

GOVERNMENT DEGREE COLLEGE FOR WOMEN (AUTONOMOUS)

BEGUMPET, HYDERABAD-16

Affiliated To Osmania University, Re-Accredited With 'B+' Grade by NAAC



DEPARTMENT OF CHEMISTRY

SYLLABUS (2019-20)

FIRST YEAR- SEMESTER I				
COD E	COURS E TITLE	COUR SE TYPE	HPW	CREDI TS
BS 101	Ability Enhancement Compulsory Course AECC-1	ES	2	2
BS 102	English	CC-1A	4	4
BS 103	Second language	CC-2A	4	4
BS 104	Optional I	DSC-1A	4T+3P=7	4+1=5
BS 105	Optional II	DSC-2A	4T+3P=7	4+1=5
BS 106	Optional III- Chemistry - I	DSC-3A	4T = 7 3P	4 = 5 1
	Laboratory Course – I (Qualitative Analysis - Semi Micro Analysis of Mixtures)			
	Total Credits		31	25
FIRST YEAR- SEMSTER II				
BS 201	Ability Enhancement Compulsory Course AECC-2	BCS	2	2
BS 202	English	CC-1B	4	4
BS 203	Second language	CC-2B	4	4
BS 204	Optional I	DSC-1B	4T+3P=7	4+1=5
BS 205	Optional II	DSC-2B	4T+3P=7	4+1=5
BS 206	Optional III- Chemistry - II	DSC-3B	4T = 7 3P	4 = 5 1
	Laboratory Course - II (Quantitative Analysis – Titrations)			
	Total Credits		31	25

SECOND YEAR- SEMSTER III				
BS 301	Safety Rules in Chemistry Laboratory and Lab Reagents Remedial methods for pollution, drinking water and Soil fertility	SE C-1 SE C-2	2 2	2 2
BS 302	English	CC-1C	3	3
BS 303	Second language	CC-2C	3	3
BS 304	Optional I	DSC-1C	4T+3P=7	4+1=5
BS 305	Optional II	DSC-2C	4T+3P=7	4+1=5
BS 306	Optional III- Chemistry - III			
	Laboratory Course - III (Synthesis of Organic compounds)	DSC-3C	4T = 7 3P	4 = 5 1
	Total Credits		3 1	25
SECOND YEAR- SEMSTER IV				
BS 401	Materials and their Applications Chemistry of Cosmetics and Food Processing	SE C-3 SE C-4	2 2	2 2
BS 402	English	CC-1D	3	3
BS 403	Second language	CC-2D	3	3
BS 404	Optional I	DSC-1D	4T+3P=7	4+1=5
BS 405	Optional II	DSC-2D	4T+3P=7	4+1=5
BS 406	Optional III- Chemistry - IV	DSC-3D	4T = 7 3P	4 = 5 1
	Laboratory Course - IV			

	(Qualitative Analysis of Organic Compounds)			
	Total Credits		31	25

- AECC: Ability Enhancement Compulsory Course, SEC: Skill Enhancement Course, DSC: Discipline Specific Course, GE: Generic Elective, ES: Environmental Science , BCS : Basic computer skills.

THIRD YEAR-SEMESTE R-V				
CODE	COURSE TITLE	course TYPE	HPW	CREDI I S
BS 501	Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals	GE	4	4
BS 502	English	CC-IE	3	3
BS 503	Second language	CC-2E	3	3
BS 504	Optional- I A/B	DSE -IE	-	4+1=5
BS 505	Optional- II A/B	DSE -2E	-	4+1=5
BS 506	Optional- III A/B A. Spectroscopy and Chromatography (or) B. Metallurgy, Dyes and Catalysis	DSE -3E	4T = 7	4
	Laboratory Course -V Experiments in Physical Chemistry-I		3P	1
	TOTAL			25
THIRD YEAR- SEMESTER VI				
BS 601	Project in Chemistry/ Advanced Chemistry			4
BS 602	English	cc-IF	3	3

BS 603	Second language	CC-2F	3	3
BS 604	Optional- I A/D	DSE-IF	-	4+1=5
BS 605	Optional- II A/B	DSE -2F	-	4+1=5
BS 606	Optional- III A/B A. Medicinal Chemistry (or)	DSE -3F	4T = 7	4 = 5
	B. Agricultural and Fuel Chemistry		3P	
	Laboratory Course -VI Experiments in Physical Chemistry-II			1
	TOTAL			25
	TOTAL Credits			150

I B.Sc. Chemistry syllabus

I Semester 60 Hrs (4 H/W)

Course Code: CHE 101

(Syllabus with effect from 2019-20)

	Unit-I (Inorganic Chemistry)	15h
I	Chemical Bonding	8
II	P-Block Elements	7
	UNIT II Organic Chemistry	15h
I	Structural Theory in Organic Chemistry	5
II	Acyclic Hydrocarbons	6
III	Aromatic Hydrocarbons	4
	Unit-III Physical Chemistry	15h

I	Atomic structure and elementary quantum mechanics	3
II	Gaseous State	5
III	Liquid State and Solutions	4
IV	Solutions	3
	Unit-IV General Chemistry	15h
I	General Principles of Inorganic Qualitative Analysis	6
II	Isomerism	5
III	Solid state Chemistry	4

CHEMISTRY SEMESTER WISE SYLLABUS SEMESTER I

PAPER I CHEMISTRY

COURSE CODE CHE 101

Unit-I (Inorganic Chemistry) 15 h (1 hr/week)

S1- I-1. Chemical Bonding 8 h

Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, polarity and polarizability of ions. VSPER Theory - Common hybridization- sp , sp^2 , sp^3 , sp^3d , sp^3d^2 and sp^3d^3 , shapes of molecules. Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. Pi and Sigma overlapping. Concept of Types of molecular orbitals- bonding, anti-bonding and non-bonding. MOED of Homo nuclear diatomics - H_2 , N_2 , O_2^- , O_2^{2-} , F_2 (unhybridized diagrams only) and hetero nuclear diatomics CO , CN^- , NO , NO^+ and HF . Bond order, stability and magnetic properties.

S1-I-2. P-Block Elements 1 7 h

Group-13: Structure of Diborane and higher Boranes (B_4H_{10} and B_5H_9), Boron nitrogen compounds ($B_3N_3H_6$ and BN) Lewis acid nature of BX_3 . Group - 14: Carbides-Classification - ionic, covalent, interstitial - Structures and reactivity. Industrial applications. Silicones - Classification - straight chain, cyclic and cross-linked. Group - 15: Nitrides - Classification - ionic, covalent and interstitial. Reactivity - hydrolysis. Reactions of hydrazine, hydroxyl amine, phosphazenes.

Unit - II (Organic Chemistry) 15h (1 hr/week)

S1-O-1: Structural Theory in Organic Chemistry 5 h

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance - Mesomeric effect, application to (a) acidity of phenol. (b) acidity of carboxylic acids and basicity of anilines. Stability of carbo cations, carbanions and free radicals. Hyper conjugation and its application to stability of carbonium ions, free radicals and alkenes.

S1-O-2: Acyclic Hydrocarbons 6 h

Alkanes- Methods of preparation: From Grignard reagent, Kolbe synthesis. Chemical reactivity

- Inert nature, free radical substitution, Halogenation example- reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1, 2 dihalides, Zaitsev's rule. Properties: Anti-addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H₂O, HOX, H₂SO₄ with mechanism and addition of HBr in the presence of peroxide (Anti – Markonikov's addition). Oxidation (cis –

additions) – hydroxylation by KMnO₄, OsO₄, Anti addition- per acids (via epoxidation) hydroboration, ozonolysis – location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1, 2 and 1,4 addition of HBr to 1,3 – butadiene and Diels – Alder reaction.

Alkynes– Preparation by dehydro halogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Chemical reactivity – electrophilic addition of X₂, HX, H₂O (tautomerism), Oxidation (formation of enediol, 1, 2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation).

Aromatic Hydrocarbons 4h

Introduction to aromaticity: Huckel's rule – Benzene, Naphthalene and Anthracene. Reactions - General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and halogenation, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para, and meta directing groups. Ring activating and deactivating groups with examples. Orientation – (i) activating groups: Amino, methoxy and alkyl groups. (ii) Deactivating groups - nitro, nitrile, carbonyl, carboxylic acid, sulphonic acid and halo groups.

Unit – III (Physical Chemistry) 15h (1 hr/week)

S1-P-1: Atomic structure and elementary quantum mechanics 3 h

Black body radiation, heat capacities of solids, Rayleigh Jeans law, Planck's radiation law, photoelectric effect, Limitations of classical mechanics, Compton Effect, de Broglie's hypothesis. Heisenberg's uncertainty principle.

S1-P-2: Gaseous State

5 h

Deviation of real gases from ideal behavior. van der Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO₂. The van der Waal's equation and critical state. Derivation of relationship between critical constants and van der Waal's constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquefaction of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

S1-P-3: Liquid State and Solutions 4 h

Liquid State

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solutions 3 h

Liquid - liquid mixtures, ideal liquid mixtures, Raoult's and Henry's laws. Non ideal systems,

Azeotropes: HCl-H₂O and C₂H₅OH - H₂O systems. Fractional distillation, Partially miscible liquids: Phenol - Water, Trimethyl amine - Water and Nicotine - Water systems.

Unit - IV (General Chemistry)

15h (1 hr/week)

S1-G-1. General Principles of Inorganic Qualitative Analysis 6 h

Anion analysis: Theory of sodium carbonate extract, classification and reactions of anions- CO_3^{2-} ,

Cl^- , Br^- , I^- , PO_4^{3-} , BO_3^{3-} , CH_3COO^- , NO_3^- . Interfering ions. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation and identification of group I individual cations (Hg^{2+} , Ag^+ , Pb^{2+}) with flow chart and chemical equations. Principle involved in separation of group II & IV cations. General discussion for the separation and identification of group II (Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Sb^{3+}), III (Al^{3+} , Fe^{3+}), IV (Mn^{2+} , Zn^{2+}) individual cations with flow chart and chemical equations. General discussion for the separation and identification of group V individual cations (Ba^{2+} , Sr^{2+} , Ca^{2+}) with flow chart and chemical equations. Theory of flame test. Identification of Group VI cations (Mg^{2+} , NH_4^+).

S1-G-2. Isomerism 5 h

Isomerism: Definition of isomers. Classification of isomers: Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional and positional isomers. Stereoisomers: enantiomers and diastereomers - definitions and examples. Representation of stereoisomers - Wedge, Fischer projection, Sawhorse, Newmann formulae.

Conformational analysis: Classification of stereoisomers based on energy. Definition and examples Conformational and configurational isomers. Conformational analysis of ethane, n-butane, 1, 2- dichloroethane, 2-chloroethanol. Cyclic compounds: Baeyer's strain theory, Conformational analysis of cyclohexane, Cis-trans isomerism: E-Z-Nomenclature

S1-G-3: Solid state Chemistry 4 h

Laws of Crystallography: (i) Law of Constancy of interfacial angles (ii) Law of Symmetry-Symmetry elements in crystals (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven Crystal systems (a brief review). X-ray diffraction by crystals; Derivation of Bragg's equation. Determination of structure of NaCl, KCl and CsCl (Bragg's method and Powder method).

References

General reference: B.Sc I Year Chemistry: Semester I, Telugu Academy publication, Hyd

Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001. Chem.
4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn.
 1. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press 1989.
 2. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
 3. Textbook of Inorganic Chemistry by R Gopalan.

Unit- II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai.

Unit III

1. Principles of physical chemistry by Prutton and Marron.
2. Text Book of Physical Chemistry by Soni and Dharmahara..
3. Text Book of Physical Chemistry by Puri and Sharma.
4. Text Book of Physical Chemistry by K. L. Kapoor.
5. Physical Chemistry through problems by S.K. Dogra.
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone.

