

PGIIS-O-1515 B-17
M.Sc. III Semester (CBCS) Degree Examination
ORGANIC CHEMISTRY
(Reaction Mechanism)
Paper : HCT - 3.2
(Old)

Time : 3 Hours

Maximum Marks : 80

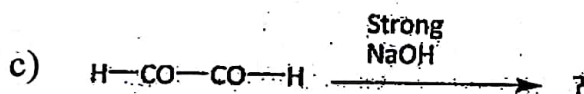
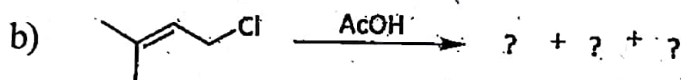
Instructions to Candidates :

- i) All questions are compulsory.
- ii) All questions carry equal marks.

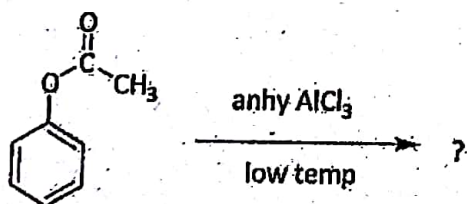
1. Answer any **Eight** of the following.

(8×2=16)

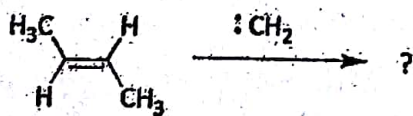
a) How is penta coordinate carbocation is detected?



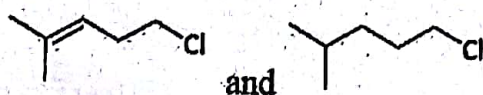
d) Give the product in the following rearrangement reaction.



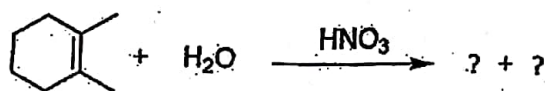
e) Predict the product.



f) Comment in the role of acetolysis of following.

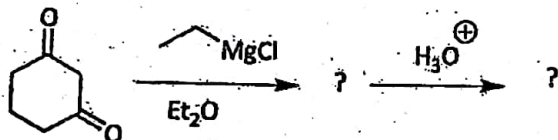


g) Identify the product (s)



h) Illustrate Sandmeyer reaction with an example.

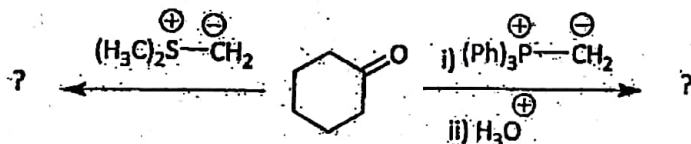
i) Predict intermediate and product.



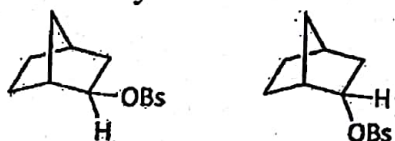
j) What is Gomberg Pechmann reaction? Give an example.

2. a) Discuss the methods of generation and stability of carbanions.

b) Predict the products with a reasonable mechanism.

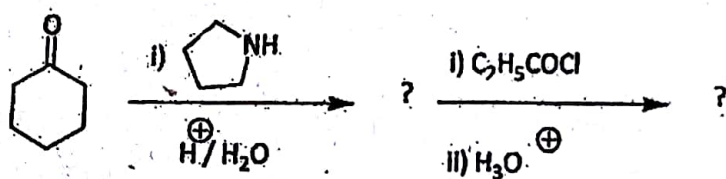


c) Predict the product and discuss about the anchimeric assistance observed if any, in the acetolysis of the following brosylate.



OR

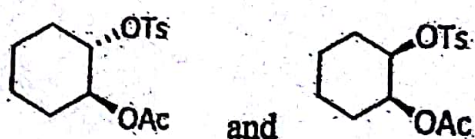
Predict the intermediates and products in the following reaction.



