Roll No. _____ [Total No. of Pages : 2

PGIS-N-1011 B-18

M.Sc. I - Semester (CBCS) Degree Examination

CHEMISTRY / ORGANIC CHEMISTRY

(Organic Chemistry)

Paper - HCT 1.2

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

1) All questions are compulsory.

2) All questions carry equal marks.

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

a) Define the term cross conjugation with suitable example.

b) State whether the following compounds are aromatic or non-aromatic:

i) 

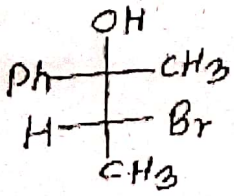
ii) 

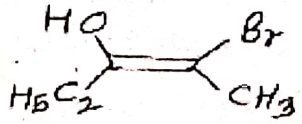
iii) 

c) Give any one method for the generation of aryne and a reaction involving aryne.

d) What is SN^1 reaction? Give its mechanism.

e) Propose the R/S of E/Z nomenclature for the following:

i) 

ii) 

f) What are Pseudo-asymmetric compounds? Give an example.

g) What is Dakins reaction? Write its mechanism.

h) Write the most stable conformation for 3-tert. Butyl-1 methyl cyclohexane.

i) What is SRN1 pathway? Give its mechanism.

j) Give any two methods for generation of free radicals.

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2. a) Write briefly on the aromaticity of benzenoid and non-benzenoid compounds.
   b) Explain the tautomerism and valence bond tautomerism using suitable examples.
   c) Write notes on :
      i) Antiaromantic and homoaromatic compounds.
      ii) Delocalised chemical bonding.

OR

   c) Write briefly on : **(5+5+6=16)**
      i) Resonance
      ii) Hyper conjugation

3. a) Discuss how the isotopic labelling and cross-over products are useful to determine the mechanism of a reaction.
   b) Discuss the structure, stability and any two reactions of carbocations.
   c) Write briefly on ylides and anamines. Discuss their applications in organic synthesis.

OR

   c) Write short notes on : **(5+5+6=16)**
      i) Stereochemistry and SN^1 and SN^2 reactions.
      ii) Structure stability and reactions of carbenes.

4. a) What is Chirality rule? Discuss CIP rules for R/S nomenclature.
   b) Explain the terms enantiomers, diastereomer and epimers giving atleast one example for each one.
   c) Write notes on :
      i) Projection formulae and their inter-conversion.
      ii) Any two chemical methods for determining geometric isomers.

OR

   c) Write an account on : **(5+5+6=16)**
      i) Curtin-Hammett principle
      ii) Conformational analysis of butane

5. a) What is benzidine rearrangement? Give its mechanism and mention its applications.
   b) Give the mechanism and application of Favorskii and Beckman reactions.
   c) Write notes on :
      i) Wagner-Meerwien reaction.
      ii) Shapiro reaction.

OR

   c) Write briefly on : **(5+5+6=16)**
      i) Baeyer-Villiger rearrangement.
      ii) Arndt-Eistert synthesis.

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Roll No. _____ [Total No. of Pages : 2

PGIS-O-1012 B-18

M.Sc. I - Semester (CBCS) Degree Examination

CHEMISTRY/ORGANIC CHEMISTRY

(Organic Chemistry - I)

Paper - HCT 1.2

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

1. *Answer all questions*
2. *All questions carry **equal** marks.*

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

a) What is delocalised chemical bonding? Give an example.

b) Comment on aromaticity of tropyllium cation.

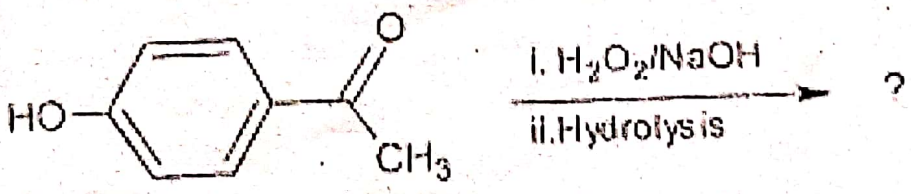
c) Sketch the mechanism of S_N1 reaction taking suitable example.

d) Give two methods for the generation of enamines

e) Give the importance of Curtin-Hammett principle

f) What are epimers? Give examples

g) Predict the product(s) with possible mechanism:



h) Give two synthetic applications of Fries rearrangement.

i) Write the mechanism of Favorskii rearrangement.

j) Give two reactions involving arynes as reaction intermediate.

