

S. S. Jain Subodh P.G. College, Jaipur

Department of Chemistry

M.Sc. I Sem Chemistry

Assignment -2024

Paper I Inorganic Chemistry

Note : Attempt any two questions

MM : 30

Unit- I

Q.1 Determine the binary formation constants by pH metric and spectrophotometric methods?

(15 marks)

Q.2 Write short note on:

(a) Bent rule

(b) Substitution reaction

(5 + 10 marks)

Unit II

Q 3 - Discuss limitations of CFT giving direct and indirect evidences. (15 marks)

Q 4 - Draw molecular orbital diagrams for three following complexes. (7.5 + 7.5 = 15 marks)

(a) $[\text{Co}(\text{NH}_3)_6]^{+3}$

(b) $[\text{PtCl}_4]^{-2}$

Unit- III

Q5. Write short notes on

(a) Selection rules

(b) Splitting of terms for p_2 configuration

(7.5 + 7.5 = 15 marks)

Q6. Explain Orgel diagrams for d_1 and d_2 octahedral and tetrahedral transition metal complexes. (15 marks)

Unit- IV

Q7. Write short note on-

a. Magnetic exchange coupling

b. Anomalous magnetic moment

(7.5 + 7.5 = 15 marks)

Q8. Explain applications of O.R.D phenomenon in brief.

(15 marks)

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Paper II Organic Chemistry

Note : Attempt any two questions

M M : 30

Unit I

1. What is Curtius-Hammett Principal? Derive an expression for product ratio. What is the implication of this principal? 15

2. Explain the following in brief with the help of suitable example: 15

1. Isotopic Labelling

2. Homo-aromaticity

3. Taft equation

4. Hammond Postulate

Unit II

3. Explain the following taking suitable examples: 15

1. Benzyne mechanism

2. $ArSN_2$ mechanism

3. Anchimeric assistance

4. SET mechanism

4. Write a note on the effect of attacking nucleophile on reactivity of SN_2 reaction. Give difference between SN_1 and SN_2 Mechanism. 15

Unit III

5. Explain the following: 15

1. Coupling of alkyne

2. Neighbouring group participation in free radical substitution reaction.

6. Explain Arenium ion mechanism of aromatic electrophilic substitution. Also draw the energy profile diagram for this mechanism. 15

Unit IV

7. Give the detailed account of E2 Elimination and E1CB Mechanism. 15

8. Write explanatory note on Benzoin condensation and Peterson reaction. 15

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Paper III Physical Chemistry

Note : Attempt any two questions

MM : 30

UNIT-I

1. (a) Give the postulates of Quantum Mechanics.
- (b) Discuss the solution of Schrodinger Equation for a particle in a three dimension box. 5 + 10
2. Write short notes on:
 - (a) Eigen values and Eigen function 7 + 8
 - (b) Angular momentum

UNIT-II

3. Explain
 - (a) Approximate method of Quantum Mechanism (7+8)
 - (b) Linear Variation principle
4. Write short note on the following:
 - (a) Elementary concept of MO and VB theories.
 - (b) Application for Huckel Theory for cyclopropenyl radical. (7+8)

UNIT-III

5. Explain different type's methods of determining rate laws. 15
6. Write short notes on:
 - a) Hinshelwood theories of Unimolecular reactions
 - (b) The Study of fast reaction by relaxation method. (7 + 8)

UNIT-IV

7. Discuss the Debye- Huckel-Onsanger treatment and its extension. 15
8. Write short notes on:

a) Bockris Devanathan models (b) Ilkovic equation.

(7 + 8)

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Paper IV Spectroscopy

Note : Attempt any Two questions

M M 30

Unit I

Q.1 (i) What is Stark Effect? Elaborate. 15

(ii) Explain the nuclear and electron with spin interaction and effect of external field with reference to Microwave Spectroscopy.

Q.2 (i) Explain applications of Microwave Spectroscopy 15

(ii) Differentiate Spectroscopy. between rigid and non-rigid rotator. Explain the spectra for rigid rotation.

Unit II

Q.3 Differentiate between harmonic and anharmonic oscillator: diatomic molecule. 15

Q.4 (i) Explain Raman Effect and give its applications. 15

(ii) Give a brief accounts of CARS.

Unit III

Q.5 Explain vector representation of momenta and vector coupling and spectra of alkali metal atoms. 15

Q.6 (i) Write short note on Koopman's Theorem. 15

(ii) What is the principle of electron spectroscopy for chemical analysis with applications.