(5+5+6=16)

3. a) Discuss the mechanism of nucleophilic substitution at trigonal carbon with a suitable example.

b) Which among the following undergoes retention or inversion upon acetolysis? Explain with a mechanism.



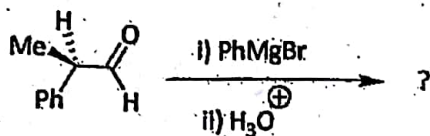
- c) Illustrate trans annular rearrangement with suitable examples.

OR

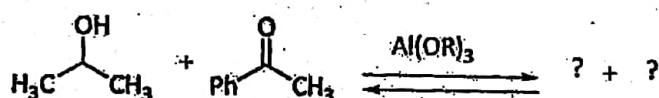
Write a role on Neighbouring group participation in addition reactions.

(5+5+6=16)

4. a) Predict the product based on Cram's Rule in the following reaction.



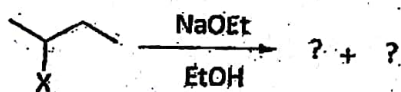
- b) Give the product with a suitable mechanism in the following reaction.



- c) Illustrate the mechanism of pyrolytic eliminations.

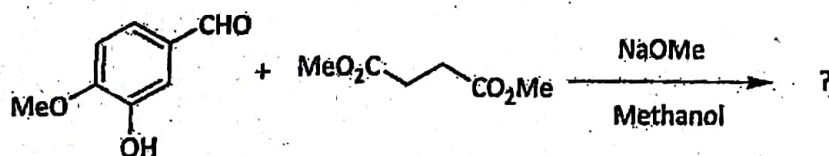
OR

Predict the major/minor product(s) when (i) X = Br & (ii) X = F in the following elimination reaction.

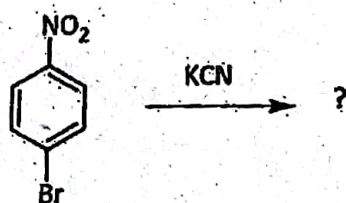


(5+5+6=16)

5. a) Give the product with mechanism for the following reaction.



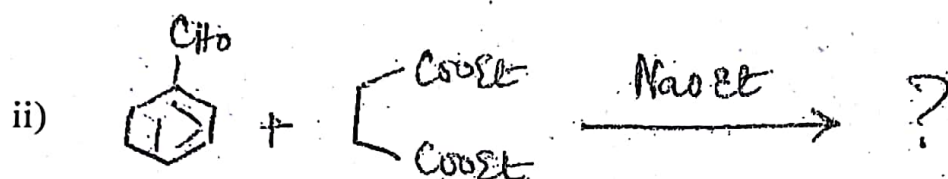
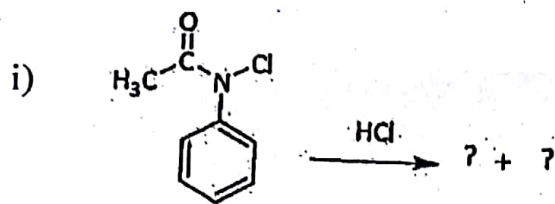
- b) Identify the product with suitable mechanism.



- c) Write the mechanism and synthetic applications of Perkin reaction.

OR

Predict the product(s) and write a reasonable mechanism for the following protocol.



(5+5+6=16)



Roll No. _____

[Total No. of Pages : 2]

PGIIS-N-1521 B-17
M.Sc. IIIrd Semester (CBCS) Degree Examination
ORGANIC CHEMISTRY
(Natural Products)
Paper : SCT - 3.1
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates :

