

J.M.J COLLEGE FOR WOMEN, TENALI (AUTONOMOUS)

First Year CHEMISTRY Syllabus

I SEMESTER

From 2015-2016

Paper: 1 INORGANIC AND ORGANIC CHEMISTRY

INORGANIC CHEMISTRY-1

UNIT-1

1. P-block elements

General characteristic of elements of groups 13, 14, 15

Group-13: Synthesis and structure of diborane and higher boranes, boron nitrogen compounds

Group-14: Preparation and applications of silanes, silicone and Silicates.

Group-15: Preparation and reactions of hydrazine, hydroxylamine.

UNIT-II

1. P-block elements

General characteristic of elements of groups 16 and 17

Group-16: Classification of oxides based on chemical behavior and oxygen content

Group-17: Interhalogen compounds and pseudo halogens.

2. Organometallic chemistry

Definition and classification of organometallic compounds, nomenclature, preparation, properties and applications of alkyls of Li and Mg elements.

3. General principles of inorganic qualitative analysis

Solubility product, common ion effect, characteristic reactions of anions, elimination of interfering anions, separation of cations into groups, group reagents, testing of cations.

ORGANIC CHEMISTRY-1

UNIT-III

1. Structural theory in Organic Chemistry

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O , NH_3 & AlCl_3).

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 acid (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol (b) acidity of carboxylic acids. Hyper conjugation and its applications to stability of carbonium ions, free-radicals and alkenes, carbanions, carbenes and nitrenes.

Types of organic reactions: Addition- Electrophilic, Nucleophilic and free radical Substitution – electrophilic, nucleophilic and free radical. Elimination- examples (mechanism not requires)

UNIT-IV

1. Alicyclic hydrocarbons (cycloalkanes)

Nomenclature, Preparation by Freunds methods, heating dicarboxylic metal salts. Properties – reactivity of cyclopropane and cyclobutane by comparing with alkanes, stability of cycloalkanes- Baeyer's strain theory, sachse and Mohr predictions and pitzer's strain theory. Conformational structures of cyclobutane, cylcopentane, cyclohexane.

UNIT-V

1. Benzene and its reactivity

Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of benzene.

Concept of aromaticity- aromaticity (definition), Huckel's rule- application to Benzenoid (benzene, Naphthalene) and Non- Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions- General mechanism of electrophilic substitution, mechanism of nitration. Friedel craft's alkylation and acylation. Orientation of aromatic substitution- definition of Ortho, Para, Meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO₂ and phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

(Explanation by taking minimum of one example from each type)

2. Poly nuclear hydrocarbons

Structure of naphthalene and anthracene (Molecular orbital diagram and resonance energy) any two methods of preparation of naphthalene and reactivity. Reactivity towards electrophilic substitution. Nitration and sulphonation as examples.

J.M.J COLLEGE FOR WOMEN, TENALI (AUTONOMOUS)

First Year CHEMISTRY Syllabus

II SEMESTER

From 2015-2016

Paper II (Physical and General Chemistry)

Physical Chemistry

UNIT-1

1. Solid state:

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point space lattice, unit cell Bravais lattice and crystal systems X-ray diffraction and crystal structure. Bragg's law. Determination of crystal structure by Bragg's method and the powder method. Indexing of planes and structure of NaCl and KCl crystals.

Defects in crystals. Stoichiometric and non-stoichiometric defects. Band theory of semiconductors. Extrinsic and intrinsic semiconductors, n- and p- type semiconductors and their applications in photo electrochemical cells.

UNIT-II

1. Gaseous state:

Compression factors, deviation of real gases from ideal behavior. Vander wall's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The vanderwaal's equation and the critical state. Relationship between critical constants and vanderwaal's constants. Joule Thomson effect. Liquefaction of gases. i) Linde's method and ii) Claude's method.

2. Liquid state:

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state classification of liquid crystals into smectic and Nematic. Differences between liquid crystal and solid/liquid . Application of liquid crystals as LCD devices.

UNIT-III

1. Solutions

Liquid –liquid-ideal solutions, Raoult's law, ideally dilute solutions, Henry's law, Non-ideal solutions. Vapour pressure- composition and vapour pressure- temperature curves. Azeotropes- HCl-H₂O, ethanol- water systems and fractional distillation. Partially miscible liquids- phenol-water, trimethylamine-water, nicotin-water systems. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation.

Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

GENERAL CHEMISTRY

UNIT-IV

1. Surface chemistry

Definition of colloids. Solids in liquids (sols), preparation, purification, properties- kinetic, optical electrical. Stability of colloids, hardy-schulze law, protective colloid. Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

Adsorption: physical adsorption, chemisorptions, freudlich, Langmuir adsorption isotherms. Applications of adsorption.

2. Chemical bonding:

Valence bond theory, hybridization, VB theory as applied to ClF₃, Ni (CO) ₄, Dipole moment Orientation of dipoles in an electric fields, dipole moment, induced dipole moment, dipole moment and structure of molecules. Molecular orbital theory –LCAO method, construction of M.O. diagrams of homo-nuclear and hetero- nuclear diatomic molecules (N₂,O₂, CO and NO).

UNIT-V:

1. Stereochemistry of carbon compounds

Molecular representations- Wedge, Fischer, Newmann and Saw-Horse formulae. Stereoisomerism, stereoisomers, enantiomers, diastereomers- definition and examples. Conformational and configurational isomerism- definition. Conformational isomerism of ethane and n – butane.

Enantiomers: Optical activity-wave nature of light, plane polarized light, interaction with molecules, optical rotation and specific rotation. Chiral molecules- definition and criteria- absence of plane, center, and S_n axis symmetry- asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans- 1, 2 dichloro cyclopropane).

Chiral centers: definition- molecules with similar chiral carbon (Tartaric acid), definition of mesomers- molecules with dissimilar chiral carbons (2, 3 – dibromopentane). Number of enantiomers and mesomers- calculation.

D, L and R, S configuration for asymmetric and dissymmetric molecules. Cahn- Ingold- Prelog rules. Racemic mixture – racemisation and resolution techniques. Diastereomers. Definition- geometrical isomerism with reference to alkenes- Cis, Trans and E, Z configuration.

J.M.J COLLEGE FOR WOMEN, TENALI (AUTONOMOUS)

First Year CHEMISTRY Syllabus

II SEMESTER

From 2015-2016

LABORATORY COURSE

Practical –II (at the end of semester-II)

Qualitative inorganic analysis

Qualitative inorganic analysis and Inorganic preparation:

Analysis of mixture salt containing two anions mixtures containing two anions and two cations (from two different groups) from the following.

