

Unit-II

Date	Topic
13-06-2022	Recaptulation of basic concepts in chemistry
15-06-2022	Syllabus discussion
2.1 Atomic structure: (10L)	
20-06-2022	a) Historical perspectives of the atomic structure; Rutherford's Atomic Model,
22-06-2022	Bohr's theory, its limitations and atomic spectrum of hydrogen atom.
	Structure of hydrogen atom
27-06-2022	b) Hydrogenic atoms:
	1. Simple principles of quantum mechanics;
29-06-2022	2. Atomic orbitals
	i) Hydrogenic energy levels
04-06-2022	ii) Shells, subshells and orbitals
	iii) Electron spin
06-06-2022	iv) Radial shapes of orbitals
04-07-2022	v) Radial distribution function
	vi) Angular shapes of orbitals.
	3. Many Electron Atoms
06-07-2022	i) Penetration and shielding
11-07-2022	ii) Effective nuclear charge 4. Aufbau principle
2.2: Periodic Table and periodicity : (5L)	
13-07-2022	Long form of Periodic Table;
18-07-2022	Classification for elements as main group, transition and inner transition elements;
20-07-2022	Periodicity in the following properties : Atomic and ionic size;
	electron gain enthalpy;
25-07-2022	ionization enthalpy, effective nuclear charge (Slater's rule);

F.Y.B.Sc. Chemistry Sem - I Paper - II Paper

Unit - II

2.0 Comparative chemistry of Main Group Elements: (15L)	
27-07-2022	Metallic and non-metallic nature, oxidation states,
01-08-2022	electronegativity, anomalous behaviour of second period elements,
03-08-2022	allotropy, catenation,
08-08-2022	diagonal relationship.
10-08-2022	Comparative chemistry of carbides,
17-08-2022	nitrides, oxides
22-08-2022	hydroxides of group I and group II elements.
24-08-2022	Some important compounds- NaHCO ₃ , Na ₂ CO ₃
30-08-2022	NaCl, NaOH,
07-09-2022	CaO, CaCO ₃ ;
12-09-2022	oxides of carbon,
14-09-2022	oxides and oxyacids of sulphur and nitrogen
19-09-2022	with respect to environmental aspects.
21-09-2022	Revision

26-09-2022	Revision
28-09-2022	Revision

Date	Topic
07-12-2022	3. Basics of Organic Chemistry 3.1 Classification and Nomenclature of Organic Compounds: (5L) Review of basic rules of IUPAC nomenclature.
19/07/2022	Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: alkanes, alkenes, alkynes, haloalkanes, alcohols, ethers, aldehydes, ketones, carboxylic acids, carboxylic acid derivatives
	Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: ethers, aldehydes, ketones, carboxylic
	Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: acid halides, esters, anhydrides, amides), nitro compounds,
	Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: nitriles and amines; including their cyclic analogues
	Bonding and Structure of organic compounds: Hybridization: sp ³ , sp ² , sp hybridization of carbon
	Hybridization: sp ³ , sp ² , sp hybridization of nitrogen;
	Hybridization: sp ³ , sp ² , sp hybridization of oxygen in Organic compounds (alcohol, ether, aldehyde, ketone, carboxylic acid, ester,
	Overlap of atomic orbitals: Overlaps of atomic orbitals to form sigma and pi bonds, shapes of organic molecules. Shapes of molecules; Influence of hybridization on bond properties (as applicable to ethane, ethene, ethyne)
	Fundamentals of organic reaction mechanism: Electronic Effects: Inductive, electromeric, resonance and mesomeric effects,
	hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strengths.
	Bond fission: Homolytic and Heterolytic fission with suitable examples.
	Electrophiles and Nucleophiles; Nucleophilicity and basicity;
	Types (primary, secondary, tertiary, allyl, benzyl), shape and their relative stability of reactive intermediates: Carbocations, Carbanions and Free radicals.
Introduction to types of organic reactions: Addition, Elimination and Substitution reaction. (With one example of each)	

S.Y.B.Sc Chemistry Sem-III Paper - I

Date	Topic
13-06-2022	Rectulation of previous year syllabus
14-06-2022	Sem-III syllabus discussion
UNIT-II Chemical Bonding	
20-07-2022	2.1.1 Ionic Bond: Conditions for the Formation of Ionic Bond.
	2.1.2 Types of Ionic Crystals
27-07-2022	2.1.3 Radius Ratio Rules
	2.1.4 Lattice Energy, Born-Landé Equation
	2.1.5 Kapustinski Equation
04-07-2022	2.1.6 Born-Haber Cycle and its Application

2.2. Directional Bonding: Orbital Approach.	
11-07-2022	2.2.1 Covalent Bonding The Valence Bond Theory- Introduction and basic tenets.
	2.2.2 Interaction between two hydrogen atoms and the Potential energy diagram of the resultant system
18-07-2022	2.2.3 Corrections applied to the system of two hydrogen atoms- Formation of H ₂
25-07-2022	2.2.4 Homonuclear diatomic molecules from He ₂ to Ne ₂
01-08-2022	2.2.5 Resonance and the concept of Formal Charge; Rules for Resonance or Canonical structures.
08-08-2022	2.2.6 Bonding in Polyatomic Species: The role of Hybridization. And types of hybrid orbitals-sp, sp ² , sp ³ , sp ³ d, sp ² d ² and sp ² d sp ³ d ² .
	2.2.7 Equivalent and Non-Equivalent hybrid orbitals
22-08-2022	2.2.8 Contribution of a given atomic orbital to the hybrid orbitals (with reference to sp ³ hybridisation as in CH ₄ , NH ₃ and H ₂ O and series like NH ₃ , PH ₃ , AsH ₃ , BiH ₃)
2.3 Molecular Orbital Theory (5L)	
29-08-2022	2.3.1. Comparing Atomic Orbitals and Molecular Orbitals.
05-09-2022	2.3.2. Linear combination of atomic orbitals. to give molecular orbitals LCAO_ x0002_ MO approach for diatomic homonuclear molecules).
12-09-2022	2.3.4. Wave mechanical treatment for molecular orbitals (H ₂ ⁺ and H ₂)
19-09-2022	2.3.4 Molecular orbital Theory and Bond Order and magnetic property: with reference to O ₂ , O ₂ ⁺ O ₂ ⁻ , O ₂ ²⁻ (Problems and numerical problems expected wherever possible)
26-09-2022	Numericals