- i) *All questions are compulsory.*
- ii) *All questions carry equal marks.*

1. Answer any **Eight** of the following. (8×2=16)
- a) 2-Hydroxypyridine is much more effective catalyst for mutarotation of tetra-O-methyl glucose than either pyridine or phenol. Account for.
 - b) Explain why cyanogen bromide specifically cleaves the carboxyl end of methionine?
 - c) What is Tilden's reagent? Give its application in terpenoid chemistry.
 - d) Write the products in the following reaction. Estrone $\xrightarrow[\text{H}^+]{\text{CH}_3\text{MgI}}$? $\xrightarrow{\text{KHSO}_4}$?
 - e) What is Blanc's rule? Explain.
 - f) Give the evidence for the presence of homoannular diene system in ergosterol.
 - g) Draw the structure of all optical isomers of ephedrine and comment on their activity.
 - h) Outline the steps involved in the following transformation.
 α -santonin \rightarrow Hyposantonin.
 - i) Explain with an example the biogenic isomerisation of aldose \rightarrow ketose.
 - j) What are sphingolipids? How they are formed in cells?
2. a) How is 2,3,6-tri-O-methyl-D-glucose obtained from maltose? Account for its oxidation to dimethyl-D-tartaric acid. (5)
- b) Give a comparative account of Sanger's and Edman's methods for the determination of sequence of polypeptides. (5)

- c) Write a note on : (6)
- Protection and deprotection of amino and carboxyl groups in peptide synthesis.
 - Secondary structure of proteins.

OR

- c) Describe general methods of structural elucidation of polysaccharides. (6)
3. a) Discuss the utility of Barbier-Wieland degradation in the structural elucidation of steroids. (5)
- b) Elucidate the structure of testosterone and give its synthesis. (5)
- c) How are the following in cholesterol established?
- Position of hydroxyl group
 - Position of double bond
 - Stereochemistry of C/D ring fusion.

OR

- c) How do you bring about the following transformations? (6)
- Cholesterol \rightarrow progesterone
 - Dehydro Epi androsterone \rightarrow Androsterone
4. a) Describe the classification of terpenes with an example in each case. (5)
- b) How the structure of nicotine is established by degradation and synthesis? (5)
- c) Give the synthesis of : (6)
- Camphor
 - Squalene

OR

- c) Outline the synthesis of quinine from ethyl quimate. (6)
5. a) Give an account on biosynthesis of mono and diterpenes. (5)
- b) What are photosynthetic and non-photosynthetic pathways for carbohydrates? Explain with suitable example. (5)
- c) Discuss the biosynthesis of indole alkaloid. (6)

OR

- c) Sketch the biosynthesis of cholesterol. (6)



Roll No. _____

[Total No. of Pages : 2

PGIIS-O-1521-B-17
M.Sc. IIIrd Semester (CBCS) Degree Examination
ORGANIC CHEMISTRY
(Natural Products)
Paper : SCT-3.1
(Old Syllabus -2011-12)

Time : 3 Hours

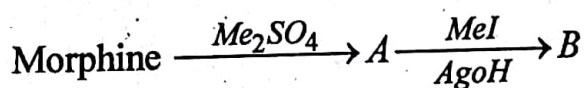
Maximum Marks : 80

Instructions to Candidates :

- i) *All questions are compulsory.*
- ii) *All questions carry equal marks.*

1. Answer any **eight** of the following: (8×2=16)

- a) Give the structure of dipeptides obtained by the condensation of tyrosine and cysteine
- b) Draw Haworth structure of maltose.
- c) What are deoxy sugars? Give any two examples.
- d) Predict the product with mechanism Cholesterol $\xrightarrow[\text{Me}_2\text{CO}]{\text{Al(OiPr)}_3}$?
- e) What are sapogenins? Give an example.
- f) Write the structure of products A and B in the following transformations.