Anions: carbonate, sulphate, chloride, bromide, iodide, acetate, nitrate, borate, phosphate

Cations: Lead, Copper, iron, aluminium, zinc, manganese, calcium, strontium, barium, potassium and ammonium

Inorganic preparations: Any one of the following:

- 1) Potash alum
- 2) Hexamine cobalt(III) chloride
- 3) Potassium tris oxalato chromate

J.M.J COLLEGE FOR WOMEN, TENALI (AUTONOMOUS)

First Year CHEMISTRY Syllabus

I SEMESTER

From 2015-2016

LABORATORY COURSE-60hrs (3h/w)

Practical -1 (At the end of semester-1)

Qualitative inorganic analysis;

Qualitative analysis and inorganic preparations:

Analysis of simple salt containing the following one anion and cation

Analysis of Anion: Carbonate, sulphate, chloride, bromide, iodide, acetate, nitrate, borate, phosphate,

Analysis of cations: Lead, copper, cadmium, iron, aluminium, zinc, manganese, nickel, calcium, strontium, barium, potassium and ammonium.

Inorganic preparations: any one of the following inorganic preparations.

- 1) Ferrous ammonium sulphate
- 2) Tetra amine copper(II) sulphate

J.M.J COLLEGE FOR WOMEN, TENALI (AUTONOMOUS), NAAC B

First Year CHEMISTRY Model question papers

I SEMESTER

From 2015-2016 Admitted batch

Paper: 1 INORGANIC AND ORGANIC CHEMISTRY

Section-A

Answer any five questions selecting two from each section 5x10=50M

Part-I

1. How is diborane prepared? And discuss its structure.
2. How are oxides classified on the basis of the nature?
3. Give the synthetic applications of alkyl magnesium bromide
4. Give the identification and confirmation tests of chloride in a mixture
5. Discuss about silicates

Part-II

6. Define inductive effect? How does it effect the strength of carboxylic acid?
7. (a) Give any two methods of preparation of cyclo alkanes
(b) Explain Baeyer's strain theory
8. Define and explain aromaticity with two examples
9. Discuss the orientation of NO₂ and NH₂ groups in benzene
10. Discuss the electrophilic, nucleophilic addition reactions?

Section-B

Answer any five from the following

5x4=20M

11. Write notes on pseudo halogens.
12. How do hydrazine and hydroxylamine react with aldehyde?
13. Give any two applications of alkyl lithium.
14. Give reactions of various types of bond fission.
15. Explain the acidic nature of phenol.
16. Give the mechanism of Friedal-Crafts alkylation.
17. In naphthalene α -position is more reactive than the β -position. Explain.
18. Explain the structure of IF₇.

J.M.J COLLEGE FOR WOMEN, TENALI (AUTONOMOUS), NAAC B

First Year CHEMISTRY Model Question paper

II SEMESTER

From 2015-2016 Admitted batch

Paper II (Physical and General Chemistry)

Section-A

Answer any five questions selecting two from each section

5x10=50M

Part-I

1. Derive Bragg's equation and explain powder method.
2. Derive Vanderwaal's equation.
3. Derive the relation between critical constants and Vanderwaal's constants.
4. Classify the liquid crystals.
5. Write notes on Raoult's law and Henry's law.

Part-II

6. Explain the optical and electrical properties of colloids.
7. Explain hybridization with suitable examples.
8. Give the M.O diagrams of N_2 , O_2 and CO.
9. Write notes on enantiomers and diastereomers.
10. Explain the optical activity of tartaric acid and 2, 3 dibromopentane.

Section-B

Answer any five of the following

5x4=20M

11. Write about space lattice and unit cell.
12. Explain Joule-Thomson effect.
13. Give the applications of liquid crystals.
14. Define Nernst distribution law and give its applications.
15. Give the preparation and uses of gels.
16. Write about dipole moment.
17. What are chiral molecules give two examples?
18. Explain E, Z configurations.

J.M.J. COLLEGE FOR WOMEN, TENALI
Autonomous, B
Syllabus for II B.Sc., Chemistry(2012-2013)
SEMESTER III
In Organic & General Chemistry

UNIT-I (Inorganic Chemistry-II)

I. Chemistry of d-block elements: Stability of various oxidation states and e.m.f. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu traids in respect of electronic configuration and reactivity of different oxidation states. 7 h

II. Chemistry of f-block elements: Spectral properties and separation of lanthanides by ion exchange and solvent extraction methods. Chemistry of actinides – electronic configuration, oxidation states, actinide contraction, position of actinides in periodic table, comparison with lanthanides in terms of magnetic properties, spectral properties and complex formation. 7 h

III.Theories of bonding in metals: Valence bond theory. Explanation of metallic properties and its limitations. Free electron theory, thermal conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semi-conductors and insulators. 6 h

IV.Metal carbonyls and related compounds – BAN rule, classification of metal carbonyls, structures and shapes of metal, carbonyls of V, Cr. Mn. Fe, Co and Ni. Metal nitrosyls and metallocenes (only ferrocene).

Unit –II (General Chemistry-II)

1. Molecular symmetry 5 h

Concept of symmetry is chemistry-symmetry operations, symmetry elements. Rotational axis of symmetry and types of rotational axes. Planes of symmetry and types of planes. Improper rotational axis of symmetry. Inversion centre. Identify element. The symmetry operations of a molecule from a group. Flow chart for the identification of molecular point group.

2. Introductory treatment to:

a)Pericyclic reactions : 5 h

Concerted reactions, Molecular orbitals, Symmetry properties HOMO, LUMO, Thermal and photochemical pericyclic reactions. Types of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – one example each.

b) Synthetic strategies 4 h

Terminology – Disconnection (dix), Symbol (), Synthetic equivalent (SE), Functional group interconversion (FGI), Linear, Convergent and Combinatorial synthesis, Target molecule TM Retrosynthesis of the following molecules.1)Acetophenone 2)Cyclohexene 3)Phenylethylbromide

(3) Theory of quantitative analysis 6 h

a) Principles of volumetric analysis: Theories of acid-base, redox, complexometric, iodometric and precipitation titrations, choice of indicators for these titrations.

b) Principles of gravimetric analysis: Precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and washing of precipitate, drying and ignition, precipitation from homogenous, requirements of gravimetric analysis

(4) Evaluation of analytical data 4 h

Theory of errors, idea of significant figures and its importance, accuracy – methods of expressing accuracy, error analysis and minimization of errors, precision – methods of expressing precision, standard deviation and confidence limit.

J.M.J. COLLEGE FOR WOMEN (AUTONOMOUS): TENALI

II B.Sc. Chemistry – Paper – III

Semester III

Max. Marks: 70

Inorganic & General Chemistry

Time: 3 hrs.