Unit IV

Q.7 Determine Sn^{+2} and Sn^{+4} compounds nature of M1-LL bond. co-ordination number and structure. Focus on spectral parameters and display of their Mossbauer Spectrum. 15

Q.8 Elaborate application of ESR-spectroscopy with main reference to inorganic tree radicals such as PH_4 , F_2^- and $[\text{BH}_3]^{-1}$ 15

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Paper V : Bioinorganic Chemistry

Attempt any two questions

Max. Marks 15

UNIT - I

- Q 1 a) Discuss role of Sodium, Potassium and Calcium in biological system. (4)
b) Give classification of essential elements. (3.5)
- Q 2 a) Write about the role of Calcitriol, Parathyroid hormone in detail.. (4)
b) Discuss about Calmodulin giving its structure. (3.5)

UNIT – II

- Q 3 - What are Iron-sulphur proteins? Give their structure and functions. (7.5)
- Q 4 - a) Explain cyclic photo-phosphorylation. (4)
b) Write about functions of Photosystem-II (3.5)

UNIT III

5. Write short notes on followings
(a) Haem Protein (b) Model synthetic complexes of iron. (3.5)+ (4)
6. Discuss the structure and function of haemoglobin (7.5)

Unit-IV

- Q.7. Write short note on followings
(a) Nitrogen in biosphere (4)
(b) Nitrogenase (3.5)
- Q.8 Discuss nitrogen cycle and nitrification role of microorganism. (7.5)

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Assignment -2024

Paper IV: Introduction to Analytical Techniques and Nanochemistry

Note : Attempt any Two questions

Max. Marks: 15

Unit I

Q.1 Write a detail note on Coulometry. 7.5 Marks

Q.2 Explain the process of cyclic voltammetry. 7.5 Marks

Unit II

Q.3 What is solvent extraction.Explain its principle and method. 7.5 Marks

Q.4 Give application of Atomic Absorption Spectroscopy. 7.5 Marks

Unit III

Q.5 Define the following: 3.5+4 Marks

(i) Nanoparticles

(ii) Quantum Dots

Q.6 Define Nanotechnology.Explain the application of nanotechnology in various fields. 7.5 Marks

Unit IV

Q.7 Explain the following:

3.5+4 Marks

i) Sol-gel method

ii) Micelles

Q.8 Explain sonochemical route in detail for the synthesis of nanomaterials. 7.5 Marks

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M.Sc. III Sem Chemistry

Assignment -2024

Paper I Photochemistry

Note : Attempt any two questions

M M : 30

Unit- I

Q.1 Write short notes on:

- | | |
|----------------------------|---|
| (i) Gas Phase Photolysis | 6 |
| (ii) Quantum Yield | 5 |
| (iii) Types of Excitations | 4 |

Q.2 Discuss the rate constant and lifetimes of reactive energy states? 15

UNIT- II

Q.3 Discuss the Photochemistry of conjugated and cross conjugated cyclodienones? 15

Q.4 Write a note on Paternobuchi reaction and photochemistry of β , γ -unsaturated ketones? 5 + 10

Unit- III

Q.5 Discuss the cis-trans isomerisation in stilbene? 15

Q.6 Write Short note on

- | | |
|----------------------------------|---|
| (i) Cyclization reactions | 8 |
| (ii) Di-II methane rearrangement | 7 |

Unit-IV

Q.7 Write a short note on

- | | |
|------------------------------|---|
| (i) Photochemistry of vision | 5 |
|------------------------------|---|

(ii) Singlet molecular oxygen

10

Q.8 Discuss the photoisomerisation reactions in aromatic compounds?
15

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M.Sc. III Sem Chemistry

Assignment -2024

Paper II Bioorganic Chemistry

Note : Attempt any two questions

M M : 15

Unit I

- Q 1. What are Enzymes? Describe their classification and nomenclature. (7.5)
- Q 2. Write short notes on:- (4 + 3.5)
- (a) Enzyme Specificity
 - (b) Extraction process of enzymes

Unit II

- Q 3. (a) Explain transition state theory. (3 + 4.5)
- (b) Explain the orientation and steric effects on enzyme catalysis.
- Q 4. Explain the following:- (4 + 3)
- (a) β - Cleavage and condensation reaction of enzymes.
 - (b) Enzymes catalyzed carboxylation and decarboxylation.

