



MCHT 3.1

III Semester M.Sc. Degree Examination, September 2016

CHEMISTRY
Inorganic Chemistry – III

Time : 3 Hours

Max. Marks : 80

Instruction : Answer any eight questions from Part – I and any four full questions from Part – II.

PART – I

(8x2=16)

- i. What is substitution reaction of coordination compound ? Give example.
- ii. With suitable example explain the Electron transfer reaction in coordination compounds.
- iii. What is Anation Reaction ? Explain with example.
- iv. Give the differences between hapticity and denticity. Illustrate with example.
- v. Write any two reactions of organoaluminum compounds.
- vi. What are arene organometallics ? Give examples.
- vii. Write the structure and the type of bonding in Gilman reagents.
- viii. Give a brief account of olefin isomerization and its application.
- ix. Indicate the general properties associated with inorganic polymers.
- x. What are Inter halogen compounds ? Give two examples.

PART – II

1. a) Discuss the evidences for dissociative mechanisms.
b) Explain the S_N1 mechanism and the energy profile involved in octahedral complexes.
c) Discuss the π -Bonding Theory and polarisation theory of trans-effect. **(4+6+6=16)**
2. d) Illustrate briefly about counting of electrons in finding metal-metal bonds in organometallic compounds.
e) Discuss the structure of organoberyllium and organoaluminum compounds.
f) What are cyclopentadienyl organometallics ? Discuss the structure and reactions of ferrocene. **(6+6+4=16)**

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3. g) Discuss the structure and bonding in Gilman reagents and explain the reactions of Gilman reagents.
- h) What is Hydroformylation reaction? Explain the mechanism of this reaction and discuss the advantages of using [Rh] over [Co].
- i) What are fluxional molecules? Discuss the different techniques used for studying fluxional behavior.

(6+6+4=16)

4. j) What are phosphazenes? Discuss the structure phosphazenes.
- k) What are metallo carboranes? Explain the synthesis of metallo carborane and compare the metallo carborane with metallocene.
- l) Explain the method of preparations of interhalogen compounds and discuss their structures.

(6+4+6=16)

5. m) Discuss factors affecting the rates of substitution reactions in square planar complexes.
- n) What are alkylidynes complexes? Explain reactivity.
- o) Explain S_N1CB mechanism in reactions of co-ordination compounds and account for the evidence in favour of this mechanism.

(6+4+6=16)

6. p) What are borazines? Explain the different methods of synthesis of borazines.

q) Write a brief notes on :

- i) Schrock's Metathesis Catalyst and
- ii) Grubbs' Metathesis Catalyst.

r) Discuss the preparation of cis and trans $[Pt(NH_3)(NO_2)Cl_2]$ from $[PtCl_4]^{2-}$.

(6+4+6=16)



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CHEMISTRY
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PART – I

(8×2=16)

- i. What are allowed and forbidden transition ? Explain with examples.
- ii. Cis-1,2- dichloroethene is Infra-Red active while trans-1,2- dichloroethene is IR inactive. Explain.
- iii. With example explain the influence of electron density on chemical shift.
- iv. What is vicinal spin-spin coupling ?
- v. Write the pattern of NMR spectra of ethyl alcohol and specify the δ value of each proton.
- vi. Explain the terms singlet and triplet state.
- vii. Name and write the different isomers of benzene molecule under photochemical condition.
- viii. Why furon is less aromatic than pyrrole ? Give reason.
- ix. What is Reimer-Tiemann reaction (formylation) ? Give an example.
- x. Explain the any one method of synthesis of Azepine.



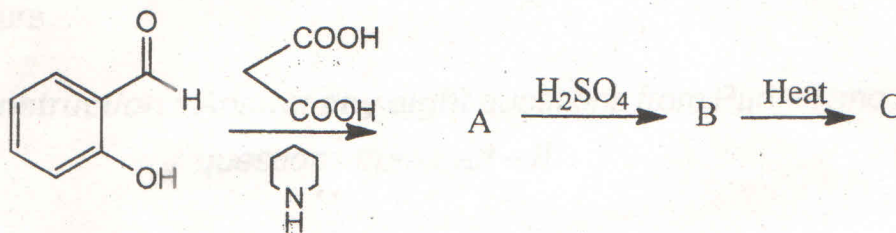
PART – II

1. a) In IR spectrum of acetylene – C = C – H str appears at about 3300 cm^{-1} . How will you distinguish it from an O–H str in ethyl alcohol ?
b) Write the important IR regions of absorption for
O–H str for alcohols
O–H str for carboxylic acids
N–H str for primary and secondary amines.
c) With example explain the McLafferty Rearrangement. (4+6+6 = 16)
2. d) Write a note on different types of coupling constants observed in organic molecules.
e) What is DEPT ? Discuss the determining ^{13}C signal multiplicity using DEPT.
f) Explain the theory of 2D NMR. (6+6+4 = 16)
3. g) Explain why benzophenone is used as photosensitizer to get triplet 1,3-butadiene state instead of direct photolysis ?
h) Discuss Norrish type I and Norrish type II cleavage with suitable examples.
i) Explain the various reactions possible with singlet molecular oxygen. (6+6+4 = 16)
4. j) Compare the stability of 3 and 4 membered heterocycles. Write the any two common reactions observed in 3 membered heterocycles.
k) Explain the directing effect of substituents in benzo [b] furan.
l) Explain the synthesis and reactions of Pyrimidines. (6+4+6 = 16)
5. m) Explain red shift and blue shift in UV-Visible spectroscopy.
n) What is molecular ion peak ? Write the important fragment peaks for benzyl alcohol and acetophenone.
o) Discuss the effect of dihedral angle and substituent effects on chemical shifts in cyclohexane ring system. (6+4+6 = 16)



6. p) Draw the Jablonski diagram and define the terms phosphorescence and fluorescence.

q) Write the structure of the products for the following reaction scheme.



r) What is Di-pi-methane rearrangement? Explain with example.