- g) Formulate the product (s) in the following reaction: Squalene $\xrightarrow[\text{Me}_2\text{CO}]{\text{KMnO}_4}$?
- h) Write the stereochemical structure of PGE₂
- i) Distinguish between replication and transcription
- j) Write the structure of riboflavin and give its biological significance

2. a) How do you establish the presence of pyranose ring in D-glucose by methylation and oxidation? (5)
 b) What is Edman degradation? How it is useful in the determination of amino acid sequencing in polypeptides? (5)
 c) How is the structure of sucrose established by chemical degradation studies? (6)

OR

3. a) Outline Merrifield synthesis of the following tripeptide Tyr.Gly.Ala (6)
 a) How are the following in cholesterol established?
 i) Position of double bond (5)
 ii) Stereochemistry of A/B ring fusion. (5)
 b) Discuss the utility of Barbier-wieland degradation in the structural elucidation of steroids. (5)
 c) Sketch the synthesis of estrone (6)

OR

4. a) Elucidate the structure of testosterone and give its synthesis. (6)
 a) How are camphoric acid and camphoronic acid obtained from camphor? Discuss the degradation reactions which led to the structure of camphoronic acid. (5)
 b) Illustrate the use of Hofmann exhaustive methylation in alkaloid chemistry. (5)
 c) Discuss various chemical reactions that led to the structure elucidation of papaverine (6)

OR

5. a) Outline the biogenesis of mono-and diterpenes. (6)
 a) Give the synthesis of any two key intermediates used in the synthesis of prostaglandins. (5)
 b) Describe the biological importance of biotin and ascorbic acid. (5)
 c) Write a note on:
 i) Genetic code (6)
 ii) Recombinant DNA technology. (6)

OR

Explain the role of different types of RNA in protein biosynthesis (6)



PGIIS-N-1515 B-17
M.Sc. IIIrd Semester (CBCS) Degree Examination
ORGANIC CHEMISTRY
(Reaction Mechanism)
Paper : HCT - 3.2
(New)

Time : 3 Hours

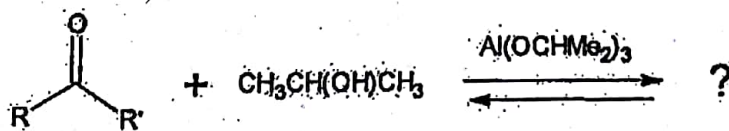
Maximum Marks : 80

Instructions to Candidates :

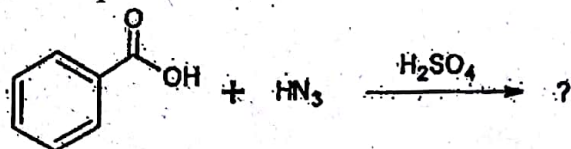
- i) All questions are compulsory.
- ii) All questions carry equal marks.

1. Answer any **Eight** of the following.**(8×2=16)**

- a) What is the difference between singlet and triplet carbenes?
- b) Formulate any two methods for the generation of arynes.
- c) Give an example of neighboring group participation reaction involving alkyl group.
- d) Explain transannular rearrangement with an example.
- e) Predict the product and name the following reaction:

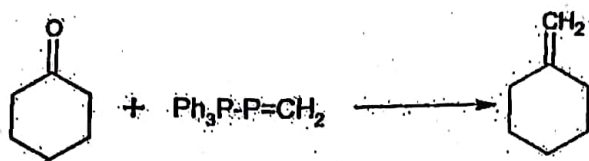


- f) Explain E2 elimination reaction with an example.
- g) Write the product (s) and name the following reaction:

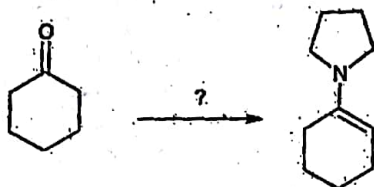


- h) Give two synthetic applications of Perkin condensation.
- i) How are nitrogen ylides generated?
- j) Define pyrolytic elimination reaction with suitable example.

2. a) What are phosphorous ylides? How are they generated? Write the mechanism for following transformation:



- b) Write the reagent(s) used in the following transformation and propose the mechanism:



- c) Give an account on formation, stability and reactions of Free radicals.

OR

Carbenes.

(5+5+6=16)

3. a) Account on neighbouring group participation involving phenonium ion.
b) Discuss with suitable examples, the nucleophilic substitution reaction at allylic carbon.
c) Elaborate giving suitable examples, the neighbouring group participation in elimination reactions.