SECTION – A

Answer any five questions selecting at least two from Part-I and Part-II 5 x 10 = 50 M

PART-I

1. a) Discuss the stability of various oxidation states of d –block elements.
b) Write notes on Titanium Triad.
2. a) How can we separate lanthanides by Ion exchange method?
b) Compare the Actinides with Lanthanides in terms of magnetic properties, Spectral properties and complex formation.
3. a) Explain the bonding in metals by Valence bond theory.
b) Write notes on Conductors and Semi conductors.
4. What is EAN rule? How are metal carbonyls classified? Discuss the structures of $\text{Ni}(\text{CO})_4$ and $\text{Fe}(\text{CO})_5$

PART – II

5. a) Give the various symmetry elements of a cube.
b) Write notes on co-precipitation.
6. Discuss the action of litmus and phenolphthalein as indicators in acid based titrations.
7. a) Write about the precision and accuracy of measurement.
b) Define and explain the significant figures
8. a) Give the thermal and photochemical pericyclic reactions.
b) What is convergent synthesis?

SECTION – B

Answer any FIVE of the following

5 x 4 = 20 M

9. Compare the elements of 2nd and 3rd transition series with the first transition series.
10. What is lanthanide contraction and how it affects the basicity of lanthanide ions.
11. Write about the free electron theory of bonding in metals.
12. Write short notes on nitrosyls.
13. Give the retrosynthesis of acetophenone .
14. Write notes on EDTA titrations.
15. Discuss about post-precipitation.
16. Define error and explain the various types of errors in analysis.

J.M.J. COLLEGE FOR WOMEN, TENALI

Autonomous, B++

Syllabus for II B.Sc., Chemistry

SEMESTER IV

Physical & Organic Chemistry

UNIT-I II (Physical Chemistry-II)

1. Phase rule:

5 h

Concept of phase, components, degree of freedom. Derivation of Gibbs phase rule. Phase equilibrium of one component – water system. Phase equilibrium of two-component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, desilverisation of lead. Solid solutions – compound with congruent melting point. (Mg-Zn) system, compound with incongruent melting point – NaCl – water system. Freezing mixtures.

2. Catalysis:

12 h

Homogenous and Heterogeneous catalysis, comparison with examples. Kinetics of specific and catalysed reactions, inversion of cane sugar. Kinetics of specific base catalyzed reactions, base catalyzed conversion of acetone to diacetone alcohol. Acid and base catalyzed reactions – hydrolysis of esters, mutarotation of glucose. Catalytic activity at surfaces. Mechanisms of heterogeneous catalysis. Langmuir – Hinshelwood mechanism.

Enzyme catalysis: Classification, characteristics of enzyme catalysis. Kinetics of enzyme catalysed reactions – Michaelis-Menten law, significance of Michaelis constant (K_m) and maximum velocity (V_{max}). Factors affecting enzyme catalysis-effect of temperature, pH, concentration and inhibitor. Catalytic efficiency. Mechanism of oxidation of ethanol by alcohol dehydrogenase.

3. Electrochemistry

14 h

Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf's method. Application of conductivity measurements-determination of dissociation constant (K_a) of an acid, determination of solubility product of sparingly soluble salt, conductometric titrations. Types of reversible electrodes – the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions. Calculations of thermodynamic quantities of cell reactions (G , H and K). Determination of pH using quinhydrone electrode, solubility product of AgCl. Potentiometric titrations.

UNIT-IV (Organic Chemistry – II)

1. Halogen compounds : Nucleophilic aliphatic substitution reaction-classification into SN_1 and SN_2 . Energy profile diagram of SN_1 and SN_2 reactions. Stereochemistry of SN_2 (Walden inversion) SN_1 (Racemisation). Explanation of both by taking the example of optically active alkyl halide – 2-bromobutane. Ease of hydrolysis – comparison of alkyl, benzyl, allyl, vinyl and aryl halides. Nature of nucleophile, Nature of leaving group, Nature of solvent, SN_1 , Neighbouring group participation. 4 h

2. Hydroxy compounds

5 h

Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols.

Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene with mechanism

Chemical Properties:

- Acidic nature of phenols,
- Formation of alkoxides /phenoxides and their reaction with RX ,
- Esterification of acids (mechanism)
- Dehydration of alcohols

e) Special reaction of phenols with mechanism, Bromination, Kolb-Schmidt reaction, Reimer – Timmer Reaction

Polyhydroxy compounds: Oubacik-Pinacolone rearrangement.

3. Carbonyl compounds

8 h

Synthesis of aldehydes from chlorides, synthesis of ketones from nitriles and from carboxylic acids.

Physical properties: Absence of hydrogen bonding, keto-enol tautomerism, reactivity of carbonyl group in aldehydes and ketones. Nucleophilic addition reaction with a) NaHSO_3 , b) HCN , c) RMgX , d) 2,4 DNP with mechanism.

Halogenation using PCl_5 with mechanism.

Base catalysed reactions with mechanism:

a) Aldol, b) Cannizzaro reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction.

Oxidation of aldehydes: Baeyer-Villiger oxidation of ketones with mechanism.

Reduction: Wold – Kishner reduction, MPV reduction, reduction with LiAlH_4 and NaBH_4 (all mechanisms)

Analysis of aldehydes and ketones with a) 2, 4-DNP test, b) Tollen's test, c) Fehling test, d) Schiff test, e) Haloform test (with equation)

4. Carboxylic acids and derivatives:

5 h

Methods of preparation by a) hydrolysis of nitriles, amides and esters, b) carbonation of Grignard reagents.

Special methods of preparation of aromatic acids by a) oxidation of side chain, b) hydrolysis of benzotrichlorides, c) Kolbe reaction.

Physical properties: Hydrogen bonding, dimeric association acidity-strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids.

Chemical properties: Reactions involving H, OH and COOH groups-salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Hunsdiecker reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenations by Hell-Volhard – Zelinsky reaction.

Derivatives of carboxylic acids: Reaction of acid chlorides, acid anhydrides, acid amides, esters (mechanism of the hydrolysis of esters by acids and bases).

5. Active methylene compounds

4 h

Acetoacetic esters: Preparation by Claisen condensation, keto-enol tautomerism. Acid hydrolysis and ketonic hydrolysis

Preparation of a) monocarboxylic acids, b) dicarboxylic acids

Reaction with Urea

Malonic ester: Preparation from acetic acid.

Synthetic applications: Preparation of

a) monocarboxylic acids (propionic acid and n-butyric acid)

b) dicarboxylic acids (succinic acid and adipic acid)

c) α , β -unsaturated carboxylic acids (crotonic acid). Reaction with urea.

