

**ADIKAVI NANNAYA UNIVERSITY**  
**CBCS SEMESTER PATTERN**  
**CHEMISTRY**  
**w.e.f. 2015-16 admitted batch**  
**SEMESTER-V**

**Paper - V (INORGANIC, ORGANIC & PHYSICAL CHEMISTRY)**  
**45 hrs (3 h / w)**

**INORGANIC CHEMISTRY**

**UNIT – I**

**Coordination Chemistry:**

**8h**

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.

**UNIT-II**

**1. Spectral and magnetic properties of metal complexes:**

**4h**

Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility-Gouymethod.

**2. Stability of metal complexes:**

**3h**

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.

**ORGANIC CHEMISTRY**

**UNIT- III**

**Nitro hydrocarbons:**

**3h**

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 Micheal addition and reduction.

**UNIT – IV**

**Nitrogen compounds:**

**12h**

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods –

1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism).

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-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. 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 substitution of Aromatic amines – Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

## PHYSICAL CHEMISTRY

### UNIT- V

#### Thermodynamics

15h

The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule-Thomson effect- coefficient. Calculation of  $w$ , for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation- Kirchoff's equation. Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes.

#### List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mare loudan, Purdue Univ
4. Advanced Physical Chemistry by
5. Text book of physical chemistry by S Glasstone
6. Concise Inorganic Chemistry by J.D.Lee
7. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
8. A Text Book of Organic Chemistry by Bahl and Arun bahl
9. A Text Book of Organic chemistry by I L Finar Vol I
10. Advanced physical chemistry by Gurudeep Raj

## SEMESTER-V

### Paper - VI (INORGANIC, ORGANIC & PHYSICAL CHEMISTRY)

45 hrs (3 h / w)

#### INORGANIC CHEMISTRY

##### UNIT-I

##### 1. Reactivity of metal complexes: 4h

Labile and inert complexes, ligand substitution reactions -  $SN^1$  and  $SN^2$ , substitution reactions of square planar complexes - Trans effect and applications of trans effect.

##### 2. Bioinorganic chemistry: 4h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl<sup>-</sup>. Metalloporphyrins – Structure and functions of hemoglobin, Myoglobin and Chlorophyll.

#### ORGANIC CHEMISTRY

##### UNIT- II

##### Heterocyclic Compounds 7h

Introduction and definition: Simple five membered ring compounds with one hetero atom  
Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1,4-dicarbonyl compounds, Paul-Knorr synthesis.

Properties : Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan.

Pyridine – Structure - Basicity - Aromaticity - Comparison with pyrrole - one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

##### UNIT-III

##### Carbohydrates 8h

Monosaccharides: (+) Glucose (aldo hexose) - Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) - Pyranose structure (Haworth formula and chair conformational formula).

(-) Fructose (ketohexose) - Evidence of 2 - ketohexose structure (formation of pentaacetate, formation of cyanohydrin its hydrolysis and reduction by HI). Cyclic structure for fructose (Furanose structure and Haworth formula) - osazone formation from glucose and fructose – Definition of anomers with examples.

Interconversion of Monosaccharides: Aldopentose to Aldohexose (Arabinose to D- Glucose, D-Mannose) (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose (D-Glucose to D- Arabinose) by Ruff degradation. Aldohexose to Ketohexose

[(+)] Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose)

## **UNIT- IV**

### **Amino acids and proteins**

**7h**

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: 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.

## **PHYSICAL CHEMISTRY**

### **UNIT-V**

#### **1. Chemical kinetics**

**8h**

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. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

#### **2. Photochemistry**

**5h**

Difference between thermal and photochemical processes. Laws of photochemistry- Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield-Photochemical reaction mechanism- hydrogen- chlorine, hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized reactions- energy transfer processes (simple example)

### **List of Reference Books**

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mare loudan, Purdue Univ
4. Advanced Physical Chemistry by Atkins
5. Text book of physical chemistry by S Glasstone
7. Instrumentation and Techniques by Chatwal and Anand
8. Essentials of nano chemistry by pradeep
9. A Textbook of Physical Chemistry by Puri and Sharma
10. Advanced physical chemistry by Gurudeep Raj

**LABORATORY COURSE – V**  
**Practical Paper – V Organic Chemistry**  
**(at the end of semester V)**

**30 hrs (2 h / W)**

**Organic Qualitative Analysis:**

**50M**

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic Primary Amines, Amides and Simple sugars.