Date	Topic
14/06/2022	Basic
21/06/2022	Syllabus Discussion
28/07/2022	Unit III: Organic Chemistry 3.1.1. Reactions and reactivity of halogenated hydrocarbons: [4L] 3.1.1. Alkyl halides: Nucleophilic substitution reactions:
07-05-2022	SN ₁ ,
07-12-2022	SN ₂
07-12-2022	and S _N i mechanisms with stereochemical aspects and factors affecting nucleophilic substitution reactions-nature of substrate, solvent, nucleophilic reagent and leaving group.
19-07-2022	3.1.2. Aryl halides: Reactivity of aryl halides towards nucleophilic substitution reactions.
26-07-2022	Nucleophilic aromatic substitution (S _N Ar) addition-elimination mechanism and benzyne mechanism.
08-02-2022	3.1.2. Organomagnesium and organolithium compounds: [3L]
23-08-2022	Nomenclature, nature, type and reactivity of carbon-metal bond.
30-08-2022	Preparation using alkyl / aryl halide. Structure, stability and reactions with compounds containing acidic hydrogen, carbonyl compounds, CO ₂ , cyanides and epoxides.
09-05-2022	3.2 Alcohols, phenols and epoxides: [8L]
13-09-2022	3.2.1. Alcohols: Nomenclature, Preparation: Hydration of alkenes, hydrolysis of alkyl halides,
20-09-2022	reduction of aldehydes and ketones, using Grignard reagent. Properties: Hydrogen bonding, types and
27-09-2022	effect of hydrogen bonding on different properties. Acidity of alcohols, Reactions of alcohols

10-03-2022	3.2.2. Phenols: Preparation, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols.
10-04-2022	3.2.3. Epoxides: Nomenclature, methods of preparation and reactions of epoxides: reactivity, ring opening reactions by nucleophiles (a) In acidic conditions: hydrolysis, reaction with halogen halide, alcohol, hydrogen cyanide. (b) In neutral or basic conditions: ammonia, amines, Grignard reagents, alkoxides.

S.Y.B.Sc Chemistry Sem-III Paper - II

2. Selected topics on p block elements (15L)

16-06-2022	Syllabus Discussion
2.1 Chemistry of Boron compounds	
23-06-2022	2.1.1 Electron deficient compounds – BH ₃ , BF ₃ , BCl ₃ with respect to Lewis acidity and applications.
30-06-2022 & 07-07-2022	2.1.2 Preparation of simple boranes like diborane and tetraborane.
14-07-2022 & 21-07-2022	2.1.3 Structure and bonding in diborane and tetraborane (2e-3c bonds)
28-07-2022	2.1.4 Synthesis of Borax.
2.2 Chemistry of Silicon and Germanium	
04-08-2022 & 11-08-2022	2.2.1 Silicon compounds: Occurrence, Structure and inertness of SiO ₂
11-08-2022	2.2.2 Preparation and structure of SiCl ₄
18-08-2022	2.2.3 Occurrence and extraction of Germanium
25-08-2022	2.2.4 Preparation of extra pure Silicon and Germanium
2.3 Chemistry of Nitrogen family	
01-09-2022, 08-09-2022	2.3.1 Trends in chemical reactivity - Formation of hydrides, halides, oxides with special reference to oxides of nitrogen.
15-09-2022, 22-09-2022	2.3.2 Oxides of nitrogen with respect to preparation and structure of NO, NO ₂ , N ₂ O and N ₂ O ₄ .
29-09-2022	2.3.3 Synthesis of ammonia by Bosch – Haber process
Unit III: Organic Chemistry Carbonyl Compounds: [15L]	
Date	Topic
13/06/2022	3.1 Nomenclature of aliphatic, alicyclic and aromatic carbonyl compounds.
20/06/2022	Structure, reactivity of aldehydes and ketones and methods of preparation
27/06/2022	Oxidation of primary and secondary alcohols using PCC, hydration of alkynes, action of Grignard reagent on esters
07-04-2022	Rosenmund reduction, Gattermann – Koch formylation and Friedel Craft acylation of arenes
07-11-2022	3.2 General mechanism of nucleophilic addition, and acid catalyzed nucleophilic addition reactions
07-11-2022	3.3 Reactions of aldehydes and ketones with NaHSO ₃ , HCN, RMgX, alcohol, amine, phenyl hydra
18-07-2022	zinc, 2,4-Dinitrophenyl hydrazine, LiAlH ₄ and NaBH ₄
25-07-2022	3.4 Mechanisms of following reactions: Benzoin condensation,

