



**ALL INDIA ONLINE TEST SERIES**  
**GATE Chemistry 2020**  
**STARTING – Oct 2019**

**50 TESTS: 27 Unitwise Practice Test + 10 Minor Test + 5 Major Test+ 3 Part Test + 5 Full Length Tests**

**Value Addition Material + Supplementary Material:Soft copy& Hard copy**  
**(Expert Support:Telephonic Discussion/ Email Interaction)**

**Program Objective:**This is a comprehensive and intensive ‘interactive’ program focussing on sincere GATE Aspirants who will appear in GATE CHEMISTRY 2020. Our experts provide steps by step guidance to aspirants for understanding the concepts chemistry and preparing them for scoring good marks.

**Approach & Strategy:**Our Simple, practical and focussed approach will help aspirants understand the demand of GATE Exam effectively. Our strategy is to constantly innovate to keep the preparation process dynamic and give personalized attention to individual aspirants based on factor core competence, availability of time and resource and the requirement of GATE Exam.

**Our interactive Learning approach (Email/Telephonic Discussion: Expert with Aspirants) will continuously improve aspirant’s performance and move their preparation in the right direction.**

**Number of Mock Test: 50 TESTS: 27 Unitwise + 10 Minor + 5 Major + 3 Part + 5 Full Length**

**Fee (Incl. all taxes): Rs 5000/-**

**Nature:**Flexible- **Date of Mock Test: Reschedule on the demand of aspirants. (POSTPONE, BUT NOT PREPONE)**

**What you will get:**

- Login ID Password for performance analysis of aspirants. (Innovative Assessment System including POST TEST ANALYSIS)
- 50 Mock Test Papers & detailed conceptual Answer Explanations.
- Analysis of Mock Test papers based on difficulty level & nature of questions.
- Comprehensive analysis of previous year questions papers.

## INNOVATIVE ASSESSMENT SYSTEM:

Static & dynamic Potential of Mock test papers (Scoring Potential). Macro & Micro performance Analysis of aspirants, Section wise analysis, Difficulty Analysis, All India Rank, comparison with toppers, Geographical Analysis, Integrated Score Card, Analysis of Mock Test paper based on difficulty level & nature of question etc.

**HOW IT WORKS: The tests are planned at Five different levels of preparation required for a student to succeed in GATE EXAMINATION.**

**1. Unit level- Test 1 to 27:** Each test will be based entirely on the most unit sources of that particular section. Here we will test whether you have thoroughly prepared these unit sources or not and if you have understood all the basic concepts or not. These tests will be available on Chem Academy Portal right from your date of enrolment, you can give these test anytime as per your convenience. These papers are developed in order to boost your foundation and effective preparation of every particular unit mentioned in GATE Chemistry Syllabus. These are three hour tests each containing 55 questions based on GATE Chemistry Syllabus and Pattern.

**2. Applied level (Minor, Major) – Test 28 to 37 & 38 to 42:** In this level, we will test your subject knowledge at an applied level. Test would be more analytical in nature, application oriented with relevance to recent concepts. These tests would not be restricted to few particular sources and it would cover the entire primary, Secondary and other sources. These tests are of 3 hours, each containing as expected 55 questions pertaining to Chemistry subject.

**3. Comprehensive level ( Part and Full test) -Test 43 to 45 & 46 TO 50:** These are Full Length (FLT) covering all the levels of difficulty and all the types of questions similar to the GATE paper. These tests will validate that your preparation is complete and you have achieved that extra edge to succeed in GATE. Part test will again comprise of 55 questions each. In Part Tests number of topics (from each Physical, Inorganic and Organic Chemistry) are more compared to Major tests and eventually in Full tests you will have 55 questions, 10 questions from General Aptitude.

## DISCLAIMER

- **Chem academy material is for the individual only. In case a student is found involved in any violation of copyrights of Chem academy material, the admission to the test series will be cancelled.**
- **We have facility of fee payment in cash too.**
- **Fee once paid is non-refundable and non-transferable in all circumstances**
- **Chem academy reserves all rights related to admission.**
- **Chem academy reserves all rights to make any changes in test series schedule/ test writing days and timing etc., if need so arises.**

UNIT No.	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
1	Organic Photochemistry	Photochemistry of alkenes, arenes and carbonyl compounds. Photooxidation and photoreduction. Di- $\pi$ -methane rearrangement, Barton reaction.	Classnotes, Chem Academy GATE ( DLP Kit)	V. Ramamurthy, Jochen Mattay, J.D Coyle, J.M Coxen
2	Basic principles of quantum mechanics	Postulates of quantum mechanics. Time dependent and time independent Schrödinger equations. Born interpretation. Particle in a box. Harmonic oscillator. Rigid rotor. Hydrogen atom: atomic orbitals. Multi-electron atoms: orbital approximation.	Classnotes, Chem Academy GATE ( DLP Kit)	Donald A Macquarrie, David J Griffith, Eugen Merzbacher, Peter Atkins, Tamas Veszpremi
3	Stereochemistry	General organic chemistry, Chirality of organic molecules with or without chiral centres and determination of their absolute configurations. Relative stereochemistry in compounds having more than one stereogenic centre. Homotopic, enantiotopic and diastereotopic atoms, groups and faces. Stereoselective and stereospecific synthesis. Conformational analysis of acyclic and cyclic compounds. Geometrical isomerism. Configurational and conformational effects, and neighbouring group participation on reactivity and selectivity/specificity	Class notes, Chem Academy GATE ( DLP Kit)	Subratosen Gupta, P S Kalsi, Jonathan clayden, Ernest Eliel
4	Approximate methods of quantum mechanics	Variation and first order perturbation techniques	Class notes Chem Academy GATE ( DLP Kit), K L Kapoor	Castellen, Charles Mortimer, Puri Sharma - Pathania, Donald Macquarrie