6. Exercises in interconversion: Halogen derivatives to hydroxyl compounds, carboxylic acids and its derivatives.

2 h

4. Determination of nickel as Ni-DMG complex

5. Determination of magnesium as magnesium pyrophosphate

J.M.J. COLLEGE FOR WOMEN (AUTONOMOUS): TENALI

II B.Sc. Chemistry – Paper – IV

Semester IV

Max. Marks: 70

Physical and Organic Chemistry

Time: 3 hrs.

SECTION – A

Answer any five questions selecting atleast two from Part-I and Part-II

5 x 10 = 50 M

PART-I

1. a) Define phase rule and explain the terms in it.
b) Apply the phase rule to one component system.
2. a) What is homogeneous and heterogeneous catalysis? Give examples.
b) Discuss the factors affecting the enzyme catalysis.
3. Define transport number and how is it determined by Hittorf's method?
4. a) How the catalytic activity takes place on metal surfaces?
b) Write notes on gas electrodes.

PART – II

5. a) Compare the reactivities of alkyl, benzyl, vinyl and aryl halides
b) How Phenol is acidic in nature?
6. Discuss the mechanism of
 - i) Alchol condensation
 - ii) Benzoin condensation
7. a) How are Carboxylic acids prepared by hydrolysis methods?
b) How are the following compounds prepared from Carboxylic acids?
 - i) Acid anhydrides
 - ii) Acid amides
 - iii) Esters
8. a) How is acetoacetic esters is prepared? Give the mechanism.
b) How can we prepare the following from acetoacetic ester?
 - i) adipic acid
 - ii) Crotonic acid
 - iii) n-butyl acid
 - iv) 4-methyl uracil

SECTION – B

Answer any FIVE of the following

5 x 4 = 20 M

9. Give the phase diagram of Pb-Ag system and define eutectic point.
10. What are the characteristics of enzyme catalysis?
11. How can we determine the pH using quinhydrone electrodes?
12. How is melonic acid prepared?
13. How phenol reacts with bromine water and chloroform?
14. How alcohols are prepared from
 - i) Alkyl halides
 - ii) ester
15. Give the reactions of acetone with
 - i) RMgX
 - ii) HCN
16. How do you distinguish between aldehyde and ketone

J.M.J. COLLEGE FOR WOMEN (AUTONOMOUS): TENALI

SECOND YEAR CHEMISTRY SYLLABUS

LABORATORY COURSE - II

Practical Paper – II (Organic Chemistry)

I. Titrimetric analysis:

- 1) Determination of carbonate and bicarbonate in a mixture
- 2) Determination of Fe (II) using $K_2Cr_2O_7$
- 3) Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard
- e) Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard
- 5) Determination of Zinc using EDTA
- 6) Determination of Magnesium using EDTA
- 7) Determination of hardness of water
- 8) Determination of Zinc by ferrocyanide

II. Gravimetric analysis (any three of the following)

1. Determination of barium as barium sulphate
2. Determination of sulphate as barium sulphate
3. Determination of lead as lead chromate
4. Determination of nickel as Ni-DMG complex
5. Determination of magnesium as magnesium pyrophosphate

J M J College for Women (Autonomous), Tenali

III B.Sc., V Semester – Chemistry Syllabus

w.e.f. 2010 - 11 (2008 - 09 admitted batch)

Paper V (Inorganic, Organic and Physical chemistry)

Unit – I (Inorganic Chemistry)

1. Coordination Chemistry

- 10 h

IUPAC nomenclature, bonding theories – review of Werner's theory and Sidgwick's concept of coordination, Valence bond theory, geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, Crystal Field theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes – low spin and high spin complexes – factors affecting crystal- field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds – structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

2. Spectral and magnetic properties of metal complexes

- 04 h

Electronic absorption spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility – Gouy method.

UNIT – II (Organic Chemistry)

1. Nitrogen compounds

- 09 h

Nitro hydrocarbons: Nomenclature and classification – nitro hydrocarbons – structure. Tautomerism of nitroalkanes leading to aci and keto form. Preparation of Nitroalkanes. Reactivity – halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1^0 , 2^0 , 3^0 Amines and Quaternary ammonium compounds. Preparative methods -1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). 4. Reduction of Amides and Schmidt reaction. Physical properties and basic character – Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline – comparative basic

strength of aniline, N-methylaniline and N,N-dimethylaniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. Chemical properties: a) Alkylation b) Acylation

c) Carbylamine reaction d) Hinsberg separation e) 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. Diazotization.

Cyanides and isocyanides: Nomenclature (aliphatic and aromatic) structure. Preparation of cyanides from a) Alkyl halides b) Amides c) Aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides & isocyanides - i) hydrolysis ii) addition of Grignard reagent iii) reduction iv) oxidation.

2. Amino acids and proteins

- 06 h

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids – definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. 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: L-configuration, irrespective of sign rotation, Zwitter ion structure – salt like character - solubility, melting points, amphoteric 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 and proteins.

Unit – III (Physical Chemistry)

1. Thermodynamics

- 16 h

The first law of thermodynamics - statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule's law - Joule-Thomson coefficient. Calculation of w , q , dU and dH for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation - Kirchhoff's equation. Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as

a state function, entropy changes in cyclic, reversible, and irreversible processes and reversible phase change. Calculation of entropy changes with changes in V & T and P & T . Entropy of mixing inert perfect gases. Entropy changes in spontaneous and equilibrium processes.

The Gibbs (G) and Helmholtz (A) energies. A & G as criteria for thermodynamic equilibrium and spontaneity - advantage over entropy change. Gibbs equations and the Maxwell relations. Variation of G with P , V and T .

J M J College for Women (Autonomous), Tenali

III B.Sc., V Semester – Chemistry Syllabus

w.e.f. 2011 - 12 (2009 - 10 admitted batch)

Paper VI E1 (Chemistry and Industry)

Unit – I (Physico Chemical methods of analysis)

1. Separation techniques

- 12 h

- i. Solvent extraction: Principle and process, Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron (III)
- ii. Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, R_f values, factors effecting R_f values.
 - a. Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram – ascending, descending and radial. Two dimensional chromatography, applications.
 - b. Thin layer Chromatography (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.
 - c. Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications
 - d. High Performance Liquid Chromatography (HPLC): Principles and Applications.
 - e. Gas Liquid Chromatography (GLC): Principles and Applications

2. Spectrophotometry

- 03 h

General features of absorption - spectroscopy, Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of

- i. Chromium in $K_2Cr_2O_7$

- ii. Manganese in manganous sulphate
- iii. Iron (III) with thiocyanate.