Unit IV

1. Qualitative analysis by Welcher and Hahn.
2. Vogel's Qualitative Inorganic Analysis by Svehla.
3. Text Book of Organic Chemistry by Morrison and Boyd.
4. Text Book of Organic Chemistry by Graham Solomons.

5. Text Book of Organic Chemistry by Bruice Yuranis Powla.
6. Text Book of Organic Chemistry by Soni.
7. Text Book of Physical Chemistry by Soni And Dharmahara..
8. Text Book of Physical Chemistry by Puri And Sharma.
9. Text Book of Physical Chemistry by K. L. Kapoor.

Unit-I (Inorganic Chemistry)

1. To predict the atomic structure, chemical bonding, and molecular geometry based on accepted models.
2. Characterize bonding between atoms, molecules, interaction and energetics (ii) hybridization and shapes of atomic, molecular orbitals, bond parameters, bond- distances and energies.
3. Valence bond theory incorporating concepts of hybridization predicting geometry of molecules.
4. Importance of hydrogen bonding, metallic bonding.
5. Predicting structure of molecules
6. Structure, bonding of p block materials and their oxides/compounds.
7. Understanding chemistry of compounds of p block elements and their structures.

UNIT II Organic Chemistry

1. Basic of organic molecules, structure, bonding, reactivity and reaction mechanisms.
2. Aromatic compounds and aromaticity, mechanism of aromatic reactions.
3. Understanding hybridization and geometry of atoms, 3-D structure of organic molecules.
4. Reactivity, stability of organic molecules, structure, stereochemistry.
5. Electrophile, nucleophiles, free radicals, electronegativity, resonance, and intermediates along the reaction pathways.
6. Mechanism of organic reactions (effect of nucleophile/leaving group, solvent), substitution vs. elimination.

Unit-III Physical Chemistry

Atomic theory and its evolution.

Learning scientific theory of atoms, concept of wave function.

1. Familiarization with various states of matter.
2. Physical properties of each state of matter and laws related to describe the states.
3. Understanding Kinetic model of gas and its properties.
4. Behavior of real gases, its deviation from ideal behavior, equation of state, isotherm, and law of corresponding states.
5. Liquid state and its physical properties related to temperature and pressure variation.
6. Properties of liquid as solvent for various household and commercial use.

Unit-IV General Chemistry.

Stereochemistry of organic molecules – conformation and configuration, asymmetric molecules and nomenclature.

3-D structure of organic molecules, identifying chiral centers.

Solids, lattice parameters – its calculation, application of symmetry, solid characteristics of simple salts.

SEMESTER-I

OBJECTIVES

The objective of **B.Sc. Chemistry I** is intended to provide:

- To predict the atomic structure, chemical bonding, and molecular geometry based on accepted models.
- To Characterize bonding between atoms, molecules, interaction and energetics and to know hybridization and shapes of atomic, molecular orbitals, bond parameters, bond-distances and energies.
- To Predict structure of molecules.
- To understand the Basic of organic molecules, structure, bonding, reactivity and reaction mechanisms.
- To understand about the Electrophile, nucleophiles, free radicals, electronegativity, resonance, and intermediates along the reaction pathways.
- To know about atomic theory and its evolution.
- To Familiarization with various states of matter and Physical properties of each state of matter and laws related to describe the states.
- To know lattice parameters of Solids, and its calculation, application of symmetry, solid characteristics of simple salts.

OUTCOMES

After the successful completion of the course, students should be able to:

- Differentiate the type of bonds present in the given molecule.
- Identify hybridization, structure of molecule and their bond angles.
- Interpret the Factors responsible for any Organic chemical reaction to take place.
- Identify the composition of matter which is made up of atoms and molecules.
- Describe the characteristics of states of matter and how states of matter are affected by the parameters (Pressure, Volume and Temperature)

Laboratory Course

I Practical (Inorganic Chemistry)

Paper I - Qualitative Analysis - Semi micro analysis of mixtures

45h (3 h /

week)

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: CO_3^{2-} , SO_3^{2-} , S^{2-} , Cl^- , Br^- , I^- , CH_3COO^- , NO_3^- , PO_4^{3-} , BO_3^{3-} , SO_4^{2-} . .

Cations: Hg^{2+} , Ag^+ , Pb^{2+}

Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Cu^{2+} , $As^{3+}/5+$, $Sb^{3+}/5+$, $Sn^{2+}/4+$

Al^{3+} , Cr^{3+} , Fe^{3+}

Zn^{2+} , Ni^{2+} , Co^{2+} , Mn^{2+}

Ba^{2+} , Sr^{2+} , Ca^{2+}

Mg^{2+} , NH^+

II. Inorganic quantitative Analysis-Inorganic Preparations

1. Tetraamine Copper (II) Sulphate
2. Potash alum $KAl(SO_4)_2 \cdot 12H_2O$,

The objective of B.Sc. Chemistry Practical – I is intended to provide:

- Qualitative semimicro analysis of mixtures containing 2 anions and 2 cations.
- Emphasis should be given on understanding of the chemistry of different reactions.
- To get acquainted with basic preparation methods of inorganic metal complexes.

OUTCOMES.

After the successful completion of the course, students should be able to:

- To get adapted with techniques involved in Qualitative semimicro analysis.
- To get acknowledged with various chemical reactions of basic and acidic radicals.
- To get acknowledged with techniques involved in preparation methods of inorganic metal complexes.

GOVERNMENT DEGREE COLLEGE FOR WOMEN
BEGUMPET, HYDERABAD - 16
B.Sc. 1 YEAR MODEL INTERNAL QUESTION PAPER
Subject: CHEMISTRY
SEMESTER - 1

COURSE CODE- CHE101

Section – A

I Short Answer questions

Answer any TWO of the following questions

2x5=10marks

1. Explain salient features of L.C.A.O method?
2. What is Diel's-Alder reaction? Give an example?
3. Write a note on de-Broglie's wave theory?
4. What is common ion effect ? Explain?

SECTION-B

II Essay questions

Answer any one question

1X10 = 10 Marks

5. Draw MOED of N_2 and O_2 . Explain the bond order, stability and magnetic properties?

(or)

6. Explain Freidel-Craft Alkylation and Freidel-Craft Acylation of benzene with Mechanism?

GOVERNMENT DEGREE COLLEGE FOR WOMEN
BEGUMPET, HYDERABAD - 16
B.Sc. 1 YEAR SEMESTER MODEL QUESTION PAPER
Subject: CHEMISTRY
SEMESTER - 1

Time: 2 Hours

Max. Marks: 60
Min. Marks: 24

Section – A

I Short Answer questions

Answer any Five of the following questions

5x4=20marks

1. Explain salient features of L.C.A.O method?
2. What are carbides? Give the classification?
3. What is Diel's-Alder reaction? Give an example?
4. What is Huckels rule ?Give examples?
5. Write a note on de-Broglie's wave theory?
6. Describe the liquification of gas by lindes method?
7. What is common ion effect ? Explain?
8. Write the conformational isomers of 1,2-dichloroethane?

SECTION-B

II Essay questions

Answer all questions choosing any one bit from each question

4X10 = 40 Marks

9. (a) Draw MOED of N₂ and O₂. Explain the bond order, stability and magnetic properties?
(or)
(b) Write the reactions of Hydrazine and Hydroxylamine?
10. (a) What is inductive effect? Explain the acidic strength of carboxylic acids?
(or)
(b) Explain Freidel-Craft Alkylation and Freidel-Craft Acylation of benzene with Mechanism?
11. (a) Write the derivation of relation between critical constants and vanderwaal's constants?
(or)
(b) What is viscosity of liquid and write the method to determine viscosity?
12. (a) Write a note on Bayer's strain theory? Write the conformational isomers of cyclohexane?
(or)
(b) Derive Bragg's equation. Determine the structure of NaCl, KCl by bragg's method?

Government Degree College for Women, Begumpet, Hyderabad
Autonomous Accredited with "B" Grade by NAAC
Subject-Chemistry

Model Practical Question paper

B.sc I year Time: 3h

Semester I

Total marks=50marks

Scheme of Evaluation

Total Marks-50

3 Hrs

Time:

- | | |
|--|----|
| 1. Brief procedure writing for the Inorganic compounds
10 Marks | |
| 2. Solubility
Marks | 04 |
| 3. Flame Test
Marks | 02 |
| 4. Identification of two anions and two cations
4x5=20 marks | |
| 5. Report of two anions and two cations
Marks | 04 |
| 6. Record
Marks | 05 |
| 7. Voice-Viva
Marks | 05 |

Minimum qualifying marks: 20 marks

B.Sc I Yr CHEMISTRY SEMESTER WISE SYLLABUS

SEMESTER II Paper – II Chemistry – II

Course Code: CHE 201

Unit-I (Inorganic Chemistry) 15 h (1 hr/week)

S2-I-1 P-block Elements -II 7 h

Oxides: Types of oxides (a) Normal- acidic, basic amphoteric and neutral (b) Mixed b. sub oxide d) peroxide e) superoxide. Structure of oxides of C, N, P, S and Cl - reactivity, thermal stability, hydrolysis.

Oxy acids: Structure and acidic nature of oxyacids of B, C, N, P, S, Cl and I. Redox properties of oxyacids of Nitrogen: HNO₂ (reaction with FeSO₄, KMnO₄, K₂Cr₂O₇), HNO₃ (reaction with H₂S, Cu), HNO₄ (reaction with KBr, Aniline), H₂N₂O₂ (reaction with KMnO₄). Redox properties of oxyacids of Phosphorus: H₃PO₂ (reaction with HgCl₂), H₃PO₃ (reaction with AgNO₃, CuSO₄) . Redox properties of oxyacids of Sulphur: H₂SO₃ (reaction with KMnO₄, K₂Cr₂O₇), H₂SO₄ (reaction with Zn, Fe, Cu), H₂S₂O₃ (reaction with Cu, Au), H₂SO₅ (reaction with KI, FeSO₄), H₂S₂O₈ (reaction with FeSO₄, KI). Redox properties of oxy acids of Chlorine.

Interhalogens- Classification- general preparation- structures of AB, AB₃, AB₅ and AB₇ type and reactivity.

Pseudohalogens: Comparison with halogens.

S2-I-2: Chemistry of Zero group elements 2 h

Isolation of noble gases, Structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides. Clathrate compounds and Anomalous behaviour of He (II)

S2-I-3: Chemistry of d-block elements 6 h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, ability to form complexes, magnetic properties & catalytic properties. Stability of various oxidation states and standard reduction potentials. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu triads. Titanium triad – electronic configuration and reactivity of +3 and +4 states – oxides and halides. Chromium triad – reactivity of +3 and +6 states. Copper triad – reactivity of +1, +2 and +3 states.

Unit - II (Organic Chemistry) 15h(1 hr/week)

S2-O-1: Halogen compounds 4 h

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl. Chemical reactivity - reduction, formation of RMgX, Nucleophilic substitution reactions – classification into SN1 and SN2. Mechanism and energy profile diagrams of SN1 and SN2 reactions. Stereochemistry of SN2 (Walden Inversion) 2-bromobutane, SN1 (Racemisation) 1- bromo-1-phenylpropane Structure and reactivity – Ease of hydrolysis - comparison of alkyl, vinyl, allyl, aryl, and benzyl halides.

S2-O-2: Hydroxy compounds and ethers 6 h

Alcohols: Preparation: 1°, 2° and 3° alcohols using Grignard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, HX/ZnCl₂ (Lucas reagent), esterification, oxidation with PCC, alk. KMnO₄, acidic dichromates, conc. HNO₃ and Oppenauer oxidation (Mechanism).

Phenols: Preparation: (i) from diazonium salts of anilines, (ii) from benzene sulphonic acids and (iii) Cumene hydroperoxide .

Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Reimer Tiemann reaction (Mechanism), Kolbe reaction (Mechanism), Gattermann-Koch reaction, Azo-coupling reaction, Schotten-Boumann reaction, Houben-Hoesch condensation, .