OR

Give two neighbouring group participation reactions each for oxygen, Sulphur and chlorine.

(5+5+6=16)

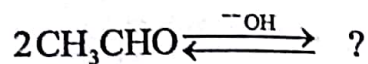
4. a) Write the mechanism of Cannizzaro reaction and give its synthetic applications.
b) Describe Saytzeff and Hofmann rules with suitable examples.
c) Discuss the mechanism of :
i) Barton reaction ii) Hoffmann elimination

OR

Illustrate the mechanism involving addition of nitrogen, Sulphur and oxygen nucleophiles across $\text{C}=\text{O}$ system.

(5+5+6=16)

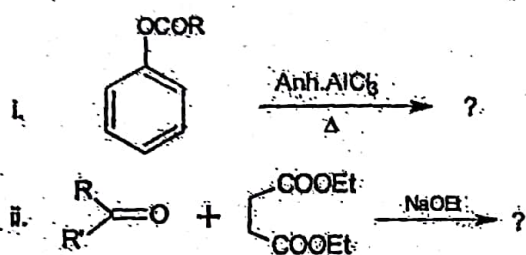
5. a) Discuss the mechanism of Orton rearrangement.
 b) Write the product and propose the mechanism in the following reaction:



- c) What is Knoevenagel condensation? Discuss its mechanism and synthetic applications.

OR

Predict the product with possible mechanism:



(5+5+6=16)



Roll No. _____

[Total No. of Pages : 3

PGIIS-O-1514 B-17

M.Sc. IIIrd Semester (CBCS) Degree Examination

CHEMISTRY / ORGANIC CHEMISTRY

(Organic Chemistry - III / Spectroscopy (Common to Chemistry and Organic Chemistry).

Paper : HCT - 3.1

(Old)

Time : 3 Hours

Maximum Marks : 80

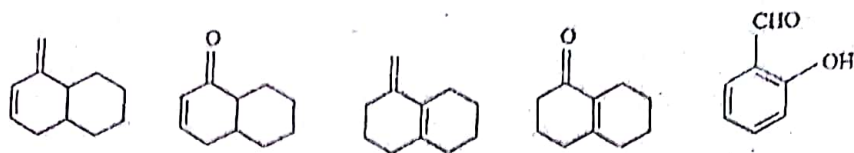
Instructions to Candidates :

- i) All questions are compulsory.
- ii) All questions carry equal marks.

1. Answer any **Eight** of the following. (8×2=16)

- a) Define and illustrate isosbestic point.
- b) Give the mathematical expression of Hooke's law and elaborate the terms. How is the law helpful in IR spectroscopy?
- c) Name and differentiate the two relaxation processes encountered in NMR spectroscopy.
- d) Write the Karplus equation and draw the Karplus curve.
- e) Name the internal standards used for recording ^{13}C and ^{19}F NMR. Give suitable reason for choosing the standard.
- f) Carbonyl carbons give signals far downfield in their ^{13}C NMR spectra. Why?
- g) State and explain the Stevenson rule.
- h) Illustrate McLafferty + 1 rule with suitable example.
- i) Molecular formula $\text{C}_7\text{H}_6\text{O}$. IR : 2930, 2820, 2720 and 1730 cm^{-1} . MS: $m/e = 106$, 105 (base peak) and 77. Assign the peaks and identify the compound.
- j) An organic liquid gave the following ^1H NMR data: δ : 7.26 (s, 5H), 2.65 (septet, 1H), and 1.46 (d, 6H). The ^{13}C NMR spectrum gave 6 signals. Identify the compound.

2. a) Predict the λ_{\max} for the following compounds:



- b) Write an account of the complementarity of IR and Raman spectroscopy's.
c) Discuss Woodward-Fieser rules to predict the λ_{\max} of α,β -unsaturated carbonyl compounds.

OR

- c) Discuss the various factors which affect the position of group frequencies in IR spectroscopy.