**LABORATORY COURSE – VI**  
**Practical Paper – VI Physical Chemistry**  
**(at the end of semester V)**

**30 hrs (2 h/W)**

1. Determination of rate constant for acid catalyzed ester hydrolysis.
2. Determination of molecular status and partition coefficient of benzoic acid in Benzene and water.
3. Determination of Surface tension of liquid
4. Determination of Viscosity of liquid.
5. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.

MODEL PAPER

THREE YEAR B.Sc. DEGREE EXAMINATION  
FINAL YEAR EXAMINATIONS  
SEMESTER V

Paper - V : INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

Time: 3 hours

Maximum Marks: 75

PART- A

Answer any FIVE of the following questions. క్రింది వానిలో ఏదీని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము.

Each carries FIVE marks. ప్రతి దానికి ఐదు మార్కులు. 5 x 5 = 25 Marks

1. Explain the EAN rule. Give any two complexes which don't obey this rule.  
EAN నియమమును వివరించుము. ఈ నియమమును పాటించని రెండు సంక్లిష్టాలను తెల్పుము.
2. Briefly explain the crystal field theory. స్వల్ప క్షేత్ర సిద్ధాంతమును గూర్చి క్లుప్తంగా వివరించుము.
3. Differentiate the thermodynamic stability and kinetic stability of complexes.  
సంక్లిష్టాల యొక్క ఉష్ణగతిక స్థిరత్వము మరియు గతి స్థిరత్వములను బేదించుము.
4. Nef reaction. నెఫ్ చర్య.
5. Explain the basicity of amines. ఎమీన్ల కారత్వమును గూర్చి వివరించుము.
6. Write notes on Diazotization. డయాజోనికరణము గూర్చి వ్యాఖ్య వ్రాయుము.
7. State and explain Joule-Thomson effect. జౌల్-థామ్సన్ ఫలితమును తెల్పి, వివరించుము.
8. Write about Entropy. ఎంట్రోపీ గూర్చి వ్రాయుము.

PART- B

Answer ALL the questions. అన్ని ప్రశ్నలకు సమాధానము నిమ్ము.

Each carries TEN marks. ప్రతి దానికి పది మార్కులు. 5 x 10 = 50 Marks

9. a) Write the postulates of Werner's co-ordination theory.  
వెర్నర్ సమన్వయ సిద్ధాంతములోని ముఖ్యాంశాలను వ్రాయుము.  
(OR)  
b) Explain the formation of  $[\text{Fe}(\text{CN})_6]^{4-}$  and  $[\text{Fe}(\text{CN})_6]^{3-}$  on the basis of valence bond theory. వేలన్స్ బంధ సిద్ధాంతము ఆధారంగా  $[\text{Fe}(\text{CN})_6]^{4-}$  మరియు  $[\text{Fe}(\text{CN})_6]^{3-}$  ఏర్పడుటను వివరించుము.
10. a) How do you determine the magnetic susceptibility of metal complexes using Guoy balance method?  
గాయ్ తుల పద్ధతి ద్వారా లోహ సంక్లిష్టాల అయస్కాంత వక్రతను ప్రయోగపూర్వకముగా ఎట్లు నిర్ణయించెదవు?  
(OR)  
b) Explain the factors that affect the stability of complexes.

సంశ్లేషణల స్థిరత్వమును ప్రభావితం చేయు అంశాలను గూర్చి వివరించుము.

11. a) Write the methods of preparation of nitroalkanes.

నైట్రో ఆల్కేన్ల తయారీ పద్ధతులను గూర్చి వ్రాయుము.

(OR)

b) Explain about the Mannich reaction and Micheal addition reaction.

మానిచ్ చర్య మరియు మైఖేల్ సంకలన చర్యను గూర్చి వివరించుము.

12. a) How amines are prepared from Gabriel synthesis and Hoffmann bromamide method?

గాబ్రెయిల్ సంశ్లేషణ మరియు హోఫ్ మన్ బ్రోమైడ్ పద్ధతుల ద్వారా ఎమీన్లను ఎట్లు తయారు చేయుదురు?

(OR)

b) Write any four electrophilic substitution reactions of aromatic amines.

ఆరోమాటిక్ ఎమీన్ల యొక్క ఏవేని నాలుగు ఎలక్ట్రోఫిలిక్ ప్రతిక్షేపణ చర్యలను వ్రాయుము.