Unit III

- Q 5. Discuss in detail structure and biological functions of Co-Enzyme A . (7.5)
- Q 6 . Write short notes on:- (4+3.5)
- (a) Crown ethers
 - (b) Cyclodextrins

Unit IV

- Q 7 . Write short notes on:-

(a) Effect of immobilization on enzyme activity (3.5)

(b) Techniques and methods of immobilization of enzymes (4)

Q 8. (a) Write about the use of enzymes in food and drink industry. (4)

b) Discuss about enzyme therapy. (3.5)

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Paper III Environment Chemistry

Note : Attempt any two questions

M M : 15

Unit I

- Q 1. (a) Discuss about biochemical effects of metals and factors responsible for heavy metal toxicity. (4)
- (b) Give biochemical and damaging effects of Mercury. (3.5)
- Q 2. (a) Give biochemical effects and classification of pesticides in detail. (4)
- (b) Write about speciation of Arsenic (3.5)

Unit II

- Q 3. How soil gets polluted by fertilizers, plastic and metals. Discuss in detail. (7.5)
- Q 4. (a) Discuss about the composition of soil. (4)
- (b) Write note on Bhopal gas Tragedy. (3.5)

Unit III

- Q 5. Write a short notes on the following:- (2.5 × 3 = 7.5)
- (a) Landfilling
- (b) Incineration
- (c) Dioxins

- Q 6. Discuss in brief the techniques of purification and disinfection. (7.5)

Unit IV

- Q 7. Explain “Wood- A major renewable resources fuel and energy resource”. (7.5)
- Q 8. Describe Hydrogen world energy resources in brief. (7.5)

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Paper IV Organic Synthesis-I

Note : Attempt any two questions

M M : 30

Unit-I

Q.1 Write short note on (any two):- (7.5+7.5)

- (a) Makaiyama Aldol Condensation
- (b) Stobbe Condensation
- (c) Knoevenagel condensation

Or

Q.2 Write short note on (any two):- (7.5+7.5)

- (a) Baylis-Lillmann reaction
- (b) Reformatsky reaction
- (c) Mc. Murry coupling reaction

Unit-II

Q.3 Discuss oxidation with Osmium tetraoxide and periodic acid. (15)

Or

Q.4 Write short note on (any two):- (7.5+7.5)

- (a) Swern oxidation
- (b) Baeyer Villiger oxidation
- (c) Woodward Prevost reaction

Unit-III

Q.5 (a) Explain the Clemmenson reduction along with its mechanism. (8+7)

(b) Explain the mechanism and use of MPV reduction.

Or

Q.6 Write short notes on :- (8+7)

(a) Homogeneous Hydrogenation

(b) Photoreduction

Unit-IV

Q.7 Explain the reactivity of phenanthrene in terms of electrophilic substitution, addition and oxidation. (15)

Or

Q.8 What are Metallocenes? Give the method of preparation, chemical properties and nature of bonding in ferrocene. (15)

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Paper V Natural Products-I

Note : Attempt any two questions

M M : 30

Unit – I

Q. 1 a) Discuss the structure elucidation of citral along with synthesis and stereochemistry?

b) Describe the following reactions of α -terpineol.

(i) Hydration and dehydration

(ii) Conversion into carvone

Q. 2 a) Describe the general methods of structural determination of terpenoids.

b) Give synthesis of Menthol and Geraniol.

c) What is isoprene rule?

Unit – II

Q. 3 a) Elucidate the structure of santonin?

b) Write geometrical isomers of farnesol and β -Carotene.

Q. 4 a) Elucidate the structure of Phytol and confirm the structure of saturated ketone in phytol.

b) Describe the following reactions of abietic acid.

(i) Isomerisation

(ii) Disproportionation

Unit – III

Q. 5 a) Describe Hoffmann exhaustive methylation and EMDE method in alkaloids for elucidating its structure.

b) Describe Ziesel's method and von-Braun degradation of alkaloids.

Q. 6 a) Discuss the synthesis and stereochemistry of nicotine and coniine.

b) Describe the constitution of meroquinene in quinine?

Unit – IV

Q. 7 a) Discuss the constitution of cyanidin chloride.

b) Describe the synthesis of quercetin.

c) Write an account of chemistry of diadzein.

Q. 8 a) Discuss the structure of cyanidin-7- arabinoside and conformed by synthesis.

b) Determine the structure and synthesis of alizarin.