08-01-2022	Knoevenagel condensation
08-08-2022	Claisen-Schmidt and Cannizzaro reaction
22-08-2022	3.5 Keto-enol tautomerism: Mechanism of acid
29-08-2022	3.6 Active methylene compounds:
09-12-2022	Acetylacetone, ethyl acetoacetate diethyl malonate, stabilised enols
19-09-2022	base catalysed enolization
26-09-2022	Reactions of Acetylacetone and ethyl acetoacetate (alkylation, conversion to ketone, mono- and dicarboxylic acid)

T.Y.B.Sc. Sem-V Paper - II Inorganic Chemistry

Date	Topic
13/06/2022	Recaptulation of Basic Concepts in Chemistry
14-06-2022	Recaptulation of Basic Concepts in Chemistry
16-06-2022	Discussion about previous year syllabus
17-06-2022	Fifth Semester Syllabus Discussion
20-06-2022	UNIT-III 3.1 Introduction: lanthanides and actinides Position in periodic table
21-06-2022	Electronic configuration of lanthanides and actinides
23-06-2022	3.2 Chemistry of Lanthanides with reference to (i) lanthanide
	contraction and its consequences
24-06-2022	(ii) Oxidation states (iii) Ability to form complexes
27-06-2022	(iv) Magnetic and
28-06-2022	spectral properties
30-06-2022	3.3 :Occurrence, extraction and separation of lanthanides
01-07-2022	by (i) Ion Exchange method
04-07-2022	and (ii) Solvent extraction method (Principles and technique)
05-07-2022	3.4 Applications of lanthanides
	UNIT-IV
	4.1 Chemistry of Non-aqueous Solvents
07-07-2022	4.1.1 Classification of solvents and
08-07-2022	importance of non-aqueous solvents
	4.1.2 Characteristics and study solvents with respect to
11-07-2022	(i) acid-base reactions and
12-07-2022	(ii) redox reactions.
14-07-2022	1. liquid ammonia,
	2. dinitrogen tetra oxide as non-aqueous solvents
	4.2 Comparative Chemistry of Group 16
18-07-2022	4.2.1 Electronic configurations,
19-07-2022	trends in physical properties,
21-07-2022	allotropy
22-07-2022	4.2.2 Manufacture of sulphuric acid by Contact process.
25-07-2022	Manufacture of sulphuric acid by Contact process.
	4.3 Comparative Chemistry of Group 17 (5L)
26-07-2022	4.3.1 Electronic configuration , General characteristics, anomalous properties of fluorine,
28-07-2022	comparative study of acidity of oxyacids of chlorine w.r.t acidity,
29-07-2022	oxidising properties and structures(on the basis of VSEPR theory)
01-08-2022	4.3.2 Chemistry of interhalogens with reference to preparations,
02-08-2022	properties and structures (on the basis of VSEPR theory) .
	UNIT-II

2.1 Structures of Solids	
04-08-2022	2.2.1 Explanation of terms viz. crystal lattice, lattice point,
05-08-2022	unit cell and lattice constants.
08-08-2022	2.1.2 Closest packing of rigid spheres (hcp, ccp),
11-08-2022	packing density in simple cubic,
12-08-2022	bcc and fcc lattices.
18-08-2022	Relationship between density, radius of unit cell and lattice parameters.
19-08-2022	2.1.3 Stoichiometric Point defects in solids (discussion on Frenkel
22-08-2022	and Schottky defects expected).
23-08-2022	Numericals
25-08-2022	Numericals
2.2 Superconductivity	
26-08-2022	2.2.1 Discovery of superconductivity.
29-08-2022	2.2.2 Explanation of terms like superconductivity, transition
30-08-2022	temperature, Meissner effect.
05-09-2022	2.2.3 Different types of super conductors viz. conventional superconductors,
06-09-2022	alkali metal fullerenes, high temperature super conductors.
08-09-2022	2.2.4 Brief application of superconductors.
UNIT-I	
1.1 Molecular Symmetry	
09-09-2022	1.1.1 Introduction and Importance of Symmetry in Chemistry.
12-09-2022	1.1.2 Symmetry elements and Symmetry operations.
13-09-2022	1.1.3 Concept of a Point Group with illustrations using the
15-09-2022	following point groups : (i) $C_{\infty v}$ (ii) $D_{\infty h}$
16-09-2022	(iii) C_{2v} (iv) C_{3v}
	(v) C_{2h} and (vi) D_{3h}
1.2 Molecular Orbital Theory for heteronuclear diatomic molecules and polyatomic species	
19-09-2022	1.2.1 Comparison between homonuclear and heteronuclear diatomic molecules.
20-09-2022	1.2.2. Heteronuclear diatomic molecules like CO,
22-09-2022	NO and HCl,
23-09-2022	appreciation of modified MO diagram for CO.
26-09-2022	1.2.3 Molecular orbital theory for H_2 and H_2^+ (correlation diagram expected).
27-09-2022	1.2.4. Molecular shape to molecular orbital approach in AB_2 molecules.
29-09-2022	Application of symmetry concepts for linear and angular species considering σ -bonding only
30-09-2022	(Examples like : i) BeH_2 , ii) H_2O).

T.Y.B.Sc Sem- V Paper - III Organic Chemistry

Unit-I

Date	Topic
14/06/2022	Syllabus DISCUSSION AND BASIC
15/06/2022	Unit I 1.1 Mechanism of organic reactions (10 L) 1.1.1 The basic terms & concepts: bond fission, reaction intermediates
16/06/2022	electrophiles & nucleophiles, ligand, base,
18/06/2022	electrophilicity vs. acidity & nucleophilicity vs basicity.
21/06/2022	1.1.2 Neighbouring group participation in nucleophilic substitution reactions
22-06-2022	participation of lone pair of electrons, kinetics and stereochemical outcome
23/06/2022	1.1.3 Acyl nucleophilic substitution (Tetrahedral mechanism):
25/06/2022	Acid catalyzed esterification of carboxylic acids (AAC2) and base promoted hydrolysis of esters (BAC2).