Ethers: Nomenclature, preparation by (a) Williamson's synthesis (b) from alkenes by the action of conc. H₂SO₄. Physical properties – Absence of Hydrogen bonding, insoluble in water, low boiling point. Chemical properties – inert nature, action of conc. H₂SO₄ and HI.

S2-O-3 Carbonyl compounds 5 h

Preparation of aldehydes & ketones from acid chloride, 1,3-dithianes, nitriles and from carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by (a) Oxidation of arenes

(b) Hydrolysis of benzal halides Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO₃ (b) HCN (c) RMgX (d) NH₃ (e) RNH₂ (f) NH₂OH (g) PhNHNH₂ (h) 2,4-DNP (Schiff bases). Addition of H₂O to form hydrate , chloral hydrate (stable), addition of alcohols -

hemi acetal and acetal formation. Cannizzaro reaction. Oxidation reactions – KMnO_4 oxidation and auto oxidation, reduction – catalytic hydrogenation, mechanism of Clemmenson's reduction, Wolf- kishner reduction, Meerwein Ponnoff Verly reduction. Reduction with LAH, NaBH_4 .

Unit - III (Physical Chemistry) 15h(1 hr/week)

S2-P-1: Electrochemistry 15 h

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kohlrausch's law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law - its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf's method for attackable electrodes. Applications of conductivity measurements: Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. Electro motive force (EMF) of a cell and its measurement. Computation of EMF. Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble

salt and redox electrodes. Electrode reactions, Nernst equation, cell EMF and Single electrode potential, Standard Hydrogen electrode – reference electrodes (calomel electrode)

– standard electrode potential, sign conventions, electrochemical series and its significance. Applications of EMF measurements. Calculation of thermodynamic quantities of cell reactions (Gibbs free energy G , Helmholtz free energy and Equilibrium constant K). Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode. Solubility product of AgCl . Potentiometric titrations.

Unit – IV (General Chemistry) 15 h (1 hr/week)

S2-G-1: Theory of Quantitative Analysis 6 h

Volumetric Analysis: Introduction, standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid –weak base, weak acid- strong base and weak acid –weak base. Theory of redox titrations - internal(KMnO_4) and external indicators – use of diphenylamine and ferroin indicators. Theory of complexometric titrations – use of EBT, Murexide and Fast sulphone black indicators. Role of pH in complexometric titrations. Precipitation titrations – theory of adsorption indicators.

Gravimetric analysis- Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, coprecipitation and post precipitation. Determination of Ni^{2+}

S2-G-2: Stereoisomerism 5 h

Optical activity: Definition, wave nature of light, plane polarised light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane,

center and S_n axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans- 1,2-dichlorocyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3-dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog rules, examples for asymmetric and dissymmetric molecules.

S2-G-3: Dilute Solutions & Colligative Properties 4 h

Dilute Solutions, Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

References

General reference: B.Sc I Year Chemistry : Semester II, Telugu Academy publication, Hyd

Unit I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001.
4. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press 1989.
5. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
6. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th Edn.
 1. Textbook of inorganic chemistry by R Gopalan.

Unit II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.

9. Organic Chemistry by C N Pillai

Unit III

1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
6. Physical Chemistry through problems by S.K. Dogra.
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

Unit IV

1. Vogel's Text Book of Quantitative Analysis by G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney 5th edn Addison Wesley Longman Inc. 1999.
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn..
3. Nano: The Essentials by T. Pradeep, McGraw-Hill Education.
4. Chemistry of nanomaterials: Synthesis, Properties and applications by CNR Rao et.al.
5. Nanostructured Materials and Nanotechnology, edited by Hari Singh Nalwa, Academic Press
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati.

OBJECTIVES OF SEMESTER-II

The objective of **B.Sc. Chemistry II** is intended to provide:

- Structure, bonding of p block materials and their oxides/compounds.
- Understanding chemistry of compounds of p block elements and their structures.
- Transition metals, its stability, color, oxidation states and complexes.
- Familiarization about classes of organic compounds and their methods of preparation and Basic uses of reaction mechanisms.
- Name reactions, uses of various reagents and the mechanism of their action.
- Basic principle of laws of electrochemistry and understanding about chemical cells, electrodes and their functions.
- Stereochemistry of organic molecules – conformation and configuration, asymmetric molecules and nomenclature.
- Partial molar quantities and its attributes.
- Dilute solution and its properties.

OUTCOMES

After the successful completion of the course, students should be able to:

- To get acquainted with application of VSEPR theory in explaining structure and bonding.
- To interpret nature of compounds of p block elements.

- To understand about the inert nature of Zero group elements, factors responsible for their reactivity and explaining structure and bonding.
- To get acquainted with characteristics of d block elements.
- To understand about the preparations, physical & chemical properties of classes of organic compounds.
- To know the basic principles of electrochemistry and its applications in daily life.
- To understand the nature of dilute solutions and its properties.

Laboratory Course 45hrs (3 h / week)
Paper II- Quantitative Analysis

Analysis Acid - Base titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.
4. Estimation of Alkali content in Antacid using HCl.
5. Estimation of NH^+ by back titration

Redox Titrations

1. Determination of Fe(II) using $K_2Cr_2O_7$
2. Determination of Fe(II) using $KMnO_4$ with sodium oxalate as primary standard.

Complexometric Titrations

1. Estimation of Mg^{2+}

Inorganic preparatios

1. Bis (dimethylglyoximato) Nickel(II)
2. Hexammine cobalt(III) Chloride

Objectives of practicals

- The objective of B.Sc. Chemistry Practical - II is intended to provide:
- To get acknowledged with techniques involved in quantitative analysis of products.
- To get acknowledged with techniques involved in Redox titrations and Complexometric titrations.
- To get acknowledged with techniques involved in preparation methods of inorganic metal complexes.

OUTCOMES

- After the successful completion of the course, students should be able to:
- To get adapted with techniques involved in Quantitative analysis of products.
- To get acknowledged with techniques involved in preparation methods of inorganic metal complexes.

B.Sc. II Year CHEMISTRY SEMESTER WISE SYLLABUS SEMESTER III

Course Code: CHE 301

Paper-III

Chemistry - III

Unit-I (Inorganic Chemistry) 15 h (1 hr/week)

S3-I-1: Chemistry of f-block elements: 5 h

Chemistry of Lanthanides: Position in periodic table, Electronic structure, oxidation state, ionic and atomic radii- lanthanide contraction- cause and consequences, anomalous behavior of post lanthanides-complexation- type of donor ligands preferred. Magnetic properties- para magnetism. Colour and spectra, f-f transitions –occurrence and separation– ion exchange method, solvent extraction.

Chemistry of actinides- general features – electronic configuration, oxidation state, actinide contraction, colour and complex formation. Comparison with lanthanides.

Additional Inputs: Comparison between f – Block and d-Block elements

S3-I-2: Coordination Compounds-I 6 h

Simple inorganic molecules and coordination complexes. Nomenclature – IUPAC rules, Coordination number, coordination geometries of metal ions, types of ligands. 2. Brief review of Werner's theory, Sidgwick's electronic interpretation and EAN rule and their limitations. (Valence bond theory (VBT) – postulates and application to (a) tetrahedral complexes $[\text{Ni}(\text{NH}_3)_4]^{2+}$, $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CO})_4]$ (b) Square planar complexes $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $[\text{PtCl}_4]^{2-}$ (c) Octahedral complexes $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{FeF}_6]^{4-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{CoF}_6]^{3-}$. Limitations of VBT. 3. Isomerism in coordination compounds, stereo isomerism – (a) Geometrical isomerism in (i) square planar metal complexes of the type $[\text{MA}_2\text{B}_2]$, $[\text{MA}_2\text{BC}]$, $[\text{M}(\text{AB})_2]$, $[\text{MABCD}]$ (ii) Octahedral metal complexes of the type $[\text{MA}_4\text{B}_2]$, $[\text{M}(\text{AA})_2\text{B}_2]$, $[\text{MA}_3\text{B}_3]$ using suitable examples, (b) Optical isomerism in (i). Tetrahedral complexes $[\text{MABCD}]$ (ii). Octahedral complexes $[\text{M}(\text{AA})_2\text{B}_2]$, $[\text{M}(\text{AA})_3]$ using suitable examples. Structural isomerism: ionization, linkage, coordination ligand isomerism using suitable examples.

Additional Inputs: Hydration isomerism

S3-I-3: Metal carbonyls and Organometallic Chemistry 4 h

Metal carbonyls: Preparation and properties of $\text{Ni}(\text{CO})_4$. Structural features of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Fe}_3(\text{CO})_{12}$ and $\text{Cr}(\text{CO})_6$ -18 valence electron rule.

Definition, nomenclature and classification of organometallic compounds. Methods of preparation, properties and applications of alkyl and aryl compounds of Li, Mg & Al.

Additional Inputs: Structure of $\text{Fe}(\text{CO})_5$

Unit - II (Organic Chemistry) 15h (1 hr/week)

S3-O-1: Carboxylic acids and derivatives 5 h

Preparation: a) Hydrolysis of Nitriles, amides and esters. b) Carbonation of Grignard reagents. Special methods of preparation of Aromatic Acids - Oxidation of Arenes. Physical properties- hydrogen bonding, dimeric association,. Chemical properties – Reactions involving H, OH and COOH groups -salt formation, anhydride formation, Acid halide formation, Esterification (mechanism) & Amide formation. Reduction of acid to the corresponding primary alcohol - via ester or acid chloride. Degradation of carboxylic acids by Huns Diecker reaction, Schmidt reaction (Decarboxylation). Arndt – Eistert synthesis, Halogenation by Hell – Volhard - Zelensky reaction. Carboxylic acid Derivatives – Hydrolysis and Amonolysis of acid halides, Acid anhydrides and esters (mechanism of ester hydrolysis by base and acid). Hydrolysis and dehydration of amides.

Additional Inputs: Comparison of acidic strength of carboxylic acid and alcohol

S3-O-2: Nitrohydrocarbons 3 h

Preparation of Nitroalkanes. Reactivity - halogenation, reaction with HNO_2 (Nitrous acid), Nef reaction, reduction. Aromatic Nitrohydrocarbons: Preparation of Nitrobenzene by Nitration. Physical properties, chemical reactivity –Reduction of Nitrobenzenes in different media.

Additional Inputs: Acidic nature of α -Hydrogen of Nitrohydrocarbons

S3-O-3: Amines, Cyanides and Isocyanides 7 h

Amines: classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods – Ammonolysis of alkyl halides, Gabriel synthesis, Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties. Use of amine salts as phase transfer catalysts. Chemical Properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation. Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines – Bromination and Nitration, oxidation of aryl and 3° Amines, diazotisation. Diazonium salts: Preparation with mechanism. Synthetic importance – a) Replacement of diazonium group by – OH, X (Cl)-Sandmeyer and Gatterman reaction, by fluorine (Schiemann's reaction), by iodine, CN, NO_2 , H and aryl groups. Coupling Reaction of diazonium salts. i) with phenols ii) with anilines. Reduction to phenyl hydrazines.

Cyanides and isocyanides: Structure. Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii) reduction iv) oxidation.

Additional Inputs: Basic strength of aliphatic amines and aromatic amines

Unit III (Physical Chemistry) 15 h (1 hr/week)

S3-P-1: Thermodynamics –I 10 h

A brief review of - Energy, work and heat units, mechanical equivalent of heat, definition of system, surroundings. First law of thermodynamics statement- various forms mathematical expression. Thermodynamic quantities- extensive properties and intensive properties, state function and path functions. Energy as a state function and exact differential. Work of expansion and heat absorbed as path function.