UNIT No.	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
5	Solid state	Crystal systems and lattices, Miller planes, crystal packing, crystal defects, Bragg's law, ionic crystals, structures of AX, AX <sub>2</sub> , ABX <sub>3</sub> type compounds, spinels, band theory, metals and semiconductors.	Class notes, Chem Academy GATE ( DLP Kit ), K L Kapoor	Hueey, Castellen, Charles Mortimer, A.R West
6	Reaction mechanism	Basic mechanistic concepts – kinetic versus thermodynamic control, Hammond's postulate and Curtin-Hammett principle. Methods of determining reaction mechanisms through identification of products, intermediates and isotopic labeling. Nucleophilic and electrophilic substitution reactions (both aromatic and aliphatic). Addition reactions to carbon-carbon and carbon-heteroatom (N,O) multiple bonds. Elimination reactions	12 <sup>th</sup> NCERT Class notes, Chem Academy GATE ( DLP Kit )	Peter Skyes, Jonathan clayden, Jerry March Carey Sandberg, George Zweifel
7	Chemical thermodynamics	Laws of thermodynamics. Standard states. Thermochemistry. Thermodynamic functions and their relationships: Gibbs-Helmholtz and Maxwell relations, van't Hoff equation. Criteria of spontaneity and equilibrium. Absolute entropy. Partial molar quantities. Thermodynamics of mixing. Chemical potential. Fugacity, activity and activity coefficients.	Class notes, Chem Academy GATE ( DLP Kit) K L Kapoor,	R.E Sonntag, Peter Atkin, Castellen, Charles Mortimer, Ira Lavine, J Bevan ott, R.M Rosenberg
8	Chemical bonding	Valence bond theory and LCAO-MO theory. Hybrid orbitals. Applications of LCAO-MOT to H <sub>2</sub> <sup>+</sup> , H <sub>2</sub> and other homonuclear diatomic molecules, heteronuclear diatomic molecules like HF, CO, NO, and to simple delocalized π– electron systems. Hückel approximation and its application to annular π – electron systems	Class notes, Chem Academy GATE ( DLP Kit)	K L Kapoor, Puri Sharma-Pathania, <b>McQuarrie Donald A</b>

<b>UNIT No.</b>	<b>Topics</b>	<b>Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)</b>	<b>Primary (Essential) Reference</b>	<b>Secondary (Additional) Reference</b>
9	Chemical applications of group theory	Symmetry elements and operations. Point groups and character tables	Class notes, Chem Academy GATE (DLP Kit)	Swarnlakshmi, Asok K Mukherjee, Robert L. Carter
10	Organic reactive intermediates	Carbocations, carbanions, carbenes, nitrenes, arynes and free radicals.	Class notes, Chem Academy GATE (DLP Kit) I L Finar Soloman fryle	Peter sykes Paula bruice, Jonathan clayden, Jerry March, George Zwiefel, Ernest Eliel, M.A Singh
11	Main group elements and their Compounds	Hydrides, halides, oxides, oxoacids, nitrides, sulfides – shapes and reactivity. Structure and bonding of boranes, carboranes, silicones, silicates, boron nitride, borazines and phosphazenes. Allotropes of carbon. Chemistry of noble gases, pseudohalogens, and interhalogen compounds. Acid-base concepts.	Classnotes, Chem academy GATE (DLP Kit)	Hueey Kieter, Shriver Atkins, GreenWood, Cotton & Wilkinson, Miessler Tarr, Ajay Kumar
12	Statistical thermodynamics	microcanonical and canonical ensembles, Boltzmann distribution, partition functions and thermodynamic properties.	Classnotes, Chem academy GATE (DLP Kit)	Terrell L hill, Ashley H carter, Herbert Callen, Andrew Maczek
13	Lanthanides and Actinides	Recovery. Periodic properties, spectra and magnetic properties	Chem academy GATE (DLP Kit)	Ajay kumar, E. Housecraft, Greenwood, Cotton & Wilkinson, Shriver Atkin, Simon Cotton

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14	Surfaces and Interfaces	Physisorption and chemisorption. Langmuir, Freundlich and BET isotherms. Surface catalysis: Langmuir-Hinshelwood mechanism. Surface tension, viscosity. Self-assembly. Physical chemistry of colloids, micelles and macromolecules.	Classnotes, Chem academy GATE (DLP Kit)	Paul C Hiemenz, Duncan J shaw, Pashley Richard, K S birdi
15	Radioactivity	Decay processes, half-life of radioactive elements, fission and fusion processes.	Class notes, Chem academy GATE (DLP Kit)	Asim K Das vol 1, Puri Sharma pathania
16	Instrumental Methods of Analysis	UV-visible spectrophotometry, NMR and ESR spectroscopy, mass spectrometry. Chromatography including GC and HPLC. Electroanalytical methods- polarography, cyclic voltammetry, ion-selective electrodes. Thermoanalytical methods	Class notes, Chem academy GATE (DLP Kit)	D.M Rao, G.R Chatwal, D.A Skoog, H.H Willard
17	Common named reactions and rearrangements	Applications in organic synthesis Molecular rearrangements involving electron deficient atoms	Class notes, Chem academy GATE (DLP Kit), I.L Finar	George Zweifel, Ernest Eliel, Carey Sandberg, Paula bruice, Jonathan clayden,
18	Organic synthesis	Synthesis, reactions, mechanisms and selectivity involving the following classes of compounds – alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids, esters, nitriles, halides, nitro compounds, amines and amides. Uses of Mg, Li, Cu, B, Zn and Si based reagents in organic synthesis. Carbon-carbon bond formation through coupling reactions - Heck, Suzuki, Stille and Sonogoshira. Concepts of multistep synthesis -	Class notes, Chem academy GATE (DLP Kit)	George Zweifel, Carey Sandberg, stuart Warren, Michael B Smith, Barbara Czako, G.A Molander

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		retrosynthetic analysis, strategic disconnections, synthons and synthetic equivalents. Umpolung reactivity – formyl and acyl anion equivalents. Selectivity in organic synthesis – chemo-, regio- and stereoselectivity. Protection and deprotection of functional groups.		
19	Electrochemistry and Conductance	Ionic mobility and conductivity. Debye-Hückel limiting law. Debye-Hückel-Onsager equation. Standard electrode potentials and electrochemical cells. Potentiometric and conductometric titrations	Classnotes, Chem Academy GATE ( DLP Kit), K L Kapoor	Engel & Reid, Castellen, Charles Mortimer, Ira Levine, Bard and Faulkner
20	Pericyclic reactions	Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlations - FMO and PMO treatments	Class notes, Chem Academy GATE ( DLP Kit), Paula Bruce, D K Mandal	Jonathan Clayden, C. Sandberg, Jerry March, G. Zweifel, Ian Fleming
21	Transition elements	Basic of Chemical Bonding, Coordination chemistry – structure and isomerism, theories of bonding (VBT, CFT, and MOT). Energy level diagrams in various crystal fields, CFSE, applications of CFT, Jahn-Teller distortion. Electronic spectra of transition metal complexes: spectroscopic term symbols, selection rules, Orgel diagrams, charge-transfer spectra. Magnetic properties of transition metal complexes. Reaction mechanisms: kinetic and thermodynamic stability, substitution and redox reactions.	Class notes, Chem academy GATE ( DLP Kit)	Huey Kieter, shriver atkins, Miessler Tarr, Catherine E. Housecraft, G. Lawrence. Greenwood, Cotton wilkinson
22	Asymmetric synthesis	Resolution (including enzymatic), desymmetrization and use of chiral auxiliaries. Carbon-carbon bond forming reactions through enolates	Class notes, Chem academy GATE ( DLP Kit)	Jonathan Clayden, C. Sandberg, Jerry March, George Zweifel,

