



MONTH	TOPICS	NO. OF SESSIONS
June-July	Part A: General Aptitude	2
	Organic Chemistry: Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.	3
	Physical Chemistry: Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.	3
	Inorganic Chemistry: Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron-transfer reactions; nitrogen fixation, metal complexes in medicine.	3
	Test	1
July-Aug	Part A: General Aptitude	2
	Organic Chemistry: Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.	3
	Physical Chemistry: Polymer chemistry: Molar masses; kinetics of polymerization.	3
	Inorganic Chemistry: Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).	3
	Test	1
Aug-Sep	Organic Chemistry: Structure determination of organic compounds by IR, UV-Vis, ^1H and ^{13}C NMR and Mass spectroscopic techniques.	3
	Physical Chemistry: Basic principles of quantum mechanics: Postulates; operator algebra; exactly-solvable systems: particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta; tunneling.	4
	Inorganic Chemistry: 1. Organometallic compounds: synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis. 2. Cages and metal clusters.	4
	Test	1



Sep-Oct	Organic Chemistry: Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations.	1+3
	Physical Chemistry: 1. Electrochemistry: Nernst equation, redox systems, electrochemical cells; Debye- Hückel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.	4
	Inorganic Chemistry: Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.	2+1
	Test	1
Oct-Nov	Organic Chemistry: 1. Benzenoid and non-benzenoid compounds – generation and reactions.	1+3
	Physical Chemistry: Chemical thermodynamics: Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.	4
	Inorganic Chemistry: 1. Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications. 2. Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents.	2+1
	Test	1
Nov-Dec	Organic Chemistry: 1. Pericyclic reactions; 2. Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst-controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.	2+2
	Physical Chemistry: 1. Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.	3
	Inorganic Chemistry: 1. Characterization of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques.	2+2
	Test	1



Full Portion Mock Tests

Month	Test
August	Mock Test 1
September	Mock Test 2
October	Mock Test 3
November	Mock Test 4
December	Mock Test 5

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