Expression for work of expansion, sign convention problems on first law. Heat changes at constant pressure and heat changes at constant volume. Enthalpy. Heat capacities at constant pressure and constant volume. Derivation of $C_p - C_v = R$. Isothermal adiabatic processes. Reversible and irreversible processes. Reversible change and maximum work. Derivation of expression for maximum work for isothermal reversible process. Problems. Internal energy of an ideal gas. Joules experiment. Joule-Thompson coefficient. Adiabatic changes in ideal gas, derivation of equation, $PV^\gamma = \text{constant}$. P-V curves for isothermal and adiabatic processes. Heat of a reaction at constant volume and at constant pressure, relation between ΔH and ΔV . Variation of heat of reaction with temperature. Kirchhoff's equation and problems. Limitations of first law and need for second law. Statement of second law of thermodynamics. Cyclic process. Heat engine, Carnot's theorem, Carnot's cycle. Derivation of efficiency of heat engine. Problems. Thermodynamic scale of temperature.

S3-P-2: Thermodynamics-II 5 h

Entropy: Definition from Carnot's cycle. Entropy as a state function. Entropy as a measure of disorder. Sign of entropy change for spontaneous and non-spontaneous processes & equilibrium processes. Entropy changes in i) Reversible isothermal process, ii) Reversible adiabatic process, iii) Phase change, iv) Reversible change of state of an ideal gas. Problems. Entropy of mixing of ideal gases. Free energy Gibb's function (G) and Helmholtz's function (A) as thermodynamic quantities. Concept of maximum work and network ΔG as Criteria for spontaneity. Derivation of equation $\Delta G = \Delta H - T\Delta S$. Significance of the equation. Gibbs equations and Maxwell relations. Variation of G with P, V and T.

Unit – IV (General Chemistry) 15 h (1 hr/week)

S3-G-1 Evaluation of analytical data 4 h

Significant figures, accuracy and precision. Errors-classification of errors- determinate and indeterminate errors, absolute and relative errors. Problems based on mean, median, range, standard deviation.

Additional Inputs: Gross errors

S3-G-2: Carbanions-I 5 h

Introduction, acidic nature of α -hydrogens and tautomerism in carbonyl compounds, nitro hydrocarbons, ethyl acetoacetate, diethyl malonate. Terminal alkynes. Stability of carbanions Reactions : Aldol reaction, Perkin reaction, Benzoin condensation, haloform reaction, conversion of smaller alkynes to higher alkynes.

Additional Inputs: Acidic nature of α -Hydrogen of different organic compounds

S3-G-3: Phase Rule 6 h

Statement and meaning of the terms – Phase, Component and Degrees of freedom, Gibb's Phase rule, phase equilibria of one component system – water system. Phase equilibria of two- component system – Solid-Liquid equilibria, simple eutectic –Pb-Ag system, desilverisation of lead. Solid solutions – compound with congruent melting point – Mg-Zn system and incongruent melting point – NaCl-H₂O system.

Additional Inputs: Applications of phase rule

References

General reference: B.Sc II Year Chemistry: Semester III, Telugu Academy publication, Hyd

Unit- I

1. Analytical chemistry by G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasada Rao, K.L.N. Reddy and C. Sudhakar
2. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications(1996).
3. Concise Inorganic Chemistry by J.D. Lee 3rd edn Van Nostrand Reinhold Company(1977)
4. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
5. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
 1. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press(1989).
 2. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
 3. Textbook of Inorganic Chemistry by R Gopalan(Universities Press(2012)
4. College Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati Universities Press (India) Limited(2012)

Unit- II

1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninth edition (2012)
2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008).
3. Text book of organic chemistry by Morrison and Boyd. Person(2009)
4. Text book of organic chemistry by Graham Solomons. Wiley(2015)
5. Text book of organic chemistry by Bruice Yuranis Powla. (2012)
6. Text book of organic chemistry by C N pillai CRC Press (2012)
7. Organic Chemistry by L. G. Wade Jr.
8. Organic Chemistry by M. Jones, Jr
9. Organic Chemistry by John McMurry.

Unit III

1. Principles of physical chemistry by Prutton and Marron. The MacmillanCompany; 4th Edn.(1970)

2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand and Sons.(2011)
3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co.(2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Colloidal and surface chemistry , M. Satake, Y. Hayashi, Y.Mido, S.A.Iqbal and
6. M.S.sethi, Discovery Publishing Pvt.Ltd (2014)
7. Material science by Kakani & Kakani, New Age International(2016)
8. Physical Chemistry by Ira Levine (Author) McGraw-Hill Education; 6 edition (May 9, 2008)

Unit IV

1. Text book of organic chemistry by Morrison and Boyd, Person(2009)
2. Text book of organic chemistry by Graham solomons, Wiley(2015)
3. Text book of organic chemistry by Sony, Sultan Chand & Sons; 29th edition (2012)
4. Text book of organic chemistry by Bruce yuranis Powla, (2012)
5. General Organic chemistry by Sachin kumar Ghosh, New Age Publishers Pvt Ltd (2008)

Semeter III Course Objectives

- To learn the sources, importance, separation techniques of lanthanides
- To understand the basics of formation of coordination compounds from various theories
- Learn the preparation and properties of metal carbonyls and organo metallic compounds
- Understand the fundamental properties and reactivity of carboxylic compounds, nitrohydro compounds, amines, cyanides and isocyanides
- Understand the various laws of thermodynamic
- Basics of phase rule, number of components and degrees of freedom, eutectic point, eutectic mixture, Water system, Pb-Ag system, NaCl system and freezing mixtures.
- Evaluation of the analytical data
- Reactions involving active methylene compounds
- Synthesis of various organic compounds

COURSE OUTCOME

Inorganic Chemistry

- Predict the nature of lanthanides and actinides and their influence on the other elements of periodic table
- Analyse the geometry, stability, magnetic properties and isomerism of coordination compounds
- With the basics of 18 valence electron rule, It will help students to predict the stability of metal carbonyls
- Using the knowledge of organo metallic compounds, students can design new synthetic pathways for the synthesis of novel compounds, Hence creating a interest in research and development

Organic Chemistry

- Gains broad knowledge of the preparation and properties of mono, di and unsaturated carboxylic acids with their mechanisms that helps in understanding their importance.
- Reactivity of Nitrogen containing organic compounds and gains the knowledge of preparing various compounds such as dyes

Physical chemistry

- Students will be able to state and apply laws of thermodynamics in predicting the predict the feasibility of a process and extent of yield of the product obtain
- Differentiate between extensive properties and intensive properties, state function and path functions

General Chemistry

- Students will be able to synthesize new compounds from carbon-carbon new bond formation methods learned in carbanions
- Analyse and evaluate the experiment through the analytical data obtained in the observations made
- Use the knowledge of phase rule in the separation of various compounds

Laboratory Course
Paper III (Organic Synthesis) 45 h (3h/week)

1. Synthesis of Organic compounds:

- i. Acetylation: Acetylation of salicylic acid, Benzoylation of Aniline.
- ii. Aromatic electrophilic substitution: Nitration: Preparation of nitro benzene and m-dinitro benzene.
- iii. Halogenation: Preparation of p-bromo acetanilide, Preparation of 2, 4, 6-tribromo phenol.
- iv. Oxidation: Preparation of benzoic acid from benzyl chloride.
- v. Esterification: Preparation of n-butyl acetate from acetic acid.
- vi. Methylation: Preparation of β -naphthyl methyl ether.
- vii. Condensation: Preparation of benzilidene aniline from Benzaldehyde and aniline.
- viii. Diazotisation: Azocoupling of β -Naphthol.

2. Microwave assisted synthesis of Aspirin – DEMO (demonstration only)

Outcomes of Practicals

- Will learn and implement the ethics of the laboratory rules while performing the experiments
- Develop the skills of handling various instruments such as distillation units, melting point apparatus etc
- Experimental learning in the preparation of various organic compounds that improves their skills in organic synthesis

Government Degree College for Women, Begumpet, Hyderabad
Autonomous Accredited with “B” Grade by NAAC

II B.Sc Chemistry
(Practicals)

III Semester

Paper- III

Practical Model Question Paper

Duration : 2 Hours

Total Marks : 50

1. Write brief Procedure with chemical equation and principle for the preparation of an organic compound. (10M)
2. Prepare and submit the crude sample of organic compound (30M)
3. Record (5M)
4. Viva (5M)

**GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET
AUTONOMOUS**

Max marks: 20M

Time: 1hour

Date:

NAAC ACCREDITED "B"

II Year Internal Question Paper

Internal assessment Test No.1

CHEMISTRY

Invigilator Signature

Paper-III

Name: _____

Class: _____

III _____

Roll No. _____

Semester:

SECTION – A

Answer any 2 questions of the following, each question carries 5 marks

2x5=10M

- I. 1. Explain the Sidgwick's concept of EAN and Calculate EAN for the following complexes $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{CN})_6]^{3-}$
2. Explain the structure of $\text{Fe}(\text{CO})_5$?
3. Write classification of Organo Metallic Compounds (OMC)?
4. What is lanthanide contraction and explain its consequences?

SECTION – B

Answer any one question from the following, each question carries 10 marks

1X10=10M

- II. 1. Explain the Valance Bond Theory (VBT) postulates with examples each from tetrahedral complex, square planar complex and octahedral complex?

(OR)

2. Write the preparation of Nitrobenzene with mechanism and reduction of Nitrobenzene in different media.

GOVERNMENT DEGREE COLLEGE FOR WOMEN
BEGUMPET, HYDERABAD - 16
B.Sc. II YEAR SEMESTER MODEL QUESTION PAPER
Subject: CHEMISTRY
SEMESTER - III

Time: 2 Hours

Max. Marks: 60
Min. Marks: 24

Section – A

I Short Answer questions

Answer any Five of the following questions

5x4=20marks

1. Define lanthanides and actinides?
2. Explain EAN rule with one example ?
3. Write Arndt-Eistert synthesis?
4. Write preparation of Nitro hydrocarbons?
5. Explain I law of thermodynamics?
6. Derive equation of $PV^\gamma = \text{constant}$?
7. Define accuracy and precision.
8. Define phase, component and degrees of freedom?

SECTION-B

II Essay questions

Answer all questions choosing any one bit from each question

4X10 = 40 Marks

9. (a) Explain the Valence Bond Theory (VBT) postulates with examples each from tetrahedral complex, square planar complex and octahedral complex
(or)
(b) Write classification of Organo Metallic Compounds (OMC) with examples?
10. (a) Write the preparation of Nitrobenzene with mechanism and reduction of Nitro benzene in different media.
(or)
(b) Write preparation of amines using Gabriel synthesis, Hoffman's bromamide reaction with mechanism?
11. (a) Derive $C_p - C_v = R$.
(or)
(b) Explain Carnot's theorem?
12. (a) Write aldol condensation and bezoin condensation reaction?
(or)
(b) explain water system with phase diagram

B.Sc. Chemistry II Year
Semester III
Skill Enhancement Course- I (SEC-I)

COURSE CODE: 300/SEC/E

**Safety Rules in Chemistry Laboratory and Lab
Reagents Unit I: Laboratory Safety Rules and Regulations.**

General rules and regulations for lab safety: Minimizing Risks of Hazards , Personal Protective Equipment (PPE) - Hair, Dressing for the Laboratory, Eye Protection, Eye-wash fountain, Gloves,

Labeling Chemicals, Careful reading of
Laboratory Protocols, labels Prevention of Inhaling
Harmful Chemicals, Guide to Chemical Hazards, Chemical Spills etc., Accidents use of
fire

extinguisher and first aid kit in the laboratory, safety symbols- Preparation of the charts by the students and display of charts in chemistry labs. Calibration of fractional weights, calibration of glass ware - burette, pipette, standard flask, Normality/Molarity and specific gravity of concentrated acids – Preparation of dilute solutions (Numerical problems). Precautions to be taken in the preparation of dilute acids and bases and bases. Preparation of stock solutions of salts with specific examples. Properties of primary standard salt and preparation of standard solution. Good laboratory practices-maintenance of observation book record.