UNIT No.	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
		(including boron enolates), enamines and silyl enol ethers. Michael addition reaction. Stereoselective addition to C=O groups (Cram and Felkin-Anh models).		Carrutherus, R.E Gawley
23	Hetrocyclic compound	Structure, preparation, properties and reactions of furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline	Class notes, Chem academy GATE ( DLP Kit), S P Bhutani	Jonathan clayden, John Joule and Keith Mills, Beena Negi and R.K Parashar, A.R Katritzky
24	Bio inorganic Chemistry	Ion (Na <sup>+</sup> and K <sup>+</sup> ) transport, oxygen binding, transport and utilization, electron transfer reactions, nitrogen fixation, metalloenzymes containing magnesium, molybdenum, iron, cobalt, copper and zinc..	Class notes, Chem academy GATE ( DLP Kit)	Hueey Kieter, Asim K Das, Stephen J. Lippard, J D Lee, M.R Malone
25	Kinetics and Photochemistry	Transition state theory: Eyring equation, thermodynamic aspects. Potential energy surfaces and classical trajectories. Elementary, parallel, opposing and consecutive reactions. Steady state approximation. Mechanisms of complex reactions. Unimolecular reactions. Kinetics of polymerization and enzyme catalysis. Fast reaction kinetics: relaxation and flow methods. Kinetics of photochemical and photophysical processes	Class notes, Chem academy GATE ( DLP Kit), K L Kapoor	Castellen, Charles Mortimer, Peter Atkins, Ira Levine, Laidler, Engel & Reid, Paul housten
26	Organic Spectroscopy	Applications of UV-visible, IR, NMR and Mass spectrometry in the structural determination of organic molecules	Class notes, Chem academy GATE ( DLP Kit) Y R Sharma, JDS Yadev	William Kemp, J. Clayden, Pavia-Lampman- kriz, Silversteen.
27	Phase and Chemical Equilibria	Phase rule. Clausius Clapeyron equation. Phase diagram of one component systems: CO <sub>2</sub> , H <sub>2</sub> O, S; two component systems:	Class notes, Chem academy GATE ( DLP Kit)	



UNIT No.	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
		liquid-vapour, liquid-liquid and solid-liquid systems. Fractional distillation. Azeotropes and eutectics Chemical equilibria. Dependence of equilibrium constant on temperature and pressure. Non-ideal solutions	K.L Kapoor, Puri-Sharma-Pathania	Mats Hillert, Arnold Reisman, Michel Soustelle
28	Biomolecules	Structure, properties and reactions of mono- and di-saccharides, physicochemical properties of amino acids, chemical synthesis of peptides, structural features of proteins, nucleic acids, steroids, terpenoids, carotenoids, and alkaloids.	Class notes, Chem academy GATE ( DLP Kit), Paula bruice, S P Bhutani	Jonathan Clayden, Sujata V bhat, Yang Ye, N.R Krishnaswamy
29	Molecular Spectroscopy	Origin of selection rules for rotational, vibrational, electronic and Raman spectroscopy of diatomic and polyatomic molecules. Einstein coefficients. Relationship of transition moment integral with molar extinction coefficient and oscillator strength. Basic principles of nuclear magnetic resonance: nuclear g factor, chemical shift, nuclear coupling	Class notes & Chem academy (DLP Kit), Puri- Sharma-Pathania, K L Kapoor	Banwell, Levine, Peter Atkin, Charles Mortimer, J.L Mchall
30	Organometallic	18-Electron rule; metal-alkyl, metal-carbonyl, metal-olefin and metallocenes. Fluxionality in organometallic complexes. Types of organometallic reactions. Homogeneous catalysis - Hydrogenation, hydroformylation, acetic acid synthesis, metathesis and olefin oxidation. Heterogeneous catalysis - FischerTropsch reaction, Ziegler-Natta polymerization.	Class notes & Chem academy GATE (DLP Kit)	Hueey keiter, Shriver Atkins, Greenwood, Housecraft, J. Hartwig, Crabtree, Elias and Gupta, Asim K Das

### UNITWISE TOPICS SCHEDULE

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
1	Basic principles of quantum mechanics	Postulates of quantum mechanics. Time dependent and time independent Schrödinger equations. Born interpretation. Particle in a box. Harmonic oscillator. Rigid rotor. Hydrogen atom: atomic orbitals. Multi-electron atoms: orbital approximation.
2	Stereochemistry	General organic chemistry, Chirality of organic molecules with or without chiral centres and determination of their absolute configurations. Relative stereochemistry in compounds having more than one stereogenic centre. Homotopic, enantiotopic and diastereotopic atoms, groups and faces. Stereoselective and stereospecific synthesis. Conformational analysis of acyclic and cyclic compounds. Geometrical isomerism. Configurational and conformational effects, and neighbouring group participation on reactivity and selectivity/specificity
3	Approximate methods of quantum mechanics	Variation and first order perturbation techniques
	Chemical bonding	Valence bond theory and LCAO-MO theory. Hybrid orbitals. Applications of LCAO-MOT to H <sub>2</sub> <sup>+</sup> , H <sub>2</sub> and other homonuclear diatomic molecules, heteronuclear diatomic molecules like HF, CO, NO, and to simple delocalized π– electron systems. Hückel approximation and its application to annular π – electron systems
4	Solid state	Crystal systems and lattices, Miller planes, crystal packing, crystal defects, Bragg's law, ionic crystals, structures of AX, AX <sub>2</sub> , ABX <sub>3</sub> type compounds, spinels, band theory, metals and semiconductors.
5	Reaction mechanism	Basic mechanistic concepts – kinetic versus thermodynamic control, Hammond's postulate and Curtin-Hammett principle. Methods of determining reaction mechanisms through identification of products, intermediates and isotopic labeling. Nucleophilic and electrophilic substitution reactions (both aromatic and aliphatic). Addition reactions to carbon-carbon and carbon-heteroatom (N,O) multiple bonds. Elimination reactions
6	Chemical thermodynamics	Laws of thermodynamics. Standard states. Thermochemistry. Thermodynamic functions and their relationships: Gibbs-Helmholtz and Maxwell relations, van't Hoff equation. Criteria of spontaneity and equilibrium. Absolute entropy. Partial molar quantities. Thermodynamics of mixing. Chemical potential. Fugacity, activity and activity coefficients.