(5+5+6=16)

3. a) State and illustrate the first order splitting rules in ^1H NMR spectroscopy. Explain how first order and second order ^1H NMR spectra may be distinguished.
b) Discuss any two methods for the simplification of complex ^1H NMR spectra.
c) Discuss the anisotropic effects prevalent in
i) aromatic compounds and
ii) carbonyl compounds

OR

- c) Write short notes on the usefulness of
i) CIDNP and
ii) NOE

(5+5+6=16)

4. a) Outline the utility of DEPT in the structural elucidation of organic molecules.
b) Write an account of
i) Broad band decoupling and
ii) Off-resonance broad band decoupling techniques.
c) Discuss COSY with suitable example.

OR

- c) Discuss HETEROCOSY, with suitable example.

(5+5+6=16)

5. a) Describe the instrumentation of a double focus mass-spectrometer.
b) State and explain Nitrogen rule. How is the rule useful in structural elucidation of organic compounds?
c) Deduce the structure of an organic compound from the following data and assign the values:

Molecular formula : C_7H_9NO

UV λ_{max} : 296nm.

IR : 3456, 3372, 2907, 1619, 1414 and 1078 cm^{-1} .

1H NMR : δ : 6.94 (d, 2H, $J=8$ Hz), 7.02 (d, 2H, $J=8$ Hz), 3.95 (broad, 2H) and 3.81 (s, 3H).

^{13}C NMR : δ : 148.1, 137.2, 121.4, 118.9, 115.5, 110.3 and 55.0.

MS : m/e (relative intensity) : 123 (6 %), 122 (2 %), 94 (63 %), 65 (100 %), and 28 (19 %).

OR

- c) Write short notes on :
- Usefulness of CI method for production of ions and
 - Usefulness of natural isotopic abundance in the identification of mono-chloro and mono-bromo hydrocarbons in mass spectra.

(5+5+6=16)



Roll No. _____

[Total No. of Pages : 2

PGIIS-N-1517 B-17
M.Sc. III Semester (CBCS) Degree Examination
CHEMISTRY
(Physical Chemistry - III)
Paper : HCT - 3.2
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates :

- i) *All questions are compulsory.*
- ii) *All questions carry equal marks.*

1. Answer any **Eight** questions of the following. (2×8=16)

- a) Distinguish between Hamiltonian and Hermitian Operator.
- b) Write the energy level diagram of N_2 Molecule.
- c) Explain what is coulomb integral.
- d) What are superconductors? Give examples.
- e) Explain extrinsic and intrinsic properties of solids.
- f) Explain residual entropy.
- g) Calculate value of $5!$ Using Stirling's approximation.
- h) Calculate the r.m.s. velocity of CO gas at 298K.
- i) What are excess molar functions? Explain.
- j) Explain forces and fluxes.

2. a) Discuss on correlation diagram and non crossing rule. (5)
- b) Determine the energy equation for a typical aliphatic molecule employing simple Huckel approach. (5)
- c) Give an account of MO Theory to the solution of H_2 molecule. (6)

OR

Write the comparison between valence bond and Molecular Orbital Theory. (6)

3. a) Represent the different types of thermal traces for a typical compound undergoing: dehydration, crystal system transition, melting, and decomposition processes. (5)
- b) Based on the electric behaviour of solids, distinguish between ferroelectric, pyroelectric and piezoelectric behaviour of solids. (5)
- c) Draw the representative magnetic hysteresis trace for a typical magnetically concentrated system and explain the features observed from it. (6)

OR

Give an account of giant magnetoresistance compounds. (6)

4. a) What are thermodynamic excess molar functions, represent and express them. (5)
- b) Give an account of thermodynamic entropy production in irreversible process. (5)
- c) Discuss any one method to determine CMC of a liquid surfactant. (6)

OR

- c) Classify the different types of surfactants based on their properties, giving suitable examples for each. (6)
5. a) Derive the expression for classical Maxwell-Boltzmann distribution law. (5)
- b) What are partition functions? Give an account of separation of partition functions. (5)
- c) Explain rotational partition function for diatomic molecules. (6)

OR

Give the comparison between Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistic. At what condition three forms will give same results. (6)



Roll No. _____

[Total No. of Pages : 2

PGIIS-O-1517 B-17
M.Sc. IIIrd Semester (CBCS) Degree Examination
CHEMISTRY
(Physical Chemistry - III)
Paper : HCT - 3.2
(Old)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates :

- i) *Answer questions are compulsory.*
- ii) *All questions carry equal marks.*

Answer any **Eight** questions.