UNIT 2: Preparation of Lab Reagents: Preparation of indicators and use of indicators in volumetric analysis- acid base titrations, redox titrations, precipitation titrations and complexometric titrations. Role of an indicator in detecting end point (Phenolphthalein, Methyl orange, Methyl-red, Potassium Chromate, Diphenylamine, EBT, Murexide, etc). Preparation of buffers – pH 10 ammonical buffer and acetate buffer solutions. Preparation of commonly used reagents : Ammonium hydroxide solution, Ammonium molybdate reagent, Ammonium hydrogen phosphate solution, Bayer’s reagent, Benedict's solution, Bromine water, Dimethyl glyoxime reagent, 2,4-Dinitrophenyl hydrazine reagent, Eriochrome black-T reagent Fehling solution, Ferric chloride solution, Ferrous sulphate solution, Iodine solution, Molisch’s reagent, Nessler’s reagent, Neutral FeCl₃, Schiff’s reagent, Silver nitrate solution, Sodium carbonate solution , Sodium hydroxide (Caustic soda) solution, Starch solution, Tollen’s reagent.

(reference work and submission of assignments). Charts preparation depicting course content.

RECOMMENDED BOOKS

1. Vogel’s Text Book of Quantitative Chemical Analysis, 5th edition.

**B.Sc. Chemistry II Year
Semester III**

Skill Enhancement Course- II (SEC –II) (2 Credits)

**REMEDIAL METHODS FOR POLLUTION, DRINKING WATER AND
SOIL FERTILITY STANDARDS**

COURSE CODE: 300/SEC/E

UNIT I: Remedial Methods for Pollution Prevention and control of air pollution 15 h (1 hr/week)

Ozone hole-causes and harm due to ozone depletion. The effect of CFC's in Ozone depletion and their replacements. Global Warming and Greenhouse Effect Precautions to control global warming. Deleterious effect of pollutants - Endangered Monuments- acid rain. Precautions to protect monuments. Sources of Radiation pollution - Chernobyl accident and its Consequences. Radiation effect by the usage of cell phones and protection tips. Deleterious effects of cell phone towers and health hazards.

Sources of water pollution-(i). Pollution due to pesticides and inorganic chemicals, (ii). Thermal pollution (iii). Ground water pollution (iv). Eutrophication.

Methods for control of water pollution and water recycling. Dumping of plastics in rivers & oceans and their effect on aquatic life. Determination of (i) Dissolved Oxygen and (ii) Chemical Oxygen Demand in polluted water - Illustration through charts (or) demonstration of experiments. Sources of soil pollution (i). Plastic bags, (ii). Industrial and (iii). Agricultural sources. Control of soil pollution. Environmental laws in India. Environmental benefits of planting trees.

**UNIT II: Drinking Water and Soil Fertility Standards and Analysis
15 h (1 hr/week)**

Water Quality and Common Treatments for Private Drinking Water Systems: Drinking Water Standards-Primary Drinking Water Standards : Inorganics, Organics and Volatile Organic Chemicals. Secondary Drinking Water Standards-Inorganics and Physical Problems. Water Testing, Mineral Analysis, Microbiological Tests, Pesticide and Other Organic Chemical Tests. Principle involved in Water Treatment Techniques. (i) Reverse osmosis (ii) Disinfection methods such as chlorination, ultraviolet light, ozonation etc (iii) Chemical oxidation and (iv) Ion exchange (water softeners). Visit to nearby drinking water plants and interaction at sites.

Introduction to Soil Chemistry- Basic Concepts. Effect of pH on nutrient availability. Macronutrients and their effect on plants -Carbon, Hydrogen, Oxygen, Nitrogen and Phosphorus other macronutrients-Calcium, Magnesium and Sulfur. Micronutrients and their effect on plants. Boron ($B_4O_7^{2-}$), Copper (Cu^{2+}), Iron (Fe^{2+} , Fe^{3+}) Manganese (Mn^{2+}) Molybdenum (MoO_4^{2-}) Zinc (Zn^{2+}) Cobalt (Co^{2+}) Chlorine (Cl^-) and Others. Determination of soil nitrogen by Kjeldahl method- Illustration through charts (Or)

demonstration of experiment. Visit to nearby agricultural farms and interaction with farmers. Discussion with farmers on the use of Soil Analysis Kits.

References

1. A Text book for 'Remedial methods for pollution, drinking water and soil fertility standards', First Edition, Authors: Dr Mudvath Ravi, Gopu Srinivas, Putta Venkat Reddy, Vuradi Ravi Kumar, Battini Ushaiah, ISBN No. 978-93-5311-183-0.
2. Remedial methods for pollution, drinking water and soil fertility standards, Author: Dr G. Vanjatha.
3. Remedial methods for pollution, drinking water and soil fertility standards, Telugu version, Authors: Dr N. Yogi Babu, Dr. G. Vanajatha, M. Srilatha.
4. Environmental Pollution, download.nos.org/333courseE/10.pdf
5. CFC Replacements, butane.chem.uiuc.edu/pshapley/Environmental/L21/3.html
6. Effects of Acid Rain on Buildings www.air-quality.org.uk/12.php
7. Acid Rain Effects - Buildings - Chemistry chemistry.elmhurst.edu/vchembook/196buildings.html
8. How to protect national heritage - ways to protect monuments www.youthkiawaaz.com/2011/03/how-to-protect-national-heritage/
 1. Chernobyl nuclear power plant accident - NRC www.nrc.gov/reading-rm/doc-collections/fact-sheets/chernobyl-bg.pdf
 2. Side-effects of harmful radiation from mobile phones and towers pib.nic.in/newsite/printrelease.aspx?relid=116304
 3. Cell Phone Radiation Protection - Highly Effective Tips <https://www.electricsense.com/775/how-to-protect-yourself-from-cell-phone-radiation/>
 4. Chemical Waste That Impact on Aquatic Life or Water Quality blog.idrenvironmental.com/chemical-waste-that-impact-on-aquatic-life-or-water-quality
 5. Trees and Your Environment - Clean Air Gardening www.cleanairgardening.com/plantingtrees
14. water quality and common treatments for private drinking water . extension.uga.edu/publications/detail.html?number=b939
 1. Soil chemistry <https://casfs.ucsc.edu/about/publications/Teaching-Organic-Farming/PDFdownloads/2.2-soil-chemistry.pdf>
 2. Soil Analysis-Determination of Available Nitrogen ... - Amrita Virtual Lab vlab.amrita.edu/?sub=2&brch=294&sim=1551&cnt=1
 3. Determination of dissolved oxygen (DO) www.cutm.ac.in/pdf/env%20engg%20lab%20manual.pdf
18. Determination of chemical oxygen demand of wastewater www.pharmaguideline.com > quality control >

COURSE OBJECTIVES:

- To Understand chemistry involved in environment
- To Identify the chemical reactions and changes in contaminants
- Imparts knowledge on essential nutrients, soil fertility, nutrient transformations in soil.
- To assess the water demand of area under consideration
- To plan and design water supply system
- Understand impact of human action on soil and land.
- To learn significance of water quality and its importance for living being including humans.

COURSE OUTCOMES:

- Enhance the ability to apply this knowledge and proficiency to find solutions relating to environmental concerns of varied dimensions of present times.
- Students gain Knowledge of water sources and processes involved and Application of knowledge on water resource technology
- To get acquainted in Understand the Indian constitutional provisions with respect to the environmental protection, division of powers, and fundamental rights
- Students Understand impact of human action on soil and land
- Apply the gained knowledge to practical situations particularly in agriculture.
- Ability to respond flexibly towards restoration of problematic soils of specific areas.
- Able to do sampling and analysis of air pollutant Develop an understanding of working of air pollution control devices
- Students will gain knowledge on concepts and principles of Soil fertilizers.

**GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET
AUTONOMOUS
NAAC ACCREDITED "B"**

Max marks: 40M

Time: 1 1/2hour

Date:

SEC Model Paper

Invigilator Signature

Name: _____

Class: _____

Roll No. _____

Semester: III _____

SECTION-A

Answer any 4 questions from the following, each question carries 4 marks 4x4=16M

1. UNIT -1
2. UNIT -1
3. UNIT -1
4. UNIT -2
5. .UNIT -2
6. .UNIT -2

SECTION-B

Answer all questions, each question carries 12 marks 12x2=24M

7. UNIT -1
8. UNIT -2

B.Sc. II yr CHEMISTRY
Course Code: CHE 401

SEMESTER IV Paper-IV
Chemistry - IV

Unit-I (Inorganic Chemistry) 15h (1 h/week)

S4-I-1: Coordination Compounds –II 11 h

Crystal field theory (CFT)- Postulates of CFT, splitting patterns of d-orbitals in octahedral, tetrahedral, square planer with suitable examples. Crystalfield stabilization energies and its calculations for various dn configurations in octahedral complexes. High Spin Low Spin complexes. Colour and Magnetic properties of transition metal complexes. Calculations of magnetic moments spin only formula. Detection of complex formation - basic principles of various methods- change in chemical properties, solubility, colour, pH, conductivity, magnetic susceptibility.

Hard and soft acids bases (HSAB) - Classification, Pearson's concept of hardness and softness, application of HSAB principles – Stability of compounds / complexes, predicting the feasibility of reaction. Thermodynamic and kinetic stability of transition of metal complexes. Stability of metal complexes –stepwise and overall stability constant and their relationship and chelate effect determination of composition of complex by Job's method and mole ratio method.

Applications of coordination compounds: Applications of coordination compounds a) in quantitative and qualitative analysis with suitable examples b) in medicine for removal of toxic metal ions and cancer therapy c) in industry as catalysts polymerization – Ziegler Natta catalyst d) water softening.

Additional Input: Spectrochemical Series

S4-I-2: Bioinorganic Chemistry 4 h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl⁻). Toxic metal ions As, Hg & Pb Oxygen transport and storage – structure of hemoglobin, binding and transport of oxygen. Fixation of CO₂ in photosynthesis- overview of light and dark reactions in photosynthesis. Structure of chlorophyll and coordination of magnesium. Electron transport in light reactions from water to NADP⁺ (Z – scheme).

Additional Input: Toxicity of Sn

Unit - II (Organic Chemistry)

15h(1 hr/week)

S4-O-1: Carbohydrates 6 h

Introduction: Classification and nomenclature. Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure. Number of optically active, isomers possible for the structure, configuration

of glucose based on D-glyceraldehyde as primary standard (No proof for configuration is required). Evidence for cyclic structure of glucose (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 – keto hexose structure. Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure, Haworth formula).

Inter Conversion of Monosaccharides: : Arabinose to D-glucose, D- mannose (kiliani – Fischer method). Epimers, Epimerisation- Lobry de bruyn van Ekenstein rearrangement. D-glucose to D-arabinose by Ruff's degradation. Aldohexose(+) (glucose) to ketohexose (-) (fructose) and Ketohexose(Fructose) to aldohexose (Glucose).

Additional Input: Difference between glucose and fructose

S4-O-2: Amino acids and proteins 5 h

Classification. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples – Glycine, Alanine, Valine and Leucine) by following methods: a) From halogenated Carboxylic acid b) Malonic ester synthesis c) strecker's synthesis. Physical properties: Optical activity of naturally occurring amino acids. Zwitter ion structure – salt like character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups – Lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides. Primary structure of proteins, di peptide synthesis

Additional Input: strecker's synthesis mechanism

S4-O-3: Heterocyclic Compounds 4 h

Introduction and definition: 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring systems –Numbering. Aromatic character

Resonance structures: Explanation of feebly acidic character of pyrrole, electrophilic substitution, Halogenation, Nitration and Sulphonation. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene Paul-Knorr synthesis. Structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – preparation by Hantsch method and properties – Reactivity towards Nucleophilic substitution reaction – chichibabin reaction.

Additional Input: Nomenclature of heterocyclic compounds

Unit III (Physical Chemistry)

15h (1 hr/week)

S4-P-1: Chemical Kinetics 11 h

Introduction to chemical kinetics, rate of reaction, variation of concentration with time, rate laws and rate constant. Specific reaction rate. Factors influencing reaction rates: effect of concentration of reactants, effect of temperature, effect of pressure, effect of reaction medium, effect of radiation, effect of catalyst with simple examples. Order of a reaction.