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
7	Chemical applications of group theory	Symmetry elements and operations. Point groups and character tables
	Radioactivity	Decay processes, half-life of radioactive elements, fission and fusion processes
8	Organic reactive intermediates	Carbocations, carbanions, carbenes, nitrenes, arynes and free radicals.
9	Main group elements and their Compounds	Hydrides, halides, oxides, oxoacids, nitrides, sulfides – shapes and reactivity. Structure and bonding of boranes, carboranes, silicones, silicates, boron nitride, borazines and phosphazenes. Allotropes of carbon. Chemistry of noble gases, pseudohalogens, and interhalogen compounds. Acid-base concepts.
10	Statistical thermodynamics	Microcanonical and canonical ensembles, Boltzmann distribution, partition functions and thermodynamic properties.
11	Lanthanides and Actinides	Recovery. Periodic properties, spectra and magnetic properties
12	Surfaces and Interfaces	Physisorption and chemisorption. Langmuir, Freundlich and BET isotherms. Surface catalysis: Langmuir-Hinshelwood mechanism. Surface tension, viscosity. Self-assembly. Physical chemistry of colloids, micelles and macromolecules.
13	Instrumental Methods of Analysis	UV-visible spectrophotometry, NMR and ESR spectroscopy, mass spectrometry. Chromatography including GC and HPLC. Electroanalytical methods- polarography, cyclic voltammetry, ion-selective electrodes. Thermoanalytical methods
14	Common named reactions and rearrangements	Applications in organic synthesis Molecular rearrangements involving electron deficient atoms

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
15	Organic synthesis	Synthesis, reactions, mechanisms and selectivity involving the following classes of compounds – alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids, esters, nitriles, halides, nitro compounds, amines and amides. Uses of Mg, Li, Cu, B, Zn and Si based reagents in organic synthesis. Carbon-carbon bond formation through coupling reactions - Heck, Suzuki, Stille and Sonogoshira. Concepts of multistep synthesis - retrosynthetic analysis, strategic disconnections, synthons and synthetic equivalents. Umpolung reactivity – formyl and acyl anion equivalents. Selectivity in organic synthesis – chemo-, regio- and stereoselectivity. Protection and deprotection of functional groups.
16	Electrochemistry and Conductance	Ionic mobility and conductivity. Debye-Hückel limiting law. Debye-Hückel-Onsager equation. Standard electrode potentials and electrochemical cells. Potentiometric and conductometric titrations
17	Pericyclic reactions	Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlations - FMO and PMO treatments
	Organic Photochemistry	Photochemistry of alkenes, arenes and carbonyl compounds. Photooxidation and photoreduction. Di- $\pi$ -methane rearrangement, Barton reaction
18	Transition elements	Basic of Chemical Bonding, Coordination chemistry – structure and isomerism, theories of bonding (VBT, CFT, and MOT). Energy level diagrams in various crystal fields, CFSE, applications of CFT, Jahn-Teller distortion. Electronic spectra of transition metal complexes: spectroscopic term symbols, selection rules, Orgel diagrams, charge-transfer spectra. Magnetic properties of transition metal complexes. Reaction mechanisms: kinetic and thermodynamic stability, substitution and redox reactions.
19	Asymmetric synthesis	Resolution (including enzymatic), desymmetrization and use of chiral auxiliaries. Carbon-carbon bond forming reactions through enolates (including boron enolates), enamines and silyl enol ethers. Michael addition reaction. Stereoselective addition to C=O groups (Cram and Felkin-Anh models).
20	Heterocyclic compound	Structure, preparation, properties and reactions of furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline
21	Bio inorganic Chemistry	Ion ( $\text{Na}^+$ and $\text{K}^+$ ) transport, oxygen binding, transport and utilization, electron transfer reactions, nitrogen fixation, metalloenzymes containing magnesium, molybdenum, iron, cobalt, copper and zinc..
22	Kinetics and Photochemistry	Transition state theory: Eyring equation, thermodynamic aspects. Potential energy surfaces and classical trajectories. Elementary, parallel, opposing and consecutive reactions. Steady state approximation. Mechanisms of complex reactions. Unimolecular reactions. Kinetics of polymerization and enzyme catalysis. Fast

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
		reaction kinetics: relaxation and flow methods. Kinetics of photochemical and photophysical processes
23	Organic Spectroscopy	Applications of UV-visible, IR, NMR and Mass spectrometry in the structural determination of organic molecules
24	Phase and Chemical Equilibria	Phase rule. Clausius Clapeyron equation. Phase diagram of one component systems: CO <sub>2</sub> , H <sub>2</sub> O, S; two component systems: liquid-vapour, liquid-liquid and solid-liquid systems. Fractional distillation. Azeotropes and eutectics Chemical equilibria. Dependence of equilibrium constant on temperature and pressure. Non-ideal solutions
25	Biomolecules	Structure, properties and reactions of mono- and di-saccharides, physicochemical properties of amino acids, chemical synthesis of peptides, structural features of proteins, nucleic acids, steroids, terpenoids, carotenoids, and alkaloids.
26	Molecular Spectroscopy	Origin of selection rules for rotational, vibrational, electronic and Raman spectroscopy of diatomic and polyatomic molecules. Einstein coefficients. Relationship of transition moment integral with molar extinction coefficient and oscillator strength. Basic principles of nuclear magnetic resonance: nuclear g factor, chemical shift, nuclear coupling
27	Organometallic	18-Electron rule; metal-alkyl, metal-carbonyl, metal-olefin and metallocene complexes and metallocenes. Fluxionality in organometallic complexes. Types of organometallic reactions. Homogeneous catalysis - Hydrogenation, hydroformylation, acetic acid synthesis, metathesis and olefin oxidation. Heterogeneous catalysis - FischerTropsch reaction, Ziegler-Natta polymerization.