Unit – II (Drugs, formulations and pesticides)

1. Drugs

- 15 h

- i. Introduction: Drug, disease (definition), Historical evolution, Sources – Plant, Animal synthetic, Biotechnology and human gene therapy
- ii. Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief treatment) Metabolites and Anti metabolites.
- iii. Nomenclature: Chemical name, Generic name and trade names with examples
- iv. Classification: Classification based on structures and therapeutic activity with one example each.
- v. Synthesis: Synthesis and therapeutic activity of the following drugs, L-Dopa, Chloroquin, Omeprazole, Albuterol and ciprofloxacin.
- vi. Drug Development: Pencillin, Separation and isolation, structures of different pencillins

Unit-III: (Macromolecules and materials Science)

1. Macromolecules

- 11 h

Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization - tacticity. Molecular weight of polymers-number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by Viscometry, Osmometry and Light scattering methods. Preparation and industrial application of polyethylene, PVC, Teflon, polyacrylonitrile, terelene and Nylon66. Introduction to biodegradability.

2. Materials science

- 04 h

Superconductivity, characteristics of superconductors, Meissner effect, types of superconductors and applications.

J M J College for Women (Autonomous), Tenali

III B.Sc., VI Semester – Chemistry Syllabus

w.e.f. 2010 - 11 (2008 - 09 admitted batch)

Paper VII (Inorganic, Organic and Physical chemistry)

Unit – I (Inorganic Chemistry)

1. Reactivity of metal complexes - 04 h

Labile and inert complexes, ligand substitution reactions – S_N1 and S_N2 , substitution reactions of square planar complexes – Trans effect and applications of trans effect.

2. Stability of metal complexes - 04 h

Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

3. Hard and soft acids and bases (HSAB) - 03 h

Classification, Pearson's concept of hardness and softness, applications of HSAB principle – Stability of compounds / complexes, predicting the feasibility of a reaction.

4. Bioinorganic chemistry - 04 h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl^-). Metalloporphyrins – hemoglobin, structure and function, Chlorophyll, structure and role in photosynthesis.

UNIT – II (Organic Chemistry)

1. Heterocyclic Compounds - 05 h

Introduction and definition: Simple 5 membered ring compounds with one hetero atom

Ex. Furan. Thiophene and pyrrole. Importance of ring system – presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter and Numbers. Aromatic character – 6 - electron system (four - electrons from two double bonds and a

pair of non - bonded electrons from the hetero atom). Tendency to undergo substitution reactions.

Resonance structures: Indicating electron surplus carbons and electron deficient hetero atom. Explanation of feebly acidic character of pyrrole, electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions. Reactivity of furan as 1, 3-diene, Diels Alder reaction (one example). Sulphonation of thiophene (purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4 - dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – one method of preparation and properties – Reactivity towards Nucleophilic substitution reaction – chichibabin reaction.

2. Carbohydrates

- 06 h

Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as an example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acid). 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 (some negative aldehydes tests and mutarotation). Cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 – ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give 2-Carboxy-n-hexane). Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure and Haworth formula). Interconversion of Monosaccharides: Aldopentose to aldo hexose – eg: Arabinose to D- Glucose, D-Mannose (Kiliani - Fischer method). Epimers, Epimerisation – Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D- arabinose by Ruff's degradation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (fructose) to aldohexose (Glucose)

3. Mass Spectrometry

- 04 h

Basic principles – Molecular ion / parent ion, fragment ions / daughter ions. Theory – formation of parent ions. Representation of mass spectrum. Identification of parent ion, (M+1), (M+2), base

peaks (relative abundance 100%) Determination of molecular formula – Mass spectra of ethyl benzene, acetophenone, n-butyl amine and 1- propanal.

Unit – III (physical chemistry)

1. Chemical kinetics

- 10 h

Rate of reaction, factors influencing the rate of a reaction - concentration, temperature, pressure, solvent, light, catalyst. Experimental methods to determine the rate of reaction. Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Kinetics of complex reactions (first order only): opposing reactions, parallel reactions, consecutive reactions and chain reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Theories of reaction rates - collision theory-derivation of rate constant for bimolecular reaction. The transition state theory (elementary treatment).

2. Photochemistry

- 05 h

Difference between thermal and photochemical processes. Laws of photochemistry - Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Ferrioxalate actinometry. Photochemical hydrogen - chlorine, hydrogen - bromine reaction. Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing). Photosensitized reactions- energy transfer processes (simple example)

J M J College for Women (Autonomous), Tenali

III B.Sc., V Semester – Chemistry Syllabus

w.e.f. 2014 - 15 (2012 - 13 admitted batch)

Paper VI E2 (Chemistry and Environment)

Unit – I (Physico Chemical methods of analysis)

1. Separation techniques

- 12 hr

- iii. Solvent extraction: Principle and process, Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron (III)
- iv. Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, R_f values, factors effecting R_f values.
 - f. Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.
 - g. Thin layer Chromatography (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.
 - h. Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications
 - i. High Performance Liquid Chromatography (HPLC): Principles and Applications.
 - j. Gas Liquid Chromatography (GLC): Principles and Applications

2. Spectrophotometry

- 3 hr

General features of absorption – spectroscopy, Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of

- iv. Chromium in $K_2Cr_2O_7$
- v. Manganese in manganous sulphate

- vi. Iron (III) with thiocyanate.

Unit – II (Chemistry of Environment)

1. Introduction - 3 hr

Concept and scope of environmental chemistry. Definition of terms – pollutant, contaminant, receptor, sink, pathway of pollutant, speciation, DO, BOD, COD, Environmental segments.

2. Atmosphere - 6 hr

Structure, Earth's radiation balance, air pollution, particles, ions, radicals in the atmosphere, chemical and photochemical reactions in the atmosphere, acid rain, green house effect, ozone layer, significance and chemicals resulting in the depletion of ozone layer.

3. Hydrosphere - 6 hrs

Water resources, hydrological cycle, water pollution and pollutants – industrial pollution, microorganisms, sewage treatment.

Unit-III: (Agricultural Chemistry)

1. Soil - 4 hrs

Definition, classification and properties of soil - soil water, soil oil, soil temperature, soil minerals, soil colloids, soil pH, soil acidity, soil alkalinity.

2. Soil fertility - 3 hrs

Soil fertility and its evaluation, buffering of soil and its effect. Soil formation and its reclamation.

3. Fertilizers - 3 hrs

Importance of fertilizers, examples, secondary nutrients, role on the growth and development composting and manures.

4. Pesticides - 5 hrs

Classification and examples for insecticides, fungicides and herbicides - fluorine compounds, boron compounds, arsenic compounds, mercury compounds, pyridine compounds - ill effects of use of chemical fertilisers and insecticides.