First order reaction, derivation of equation for rate constant. Characteristics of first order reaction. Units for rate constant. Half- life period, graph of first order reaction, Examples- Decomposition of H₂O₂ and decomposition of oxalic acid, Problems.

Pseudo first order reaction, Hydrolysis of methyl acetate, inversion of cane sugar, problems. Second order reaction, derivation of expression for second order rate constant, examples-16. Saponification of ester, $2O_3 \rightarrow 3O_2$, $C_2H_4 + H_2 \rightarrow C_2H_6$. Characteristics of second order reaction, units for rate constants, half- life period and second order plots. Problems

Additional Input: Zero order reaction

S4-P-2: Photochemistry 4 h

Introduction to photochemical reactions, Difference between thermal and photochemical reactions, Laws of photo chemistry- Grotthus Draper law, Stark–Einstein’s Law of photochemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2-Cl_2 and H_2-Br_2 reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency. Consequences of light absorption. Singlet and triplet states. Jablonski diagram. Explanation of internal conversion, inter- system crossing, phosphorescence, fluorescence.

Additional Input: Chemiluminescence

Unit IV (General Chemistry)

15h

(1 hr/week)

S4-G-1: Theories of bonding in metals 4 h

Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors n-type and p-type, extrinsic & intrinsic semiconductors, and insulators.

S4-G-2: Carbanions-II 5 h

Mannich reaction , Michael addition and Knoevengeal condensation Synthetic applications of Aceto acetic ester. Acid hydrolysis and ketonic hydrolysis: Preparation of ketones, monocarboxylic acids and dicarboxylic acids Malonic ester– synthetic applications. Preparation of (i) substituted mono carboxylic acids and (ii) substituted dicarboxylic acids.

Additional Input: Michael addition mechanism

S4-G-3: Colloids & Surface Chemistry 6 h

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties – Kinetic, Optical and Electrical stability of colloids. Protective action. Hardy–Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels): Classification, preparations and properties, General applications of colloids.

Adsorption:Types of adsorption. Factors influencing adsorption. Freundlich adsorption isotherm. Langmuir theory of unilayer adsorption isotherm. Applications.

References

General reference: B.Sc II Year Chemistry : Semester IV, Telugu Academy publication, Hyd

Unit- I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company (1977)
3. Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press (1989).
6. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
7. Textbook of Inorganic Chemistry by R Gopalan, Universities Press, (2012)

Unit- II

1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninth edition (2012)
2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008)
3. Text book of organic chemistry by Morrison and Boyd. Person (2009)
4. Text book of organic chemistry by Graham Solomons. Wiley (2015)
5. Text book of organic chemistry by Bruce Yuranis Powla. (2012)
6. Text book of organic chemistry by C N Pillai CRC Press (2012)
8. Organic Chemistry by L. G. Wade Jr.
9. Organic Chemistry by M. Jones, Jr
10. Organic Chemistry by John McMurry.

Unit III

1. Principles of physical chemistry by Prutton and Marron. The Macmillan Company; 4th edn. (1970)
- 2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand & sons. (2011)**
3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chand and Co. (2017)
4. Text Book of Physical Chemistry by K. L. Kapoor. (2012)
5. Physical Chemistry through problems by S.K. Dogra. (2015)
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone. Macmillan (1966)
8. Industrial Electrochemistry, D. Pletcher, Chapman & Hall, London, 1990

Unit IV

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company (1977)
3. Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Text book of organic chemistry by Morrison and Boyd, Person (2009)
6. Text book of organic chemistry by Graham solomons, Wiley (2015)
7. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, CBA, (2014)
8. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010

7. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
8. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
9. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities, Press 2014

Semester IV Course Objectives

- To understand and learn the Crystal field theory splitting in d-orbitals of octahedral, tetrahedral, square planer coordination compounds.
- Pearson's concept of hardness and softness, application of HSAB principle
- Biological significance of various inorganic elements
- Preparation and properties of carbohydrates, aminoacids, proteins and heterocyclic compounds
- Understand Kinetics of chemical reactions
- Learn laws of photochemical reactions
- Understand various theories of bonding in metals
- Understand the chemistry of colloids and adsorption
- Synthesis of organic compounds

COURSE OUTCOME

Inorganic Chemistry

- Identify the geometries associated with various d-orbital splitting patterns, predict and analyse the stability, magnetic properties and spectra of coordination compounds
- Determine the stability of compounds / complexes and predicting the feasibility of reaction using HSAB rule
- Determine the complex composition using jobs method and mole fraction method, using this knowledge students can synthesis and analyse the new coordination compounds
- Importance of micro and macro inorganic compounds for the human body.

Organic Chemistry

- Elaborate study of classification, structural elucidation, properties, and interconversions of carbohydrates and various tests for the identification of carbohydrates
- Understand the importance of amino acids and proteins in living organisms, their preparation, and properties.
- Students will be able write the various reactions of heterocyclic compound. As heterocyclic compounds play a crucial role in improving the medicinal values of the drugs, having this knowledge will enhance their creative skill in designing the new drugs, especially while working in the research and development laboratories

Physical chemistry

- Understanding chemical kinetics will help students in determining the rates of reactions and under given conditions, Therefore can predict and implement various ways of improving the reaction that is increasing the speed of the reaction
- With the laws of photochemistry, students can understand the photochemical and photophysical processes like fluorescence, phosphorescence, chemiluminescence and photosensitization etc.

General Chemistry

- Students will be able to synthesize new compounds using active methylene compounds from carbon-carbon new bond formation methods learned in carbanions

- Predict the nature of bonding between metal atoms in metals through various theories and predicting the various properties of metals.
- Understand the chemistry behind the working of batteries through their knowledge of conductors, insulators and semi conductors and Knowledge gained in colloids and adsorption.

Laboratory Course
Paper IV Semester-IV

Qualitative Analysis of Organic Compounds: 45hrs (3 h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis - ignition test, determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

Outcomes of Practicals

- Will learn and implement the ethics of the laboratory rules while performing the experiments
- Develop the skills of handling various instruments such as Bunsen burner,
- Experimental learning in the Qualitative analysis: Identification of organic compounds through the functional group analysis
- Can identify any unknown compound after performing experiment, this improves and builds their confidence in the synthesis of new compounds and identifying them qualitatively

Government Degree College for Women, Begumpet, Hyderabad
Autonomous Accredited with "B" Grade by NAAC

II B.Sc Chemistry
(Practicals)

IV Semester

Paper- IV

Practical Model Question Paper

Date

BATCH

Duration: 2 Hours

Total Marks: 50

1. Write functional group tests for the following compound
(10M)
2. Identify the functional group present in the given Organic compound and report its nature, Physical constant, and solubility and functional group tests. Prepare a solid derivative and submit. (30M)
 - a. Flame test (3M)
 - b. Physical constant (3M)
 - c. Solubility (5M)
 - d. Functional group tests (15M)
 - e. Derivative (4M)
3. Record -5M
4. Viva -5M

**GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET
AUTONOMOUS**

Max marks: 20M

Time: 1hour

Date:

NAAC ACCREDITED "B"

II Year Internal Question Paper

Internal assessment Test No.1

CHEMISTRY

Paper-IV

Invigilator Signature

Name: _____

Class: _____

IV _____

Roll No. _____

Semester:

SECTION – A

Answer any 2 questions of the following, each question carries 5 marks

2x5=10M

1. Write Pearson's concept of hardness and softness, application of HSAB principles?
2. Write biological significance of Na, K and Mg?
3. Write chichibabin reaction?
4. Write paul-knorr synthesis?

SECTION – B

Answer any one question from the following, each question carries 10 marks

1X10=10M

II. 1. Write Crystal field theory (CFT)- Postulates of CFT, splitting patterns of d-orbitals in octahedral,

tetrahedral with suitable examples

(OR)

2. Write all discussion to be confined to (+) glucose as an example of aldo hexoses?

GOVERNMENT DEGREE COLLEGE FOR WOMEN
BEGUMPET, HYDERABAD - 16
B.Sc. II YEAR SEMESTER MODEL QUESTION PAPER
Subject: CHEMISTRY
SEMESTER - IV

Time: 2 Hours

Max. Marks: 60

Min. Marks: 24

Section – A

I Short Answer questions

Answer any Five of the following questions

(5x4=20marks)

1. Write Pearson's concept of hardness and softness, application of HSAB principles?
2. Write applications of coordination compounds ?
3. Define anomers and epimers with example?
4. Write chichibabin reaction?
5. Explain briefly Factors influencing on reaction rate?
6. Explain Stark–Einstein's Law of photochemical equivalence?
7. Explain conductors, semiconductors and insulators.
8. Write Mannich reaction?

SECTION-B

II Essay questions

Answer all questions choosing any one bit from each question

(4X10 = 40 Marks)

9. (a) Write Crystal field theory (CFT)- Postulates of CFT, splitting patterns of d-orbitals in octahedral,

tetrahedral with suitable examples

(or)

(b) Write biological significance of Na, K, Mg, Ca and Fe?

10. (a) Write all discussion to be confined to (+) glucose as an example of aldo hexoses?

(or)

(b) Write preparation of glycine and alanine using Strecker synthesis and Gabriel pthalimide synthesis.

11. (a) Define First order reaction, derivation of equation for rate constant.

(or)

(b) Explain Jablonski diagram with internal conversion, inter- system crossing, phosphorescence, fluorescence?

12. (a) Explain Freundlich adsorption isotherm. Langmuir theory of unilayer adsorption isotherm

and its Applications?

(or)

(b) Write Michael addition and Knoevenagel condensation reaction.

**B.Sc. Chemistry II Year
Semester - IV**

COURSE CODE: 400/SEC/E

**Skill Enhancement Course- III (SEC - III) (2 Credits)
Materials and their Applications**

Unit – I: Types of Materials 15 h (1 hr/week)

Introduction: Materials and their importance. Classification of Materials, Advanced materials and their need. Types of Materials: Metals, ceramics, polymers and composites; Nature of bonding (Type of bond present). Types and applications of metal alloys: Classification- ferrous and non-ferrous alloys. Ferrous alloys -types and their applications. Non-ferrous alloys – Cu, Al, Ti alloys, their applications and super alloys.

Field Work- Collection of Metal Alloy Samples.

Types and Applications of Ceramics: Classification of Ceramics based on their application- glasses, clay products, refractories, abrasives, cements, and advanced ceramics. Glasses: Compositions and Characteristics of Some of the Common Commercial Glasses; Properties and applications of glass ceramics - preparation of charts depicting various types of glass and their use. Clay products: Structural clay products and the white wares. Refractories: Compositions of four Common Ceramic Refractory Materials, fireclay, silica, basic refractories ex. MgO and special refractories ex. Alumina and Zirconia Cements: Classification, preparation of cement and the setting process; quick setting cements; applications.

Field Work-Visit to industries and collection of samples of materials

Unit – II: Types of Polymers and Applications 15 h (1 hr/week)

Classification of Polymeric materials based on application: Coatings, adhesives, films, foams with examples Polymer Additives: Fillers, Plasticizers, Stabilizers, Colorants, Flame Retardants with examples.

Advanced Materials: Types of advanced materials - semiconductors, bio-compatible materials, smart materials, advanced polymeric materials and nano-engineered materials. Biocompatible materials: Definition. Materials used as biomaterials and their properties. Metals and alloys used in bone and joint replacement. Filling and restoration materials – dental cements, dental amalgams, dental adhesives.

Field Work- Visit to Dental Clinics and interaction with Doctors regarding materials used in Dental treatments.

Smart materials: Shape memory alloys- definition and examples (Ni-Ti alloys, Cu based alloys), applications. Conducting polymers: - Introduction, Electrically conducting polymers and their uses (polyaniline, polypyrrole, polyacetylene and polythiophene).