### MINOR TEST SERIES SCHEDULE

S.No.	Topic	Test Date (online)
1	Chemical applications of group theory, Common named reactions and rearrangements, , Solid state	15 October 2019
2	Principles of stereochemistry, Nuclear chemistry, Bioinorganic chemistry	19 October 2019
3	Organic reaction mechanisms, Organic reactive intermediates	24 October 2019
4	Basic principles of quantum mechanics, Approximate methods of quantum mechanics, Coordination chemistry	29 October 2019
5	Organometallic compounds, Chemical bonding in diatomics, Biomolecules	02 November 2019
6	Hetrocyclic compounds, Surfaces and Interfaces, Inner transition elements,	06 November 2019
7	Organic synthesis, Kinetics and Photochemistry, Asymmetric synthesis,	11 November 2019
8	Electrochemistry and Conductance, Main group elements and their compounds, Organic Spectroscopy	15 November 2019
9	Chemical thermodynamics, Phase and Chemical Equilibria, Molecular Spectroscopy	19 November 2019
10	Statistical thermodynamics, Instrumental Methods of Analysis, , Pericyclic reactions & Organic Photochemistry	23 November 2019

## MAJOR TESTS SERIES SCHEDULE

### Major Test 1

**Date: 30 November 2019**

Physical Chemistry	Basic principles of quantum mechanics, Molecular spectroscopy, Statistical thermodynamics
Inorganic Chemistry	Main group elements and their compounds
Organic Chemistry	Stereochemistry, Organic reactive intermediates

### Major Test 2

**Date: 05 December 2019**

Physical Chemistry	Approximate methods of quantum mechanics, Chemical bonding, Chemical thermodynamics
Inorganic Chemistry	Transition elements
Organic Chemistry	Reaction mechanism, Common named reactions and rearrangements

### Major Test 3

**Date: 10 December 2019**

Physical Chemistry	Chemical applications of group theory, Phase and Chemical Equilibria
Inorganic Chemistry	Organometallic compounds, Bio inorganic Chemistry
Organic Chemistry	organic synthesis, Organic Photochemistry

### Major Test 4

**Date: 16 December 2019**

Physical Chemistry	Electrochemistry and conductance, Solid state
Inorganic Chemistry	Lanthanides and Actinides, Radioactivity
Organic Chemistry	Asymmetric synthesis, Heterocyclic compound

### Major Test 5

**Date: 20 December 2019**

Physical Chemistry	Chemical kinetics and Photochemistry, surfaces and Interfaces
Inorganic Chemistry	Instrumental Methods of Analysis
Organic Chemistry	Biomolecules, , Pericyclic reactions

## PART TESTS SERIES SCHEDULE

### **PART Test 1**

**Date: 26 December 2019**

Physical Chemistry	Basic principles of quantum mechanics, Approximate methods of quantum mechanics, Chemical bonding, Chemical applications of group theory
Inorganic Chemistry	Transition elements, Lanthanides and Actinides
Organic Chemistry	Principles of stereochemistry, Organic reactive intermediates, Organic Photochemistry, Reaction mechanism

### **PART Test 2**

**Date: 31 December 2019**

Physical Chemistry	Molecular spectroscopy, Chemical thermodynamics, Electrochemistry and Conductance, Chemical kinetics
Inorganic Chemistry	Main group elements and their compounds, Bio inorganic Chemistry
Organic Chemistry	Common named reactions and rearrangements, Concepts in organic synthesis, Pericyclic reactions, Biomolecules

### **PART Test 3**

**Date: 05 January 2019**

Physical Chemistry	Statistical thermodynamics, surfaces and Interfaces , Solid state, Molecular Spectroscopy
Inorganic Chemistry	Organometallic compounds, Nuclear chemistry, Instrumental Methods of Analysis
Organic Chemistry	Asymmetric synthesis, heterocyclic compounds, Organic Spectroscopy



## FULL TESTS SERIES SCHEDULE

### **Full Test 1**

**Date: 06 January 2020**

Physical Chemistry	Complete Syllabus for GATE
Inorganic Chemistry	Complete Syllabus for GATE
Organic Chemistry	Complete Syllabus for GATE

### **Full Test 2**

**Date: 13 January 2020**

Physical Chemistry	Complete Syllabus for GATE
Inorganic Chemistry	Complete Syllabus for GATE
Organic Chemistry	Complete Syllabus for GATE

### **Full Test 3**

**Date: 20 January 2020**

Physical Chemistry	Complete Syllabus for GATE
Inorganic Chemistry	Complete Syllabus for GATE
Organic Chemistry	Complete Syllabus for GATE

### **Full Test 4**

**Date: 27 January 2020**

Physical Chemistry	Complete Syllabus for GATE
Inorganic Chemistry	Complete Syllabus for GATE
Organic Chemistry	Complete Syllabus for GATE

### **Full Test 5**

**Date: 02 February 2020**

Physical Chemistry	Complete Syllabus for GATE
Inorganic Chemistry	Complete Syllabus for GATE
Organic Chemistry	Complete Syllabus for GATE



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**CSIR NET/JRF Chemical Science Dec 2019**  
**STARTING – Oct 2019**

**47 TESTS: 26 Unitwise Practice Test + 8 Minor Test + 5 Major Test + 3 Part Test**  
**+ 5 Full Length Tests**

**Value Addition Material + Supplementary Material: Soft copy & Hard copy**  
**(Expert Support: Telephonic Discussion/ Email Interaction)**

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**Approach & Strategy:** Our Simple, practical and focussed approach will help aspirants understand the demand of CSIR NET Exam effectively. Our strategy is to constantly innovate to keep the preparation process dynamic and give personalized attention to individual aspirants based on factor core competence, availability of time and resource and the requirement of CSIR NET Exam.

**Our interactive Learning approach (Email/Telephonic Discussion: Expert with Aspirants) will continuously improve aspirant’s performance and move their preparation in the right direction.**

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**Fee (Incl. all taxes): Rs 4500/-**

**Nature:** Flexible- **Date of Mock Test: Reschedule on the demand of aspirants. (POSTPONE, BUT NOT PREPONE)**

**What you will get:**

- Login ID Password for performance analysis of aspirants. (Innovative Assessment System including POST TEST ANALYSIS)
- 47 Mock Test Papers & detailed conceptual Answer Explanations.
- Analysis of Mock Test papers based on difficulty level & nature of questions.
- Comprehensive analysis of previous year questions papers.

## INNOVATIVE ASSESSMENT SYSTEM:

Static & dynamic Potential of Mock test papers (Scoring Potential). Macro & Micro performance Analysis of aspirants, Section wise analysis, Difficulty Analysis, All India Rank, comparison with toppers, Geographical Analysis, Integrated Score Card, Analysis of Mock Test paper based on difficulty level & nature of question etc.

**HOW IT WORKS:** The tests are planned at Five different levels of preparation required for a student to succeed in CSIR NET/JRF.

**1. Unit level- Test 1 to 26:** Each test will be based entirely on the most unit sources of that particular section. Here we will test whether you have thoroughly prepared these unit sources or not and if you have understood all the basic concepts or not. These tests will be available on Chem Academy Portal right from your date of enrolment, you can give these test anytime as per your convenience. These papers are developed in order to boost your foundation and effective preparation of every particular unit mentioned in CSIR NET/JRF Syllabus. These are three hour tests each containing 60 questions based on CSIR NET Syllabus . These are just practice papers.