28/06/2022	1.1.4 Pericyclic reactions, classification and nomenclature
29/06/2022	1.1.4.1 Electro cyclic reactions (ring opening and ring closing), cycloaddition, sigma tropic Rearrangement, group transfer reactions, cheletropic reaction (definition and one example of each type)
30/06/2022	1.1.4.2 Pyrolytic elimination: Cope, Chugaev, pyrolysis of acetates
07-05-2022	1.2 Photochemistry (5 L) 1.2.1 Introduction: Difference between thermal and photochemical reactions.
07-06-2022	Jablonski diagram, singlet and triplet states, allowed and forbidden transitions, fate of excited molecules, photosensitization
07-07-2022	1.2.2 Photochemical reactions of olefins: photoisomerization, photochemical Rearrangement of 1,4- dienes (di- π methane)
07-09-2022	1.2.3 Photochemistry of carbonyl compounds: Norrish I, Norrish II cleavages. Photo reduction (e.g. benzophenone to benzpinacol)
Unit-II	
07-12-2022	Unit II 2.1 Stereochemistry I (5 L) 2.1.1 Molecular chirality and elements of symmetry:
13-07-2022	Mirror plane symmetry, inversion center,
14-07-2022	rotation -reflection (alternating) axis.
16-07-2022	2.1.2 Chirality of compounds without a stereo genic center
19-07-2022	cummulenes and biphenyls
20-07-2022	2.2 Agrochemicals (4 L) 2.2.1 General introduction & scope, meaning & examples of insecticides, herbicides, fungicide, rodenticide, pesticides, plant growth regulators
21-07-2022	2.2.2 Advantages & disadvantages of agrochemicals
23-07-2022	2.2.3 Synthesis & application of IAA (Indole Acetic Acid) & Endosulphan
26-07-2022	2.2.4 Bio pesticides – Neem oil & Karanj oil
27-07-2022	2.3 Heterocyclic chemistry: (6 L) 2.3.1 Reactivity of pyridine-N-oxide, quinoline and iso-quinoline.
28-07-2022	2.3.2 Preparation of pyridine-N-oxide, quinoline (Skraup synthesis)
30-07-2022	iso-quinoline (BischlerNapieralski synthesis).
08-02-2022	2.3.3 Reactions of pyridine-N-oxide: halogenation, nitration and reaction with $\text{NaNH}_2/\text{liq.NH}_3$, n-BuLi
08-03-2022	2.3.4 Reactions of quinoline and isoquinoline;.
08-04-2022	oxidation,reduction,nitration,halogenation and reaction with $\text{NaNH}_2/\text{liq.NH}_3$,n-BuLi
Unit-III	
08-06-2022	Unit III 3.1 IUPAC (5 L) IUPAC Systematic nomenclature of the following classes of compounds (including compounds upto two substituents / functional groups)
08-10-2022	3.1.1 Bicyclic compounds – spiro, fused and bridged (upto 11 carbon atoms) – saturated and unsaturated compounds
08-11-2022	3.1.2 Biphenyls
13-08-2022	3.1.3 Cummulenes with upto 3 double bonds
17-08-2022	3.1.4 Quinolines and isoquinolines
18-08-2022	3.2 Synthesis of organic compounds (10L) 3.2.1 Introduction: Linear and convergent synthesis, criteria for an ideal synthesis,
20/8/2022	concept of chemo selectivity and regioselectivity with examples, calculation of yields.
23-08-2022	3.2.2 Multicomponent Synthesis: Mannich reaction
24-08-2022	Biginelli reaction. Synthesis with examples (no mechanism)
25-08-2022	3.2.3 Green chemistry and synthesis: Introduction: Twelve principles of green chemistry,

27-08-2022	concept of atom economy and E-factor, calculations and their significance, numerical examples
30-08-2022	i) green reagents: dimethyl carbonate
09-06-2022	ii) Green starting materials: D-glucose iii) Green solvents : supercritical CO ₂ iv) Green catalysts: Bio catalysts
09-07-2022	.2.4 Planning of organic synthesis i) synthesis of nitroanilines. (o&p) ii) synthesis of halobenzoic acid. (o&p
09-08-2022	ii) Alcohols (primary / secondary / tertiary) using Grignard reagents. iv) Alkanes (using organo lithium compounds
Unit-IV	
09-10-2022	4.1 Spectroscopy I (5 L) 4.1.1 Introduction: Electromagnetic spectrum, units of wavelength and frequency
13-09-2022	4.1.2 UV – Visible spectroscopy: Basic theory, solvents, nature of UV-Visible spectrum, concept of chromophore, auxochrome, bathochromic and hypsochromic shifts, hyperchromic and hypochromic effects, chromophore-chromophore and chromophore-auxochrome interactions
14-09-2022	4.1.3 Mass spectrometry: Basic theory. Nature of mass spectrum. General rules of fragmentation.
15-09-2022	Importance of molecular ion peak, isotopic peaks, base peak, nitrogen rule, rule of 13 for determination of empirical formula and molecular formula
17-09-2022	Fragmentation of alkanes and aliphatic carbonyl compounds
20-09-2022	4.2 Natural Products: (10L) 4.2.1. Terpenoids: Introduction, Isoprene rule, special isoprene rule and the gem-dialkyl rule
21-09-2022	4.2.2 Citral: a) Structural determination of citral.
22-09-2022) Synthesis of citral from methyl heptenone
24-09-2022	c) Isomerism in citral. (Cis and trans form).
27-09-2022	4.2.3. Alkaloids Introduction and occurrence.
28-09-2022	Hofmann's exhaustive methylation and degradation in: simple open chain and N – substituted monocyclic amines
29-09-2022	4.2.4 Nicotine: a) Structural determination of nicotine. (Pinner's work included)
09-04-2022	b) Synthesis of nicotine from nicotinic acid c) Harmful effects of nicotine
09-06-2022	4.2.5 Hormones: Introduction, structure of adrenaline (epinephrine), physiological action of adrenaline
09-08-2022	Synthesis of adrenaline from a) Catechol b) p-hydroxybenzaldehyde (Ott's synthesis)