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III B.Sc., VI Semester – Chemistry Syllabus

w.e.f. 2011 - 12 (2009 - 10 admitted batch)

Paper VIII E1 (Chemistry and Industry)

Unit – I (Physico Chemical methods of analysis)

1. Molecular spectroscopy

- 15 h

(i) Electronic spectroscopy:

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (σ, π, n). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore.

(ii) 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.

(iii) Proton magnetic resonance spectroscopy (^1H -NMR)

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals – spin-spin coupling, coupling constants. Applications of NMR with suitable examples – ethyl bromide, ethanol, acetaldehyde, 1,1,2 - tribromo ethane, ethyl acetate, toluene and acetophenone.

(iv) Spectral interpretation

Interpretation of IR, UV-Visible, ¹H-NMR and mass spectral data of the following compounds 1. Phenyl acetylene 2. Acetophenone 3. Cinnamic Acid 4. para-nitro aniline.

Unit – II (Drugs, formulations, pesticides)

1. Drugs

- 08 h

- i. HIV-AIDS: Immunity – CD-4 cells, CD-8 cells Retrovirus, replication in human body. Investigation available, prevention of AIDS. Drugs available – examples with structures: PIS: Indinavir (Crixivan), Nelfinavir (Viracept), NNRTIS: Efavirenz (Susrtiva), Nevirapine (Viramune) NRTIs: Abacavir (Ziagen), Lamivudine (Epivir, 3TC) Zidovudine (Retravir, AZT, ZDV)
- ii. Monographs of drugs: Eg Paracetamol, Sulpha methoxazole (Tablets)

2. Formulations

- 03 h

- i. Need of conversion of drugs into medicine. Additives and their role (brief account only)
- ii. Different types of formulations

3. Pesticides

- 04 h

- i. Introduction to pesticides – types – Insecticides, Fungicides, Herbicides, Weedicides, Rodenticides, plant growth regulators, Pheremones and Hormones. Brief discussion with examples, Structure and uses.
- ii. Synthesis and present status of the following.
DDT, BHC, Malathion, Parathion, Endrin, Baygon, 2,4-D and Endo-sulphon

Unit-III: (Materials Science and Green Chemistry)

1. Nanomaterials

- 05 h

Synthetic techniques, bottom-up-sol-gel method, top-down- electro deposition method.

Properties and applications of nano-materials. Composites - definition, general characteristics, particle reinforce and fiber reinforce composites and their applications.

2. Green Chemistry

- 10 h

Introduction: Definition of green Chemistry, need of green chemistry, basic principles of green chemistry

Green synthesis: Evaluation of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic), Pericyclic reactions (no by-product).

Selection of solvent:

- i) Aqueous phase reactions ii) Reactions in ionic liquids iii) Solid supported synthesis iv) Solvent free reactions (solid phase reactions)

Green catalysts: i) Phase transfer catalysts (PTC) ii) Biocatalysts

Microwave and Ultrasound assisted green synthesis:

- i. Aldol condensation
- ii. Cannizzaro reaction
- iii. Diels-Alder reactions
- iv. Strecker synthesis
- v. Willaimson synthesis
- vi. Dieckmann condensation

J M J College for Women (Autonomous), Tenali

III B.Sc., VI Semester – Chemistry Syllabus

w.e.f. 2014 - 15 (2012 - 13 admitted batch)

Paper VIII E2 (Chemistry and Environment)

Unit – I (Molecular spectroscopy)

1. Electronic spectroscopy: - 4 hr

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (σ, π, n). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore.

2. Infra red spectroscopy - 4 hr

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.

3. Proton magnetic resonance spectroscopy ($^1\text{H-NMR}$) - 4 hr

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals – spin-spin coupling, coupling constants. Applications of NMR with suitable examples – ethyl bromide, ethanol, acetaldehyde, 1,1,2 - tribromo ethane, ethyl acetate, toluene and acetophenone.

4. Spectral interpretation - 3 hr

Interpretation of IR, UV-Visible, ^1H -NMR and mass spectral data of the following compounds 1. Phenyl acetylene 2. Acetophenone 3. Cinnamic Acid 4. para-nitro aniline.

Unit – II (Chemistry of Environment)

1. Lithosphere

- 4 hr

Composition of lithosphere, inorganic and organic compounds in soil, soil pollution, wastes and pollutants in soil.

2. Noise pollution

- 3 hr

Measurement of noise, classification of noise. Ill effects of noise with examples, noise control criteria

3. Chemical Toxixology

- 8 hr

Toxic chemicals in air, water and soil. Impact of toxic chemicals on enzymes, biochemical effects of cadmium, carbon monoxide, cyanides, oxone and pesticides. Carcinogens.

Unit-III: (Materials Science and Green Chemistry)

1. Nanomaterials

- 5 hr

Synthetic techniques, bottom-up-sol-gel method, top-down- electro deposition method. Properties and applications of nano-materials. Composites - definition, general characteristics, particle reinforce and fiber reinforce composites and their applications.

2. Green Chemistry

- 10 hr

Introduction: Definition of green Chemistry, need of green chemistry, basic principles of green chemistry

Green synthesis: Evaluation of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic), Pericyclic reactions (no by-product).

Selection of solvent: i) Aqueous phase reactions ii) Reactions in ionic liquids iii) Solid supported synthesis iv) Solvent free reactions (solid phase reactions)

Green catalysts: i) Phase transfer catalysts (PTC) ii) Biocatalysts

Microwave and Ultrasound assisted green synthesis:

1. Aldol condensation
2. Cannizzaro reaction
3. Diels-Alder reaction

4. Strecker synthesis
5. Willaimson synthesis
6. Dieckmann condensation

J.M.J.COLLEGE FOR WOMEN (AUTONOMOUS), TENALI

III B.Sc. – semester V

PAPER –V (Inorganic, Organic and Physical Chemistry)

Time: 3 hrs

Max. Marks: 70

Section I

Answer all questions 3 X 12 =36

1. Explain crystal field splitting in octahedral and tetrahedral complexes. - 6+6

Or

Explain Stereoisomerism in complexes with co-ordination number 6. - 6+6

2. a. What is benzene diazonium chloride? Explain the mechanism of diazotisation. - 6
 b. Explain the reduction reactions of nitrobenzene in different media. - 6

Or

- a. What are α amino acids? Give an example. How are they classified? - 6
 b. How is alanine prepared from i. α -halo acids ii. Malonic ester - 6
3. a. What is isothermal process ? Derive an expression for the maximum work done in a reversible isothermal process. - 8
 b. Calculate the work done during isothermal expansion of 5 moles of an ideal gas from 5 atm to 2 atm at 27°C - 4