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Paper IV Heterocyclic chemistry-I

Note : Attempt any two questions

M M : 30

Unit- I

Q. 1. Draw the structures of the following heterocycles:

15

(i) Pyrazino [2,3-c] pyrimidine

(ii) Imidazo [2,1,-b] oxazole

(iii) 1-oxa-6-thiaspiro[4.4] nonane

(iv) 7-oxabicyclo[2.2.1] heptane

Q. 2. Draw structures of the following heterocycles:

15

a) Tricyclo [4, 3, 1, 12] undecane,

b) Dibenzo [f, g, q, r] pentacene

c) 1, 2, 4 Triazolo [4.3a] pyridine

Unit- II

Q.3. What is Pyramidal Inversion? How does it influence the conformation in six-membered saturated nitrogen heterocycles? 15

Q.4. What is Anomeric effect? Explain how does anomeric effect influence the reactivity of heterocycles? 15

Unit- III

Q. 5. How will you synthesize: 15

(a) Azetidines from Aziridines

(b) Thiranes from Oxirane

(c) Thietanes from Cyclic carbonate

(d) Oxetane from benzophenone.

Q.6. (I) Write the synthesis of Aziridines by following methods- 10

A. Intramolecular cyclization

B. Cycloaddition Reaction

(II) Explain Acid and base catalysed hydrolysis of oxaziridines.

5

Unit - IV

Q.7. Give two methods for the synthesis of imidazole. Why is it more basic than pyrazoles?

Compare the electrophilic aromatic substitution reaction of imidazole, oxazole and thiazole.

15

Q.8. Write down the mechanism of the following reactions.

5 X 3

(a) Fischer indole synthesis

(b) Benzofurans from coumarins

(c) Benzothiophene from Cinnamic acids.

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Paper IV Advanced electrochemistry(Physical Specialization)

Note : Attempt any two questions

M M : 30

UNIT-I

Q.1. What are energy storage system. Explain various properties of energy storage system.

Q.2. Discuss the following

- i) Hydrogen as future electricity storage.
- ii) Role of non aqueous solution in electricity stores.

UNIT-II

Q.3. What is electrogravimetry? Give a detailed accounts about theory and principle of electrogravimetry.

Q.4. What are Fuel Cell? Discuss in Detail about Hydrogen – Oxygen fuel cell.

UNIT-III

Q.5. a) Explain Evans diagram in detail.

b) Explain measurement of corrosion rate by weight loss method.

Q.6. a) Explain the surface mechanism of corrosion of metals.

b) Explain cathodic protection method by addition of substrate to electrolyte environment.

UNIT- IV

Q.7. Write Short note on-

- i) Membrane potentials
- ii) electrical conductance in biological organism

Q.8. Write short note on-

i)Hodgkin –Huxley equation

ii)Electrocardiography

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Assignment -2024

Paper V: Phase rule and Surface phenomenon(Physical specialization)

Note : Attempt any two questions

M M : 30

UNIT I

- Q.1. i) What is critical solution temperature? 2
- ii) Explain the effect of change in composition and temperature in the solubility curve of partially miscible liquids? 10
- iii) Explain temperature- composition diagram of a system exhibiting closed solubility curve.
- Q.2. What are azeotropic mixtures? Explain fractional distillation of Zeotropic and Azeotropic mixtures.

UNIT II

- Q.3. Write short note on 15
- i) Charge and stability of colloidal dispersion
- ii) Stern's theory of double layer
- Q.4. Write short on 15
- i) Application of colloids
- ii) Micelle formation

UNIT III

- Q.5. Explain surface catalyzed bimolecular reactions. 15

Q.6. Write Short note on:

15

I) Difference in between physical and chemical adsorption

ii) Tempkin adsorption isotherm

UNIT IV

Q.7. i) What is Trouton's rule? Explain Bernal Scott theory of liquids.

10

ii) Explain intermolecular force in liquids.

5

Q.8.i) Explain specific heat of liquids.

5

ii) Explain the property of surface tension of liquids . How is it measured?

5

iii) How is viscosity of liquids determined.

5

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Assignment -2024

Paper- VI : Advanced Chemical Kinetics

Attempt any two questions

Max. Marks 30

Unit I

- Q 1. (a) What do you understand by induced reactions? Discuss their kinetics (8)
(b) What is steady state approximation ? (7)
- Q 2. (a) Discuss Frank -Robinovich effect (8)
(b) Write about parallel reactions. (7)

Unit II

- Q 3. Discuss reactions in which first step is rate determining step. (15)
- Q 4. . Discuss reactions in which all steps have comparable rate (15)
- .

Unit III

- Q 5. Write a short notes on the following:- .5 × 3 = 15)
- (a) autocatalysis
(b) Auto-oxidation
(c) Anation reaction

- Q 6. Discuss Rice-Herzfeld mechanism (7.5)

Unit IV

- Q 7. Discuss Henry Taube s Classical reaction in detail .What is the difference between outer sphere and inner sphere reactions (15)
- Q 8. Discuss theory of absolute reaction rates as applicable to solutions (15)