T.Y.B.Sc Sem- V Paper - IV Physical Chemistry

Month	Topic
	Syllabus discussion
	Physical Chemistry UNIT I 1.0 MOLECULAR SPECTROSCOPY
	1.1 Rotational Spectrum: Introduction to dipole moment, polarization of a bond, bond moment, molecular structure, .
	Rotational spectrum of a diatomic molecule, rigid rotor, moment of inertia, energy levels, conditions for obtaining pure rotational spectrum, selection rule, nature of spectrum, determination of internuclear distance and isotopic shift.
	1.2 Vibrational spectrum: Vibrational motion, degrees of freedom, modes of vibration, vibrational spectrum of a diatomic molecule, simple harmonic oscillator, energy levels, zero point energy, conditions for obtaining vibrational spectrum, selection rule, nature of spectrum.
	1.3 Vibrational-Rotational spectrum of diatomic molecule: energy levels, selection rule, nature of spectrum, P and R branch lines. Anharmonic oscillator - energy levels, selection rule, fundamental band, overtones. Application of vibrational-rotational spectrum in determination of force constant and its significance.

June

Infrared spectra of simple molecules like H ₂ O and CO ₂ .
1.4 Raman Spectroscopy : Scattering of electromagnetic radiation, Rayleigh scattering, Raman scattering, nature of Raman spectrum, Stoke's lines, anti-Stoke's lines, Raman shift,
quantum theory of Raman spectrum, comparative study of IR and Raman spectra, rule of mutual exclusion- CO ₂ molecule.
Inorganic Chemistry Unit I 1. Molecular Symmetry and Chemical Bonding 1.1 Molecular Symmetry 1.1.1 Introduction and Importance of Symmetry in Chemistry. 1.1.2 Symmetry elements and Symmetry operations.
1.1.2 Symmetry elements and Symmetry operations.
1.1.3 Concept of a Point Group with illustrations using the following point groups : (i) C _∞ v (ii) D _∞ h (iii) C ₂ v (iv) C ₃ v (v) C ₂ h and (vi) D ₃ h
1.2 Molecular Orbital Theory for heteronuclear diatomic molecules and polyatomic species (9L) 1.2.1 Comparison between homonuclear and heteronuclear diatomic molecules.
1.2.2. Heteronuclear diatomic molecules like CO, NO and HCl, appreciation of modified MO diagram for CO.
1.2.3 Molecular orbital theory for H ₃ and H ₃ + (correlation diagram expected). 1.2.4. Molecular shape to molecular orbital approach in AB ₂ molecules. Application of symmetry concepts for linear and angular species considering σ- bonding only. (Examples like : i) BeH ₂ , ii) H ₂ O).
Analytical Chemistry UNIT III: OPTICAL METHODS 3.1 Atomic Spectroscopy: Flame Emission spectroscopy(FES) and Atomic Absorption Spectroscopy(AAS) 3.1.1 Introduction, Energy level diagrams, Atomic spectra, Absorption and Emission Spectra 3.1.2 Flame Photometry – Principle, Instrumentation (Flame atomizers, types of Burners, Wavelength selectors, Detectors)
3.1.3 Atomic Absorption Spectroscopy – Principle, Instrumentation (Source, Chopper, Flame and Electrothermal Atomiser) 3.1.4 Quantification methods of FES and AAS – Calibration curve method, Standard addition method and Internal standard method.
3.1.5 Comparison between FES and AAS 3.1.6 Applications, Advantages and Limitations 3.2 Molecular Fluorescence and Phosphorescence Spectroscopy 3.2.1 Introduction and Principle 3.2.2 Relationship of Fluorescence intensity with concentration 3.2.3 Factors affecting Fluorescence and Phosphorescence 3.2.4 Instrumentation and applications 3.2.5 Comparison of Fluorimetry and Phosphorimetry 3.2.6 Comparison with Absorption methods
3.3 Turbidimetry and Nephelometry 3.3.1 Introduction and Principle 3.3.2 Factors affecting scattering of Radiation: Concentration, particle size, wavelength, refractive index
Analytical Chemistry UNIT IV: METHODS OF SEPARATION – I 4.1 Solvent Extraction 4.1.1 Factors affecting extraction: Chelation, Ion pair formation and Solvation 4.1.2 Graph of percent extraction versus pH. Concept of [pH] ^{1/2} and its significance (derivation not expected)
4.1.3 Craig's counter current extraction: Principle, apparatus and applications 4.1.4 Solid phase extraction: Principle, process and applications with special reference to water and industrial effluent analysis. 4.1.5 Comparison of solid phase extraction and solvent extraction.
4.2 High Performance Liquid chromatography (HPLC) 4.2.1 Introduction and Principle Instrumentation- components with their significance: Solvent Reservoir, Degassing system, Pumps-(reciprocating pumps, screw driven- syringe type pumps, pneumatic pumps, advantages and disadvantages of each pump), Precolumn,
Sample injection system, HPLC Columns, Detectors(UV – Visible detector, Refractive index detector) 4.2.2 Qualitative and Quantitative Applications of HPLC
4.3 High Performance Thin Layer Chromatography (HPTLC) 4.3.1 Introduction and Principle Stationary phase, Sample application and mobile phase
4.3.2 Detectors a) Scanning densitometer- Components. Types of densitometer- Single beam and Double beam b) Fluorometric Detector 4.3.3 Advantages, disadvantages and applications 4.3.4 Comparison of TLC and HPTLC