Or

- a. State Carnot's theorem & with the help of Carnot cycle derive the expression for the efficiency of a reversible engine working between the temperatures T_2 and T_1 - 10
 b. Calculate the efficiency of a steam engine operating between 100°C and 0°C - 2

Section – II

Answer any six of the following

6 X 4 = 24 M

4. Explain the electronic absorption spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$
5. Explain the Geometry and magnetic properties of $[\text{Fe}(\text{CN})_6]^{4-}$ by applying Valence bond theory.
6. Write the IUPAC names of the following Complexes.
 (a) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (b) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (c) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ (d) $[\text{Ni}(\text{NH}_3)_6]^{2+}$
7. Distinguish between Cyanides and Isocyanides
8. Explain the following reactions with equations.
 (a) Carbyl amine reaction (b) Libermann Nitroso reaction
9. Explain the significance of Zwitter ion and Isoelectric point
10. Define heat capacities and derive the relation between them
11. Derive Kirchoff's equation
- 12 Write any two definitions of first law of thermodynamics. Give the mathematical expression

Section – III

Answer any five of the following

2 X 5 = 10M

13. How is the magnetic moment of a Complex determined by using spin? Give an example.
14. Explain EAN rule with an example
15. What is Peptide linkage? Give an example.
16. Explain the Acidic character of Nitroalkanes
17. Give any two definitions of second law of thermodynamics.
18. How does Entropy change in spontaneous and equilibrium processes?

J.M.J.COLLEGE FOR WOMEN (AUTONOMOUS), TENALI

III B.Sc. – semester V

PAPER –VI E1 (Chemistry and Industry)

Time: 3 hrs

Max. marks : 70

Section I

Answer all questions

3 X 12 = 36

1. a. Define and explain solvent extraction with an example. - 6
- b. How can you determine iron (III) by applying the principle of solvent extraction? - 6
- or
- a. What is chromatography? How are the chromatographic methods classified? - 6
- b. Explain the separation of amino acids by Thin Layer chromatography? - 6
2. Define drug and explain with two examples. How will you classify drugs based on structure and therapeutic action with suitable examples?

or

Explain the synthesis, uses and toxicities of chloroquin and omeprazole

3. a. Define and explain number average and weight average molecular weights. - 6
- b. Describe a method to determine the molecular weight of a polymer - 6
- or
- a. Explain chain polymerization with a suitable example - 6
- b. Explain the preparation and industrial applications of PVC - 6

Section II

Answer any six of the following

6 X 4 = 24

4. What is R_f value? Mention the factors effecting R_f value
5. Explain Beer-Lambert's law.
6. How is column chromatography used as a separation technique?

7. Write short notes on synthetic drugs
8. Differentiate the following – (i) metabolite and antimetabolite (ii) bacteria and virus
9. What is pharmacophore? Explain with an example
10. Explain the synthesis of polyethylene by coordination polymerization
11. Define superconductivity and explain the applications of superconductors
12. What is tacticity? Give the names and structures of various optical isomers of polymers

Section III

Answer any five of the following

5 X 2 = 10

13. What is the importance of solvent in chromatography?
14. Mention any two applications of Gas Liquid chromatography.
15. Write trade names of the following – (i) Analgin (ii) Barbitol (iii) Aspirin (iv) Diazepam
16. Define drug according to W H O. Give an example.
17. Give a brief account of Meissner effect.
18. What is biodegradability? Give an example.

J.M.J.COLLEGE FOR WOMEN (AUTONOMOUS), TENALI

III B.Sc. – semester V

PAPER –VI E2 (Chemistry and Environment)

Time: 3 hrs

Max. Marks: 70

Section I

Answer all questions

3 X 12 = 36

1. a. Define and explain solvent extraction with an example. - 6
- b. How can you determine iron (III) by applying the principle of solvent extraction? - 6
- or
- c. What is chromatography? How are the chromatographic methods classified? - 6
- d. Explain the separation of amino acids by Thin Layer chromatography? - 6
2. What is air pollution? Explain various types of air pollution.
- or
- a. Explain various pollutants causing water pollution - 8
- b. Describe water cycle - 4
3. a. Define soil fertility. How is it evaluated? - 6
- b. Explain the importance of fertilizers in the growth of plants. - 6
- or
- c. Explain the classification of pesticides with suitable examples - 6
- d. Define the terms soil minerals, soil pH and soil water. - 6

Section II

Answer any six of the following

6 X 4 = 24

4. What is R_f value? Mention the factors effecting R_f value
5. Explain Beer-Lambert's law.
6. How is column chromatography used as a separation technique?

7. Write short notes on green house effect
8. Give a brief account of earth's radiation balance
9. What is sewage? Explain a method for the treatment of sewage
10. Explain the formation and reclamation of soil
11. Describe the ill effects of fertilizers
12. What is manure? How are manures developed?

Section III

Answer any five of the following

5 X 2 = 10

13. What is the importance of solvent in chromatography?
14. Mention any two applications of Gas Liquid chromatography.
15. How are soils classified?
16. Give examples of mercury compounds acting as pesticides.
17. Define and explain BOD.
18. What is meant by depletion in ozone layer?

J.M.J.COLLEGE FOR WOMEN (AUTONOMOUS), TENALI

III B.Sc. – semester VI

PAPER –VII (Inorganic, Organic and Physical Chemistry)

Time: 3 hrs

Max. Marks: 70

Section I

Answer all questions

3 X 12 = 36

1. a. Explain various factors affecting the lability of complexes. - 6
- b. Explain HSAB theory with suitable examples - 6

or

Explain the biological significance of sodium, potassium and chloride

2. a. Explain the aromatic nature of pyrrole by orbital theory. - 6
- b. How is the molecular formula of acetophenone determined from its mass spectrum - 6

or

What are the drawbacks of open chain formula of glucose? How are they rectified in ring structure?