References

1. William D. Callister Materials Science and Engineering An Introduction, John Wiley & Sons, Inc, 2006.
2. Material science by Kakani and Kakani.
3. Sujata V., Bhat., —Biomaterials, Narosa Publication House, New Delhi, 2002.
4. M. V. Gandhi and B. S. Thompson, —Smart Materials and Structures, Chapman and Hall, London, First Edition, 1992.
5. Duerig, T. W., Melton, K. N, Stockel, D. and Wayman, C.M., —Engineering aspects of Shapememory Alloys, Butterworth – Heinemann, 1990.
6. Conducting Polymers, Fundamentals and Applications A Practical Approach Authors: Chandrasekhar, Prasanna Ashwin-Ushas Corp., Inc. Kluwer Academic Publishers. Boston

Course Objectives:

The objective of Materials and their Applications is intended to provide:

- Basic knowledge of materials science, so that they would be able to understand and distinguish between variety of materials based on their structure and properties.
- Concept of Alloys - its classification and applications.
- To understand the fundamentals (structure, properties and processing) of ceramic materials to appreciate its advantages and limitations and to apply those fundamentals for selecting and developing ceramic materials for different engineering applications.
- Understand the basics of polymers and composites- classifications and their properties and applications.

Course Outcome:

After the successful completion of the course, students should be able to:

- Understand and distinguish between variety of materials based on their structure and properties.
- Know the structure and properties of different ceramic materials.
- Understand the structure and properties of nonferrous metals and alloys.

B.Sc. Chemistry II Year Semester IV
COURSE CODE: 400/SEC/E

Skill Enhancement Course- IV (SEC - IV) (2 Credits)
Chemistry of Cosmetics and Food Processing

Unit-I: Chemistry of Cosmetics and Perfumes

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol. Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Analysis of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition, analysis of calcium in milk by complexometric titration, spectrophotometric analysis of iron in foods, Spectrophotometric identification and determination of caffeine and benzoic acid in soft drinks. Field Work -Visit to Food Industries. Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce. Field Work-Collection of adulterated food samples, demonstration of a minimum of five experiments for testing adulterants in food items.

References

1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi
3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
4. Rameen Devi, Food Processing and Impact on Nutrition, Sc J Agric Vet Sci., AugSep 2015; 2(4A):304-311.
5. W.A. Poucher, Perfumes, Cosmetics and Soaps (1993).
6. Srilakshmi, Food Science. Edition: 3rd (2004). 7. Lillian Hoagland Meyer, Food chemistry (2008).
1. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, S. Ranganna, Tata McGraw-Hill Education, 1986 – Food.
2. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi.
3. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.

Course Objectives:

- Provide knowledge on cosmetics, and related sciences, cosmeceuticals (cosmetics with skin, hair and oral care benefits) and personal care and hygiene products.
- Provide multidisciplinary scientific knowledge to gain expertise in the field and to respond the industry challenges effectively.
- Provide with knowledge on marketing approaches on studying consumer need, need gaps, managing competition and global markets.
- Develop your potential to have a career in this fast growing industry in the area of product development & research, regulatory, quality assurance and manufacturing or pursue academic research in the area or to become an entrepreneur in the field.
- To learn about food preservatives and utility.
- To learn about the nutrition and its importance.

Course Outcome:

- To create a workforce in application of principles of cosmetic science for the rapidly growing FMCG
- Provide in depth learning in cosmetic science, which will serve as a focus for research into the field of cosmetic science
- This course is designed to provide foundation knowledge of cosmetic principles to address the needs of cosmetic industry.
- Provide practical skills in the area of biology, formulation science and analytical techniques required to scientifically design and develop products.
- Students understand the terms food adulteration and adulterant.
- Students understand the different types of adulterants used in food.
- Students acquire the skill to detect the presence of adulterants in different food samples after having observed the animation and simulation.

**GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET
AUTONOMOUS
NAAC ACCREDITED "B"**

Max marks: 40M

Invigilator Signature

Date: _____ **SEC - Model Paper**

Name: _____

Roll No. _____

Class: _____

Semester: IV _____

SECTION-A

Answer any 4 questions from the following, each question carries 4 marks 4x4=16M

1. UNIT -1
2. UNIT -1
3. UNIT -1
4. UNIT -2
5. UNIT -2
6. .UNIT -2

SECTION-B

Answer all questions, each question carries 12 marks

12x2=24M

7. UNIT -1
8. UNIT -2

B.Sc III yr CHEMISTRY
SEMESTER WISE SYLLABUS
Course Code: CHE 501

SEMESTER V
Paper-V
Discipline Specific Elective- A (4 credits)

Spectroscopy and Chromatography 60Hrs

Unit

I Molecular spectroscopy 15Hrs

Introduction to electromagnetic radiation, interaction of electromagnetic rations with molecules, various types of molecular spectra.

Rotational spectroscopy (Microwave spectroscopy)

Rotational axis, moment of inertia, classification of molecules (based on moment of inertia), rotational energies, selection rules, determination of bond length of rigid diatomic molecules eg. HCl.

Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.

Electronic spectroscopy:

Bonding and antibonding molecular orbitals, electronic energy levels of molecules (σ , π , n), types of electronic transitions: σ - σ^* , n - σ^* , n - π^* , π - π^* with suitable examples. Selection rules, Terminology of chromophore, auxochrome, bathochromic and hypsochromic shifts. Absorption of characteristic of chromophones: diene, enone and aromatic chromophores. Representation of UV-visible spectra.

Unit II: NMR and Mass Spectrometry

15 Hrs

S5-E-A-II: Proton Magnetic Resonance Spectroscopy

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, factors affecting chemical shifts, NMR splitting of signals — spin-spin

coupling, representation of proton NMR spectrum — Integrations. ¹H NMR spectrum of— ethyl bromide, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate and acetophenone.

Mass Spectrometry

Electron Impact Mass: Basic principles, Nitrogen rule, types of ions: Molecular ion and fragment ions. Representation of mass spectrum, types of peaks (molecular ion peak, base peak and isotopic ion peaks). Determination of molecular formula. Mass spectrum of ethyl chloride, ethyl bromide and acetophenone.

Unit III: Separation techniques – I

15Hrs

SS-E-A-III Solvent Extraction - Principle, Methods of extraction: Balch extraction, continuous extraction and counter current extraction. Application — Determination of Iron(III). **Chromatography:** Classification of chromatographic methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems.

Thin layer Chromatography (TLC): Advantages, preparation of plates, Solid phase and mobile phase used in TLC, elution series, development of the chromatogram, Detection of the spots, visualizing agents, factors effecting R_f values and applications of TLC.

Paper Chromatography: Principle, choice of paper and solvent systems, development of chromatogram – ascending, descending, radial and two dimensional chromatography and applications.

Unit IV: Chromatography- II

15Hrs

S5-E-A-I: Column Chromatography- Principle, Types of stationary phases, Column packing – Wet packing technique, Dry packing technique. Selection criteria of mobile phase solvents for eluting polar, non-polar compounds and its applications.

Ion exchange chromatography: Principle, cation and anion exchange resins, its application in separation of ions.

Gas Chromatography: Theory and instrumentation (Block Diagram), Types of stationary phases and carrier gases (mobile phase).

High performance liquid chromatography: Theory and instrumentation, stationary phases and mobile phases. Analysis of paracetamol.

Recommended Text Books and Reference Books

1. Fundamentals of Molecular Spectroscopy, Banwell & McCash
2. Organic spectroscopy, William Kemp, Palgrave Macmillan; 2nd Revised edition
3. Spectroscopy, B K Sharma Krishna Prakashan Media, 1981

4. Elements of Organic Spectroscopy, Y R Sharma.
5. Applications of Absorption Spectroscopy of Organic Compounds (English, Paperback, Dyer R. John)
6. Organic Chemistry, Morrison and Boyd, Pearson Publications.
7. Introduction to Spectroscopy by Donald Pavia, Gary Lampman and George Kriz. Saunders College Division, 2001
8. Chemistry text book for B.Sc., published by Telugu Academy, Govt. of Telangana.
9. Analytical Chemistry by David Krupadanam, Universities Press (India) Limited.
10. Principles of Instrumental Analysis, D.A. Skoog, F.J. Holler, T.A. Nieman, Engage Learning India Ed.
11. Fundamentals of Analytical Chemistry 6th Ed., D. A. Skoog, D.M. West, F.J. Holler, Saunders College Publishing, Fort Worth (1992).
12. Instrumental Methods of Analysis. 7th Ed. Willard, H.H., Merritt, L.L., Dean, J, & Settle, F.A. Wordsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
13. A Textbook of Quantitative Inorganic Analysis 7th Ed., Vogel, A. I. Prentice Hall.
14. Analytical Chemistry 7th edition by Gary D. Christian (2004).
15. Separation Methods, M.N Sastry, Himalaya Publication (2004).

Outcomes of Semester-V

- Gaining practical knowledge of handling chemicals and analytical instruments
- Explain principle and Applications of analytical and chromatographic techniques
- Students will be able to describe the common methods and main methods of spectroscopic and chromatographic analysis
- Assess and suggest a particular analytical technique and evaluate sensitivity
- Explain theoretical principle in separation and structure elucidation
- Able to interpret the structure with help of spectra
- Gain knowledge on importance of instrumental methods than chemical methods.
- Gain knowledge on principles involved in various techniques.

Semester - V
Laboratory Course
Paper V Experiments in Physical Chemistry-I

45 h (3 h / w)

1. Distribution law

- a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
- b) Determination of distribution coefficient of acetic acid between n-butanol and water.

2. Electrochemistry

- a) Determination of cell constant of a conductivity cell.
- b) Verification of Ostwald's dilution law- Determination of dissociation constant (K_a) of acetic acid by conductivity measurements.

3. Colorimetry

- a) Verification of Beer's law using $KMnO_4$
- b) Determination of the concentration of the given $KMnO_4$ solution.

4. Adsorption

- b) Adsorption of acetic acid on animal charcoal - Verification of Freundlich adsorption isotherm.

5. Physical constants

- a) Surface tension and b) viscosity of liquids. (Demonstration Experiment)

Reference books:

1. Senior practical physical chemistry. B. D. Khosla, V.C. Garg, Adarsh Gulati Published by R. Chand & Co.
2. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan. Viva Books
3. Practicals in Physical Chemistry by P.S. Sindhu ISBN-10: 1-4039-2916-5 / 1403929165
ISBN-13: 978-1-4039-2916-7 / 9781403929167

Outcomes:

- Developed skills in procedures and instrumentations
- Skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
- Understanding of the professional and safety responsibilities when working with chemical systems

**GOVERNMENT DEGREE COLLEGE FOR WOMENS
BEGUMPET, HYDERABAD
III YEAR PRACTICAL MODEL QUESTION PAPER**

Semester-V

Duration : 3hrs.

Total marks 50

1. Write the principle and procedure with necessary equation. (5M)
2. Five sets of experimental readings (for kinetics) and twelve experimental readings (for instrumentation experiments) with proper tabulation. (15M)
3. Calculation results (10M)
4. Graph (10M)
5. Viva (5M)
6. Record (5M)

**GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET
AUTONOMOUS**

Max marks: 20MARKS

NAAC ACCREDITED "B"

Time: 1hour

model Internal Question Paper

Invigilator Signature

Date:

Internal assessment Test No.1

CHEMISTRY

Paper-V

Name: _____

Roll No. _____

Class: _____

Semester:

V

SECTION – A

Answer any 2 questions (5x2=10M)

1. Define chemical shift and coupling constant.
2. Discuss about nitrogen rule.
3. Define chromophore and auxochrome
4. Write characteristic absorption bands of various functional groups

SECTION – B

Answer any one question (10X1=10M)

1. Write Beer Lambert's Law and its limitations ?

(or)

1. Draw mass spectrum of ethyl chloride and acetophenone

**GOVERNMENT DEGREE COLLEGE FOR WOMEN
BEGUMPET, HYDERABAD - 16
B.Sc. III YEAR Model question paper
Subject: CHEMISTRY
SEMESTER – V
PAPER - V**

Time: 2 Hours

Max. Marks: 60

Section-A

I. Answer any four of following questions.

4 x 5 = 20

1. Unit-1
2. Unit-1
3. Unit-2
4. Unit-2
5. Unit-3
6. Unit-3
7. Unit-4
8. Unit-4

SECTION –B

Answer the following by selecting any two from each. 4 x10 = 40M

9. a) Unit-1
b) Unit-1
c. Unit-1
d. Unit-1

10. a) Unit-2
b) Unit-2
c. Unit-2
d. Unit-2

11. a) Unit-3
b) Unit-3
c. Unit-3
d. Unit-4

12. a) Unit-4
b) Unit-4
c. Unit-4
d. Unit-4

Semester V

Generic Elective (GE) Course

- I (4Credits)

(for B.Sc. Non
Chemistry/B.A/B.Com Students)

Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals 60Hrs

Unit-I: Chemistry of Cosmetics and Perfumes

15 Hrs

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talc powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol.