July	Inorganic Chemistry Unit II SOLID STATE CHEMISTRY 2.1 Structures of Solids 2.2.1 Explanation of terms viz. crystal lattice, lattice point, unit cell and lattice constants.
	2.1.2 Closest packing of rigid spheres (hcp, ccp), packing density in simple cubic, bcc and fcc lattices. Relationship between density, radius of unit cell and lattice parameters.
	2.1.3 Stoichiometric Point defects in solids (discussion on Frenkel and Schottky defects expected).
	2.2 Superconductivity 2.2.1 Discovery of superconductivity. 2.2.2 Explanation of terms like superconductivity, transition temperature, Meissner effect.
	2.2.3 Different types of super conductors viz. conventional superconductors, alkali metal fullerenes, high temperature super conductors. 2.2.4 Brief application of superconductors.
	Physical Chemistry Unit II 2.0 CHEMICAL THERMODYNAMICS 2.1.1 Colligative properties: Vapour pressure and relative lowering of vapour pressure. Measurement of lowering of vapour pressure - Static and Dynamic method.
	2.1.2 Solutions of Solid in Liquid: 2.1.2.1 Elevation in boiling point of a solution, thermodynamic derivation relating elevation in boiling point of the solution and molar mass of non-volatile solute.
	2.1.2.2 Depression in freezing point of a solution, thermodynamic derivation relating the depression in the freezing point of a solution and the molar mass of the non-volatile solute.
	Beckmann Method and Rast Method. Numericals
	2.1.3 Osmotic Pressure : Introduction, thermodynamic derivation of Van't Hoff equation, Van't Hoff Factor. Measurement of Osmotic Pressure - Berkeley and Hartley's Method, Reverse Osmosis.
	2.2 CHEMICAL KINETICS 2.2.1 Collision theory of reaction rates : Application of collision theory to 1. Unimolecular reaction Lindemann theory and 2. Bimolecular reaction. (derivation expected for both)
	2.2.2 Classification of reactions as slow, fast and ultra -fast. Study of kinetics of fast reactions by Stop flow method and Flash photolysis (No derivation expected).
	UNIT III 3.0 NUCLEAR CHEMISTRY 3.1. Introduction: Basic terms-radioactive constants (decay constant, half life and average life) and units of radioactivity 3.2 Detection and Measurement of Radioactivity: Types and characteristics of nuclear radiations, behaviour of ion pairs in electric field,
	detection and measurement of nuclear radiations using G. M. Counter and Scintillation Counter.
	3.3 Application of use of radioisotopes as Tracers : chemical reaction mechanism, age determination - dating by C14.
	3.4 Nuclear reactions: nuclear transmutation (one example for each projectile), artificial radioactivity, Q - value of nuclear reaction, threshold energy.
	3.5 Fission Process : Fissile and fertile material, nuclear fission, chain reaction, factor controlling fission process. multiplication factor and critical size or mass of fissionable material,
	nuclear power reactor and breeder reactor.
	3.6 Fusion Process : Thermonuclear reactions occurring on stellar bodies and earth.
	Analytical Chemistry UNIT II : CLASSICAL METHODS OF ANALYSIS (TITRIMETRY) 2.1 Redox Titrations (Numerical and word Problems are expected) 2.1.1 Introduction 2.1.2 Construction of the titration curves and calculation of E _s system in aqueous medium in case of: (1) One electron system
	(2) Multielectron system
	2.1.3 Theory of redox indicators, Criteria for selection of an indicator Use of diphenyl amine and ferroin as redox indicators
	2.2 Complexometric Titrations 2.2.1 Introduction, construction of titration curve
2.2.2 Use of EDTA as titrant and its standardisation, absolute and conditional formation constants of metal EDTA complexes, Selectivity of EDTA as a titrant.	
Factors enhancing selectivity with examples. Advantages and limitations of EDTA as a titrant.	