3. a. What is order of a reaction? Derive an expression for the rate constant of third order reaction. - 8
- b. A second order reaction in which the initial concentration of both the reactants are same is 25% completed in 600 seconds. How long will it take for the reaction to go to 60% completion? - 4

or

- a. State and explain the laws of photochemistry. - 6
- b. Why is the quantum yield for the photochemical combination of H_2 and Cl_2 abnormally high? - 6

Section II

Answer any six of the following

6 X 4 = 24

4. Give the structure of chlorophyll. What is its importance in photosynthesis?
5. Explain Job's method for the determination of composition of a complex
6. How can you predict the feasibility of a reaction using HSAB principle? Explain with suitable examples.
7. Write short notes on Diel's Alder reaction
8. Thiophene is more stable than Pyrrole and Furan. Explain
9. Write short notes on Osazone formation
10. Explain Jablonski diagram depicting various photoprocesses
11. How is the order of a reaction determined by half-life method?
12. Explain Entropy

Section III

Answer any five of the following

5 X 2 = 10

13. What is a chelate? Give one example with structure
14. Explain two important functions of hemoglobin
15. What are epimers? Give one example
16. Write about chichibabin reaction with a suitable example
17. Give an example for zero order reaction. What are units for rate constant of zero order reaction?
18. Mention any two differences between isothermal and adiabatic processes

J.M.J.COLLEGE FOR WOMEN (AUTONOMOUS), TENALI

III B.Sc. – semester VI

PAPER –VIII E1 (Chemistry and Industry)

Time: 3 hrs

Max. Marks: 70

Section I

Answer all questions

3 X 12 = 36

1. a. Explain the concept of Chromophore with two examples - 6
- b. Interpret the I R spectra of acetophenone - 6
- or
- a. What is the principle involved in nuclear magnetic resonance - 6
- b. Define chemical shift. How is it measured? - 6
2. a. What is HIV? Describe the methods available for the investigation of HIV - 6
- b. Write about different types of formulations of drugs - 6

or

What are pesticides? Explain the synthesis and uses of Malathion and Endosulphon

3. a. Define Green chemistry. What are the basic principles of green chemistry - 6
- b. Explain the concept and uses of biocatalysts - 6

or

Explain any two methods to prepare nanomaterials

Section II

Answer any six of the following

6 X 4 = 24

4. Explain various types of electronic transitions taking place in unsaturated molecules
5. Describe various modes of vibrations in polyatomic molecules

6. How is NMR spectrum useful in elucidating the structure of toluene?
7. Give a brief account of additives in drugs
8. What are plant growth regulators? Mention one plant growth hormone. Give its structure and uses.
9. Give the monograph of paracetamol
10. Explain microwave assisted aldol condensation
11. Mention any four applications of nanomaterials
12. Explain solvent free reactions with suitable examples.

Section III

Answer any five of the following

5 X 2 = 10

13. What is meant by splitting of signals?
14. Explain the significance of finger print region in I R spectrum.
15. What is antiretroviral drug? Give an example
16. Write a short note on the need to convert drug in to medicine.
17. Mention any two applications of fiber reinforce composites.
18. What is green synthesis? Give an example.

J.M.J.COLLEGE FOR WOMEN (AUTONOMOUS), TENALI

III B.Sc. – semester VI

PAPER –VIII E2 (Chemistry and Environment)

Time: 3 hrs

Max. Marks: 70

Section I

Answer all questions

3 X 12 = 36

1. a. Explain the concept of Chromophore with two examples - 6
- b. Interpret the I R spectra of acetophenone - 6
- or
- a. What is the principle involved in nuclear magnetic resonance - 6
- b. Define chemical shift. How is it measured? - 6
2. a. What is noise pollution? Explain the ill effects of noise with examples - 6
- b. Write about different types of waste causing soil pollution - 6

or

What is chemical toxicology? Explain the biochemical effects of cadmium and cyanides

3. a. Define Green chemistry. What are the basic principles of green chemistry - 6
- b. Explain the concept and uses of biocatalysts - 6

or

Explain any two methods to prepare nanomaterials

Section II

Answer any six of the following

6 X 4 = 24

4. Explain various types of electronic transitions taking place in unsaturated molecules
5. Describe various modes of vibrations in polyatomic molecules

6. How is NMR spectrum useful in elucidating the structure of toluene?
7. Write briefly about carcinogens
8. Explain the impact of toxic chemicals on enzymes.
9. Give the composition of lithosphere
10. Explain microwave assisted aldol condensation
11. Mention any four applications of nanomaterials
12. Explain solvent free reactions with suitable examples.

Section III

Answer any five of the following

5 X 2 = 10

13. What is meant by splitting of signals?
14. Explain the significance of finger print region in I R spectrum.
15. How is noise measured?
16. Mention any four harmful pollutants in soil
17. Mention any two applications of fiber reinforce composites.
18. What is green synthesis? Give an example.

J M J College for Women (Autonomous), Tenali

Chemistry Practical Paper – III (Organic Chemistry)

w.e.f 2010 – 11 (2008 – 09 admitted batch)

1. Preparation of the following Organic Compounds

(a) 2,4,6-tribromo phenol (b) phenyl azo β -naphthol (c) methyl p-nitro benzoate

2. Organic Qualitative Analysis:

Identification of an organic compound through the functional group analysis, determination of melting point / boiling point.

Scheme of valuation:	Max marks: 50
Record	- 10
Regular assessment	- 5
Preparation of compound	- 5
Identification of the compound	- 30
Physical state, colour and smell	- 1
Action of heat	- 1
Combustion	- 1
Solubility	- 2
Lassaign's test	- 2
Litmus test	- 1
Action of conc. H_2SO_4	- 1
Molisch's test	- 2
Test with NaHCO_3 solution	- 2
Test with neutral FeCl_3	- 2
Test with 2,4 – DNP	- 2

Test with NaOH	- 2
Test with alc KOH + CHCl ₃	- 2
Confirmatory test	- 2
M P or B P	- 1
Special test	- 2
Name of the compound	- 2
Viva	- 2

J M J College for Women (Autonomous), Tenali

Chemistry Practical Paper – IV (Physical Chemistry)

w.e.f 2010 – 11 (2008 – 09 admitted batch)

1. Determination of the rate constant for acid catalysed hydrolysis of methyl acetate.
2. Determination of partition coefficient of iodine between water and carbontetrachloride.
3. Determination of partition coefficient of benzoic acid between water and benzoic acid.
4. Determination of strength of HCl conductometrically using standard NaOH solution.
5. Determination of strength of acetic acid conductometrically using standard NaOH.
6. Preparation phosphate buffer solutions
7. Determination of Surface tension of the given organic liquid
8. Determination of coefficient of Viscosity of the given organic liquid.
9. Determination of concentration of $K_2Cr_2O_7$, $KMnO_4$, $CuSO_4$ solutions and verification of Beer-Lambert law.

Scheme of valuation:

Max Marks: 50

Record	- 10
Regular assignment	- 5
Practical	- 35
Procedure	- 5
Tabulation of results	- 5
Formula used	- 3
Viva	- 2
Result	- 20
Error up to 10%	- 20
Error between	10 – 11 - 18
	11 – 12 - 16
	12 – 13 - 14
	13 – 14 - 12
	14 – 15 - 10
	Above 15% - 5 (grace marks)

For wrong calculation three marks can be deducted from total marks