**2. Applied level (Minor, Major) – Test 27 to 34 & 35 to 39:** In this level, we will test your subject knowledge at an applied level. Test would be more analytical in nature, application oriented with relevance to recent concepts. These tests would not be restricted to few particular sources and it would cover the entire primary, Secondary and other sources. These tests are of 3 hours, each containing as expected 100 questions pertaining to Chemistry subject.

**3. Comprehensive level ( Part and Full test) -Test 40 to 42 AND 43 TO 47:** These are Full Length (FLT) covering all the levels of difficulty and all the types of questions similar to the CSIR NET paper. These tests will validate that your preparation is complete and you have achieved that extra edge to succeed in CSIR NET/JRF. Part test will again comprise of 100 questions each. In Part Tests number of topics (from each Physical, Inorganic and Organic Chemistry) are more compared to Major tests and eventually in Full tests you will have 120 questions, 20 questions from General Aptitude.

## DISCLAIMER

- **Chem academy material is for the individual only. In case a student is found involved in any violation of copyrights of Chem academy material, the admission to the test series will be cancelled.**
- **We have facility of fee payment in cash too.**
- **Fee once paid is non-refundable and non-transferable in all circumstances**
- **Chem academy reserves all rights related to admission.**
- **Chem academy reserves all rights to make any changes in test series schedule/ test writing days and timing etc., if need so arises.**

### **UNITWISE SYLLABUS- CONTENT & REFERENCES**

<b>Units</b>	<b>Topics</b>	<b>Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)</b>	<b>Primary (Essential) Reference</b>	<b>Secondary (Additional) Reference</b>
1	Solvent theory	Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents.	Class notes, Chem Academy NET ( DLP Kit)	Hueeykeiter, MiesslerTarr
2	Atomic and Spectroscopy	Term symbols; many-electron systems and antisymmetry principle.	Class notes, Chem Academy NET ( DLP Kit)	Peter Atkins, Engel & Reid,
3	Introduction to Organic Chemistry	IUPAC nomenclature of organic molecules including regio- and stereoisomers.	11 <sup>th</sup> NCERT, Classnotes, Chem Academy NET ( DLP Kit)	Paula Bruice, Carey Sandberg, Jerry March
4	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	Classnotes, Chem Academy NET ( DLP Kit)	David J Griffith, Eugen Merzbacher, Peter Atkins, Tamas Veszpremi
5	Principle of Stereochemistry	Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.	Class notes, Chem Academy NET ( DLP Kit)	Subratosen Gupta, P S Kalsi, Jonathanclayden, Ernest Eliel
6	Chemical bonding	Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).	11 <sup>th</sup> NCERT, class notes Chem Academy NET ( DLP Kit)	HueeyKieter, Shriver Atkins, MiesslerTarr E. Housecraft
7	Approximate methods of quantum mechanics	Variational principle; perturbation theory up to second order in energy; applications.	Class notes Chem Academy NET ( DLP Kit), K L Kapoor	Castellen, Charles Mortimer, Puri Sharma Pathania, Donald Macquarrie

Units	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
8	Solid state	Crystal structures; Bragg's law and applications; band structure of solids.	12 <sup>th</sup> NCERT, Class notes, Chem Academy NET ( DLP Kit ), K L Kapoor	Hueey, Castellen, Charles Mortimer, A.R West
9	Reaction mechanism	Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways	12 <sup>th</sup> NCERT Class notes, Chem Academy NET ( DLP Kit )	Jonathan clayden, , Carey Sandberg, George Zweifel
10	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	11 <sup>th</sup> NCERT, Class notes, Chem Academy NET ( DLP Kit) K L Kapoor,	R.E Sonntag, Peter Atkin, Castellen, Charles Mortimer, Ira Lavine, J Bevan ott, R.M Rosenberg
11	Chemical bonding in diatomics	elementary concepts of MO and VB theories; Huckel theory for conjugated $\pi$ -electron systems.	Class notes, Chem Academy NET ( DLP Kit)	K L Kapoor, Puri Sharma Pathania, <b>McQuarrie Donald A</b>
12	Periodic properties of elements	Periodic classification of elements and periodicity in properties; general methods of isolation and purification of elements	11 <sup>th</sup> NCERT, Class notes, Chem Academy NET ( DLP Kit)	Shriver Atkins, Cathrine E Housecraft, MiesslerTarr, Hueeykieter
13	Chemical applications of group theory	Symmetry elements, point groups, character tables, selection rules.	Class notes, Chem Academy NET ( DLP Kit)	Swarnlakshmi, Asok K Mukherjee, Robert L. Carter

Units	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
14	Organic reactive intermediates	Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes.	Class notes, Chem Academy NET (DLP Kit) I L Finar Solomanfryle	Peter sykes Paula bruice, Jonathan clayden, Jerry March, George Zwiefel, Ernest Eliel, M.A Singh
15	Main group elements and their Compounds	Allotropy, synthesis, structure and bonding, industrial importance of the compounds.	11 <sup>th</sup> , 12 <sup>th</sup> NCERT, Classnotes, Chem academy NET ( DLP Kit)	HueeyKieter, Shriver Atkins, GreenWood, Cotton & Wilkinson, MiesslerTarr, Ajay Kumar
16	Statistical thermodynamics	Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems	Classnotes, Chem academy NET ( DLP Kit)	Terrell L hill, Ashley H carter, Herbert Callen, Andrew Maczek
17	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.	Class notes, Chem academy NET ( DLP Kit)	Jerry March, Paula bruice, Carey Sandberg, Carruthers Jonathan clayden, George Zweifel
18	Inner transition elements	Spectral and magnetic properties, redox chemistry, analytical applications	12 <sup>th</sup> NCERT, Chem academy NET ( DLP Kit)	Ajay kumar, E.Housecraft, Greenwood, Cotton & Wilkinson,

Units	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
				ShriverAtkin, Simon Cotton
19	Colloids and surfaces	Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis	Classnotes, Chem academy NET ( DLP Kit)	Paul C Hiemenz, Duncan J shaw, Pashley Richard, K S birdi
20	Polymer chemistry	Molar masses, kinetics of polymerization	Classnotes, Chem academy NET ( DLP Kit)	Charles E charrarher, ARavve, George Odian, Fred W Billmeyer, John Nicholson
21	Nuclear chemistry	Nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.	Class notes, Chem academy NET ( DLP Kit)	Asim K Das vol 1, PuriSharma pathania
22	Aromaticity	Benzenoid and non-benzenoid compounds – generation and reactions.	Class notes, Chem academy ( DLP Kit)	J. Clayden, Jerry March, David R Waring, G. Badger
23	Common named reactions and rearrangements	applications in organic synthesis	12 <sup>th</sup> NCERT, Class notes, Chem academy NET ( DLP Kit), I.LFinar	George Zweifel, Ernest Eliel, Carey Sandberg,Paula bruice, Jonathan clayden,
24	Concepts in organic synthesis	Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.	Class notes, Chem academy NET ( DLP Kit)	George Zweifel, Carey Sandberg, stuart Warren, Michael B Smith
		Nernst equation, redox systems, electrochemical cells; Debye-	12 <sup>th</sup> NCERT, Class notes,	Engel & Reid, Castellen,