(6+4+6=16)



III Semester M.Sc. Degree Examination, September 2016
CHEMISTRY
Physical Chemistry – III

Time : 3 Hours

Max. Marks : 80

Instruction : Answer any eight questions from Part – I and any four full questions from Part – II.

PART – I

(8x2=16)

- a. State the Zucker-Hammett hypothesis of acid base catalysis.
- b. What are auto catalyzed reaction ? Give an example.
- c. What is linear free energy relationship ? Mention two isokinetic energy relationships.
- d. Explain the irreversible electrode process with example.
- e. What is mass transport ?
- f. Write the mechanism for H_2 overvoltage.
- g. What is twinning ?
- h. Define mole fraction of a solute.
- i. What is vapour pressure of liquid ? Explain its significance.
- j. Describe chemical potential and give its significance.

PART – II

1. a) Derive the expression for kinetics of acid-base catalysis.
- b) What are oscillatory chemical reactions ? Explain with an example.
- c) Explain temperature-Jump and pressure-Jump method for determination of rate of fast reactions.

(4+6+6=16)

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2. d) Explain different types of over voltages.
e) Explain the method for identification of metal ion in solution (quantitative analysis) by using polarography.
f) Explain Tafel's theory for activation over voltage. (6+6+4=16)
3. g) Explain stacking faults with an example.
h) How n-type semiconductors are prepared? Explain their mode of conductivity.
i) What is Josephson effect? How energy gap of super conductors can be manifested? (5+5+6=16)
4. j) The vapour pressure of pure water at 0° C is 3.579 mm of Hg. A solution of lactose containing 6.45 g lactose in 100 g of water has a vapour pressure of 4.559 mm of Hg at the same temperature. Calculate the molecular weight of lactose.
k) Derive the expression for relation between depression of freezing point and lowering of vapour pressure.
l) Explain desalination of seawater by reverse Osmosis method. (6+4+6=16)
5. m) Derive the expression for the kinetics of acid-base catalysis.
n) Derive the equation for concentration over potential at the stationary surface.
o) What is explosion? Discuss gas-phase auto oxidation reaction. (6+4+6=16)
6. p) Write a note on Type-I and Type-II super conductors.
q) Explain the mechanism of electrochemical corrosion by inhibitors method.
r) What are p-n junctions? Discuss its formation and significance. (6+4+6=16)



III Semester M.Sc. Degree Examination, September 2016
CHEMISTRY
Bio-Inorganic and Bio-Physical Chemistry – III

Time : 3 Hours

Max. Marks : 80

Instructions : Answer **any eight** questions from Part – I and **any four full** questions from Part – II.

PART – I

(8×2=16)

- i. What are coupled transporters ? Explain their role in ion transporting.
- ii. List the different proteins used for iron storage in cell.
- iii. What are cytochromes ? How they are classified ?
- iv. Write the various biological processes carried out by zinc enzymes.
- v. What is meant by biological nitrogen fixation ? Explain.
- vi. Write the effect of temperature on enzyme catalyzed reaction.
- vii. Explain the effect of Cr^{3+} for glucose oxidase in the oxidation of glucose.
- viii. What is meant by bioavailability of drug ?
- ix. Explain the significance of V_D .
- x. What is Donnan membrane equilibrium ?

PART – II

1.
 - a) What is ion pump ? Explain the revolving door mechanism of Sodium and Potassium pump.
 - b) What are passive carriers ? Give one example and explain how they transport ion.
 - c) Explain the role of calcium in the clotting of blood. Depicts its mechanism. (4+6+6=16)
2.
 - d) What are electron transfer reactions ? Discuss the structure and function of Ferredoxin.
 - e) Discuss the structure and biological function of Carboxypeptidase.
 - f) Write a note on metal cluster present in dinitrogenase ? Explain their role. (6+6+4=16)



3. g) Derive the expression for effect of (substrate) on enzyme catalyzed reaction (Michalein-Menten Equation).
h) Discuss the factors affecting the bioavailability of a drug.
i) Discuss the kinetic and mechanistic application of glucose oxidase in the oxidation of glucose. **(6+4+6=16)**
4. j) Discuss the process salting out of proteins and explain its application in separation of proteins.
k) What are Micelles ? Discuss the formation of mixed micelles between bile salt and products of lipid digestion.
l) What is osmoregulation ? Explain the osmotic behavior of cells and its biological significance. **(6+4+6=16)**
5. m) Explain the biochemistry of sodium, potassium and chlorine.
n) Discuss the structure and function of cytochrome P-450 enzymes.
o) What are siderophores ? Explain the structure and iron storage method in Transferrin. **(6+4+6=16)**
6. p) Discuss the diffusion of solution across biomembrane and mechanism of application in the respiratory exchange of O_2 and CO_2 .
q) What is surface tension ? Explain the effect of temperature (γ) and effect of solute on surface tension.
r) How interstrand disulfide bonds in proteins can be determined using viscosity measurement ? **(4+6+6=16)**
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