Demonstration experiments or illustration of experimental procedures through charts for the preparation of talc powder, shampoo and vanishing cream. Chemistry and Applications of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

Unit-II: Food Processing and Food Adulteration

15 Hrs

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition,

Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce.

Food Packaging: Definition and function of packaging-Classification of packaging materials- different types of packaging materials such as glass, wood, metal, paper, wood, plastic etc., advantages and disadvantages of each packaging material. Packaging materials and systems: corrugated fibre board boxes, shrink bundles and reusable packages. Effect of packaging materials on nutritive values of food.

Food labelling: Introduction, need and importance.

Unit — III: General Characteristics of Drugs

Introduction: Diseases — causes of diseases, Drug — definition and sources.

15Hrs

ADME of drugs (brief) — Absorption, distribution, drug metabolism (in liver), elimination (brief). Toxicity. Examples (i) Zintac (Ranitidine, antacid) (ii) Paracetamol (antipyretic) (iii) Benadryl (Cough syrup). Characteristics of an ideal drug.

Nomenclature of Drugs: chemical name — generic name — trade name. Trade names for the given generic names — (i) Aspirin (ii) Amoxycillin (iii) Ciprofloxacin (iv) Paracetamol (v) Mebendazole

Drug formulations: Definition — need for conversion of drug into pharmaceutical (drug formulations) — Additives — diluents, binders, lubricants, antioxidants, flavourants, sweeteners, colourants, coating agents. Classification of Drug formulations: oral, parenterals and topical dosage forms —

advantages and disadvantages.

i. Oral Dosage forms: Tablets (Aspirin — analgesic; Ciprofloxacin - antibacterial). Capsules

(Amoxycillin — antibiotic; Omeprazole-antacid). syrup).

Syrups (B-complex syrup; Benadryl- Cough

(ii) **Parenterals (Injection forms):** Propranolol (antihypertensive), Heparin (anticoagulant)

(iii) **Topical dosage forms:** Creams and Ointments

(iv) **Antiallergic:** Aclometasone (Aclovate), Betamethasone valerate (2%) Multiple purposes,

(v) **Anti-itching:** Doxepin (Zonalon), Antifungal: Miconazole (Dactarin, Neomicol), Ketoconazole, (Nizoral Cream), Fluconazole, Anesthetic- Lidocaine, (Lidocaine ointment) and Antiseptic: Boro Plus Cream, For burns -Iodine ointment

Unit - IV: Classification of Drugs

Classification of drugs based on therapeutic action- Chemotherapeutic agents, Pharmacodynamic agents and drugs acting on metabolic processes.

Brief explanation for the following:

- (i) **Chemotherapeutic agents:** Antimalarials Chloroquine; Antibiotic — Amoxicillin; Antitubercular drugs — isoniazide; Antiprotozoals — metronidazole.
- (ii) **Pharmacodynamic agents:**
- (a) Drugs acting on CNS: Diazepam (CNS depressant), General anesthetic (thiopental sodium), antipyretic and analgesic (Ibuprofen)
- (b) Drugs acting on PNS: local anaesthetics (Benzocaine)
- (c) Drugs acting on cardiovascular system: Metoprolol (antihypertensive agents), Nifedipine (antihypertensive and antianginal agent)
- (d) Drugs acting on renal system: Diuretics (Acetazolamide)
- (iii) **Drugs acting on metabolic processes:**
- (a) Vitamins: Common name, source, deficiency, vitamin A, B2, B6, C, D, E and K — remedy
- (b) Hormones: Function (brief) - deficiency of hormones (Insulin, Testosterone and Oestrogen)

Course Objectives:

The objective of GE-1 is intended to provide:

- Basic knowledge on cosmetics and perfumes which are used in daily life
- Basic knowledge on adulteration of food
- Have an idea of processing food and packing of food
- Basic knowledge in pharmaceuticals in addition to understand the types of diseases, drugs used to cure specific diseases, concept of ADME, mode of action etc.
- To create interest among the students by illustrating the development of vaccines, drugs etc. that are used in treating common diseases.
- To make them understand the terminology used in pharmaceuticals such as pharmacy, pharmacokinetics, Pharmacodynamics, receptors etc.
- To have a basic knowledge of drug formulation, dosage forms, classification of drugs etc., so that it will be very useful in their day to day life.
- The importance of vitamins, hormones in the growth and development of human body.

Course Outcome:

After the successful completion of the course, students should be able to:

- Chemicals which are used to prepare cosmetics and perfumes

- Broad idea of adulteration of food and how to identify adulterated food
- Develop skills on food processing and food packing methods
- Differentiate the diseases according to the symptoms.
- Classify the drugs based upon chemotherapy, Pharmacodynamics properties.
- Describe development, regeneration and normal function of body systems.
- Select the dose for a drug.
- Formulate and evaluate conventional dosage forms.
- Develop the drug synthesis.

Recommended Text Books and Reference Books

- I. Industrial Chemistry, Vol -1, E. Stocchi, Ellis Horwood Ltd. UK.
1. Engineering Chemistry, P.C. Jain, M. Jain, Dhanpat Rai & Sons, Delhi.
 2. Industrial Chemistry, Sharma, B.K. & Gaur, H. , Goel Publishing House, Meerut (1996).
 3. Food Processing and Impact on Nutrition, Rameen Devi, Sc J Agric Vet Sci., Aug-Sep 2015; 2(4A):304-311.

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12.

Perfumes, Cosmetics and Soaps , W.A. Poacher,
(1993). A first course in food analysis by A Y
Sathe

Food Science by N.Potter, CBS pub[isliers

Food chemistry, Lillian Hoagland Meyer, (2008).

A Handbook of food packaging by F. A. Paine and H.Y. Paine.

Fundamental concepts of applied chemistry 3.C GhOSII, S. Chand and Co, Ltd,
New Delhi. Applied Chemistry K .Bhagavathi Sundliar, MIP publishers.

B.Sc. Chemistry III Year

Semester-VI, Paper-VI

Discipline specific elective-A(4 Credits)

Medicinal Chemistry

60Hrs

Unit- I:Introduction and Terminology

15Hrs

S6-E-A-I: Diseases: Common diseases, infective diseases–insect borne, air-borne, water-borne and hereditary diseases.

Terminology in Medicinal Chemistry: Drug, Active pharmaceutical ingredients(API),Phrmaceuticals,Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, anti metabolites and therapeutic index.

Drugs: Nomenclature: Chemical name, Generic name and Trade names with examples;

Classification: Classification based on structures and therapeutic activity with examples.

ADMET: a) Absorption: Definition, absorption of drugs across the membrane – active and passive absorption, routes of administration of drugs. b) Distribution: definition and effect of plasma protein binding. c) Metabolism: definition, phase I and phase II reactions.d) Elimination: definition and renal elimination. e) Toxicity

Unit-II: Enzymes and Receptors

15Hrs

S6-E-A-II: Enzymes: Introduction. Mechanism and factors affecting enzyme action, Specificity of enzyme action (including stereo specificity), Enzyme inhibitors and their importance. Types of inhibition - reversible, irreversible and their subtypes with examples.

Receptors: Introduction, Drug action-receptor theory, Mechanism of drug action, concept of agonists and antagonists with examples. Drug receptor interactions involved in drug receptorcomplex. binding role of –OH group, -NH₂ group, quaternary ammonium salts and double bond. Structure – activity relationships of drug molecules, explanation with sulfonamides.

Unit- III: Synthesis and Therapeutic Activity of Drugs

15Hrs

S6-E-A-III: Introduction, synthesis and therapeutic activity of :

Chemotherapeutics: Sulphanilamide, dapsone, Pencillin-G (semi synthesis), Chloroquin,

Isoniazid, Cisplatin and AZT.

Drugs to treat metabolic disorders: Anti diabetic - Tolbutamide; Antiinflammatory –

Ibuprofen; Cardiovascular- Glyceryl trinitrate; Antipyretic (paracetamol, aspirin) and Antacid-Omeprazole.

Drugs acting on nervous system: Anesthetics-definition, Classification-local and general. Volatile- Nitrous oxide, chloroform uses and disadvantages. Local anesthetics – benzocaine.

Unit- IV: Molecular Messengers and Health Promoting Drugs 15Hrs

S6-E-A-IV: Molecular Messengers: Introduction to hormones and neurotransmitters, Thyroid hormones, Antithyroid drug-Carbimazol. Adrenaline: Adrenergic drugs- salbutamol, atenelol. Serotonin: SSRIs- fluoxetine. Dopamine: Antiparkinson drug- Levodopa .

Health promoting drugs: Introduction, sources, Deficiency disorders and remedy of Vitamins A,B, C, D, E K and micronutrients – Na, K, Ca, Cu, Zn and I .

Reference books

1. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, New York. 2013.
2. Thomas Nogrady, Medicinal Chemistry, Oxford Univ. Press, New York.2005.

1. David William and Thomas Lemke, Foye's Principles of Medicinal Chemistry, Lippincott Williams & Wilkins, 2008.

1. Ashutosh Kar Medicinal Chemistry, New Age International, 2005.

2. O.D.Tyagi & M.Yadav Synthetic Drugs by, Anmol Publications,1998.

1. Medicinal Chemistry by Alka L. Gupta, Pragati Prakashan.

7.G. L. David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Drugs, Universities Press (India) Ltd. 2012.

Semester - VI

Laboratory course

Experiments in Physical Chemistry-II

Paper VI (Physical Chemistry) 45hrs (3 h/w)

1. Kinetics

- a. Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.

- b. Determination of rate of decomposition of hydrogen peroxide catalyzed by FeCl_3 .

1. Electrochemistry

A. Potentiometry:

- b. Determination of redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.
- a. Precipitation titration of KCl vs. AgNO_3 -Determination of given concentration of silver nitrate.

B. pH metry:

- a. pH metric titration of strong acid (HCl) vs. strong base- Determination of the concentration of the given acid.

- b. pH metric titration of weak acid(acetic acid) with strong base(NaOH).- Determination of acid dissociation constant (K_a) of weak acid.

1. Conductometry:

Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurements.

Paper Code: /CBCS

**GOVERNMENT DEGREE COLLEGE FOR WOMEN
BEGUMPET, HYDERABAD - 16
B.Sc. III YEAR Model question paper
Subject: CHEMISTRY
SEMESTER – VI
PAPER – VI**

Time: 2Hours

Max. Marks: 60

Section-A

I. Answer any four of the following questions.

4 x 5 = 20

1. Unit-1
2. Unit-1
3. Unit-2
4. Unit-2
5. Unit-3
6. Unit-3
7. Unit-4
8. Unit-4

SECTION –B

Answer the following by selecting any two from each. 4 x10 = 40M

9. a) Unit-1
b) Unit-1
c. Unit-1
d. Unit-1
10. a) Unit-2
b) Unit-2
c. Unit-2
d. Unit-2
11. a) Unit-3
b) Unit-3
c. Unit-3
d. Unit-4
12. a) Unit-4
b) Unit-4
c. Unit-4
d. Unit-4