Units	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
25	Electrochemistry	Huckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.	Chem Academy NET (DLP Kit), K L Kapoor	Charles Mortimer, Ira Levine, Bard and Faulkner
26	Pericyclic reactions	Electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.	class notes, Chem Academy NET (DLP Kit), Paulabruice, D K Mandal	Jonathan Clayden, C. Sandberg, Jerry March, G. Zweifel, Ian Fleming
27	Transition elements and Coordination complexes	Structure, bonding theories, spectral and magnetic properties, reaction mechanisms.	12 <sup>th</sup> NCERT, Class notes, Chem academy NET (DLP Kit)	HueeyKieter, shriveratkins, MiesslerTarr, Catherine E.Housecraft, G. Lawrence. Greenwood, Cotton wilkinson
28	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.	Class notes, Chem academy NET (DLP Kit)	Jonathan Clayden, C. Sandberg, Jerry March, George Zweifel, Carrutherus, R.E Gawley
29	Heterocyclic chemistry	Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).	Class notes, Chem academy NET (DLP Kit), S P Bhutani	Jonathan clayden, John Joule and Keith Mills, Beena Negi and R.K Parashar, A.R Katritzky
30	Bio inorganic Chemistry	Photosystems, porphyrins, metalloenzymes, oxygen transport, electron-transfer reactions; nitrogen fixation, metal complexes in medicine.	Class notes, Chem academy NET (DLP Kit)	HueeyKieter, Asim K Das, Stephen J. Lippard, J D Lee, M.R Malone
31	Chemical kinetics	Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of	12 <sup>th</sup> NCERT, class notes, Chem academy	Castellen, Charles Mortimer, Peter



Units	Topics	Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)	Primary (Essential) Reference	Secondary (Additional) Reference
		reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.	NET ( DLP Kit), K L Kapoor	Atkins, Ira Levine, Laidler, Engel & Reid, Paul housten
32	Qualitative Organic Analysis	Structure determination of organic compounds by IR, UV-Vis, <sup>1</sup> H & <sup>13</sup> C NMR and Mass spectroscopic techniques	Class notes, Chem academy NET ( DLP Kit) Y R Sharma, JDS Yadev	William Kemp, J. Clayden, Pavia- Lampman-kriz, Silversteen.
33	Inorganic Spectroscopy	Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques.	Chem academy Booklet and class notes	E. Housecraft, J Yarwood S B Duckett, Gary J Long
34	Data analysis	Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.	Chem. Academy Aptitude booklet	
35	Chemistry of natural products	Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids	Class notes, Chem academyNET ( DLP Kit), Paula bruice, S P Bhutani	Jonathan Clayden, Sujata V bhat, Yang Ye, N.R Krishnaswamy
36	Analytical chemistry	Separation, spectroscopic, electro- and thermoanalytical methods.	Class notes, Chem academy NET ( DLP Kit)	F.W. Fifield, Jessica Carol
37	Cage and Cluster	Carboranes, metalloboranes	Classnotes, Chem academy NET ( DLP Kit)	Darlmcdaniel- Alexander- Douglas, Crabtree, Elias and gupta
38	Molecular Spectroscopy	Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.	Class notes & Chem academy (DLP Kit),Puri- Sharma- Pathania, K L Kapoor	Banwell, Levine, Peter Atkin, Charles Mortimer, J.L Mchall
				Hueeykeiter,

<b>Units</b>	<b>Topics</b>	<b>Syllabus covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)</b>	<b>Primary (Essential) Reference</b>	<b>Secondary (Additional) Reference</b>
39	Organometallic	Synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis.	Class notes & Chem academy (DLP Kit)	Shriver Atkins, Greenwood, Housecraft, J. Hartwig, Crabtree, Elias and Gupta, Asim K Das

### UNITWISE TEST TOPICS SCHEDULE

<b>TEST No.</b>	<b>Syllabus</b>	<b>Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)</b>
1	Atomic and Molecular Spectroscopy	Term symbols; many-electron systems and antisymmetry principle. Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.
2	Introduction to Organic Chemistry	IUPAC nomenclature of organic molecules including regio- and stereoisomers.
	Aromaticity	Benzenoid and non-benzenoid compounds – generation and reactions.
3	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	Principle of Stereochemistry	Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
5	Chemical bonding	Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).
	Periodic properties of elements	Periodic classification of elements and periodicity in properties; general methods of isolation and purification of elements

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
6	Approximate methods of quantum mechanics	Variational principle; perturbation theory up to second order in energy; applications.
	Chemical bonding in diatomics	Elementary concepts of MO and VB theories; Huckel theory for conjugated $\pi$ -electron systems
7	Solid state	Crystal structures; Bragg's law and applications; band structure of solids.
	Nuclear chemistry	Nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.
8	Reaction mechanism	Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways
9	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
	Statistical thermodynamics	Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems
10	Chemical applications of group theory	Symmetry elements, point groups, character tables, selection rules.
	Polymer chemistry	Molar masses, kinetics of polymerization
11	Organic reactive intermediates	Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes.

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
12	Main group elements and their Compounds	Allotropy, synthesis, structure and bonding, industrial importance of the compounds.
	Solvent theory	Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents
13	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.
14	Inner transition elements	Spectral and magnetic properties, redox chemistry, analytical applications
	Bio inorganic Chemistry	Photosystems, porphyrins, metalloenzymes, oxygen transport, electron-transfer reactions; nitrogen fixation, metal complexes in medicine
15	Colloids and surfaces	Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis
16	Common named reactions and rearrangements	applications in organic synthesis
17	Concepts in organic synthesis	Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.
18	Electrochemistry and Conductance	Nernst equation, redox systems, electrochemical cells; Debye-Huckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.
19	Pericyclic reactions & Photochemistry	Electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.
20	Transition elements and Coordination complexes	Structure, bonding theories, spectral and magnetic properties, reaction mechanisms.
21	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.
	Heterocyclic chemistry	Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).