August	2.2.3 Types of EDTA titrations.
	2.2.4 Metallochromic indicators, theory, examples and applications
	Physical Chemistry Unit IV SURFACE CHEMISTRY 4.1.1 Adsorption: Physical and Chemical Adsorption, types of adsorption isotherms .
	Langmuir's adsorption isotherm (Postulates and derivation expected).
	B.E.T. equation for multilayer adsorption, (derivation not expected). Determination of surface area of an adsorbent using B.E.T. equation.
	4.2 COLLOIDAL STATE 4.2.1 Introduction to colloids - Emulsions, Gels and Sols 4.2.2 Electrical Properties : Origin of charges on colloidal particles,
	Concept of electrical double layer, zeta potential, Helmholtz and Stern model.
	Electro-kinetic phenomena - Electrophoresis, Electro-osmosis, Streaming potential, Sedimentation potential; Donnan Membrane Equilibrium.
	4.2.3 Colloidal electrolytes : Introduction, micelle formation,
	4.2.4 Surfactants: Classification and applications of surfactants in detergents and food industry.
	Analytical Chemistry UNIT I :INTRODUCTION TO QUALITY CONCEPTS,CHEMICAL CALCULATIONS AND SAMPLING 1.1 Quality in Analytical Chemistry 1.1.1 Concepts of Quality, Quality Control and Quality Assurance
	1.1.2 Importance of Quality concepts in Industry
	1.1.3 Chemical Standards and Certified Reference Materials; Importance in chemical analysis
	Quality of material: Various grades of laboratory reagents
	1.2 Chemical Calculations (Numericals and word problems are expected) 1.2.1 Inter conversion of various concentration units. (Conversion of concentration from one unit to another unit with examples)
	1.2.1 Inter conversion of various concentration units. (Conversion of concentration from one unit to another unit with examples)
	1.2.2 Percent composition of elements in chemical compounds
1.2.2 Percent composition of elements in chemical compounds	
1.3 Sampling 1.3.1 Purpose, significance and difficulties encountered in sampling	
September	1.3.2 Sampling of solids: Sample size – bulk ratio, size to weight ratio, multistage and sequential sampling, size reduction methods,
	sampling of compact solids, equipments and methods of sampling of compact solids, sampling of particulate solids, methods and equipments used for sampling of particulate solids.
	1.3.3 Sampling of liquids: Homogeneous and heterogeneous, Static and flowing liquids.
	1.3.4 Sampling of gases: Ambient and stack sampling: Apparatus and methods for sampling of gases.
	1.3.5 Collection, preservation and dissolution of the sample.
	Revision of physical chemistry Unit-I & II
	Revision of Analytical chemistry Unit-I & II
	Revision of physical chemistry Unit-III & IV
	Revision of Inorganic chemistry Unit-I & II
	Revision of Analytical chemistry Unit-III & IV
	Question answer discussion
	Question answer discussion

T.Y.B.Sc. Chemistry Sem - V Drugs and Dyes

Date	Topic
13-06-2022	Syllabus Discussion

17-06-2022	Definition of a drug, sources of drugs, requirements of an ideal drug, classification of drugs (based on therapeutic action), Nomenclature of drugs: Generic name, Brand name, Systematic name
18-06-2022	Definition of the following medicinal terms: Pharmacon, Pharmacology, Pharmacophore, Prodrug, Half – life efficiency, LD50, ED50, GI50 Therapeutic Index.
20-06-2022	Brief idea of the following terms: Receptors, Agonists, Antagonists, Drug-receptor interaction, Drug Potency, Bioavailability, Drug toxicity, Drug addiction, Spurious Drugs, Misbranded Drugs, Adulterated Drugs, Pharmacopoeia.
24-06-2022	Oral and Parenteral routes with advantages and disadvantages.
25-06-2022	Formulations & combination formulation, Different dosage forms (including Patches & Adhesives, emphasis on sustained release formulations and enteric coated tablets).
27-06-2022	Pharmacodynamic agents: A brief introduction of the following pharmacodynamic agents and the study with respect to their chemical structure, chemical class, therapeutic uses, and side effects. CNS Drugs: Classification based on pharmacological actions: CNS Depressants & CNS Stimulants. Concept of sedation and hypnosis, anaesthesia. <ul style="list-style-type: none"> • Phenytoin (Hydantoin) • Trimethadione (Oxazolinediones) (Synthesis from acetone) • Alprazolam (Benzodiazepines) • Levetiracetam (Pyrrolidines) • Amphetamine (Phenethylamine) (Asymmetric synthesis from phenyl acetic acid) • Chlorpromazine (Phenothiazines)
01-07-2022	Analgesics and Antipyretics <ul style="list-style-type: none"> • Morphine (Phenanthrene alkaloids) • Tramadol (Cyclohexanols) (Synthesis from salicylic acid) • Aspirin (Salicylates) • Paracetamol (p-Amino phenols)
02-07-2022	Anti-inflammatory Drugs Mechanism of inflammation and various inflammatory conditions. <ul style="list-style-type: none"> • Steroids: Prednisolone, Betamethasone • Sodium Diclofenac, Aceclofenac (N- Aryl anthranilic acids) (Synthesis from 2,6-dichlorodiphenyl amine)
04-07-2022	Antihistaminic Drugs: Diphenhydramine (Ethanol amines) Cetirizene (Piperazine) (Synthesis from 4-Chlorobenzhydryl chloride) Chlorpheniramine maleate (Ethyl amines) Pantoprazole (Benzimidazoles)
08-07-2022	Cardiovascular drugs: Classification based on pharmacological action <ul style="list-style-type: none"> • Isosorbide dinitrate (Nitrates) • Valsartan (Amino acids) (structure not expected) • Atenolol (Aryloxy propanol amines) • (Synthesis from 3-Hydroxy phenyl acetamide) • Amlodipine (Pyridines) • Frusemide /Furosemide (Sulfamoyl benzoic acid) • Rosuvastatin (Pyrimidine)

