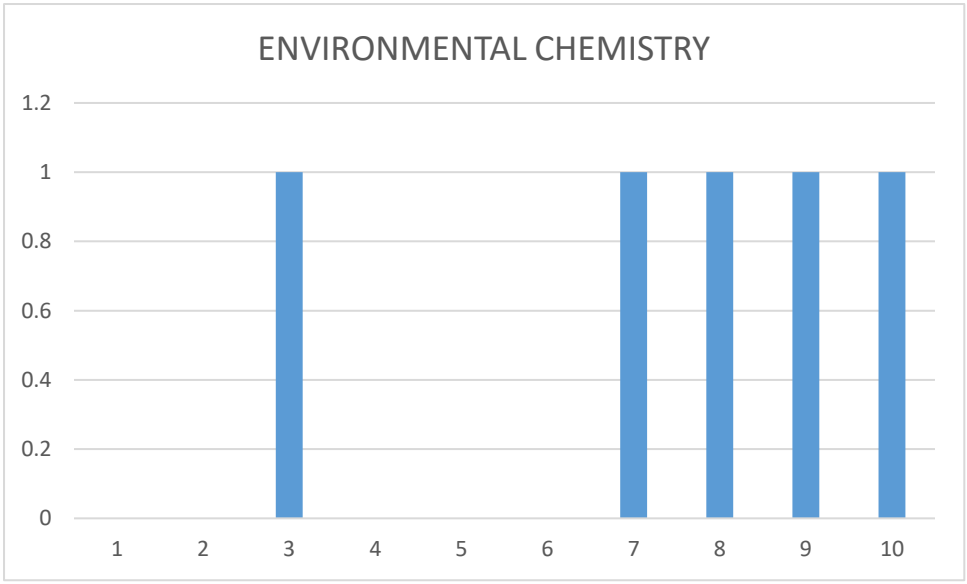
Similar to the above chapter, this chapter can be ignored as well or kept at the end for preparation.

11. Carbohydrates, Amino Acids & Polymers - Biomolecules



It is a very important chapter attracting an average of 2 questions per year and a total of 19 questions in the last 10 years. All the topics are equally important for this chapter.

12. Environmental Chemistry



With a question asked every year in the last 4 years, it should be given emphasis as well. It is a chapter that requires basic understanding and thus is a simple chapter to score marks in.

NOTE: It is important to understand that irrespective of the weightage of chapters, all reaction mechanism should be given proper emphasis.