TEST No.	Syllabus	Topic covered (The list is indicative to help students; however, it is not exhaustive. A topic may have more subtopics)
22	Chemistry of natural products	Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids
23	Chemical kinetics & Photochemistry	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.
24	Qualitative Organic Analysis	Structure determination of organic compounds by IR, UV-Vis, <sup>1</sup> H & <sup>13</sup> C NMR and Mass spectroscopic techniques
	Inorganic Spectroscopy	Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques.
25	Data analysis	Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.
	Analytical chemistry	Separation, spectroscopic, electro- and thermoanalytical methods.
26	Organometallic and Cage and Cluster	Synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis. Carboranes, metalloboranes

## MINOR TESTS

### Scheduled Syllabus for Minor Test papers

S.No.	Topic	Dates
1	Chemical applications of group theory, Structure and bonding, IUPAC nomenclature, General Organic Chemistry (Aromaticity)	02 October 2019
2	Solid state, Chemical periodicity, Common named reactions and rearrangements (Enolate Chemistry), Conductance.	05 October 2019
3	Nuclear chemistry, Principles of stereochemistry, Organic reaction mechanisms, Bioinorganic chemistry.	09 October 2019

4	Organic transformations and reagents, Organic reactive intermediates, Basic principles of quantum mechanics, Approximate methods of quantum mechanics, Chemistry of natural products.	12 October 2019
5	Coordination chemistry, Organometallic compounds, Cages and metal clusters, heterocyclic compounds, Chemical bonding in diatomics.	16 October 2019
6	Colloids and surfaces, Inner transition elements, Chemical kinetics, Concepts in organic synthesis, Asymmetric synthesis.	19 October 2019
7	Structure determination of organic compounds, Electrochemistry, Main group elements and their compounds, Concepts of acids and bases, Atomic structure and Molecular spectroscopy, Inorganic Spectra	23 October 2019
8	Polymer chemistry, Analytical chemistry, Chemical thermodynamics, Statistical thermodynamics, Pericyclic reactions	26 October 2019

## MAJOR TESTS SERIES SYLLABUS

### Major Test 1

**Date 30 October 2019**

Physical Chemistry	Chemical applications of group theory, Solid state, Conductance.
Inorganic Chemistry	Structure and bonding, Chemical periodicity, Bioinorganic chemistry.
Organic Chemistry	IUPAC nomenclature, General Organic Chemistry (Aromaticity).

### Major Test 2

**Date 04 November 2019**

Physical Chemistry	Basic principles of quantum mechanics, Approximate methods of quantum mechanics, Chemical bonding in diatomics.
Inorganic Chemistry	Nuclear chemistry, Transition elements and coordination compounds.
Organic Chemistry	Principles of stereochemistry, Organic reactive intermediates, Common named reactions and rearrangements.

### Major Test 3

**Date 07 November 2019**

Physical Chemistry	Chemical kinetics, Colloids and surfaces.
Inorganic Chemistry	Organometallic compounds, Cages and metal clusters. Concepts of acids and bases.
Organic Chemistry	Organic reaction mechanisms, Organic transformations and reagents, Chemistry of natural products.

### Major Test 4

**Date 11 November 2019**

Physical Chemistry	Atomic structure and molecular spectroscopy, Electrochemistry.
Inorganic Chemistry	Main group elements and their compounds, Inner transition elements, Inorganic spectra.
Organic Chemistry	heterocyclic compounds, Asymmetric synthesis, Pericyclic reactions.

### Major Test 5

**Date 14 November 2019**

Physical Chemistry	Polymer chemistry, Chemical thermodynamics, Statistical thermodynamics.
	Analytical chemistry and Data Analysis.
Organic Chemistry	Structure determination of organic compounds, Pericyclic reactions, Concepts in organic synthesis.

## PART TESTS SERIES SCHEDULE

### PART Test 1

**Date: 17<sup>th</sup> November 2019**

Physical Chemistry	Basic principles of quantum mechanics, Approximate methods of quantum mechanics, Atomic structure and spectroscopy, Chemical bonding in diatomics, Chemical applications of group theory
Inorganic Chemistry	Chemical periodicity, Structure and bonding, Concepts of acids and bases, Transition elements and coordination compounds
Organic Chemistry	IUPAC nomenclature, Principles of stereochemistry, Aromaticity, Organic reactive intermediates

### PART Test 2

**Date: 21<sup>st</sup> November 2019**

Physical Chemistry	Molecular spectroscopy, Chemical thermodynamics, Electrochemistry, Chemical kinetics
Inorganic Chemistry	Main group elements and their compounds, Inner transition elements, Cages and metal clusters, Analytical chemistry
Organic Chemistry	Organic reaction mechanisms, Common named reactions and rearrangements, Organic transformations and reagents, Concepts in organic synthesis, Pericyclic reactions

### PART Test 3

**Date: 25<sup>th</sup> November 2019**

Physical Chemistry	Statistical thermodynamics, Colloids and surfaces, Solid state, Polymer chemistry, Data analysis
Inorganic Chemistry	Organometallic compounds, Bioinorganic chemistry, Inorganic Spectra, Nuclear chemistry
Organic Chemistry	Asymmetric synthesis, heterocyclic compounds, Chemistry of natural products, Structure determination of organic compounds



## **FULL TESTS SERIES SCHEDULE**

### **Full Test 1**

**Date: 28<sup>th</sup> November 2019**

Physical Chemistry	Complete Syllabus for CSIR NET
Inorganic Chemistry	Complete Syllabus for CSIR NET
Organic Chemistry	Complete Syllabus for CSIR NET

### **Full Test 2**

**Date: 02<sup>nd</sup> December 2019**

Physical Chemistry	Complete Syllabus for CSIR NET
Inorganic Chemistry	Complete Syllabus for CSIR NET
Organic Chemistry	Complete Syllabus for CSIR NET

### **Full Test 3**

**Date: 06<sup>th</sup> December 2019**

Physical Chemistry	Complete Syllabus for CSIR NET
Inorganic Chemistry	Complete Syllabus for CSIR NET
Organic Chemistry	Complete Syllabus for CSIR NET

### **Full Test 4**

**Date: 09<sup>th</sup> December 2019**

Physical Chemistry	Complete Syllabus for CSIR NET
Inorganic Chemistry	Complete Syllabus for CSIR NET
Organic Chemistry	Complete Syllabus for CSIR NET

### **Full Test 5**

**Date: 12<sup>th</sup> December 2019**

Physical Chemistry	Complete Syllabus for CSIR NET
Inorganic Chemistry	Complete Syllabus for CSIR NET
Organic Chemistry	Complete Syllabus for CSIR NET