09-07-2022	Antidiabetic Agents
	General idea and types of diabetes; Insulin therapy
	<ul style="list-style-type: none"> Glibenclamide (Sulphonyl ureas)
	<ul style="list-style-type: none"> Metformin (Biguanides)
	<ul style="list-style-type: none"> Dapagliflozin (Pyranose)
	<ul style="list-style-type: none"> Pioglitazone (Thiazolidinediones) (Synthesis from 2-(5-ethylpyridin-2-yl) ethanol)
11-07-2022	Antiparkinsonism Drugs
	Idea of Parkinson's disease.
	<ul style="list-style-type: none"> Procyclidine hydrochloride (Pyrrolidines)
	<ul style="list-style-type: none"> Ethopropazine hydrochloride (Phenothiazines) Levodopa (Amino acids) (Synthesis from Vanillin)
15-07-2022	Drugs for Respiratory System
	General idea of: Expectorants; Mucolytes; Bronchodilators;
	Decongestants; Antitussives
	<ul style="list-style-type: none"> Ambroxol (Cyclohexanol) (Synthesis from paracetamol)
	<ul style="list-style-type: none"> Salbutamol (Phenyl ethyl amines)
	<ul style="list-style-type: none"> Oxymetazoline (Imidazolines) Codeine Phosphate (Opiates)
16-07-2022	Introduction to the dye-stuff Industry
	Dyes
	Definition of dyes, requirements of a good dye i.e. Colour,
	Chromophore and Auxochrome, Solubility, Linearity,
	Coplanarity, Fastness, Substantivity, Economic viability.
	Definition of fastness and its properties and Mordants with examples
18-07-2022	Explanation of nomenclature or abbreviations of commercial
	dyes with at least one example suffixes – G, O, R, B, K, L, C, S H, 6B,
	GK, 6GK,
	Naming of dyes by colour index (two examples) used in dye industries.
22-07-2022	Natural and Synthetic Dyes:
	Natural Dyes: Definition and limitations of natural dyes.
	Examples and uses of natural dyes w.r.t Heena, Turmeric, Saffron,
	Indigo, Madder, Chlorophyll –names of the chief dyeing material/s in each natural dye [structures not expected],
23-07-2022	Synthetic dyes: Definition of synthetic dyes, primaries and
	intermediates. Important milestones in the development of synthetic
	dyes – Emphasis on Name of the Scientist, dyes and the year of the discovery is required. (structure is not expected)
25-07-2022	Substrates for Dyes: Types of fibres.
	Natural: cellulosic and proteinaceous fibres, examples – wool, silk and
	cotton structures and names of dyes applied on each of them.
29-07-2022	Semi – synthetic: definition and examples
	Synthetic: Nylon, Polyesters and Polyamides structures and names of
30-07-2022	dyes applied on each of them
	Blended fabrics: definition and examples
	Binding forces of dyes on substrate: ionic forces, covalent linkages,
01-08-2022	hydrogen bonding, vander-walls forces
	Classification of dyes based on applications and dyeing methods
	Dyeing methods:
	Basic Operations involved in dyeing process:
	<ol style="list-style-type: none"> Preparation of fibres Preparation of dyebath

	iii. Application of dyes
	iv. Finishing
05-08-2022	Dyeing Method of Cotton Fibres: (i) Direct dyeing (ii) Vat dyeing (iii) Mordant dyeing (iv) Disperse dyeing
06-08-2022	Classification of dyes based on applicability on substrates (examples with structures) (a) Acid Dyes- Orange II, (b) Basic Dyes-methyl violet, (c) Direct cotton Dyes- Benzofast Yellow 5GL
08-08-2022	(d) Azoic Dyes – Diazo components; Fast yellow G, Fast orange R. Coupling components. Naphthol AS, Naphthol ASG (e) Mordant Dyes-Eriochrome Black A, Alizarin. (f) Vat Dyes- Indanthrene brown RRD,
12-08-2022	(g) Sulphur Dyes- Sulphur Black T (no structure) (h) Disperse Dyes-Celliton Fast brown 3R, (i) Reactive Dyes- Cibacron Brilliant Red B,
13-08-2022	Optical Brighteners: General idea, important characteristics of optical brighteners and their classes [Stilbene, Coumarin, Heterocyclic vinylene derivatives, Diaryl pyrazolines, Naphthylamide derivatives] general structure of each class.
15-08-2022	Colour and Chemical Constitution of Dyes Absorption of visible light, Colour of wavelength absorbed, Complementary colour.
19-08-2022	Relation between colour and chemical constitution. (i) Armstrong theory (quinonoid theory) and its limitations. (ii) Witt's Theory: Chromophore, Auxochrome, Bathochromic & Hypsochromic Shift, Hypochromic & Hyperchromic effect
20-08-2022	Valence Bond theory, comparative study and relation of colour in the following classes of compounds/dyes: Benzene, Nitrobenzene, Nitroanilines, Nitrophenols, Benzoquinones, Azo, Triphenyl methane, Anthraquinones.
22-08-2022	Molecular Orbital Theory.
26-08-2022	Unit process and Dye Intermediates Introduction to primaries and intermediates Unit processes: definition and brief ideas of below unit processes: (a) Nitration (b) Sulphonation
27-08-2022	(c) Halogenation (d) Diazotization: (3 different methods & its importance)
29-08-2022	(e) Ammonolysis (f) Oxidation
05-09-2022	Preparation of the Following Intermediates: Benzene derivatives: Benzenesulphonic acid; 1,3-Benzenedisulphonic acid
09-09-2022	sulphanilic acid; o-, m-, p-chloronitrobenzenes
10-09-2022	o-, m-, p-nitroanilines; o-, m-, p-phenylene diamines; Naphthol ASG
12-09-2022	Naphthalene Derivative: Schaeffer acid; Tobias acid
16-09-2022	Naphthionic acid; N.W. acid; cleve-6-acid; H-acid; Naphthol AS

17-09-2022	Anthracene Derivative: 1-Nitroanthraquinone; 1-Aminoanthraquinone
19-09-2022	Anthraquinone-2-sulphonic acid; Benzanthrone
23-09-2022	Revision of Unit-I & II
24-09-2022	Revision of Unit-III & IV
26-09-2022	Question answer discussion
30-09-2022	Question answer discussion