13. a) Derive Kirkoff's equation. కిర్కొఫ్ సమీకరణమును ఉత్పాదించుము.

(OR)

b) Describe the Carnot cycle. కార్నాట్ చక్రమును వర్ణించుము.



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**MODEL PAPER**  
**THREE YEAR B.Sc. DEGREE EXAMINATION**  
**FINAL YEAR EXAMINATIONS**  
**SEMESTER V**  
**Paper – VI : INORGANIC, ORGANIC & PHYSICAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 75

**PART- A**

Answer any **FIVE** of the following questions. క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము.

Each carries **FIVE** marks. ప్రతి దానికి ఐదు మార్కులు.

5 x 5 = 25 Marks

1. Define labile and inert complexes with suitable examples.  
అస్థిరత మరియు జడ సంక్లిష్టాలను తగిన ఉదాహరణలతో నిర్వచించుము.
2. Explain the biological significance of sodium and potassium.  
సోడియం మరియు పొటాషియం ల యొక్క జీవ ప్రాముఖ్యతను వివరించుము.
3. Discuss about zero order reactions. శూన్య క్రమాంక చర్యలను గూర్చి చర్చించుము.
4. Write the effect of temperature on the rate of a reaction.  
చర్య రేటుపై ఉష్ణోగ్రత ప్రభావమును గూర్చి వ్రాయుము.
5. What are photosensitized reactions? Give one example.  
కాంతి స్పందన చర్యలు అనగానేమి? ఒక ఉదాహరణ నిమ్ము.
6. Explain the nature of pyrrole and pyridine.  
పిరిడిన్ మరియు పిరోల్ ల యొక్క స్వభావాలను వివరించుము.
7. Kiliani - Fischer method. కిలియాన్ - ఫిషర్ పద్ధతి.
8. Write notes on Zwitter ion. జిప్టర్ అయాన్ గూర్చి వ్యాఖ్య వ్రాయుము.

**PART- B**

Answer **ALL** the questions. అన్ని ప్రశ్నలకు సమాధానము నిమ్ము.

Each carries **TEN** marks. ప్రతి దానికి పది మార్కులు.

5 x 10 = 50 Marks

9. a) Describe the substitution reactions of metal complexes.  
లోహ సంక్లిష్టాల ప్రతిక్షేపణ చర్యలను వర్ణించుము.  
(OR)  
b) Write the structure and functions of haemoglobin.  
హెమోగ్లోబిన్ యొక్క నిర్మాణము మరియు విధులను వ్రాయుము.
10. a) Give in detail the various methods of determining the order of a chemical reaction.  
ఒక చర్య యొక్క క్రమాంకమును కనుగొనుటకు గల వేర్వేరు పద్ధతులను తెల్పుము.

(OR)

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b) Explain the photochemical reaction mechanisms of hydrogen – chlorine and hydrogen – bromine reactions. హైడ్రోజన్ - క్లోరిన్ మరియు హైడ్రోజన్ - బ్రోమిన్ చర్యల యొక్క కాంతి రసాయన చర్య విధానమును వివరింపుము.

11. a) What are heterocyclic compounds? Discuss the aromatic character of pyrrole, furan and thiophene. విజాతీయ వలయ సమ్మేళనాలు అనగానేమి? పిర్రోల్, ఫ్యూరాన్ మరియు థయోఫీన్ యొక్క ఆరోమాటిక్ స్వభావమును గూర్చి చర్చించుము.

(OR)

b) Illustrate the substitution reactions of pyridine. పిరిడిన్ యొక్క ప్రతిక్షేపణ చర్యలను సోదాహరణముగా తెల్పుము.

12. a) Discuss the cyclic structure of glucose. గ్లూకోజ్ యొక్క వలయ నిర్మాణమును చర్చించుము.

(OR)

b) i) What are epimers? Give example. ఎపిమర్లు అనగా నేమి? ఉదాహరణ నిమ్ము.

ii) Write about the formation of glucosazone. గ్లూకోసజోన్ ఏర్పడుటను గూర్చి వ్రాయుము.

13. a) Give any three methods of preparation of alanine. ఎలనీన్ తయారుచేయుటకు ఏవేని మూడు పద్ధతులను తెల్పుము.

(OR)

b) Describe the structure of proteins. ప్రోటీన్ల నిర్మాణమును వర్ణించుము.

  
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