(8×2=16)

1.
 - a) Calculate the value of $5!$ Using Stirling approximation.
 - b) Give the definition of Boltzmann's entropy.
 - c) Give the concept of molecular partition function.
 - d) Give the definition of laplacian operator.
 - e) Give the examples of MO of simple HOMO nuclear molecules.
 - f) Define rigid rotator.
 - g) What is meant by band gap energy?
 - h) Define photoconduction.
 - i) What is critical micellar concentration?
 - j) Name any two surface active agents.
2.
 - a) Derive the expression for Maxwell-Boltzmann quantum statistics. **(5)**
 - b) Derive the expression for rotational partion function. Calculate the translational partion function for hydrogen atom at 1000 K and 1 atm. **(5)**
 - c)
 - i) Give the comparison between Bose-Einstein in and Fermi-Dirac statistics. **(6)**
 - ii) Give the comparison of various ensembles.

OR

Write a short note on :

- i) Einstein's heat capacity for solids **(6)**
- ii) Sackur-Tetrode equation.

3. a) Give an account of schrodinger wave equation applicable to Hydrogen like atoms. (5)
b) How does molecular orbital theory explain ionic and covalent bonding? (5)
c) Write a note on: (6)
i) Application of perturbation theory
ii) Non-crossing rules

OR

Write a note on: (6)

- i) Secular equation
ii) Application of simple Hückel theory to butadiene.
4. a) Write the principles involved in a generalised solid state reaction. (5)
b) Explain Schottky and Frankel defects. How to create such defects in material for device application. (5)
c) Write a note on : (6)

Classification of solid state reactions with suitable examples.

OR

- i) Photoelectric effect (6)
ii) Magnetic hysteresis
5. a) Derive the Onsager reciprocal relation from the principle of microscopic reversibility.
b) Discuss the system in stationary non-equilibrium states with particular reference to Prigogine's principle of minimum entropy production. (5)
c) Give the electro kinetic phenomena of colloids. (6)

OR

Explain Gibbs' function of mixing. (6)



Roll No. _____

[Total No. of Pages : 2

PGIIS-O-1519 B-17
M.Sc. IIIrd Semester (CBCS) Degree Examination
CHEMISTRY
(Inorganic Chemistry)
Paper : SCT - 3.2
(Old)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates :

Answer all questions.

1. Answer any **Eight** questions.

(8×2=16)

- a) Write optical and electro magnetic properties of ceramics.
- b) What are the secondary raw materials used in the manufacture of cement?
- c) Explain why the storage of iron in a non toxic form is a necessary feature of metabolism.
- d) Write the source and biochemical effects of O_3 and PAN.
- e) Explain the Interaction of γ radiation with matter.
- f) Distinguish between secular and transient equilibrium.
- g) Define quantum yield with an example.
- h) State photochemical laws.
- i) Write the nuclear power stations in India.
- j) What are cytochromes? Give example.

2. a) How is steel manufactured by open hearth furnace? Mention the advantages of this process. (5)
- b) What is glass? Explain the structure of glass. How glass is manufactured by tank furnace method. (5)
- c) Discuss in detail the procedural aspects of disposal of radioactive nuclear waste. How far these procedures are safe? (6)

OR

Write a note on harmful effects of metallurgical industries and thermal power plant pollutions. Explain the control of thermal pollution.

3. a) Discuss briefly how nitrogenase helps in vivo and in vitro nitrogen fixation? (5)
- b) Describe the source metabolism, toxicological effects and treatment. of NO_x and Hg pollution. (5)
- c) What do you mean by ferredoxin (D)? Give the examples of different types of ferredoxin and discuss their structural features. (6)

OR

Write a note on :

- i) Impact of toxic chemicals on enzymes.
 - ii) Chlorophyll and its role in photosynthesis.
4. a) What are breeder reactors? How do they differ from others? Mention their advantages. (5)
 - b) Describe the construction and operation of ionization chamber. Explain its uses. (5)
 - c) Discuss the applications of nuclear sciences. (6)

OR

Discuss the parent daughter decay growth relationship with reference to

- i) Parent shorter-lived than daughter. ($T_p < T_d$)
 - ii) Parent longer lived than daughter ($T_p > T_d$).
5. a) Write a note on charge transfer spectra and charge transfer excitations. (5)
 - b) Describe the energy dissipation by radioactive and non-radiative processes. (5)
 - c) Write a note on : (6)
 - i) Photo isomerisation and
 - ii) Photo reduction reactions

OR

Explain the following :

- i) Metal complexes as sensitizers
- ii) Photosubstitution reactions.



Roll No. _____

[Total No. of Pages : 2]

PGIIS-N-1525 B-17
M.Sc. IIIrd Semester (CBCS) Degree Examination
CHEMISTRY
Chemistry - IV (Organic Chemistry)
Paper : OET - 3.2
(New)

Time : 3 Hours

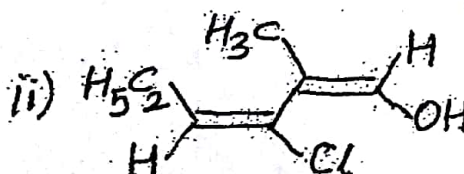
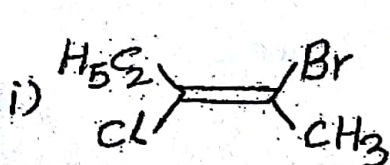
Maximum Marks : 80

Instructions to Candidates :

- i) *All questions are compulsory.*
- ii) *All questions carry equal marks.*

1. Answer any **Eight** of the following. (8×2=16)

- a) What is bond polarity? Give example.
- b) Define hybridisation.
- c) Give the classification of organic reactions.
- d) Write the mechanism of Aldol condensation reaction.
- e) Give any one method for the synthesis of pyrrole.
- f) Mention the biological importance of pyrimidine derivatives.
- g) Sketch the synthesis of acetanilide from nitrobenzene using functional group inter-conversion.
- h) What are homotopic groups? give examples.
- i) Write the E/Z or cis-trans descriptors for the following compounds:



- j) What are epimers? Give examples.

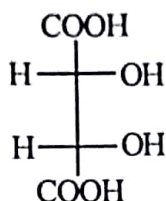
2. a) Discuss the HMO theory for benzene.
- b) Explain the effect of hybridisation on the geometry, bond angle and bond energies of ethane, ethene and ethyne.
- c) Write an account of aromaticity of non-benzenoid compounds.

OR

- c) Discuss the aromatic character of [10], [12] and [16]-annulenes.

(5+5+6=16)

3. a) Outline CIP rules to assign the R/S nomenclature for chiral carbons.
- b) Draw the Sawhorse and Newman projection formulae for meso-tartaric acid.



- c) Differentiate between enantiotopic and diastereotopic groups.

OR

- c) Discuss symmetry operations.

(5+5+6=16)

4. a) What are isotopic labelling experiments? How they are useful to determine reaction mechanism?
- b) What are cross-over Products? Give any one example.
- c) Discuss mechanism of Dieckmann cyclization with suitable example.

OR

- c) Discuss the Claisen-Schmidt reaction with mechanism.

(5+5+6=16)

5. a) Sketch any one synthesis of quinoline and discuss any two reactions.
- b) What is Fischer indole synthesis. Explain its mechanism.
- c) Describe functional group interconversions of addition and elimination reactions.

OR

- c) Describe functional group interconversions of oxidation and reduction reactions.

(5+5+6=16)