2. a) Discuss the bonding in fullerences.

b) Write a note on alternant and nonalternant hydrocarbons.

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c) What is bond order? How it will help in predicting the major products in chemical reactions.

(OR)

c) State the Huckel's rule. Explain the aromaticity of benzenoid and non-benzenoid aromatic compounds. **(5+5+6=16)**

3. a) Explain the factors affecting S_N1 and S_N2 reactions

b) Account on the generation, stability and reactions of carbenes.

c) Discuss the isotope labeling and cross over experiments methods used for the determination of reaction mechanism.

(OR)

c) Give an account of generation, stability and reactions of carbocations. **(5+5+6=16)**

4. a) Draw Fischer, Newman and Saw-horse projection formulae for 3-bromo-2-butanol.

b) Write a note on racemisation

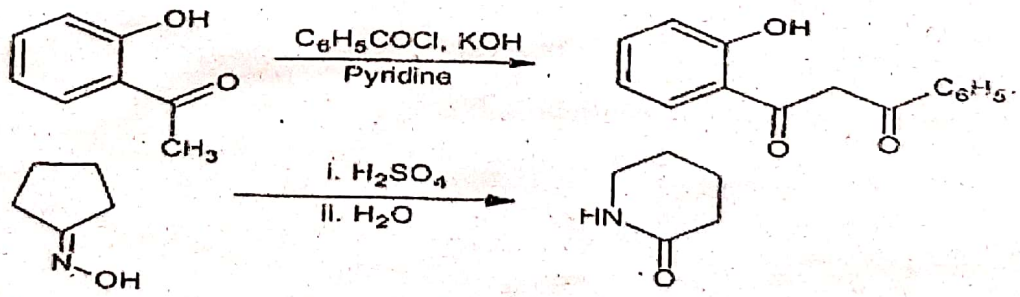
c) Discuss the conformational analysis of butane and comment on their stability.

(OR)

c) Give an account on E-Z nomenclature **(5+5+6=16)**

5. Explain the mechanism for following conversions :

a)



b)

c) Discuss the mechanism and synthetic applications of Sommelet-Hauser rearrangement.

(OR)

c) Discuss the mechanism of following : **(5+5+6=16)**

i) Baeyer-Villiger rearrangement

ii) Arndt Eistert synthesis.

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Roll No. _____ [Total No. of Pages : 2

PGIS-O-1010 B-18

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

Inorganic Chemistry - I

Paper - HCT 1.1

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all the questions and all questions carry equal marks.

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

a) Write Kapustinskii equation and explain its importance.

b) Why ionic solids are highly soluble in water?

c) List out the limitations of radius ratio rules.

d) State and explain Bent's rule.

e) How metallic bond is different from other types of bonds.

f) Give the preparation of metal-dioxygen complexes.

g) With the help of examples, explain co-ordination isomerism and linkage isomerism.

h) List and define different types of magnetic properties in complexes.

i) Define levelling effect.

j) Explain Lewis concept of acids and bases.

2. a) Describe Born-Haber cycle with an example. **(5)**

b) List the assumptions of r^+/r^- concept and find the limiting radius ratio for co-ordination number 6. **(5)**

c) Draw the M-O diagram of CO. Calculate bond order and predict the magnetic properties. **(6)**

OR

Predict the structures of the following molecules using VSEPR theory.

i) ClF_3 and ii) XeF_4

(1)

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3. a) How "free electron theory" successfully explains many properties of metals. List its limitations. **(5)**

b) Write a note on defects in solids. **(5)**

c) Describe the nature of bonding in bent and straight metal-nitrosyls. **(6)**

OR

What is back bonding? Give the evidence's of back bonding in metal carbonyls.

4. a) Explain optical isomerism in complexes with coordination number 4 and 6 with examples. **(5)**

b) Discuss σ and π M–L bonding in tetrahedral and square planar complexes. **(5)**

c) Write a note on spectrochemical and John-Teller distortion. **(6)**

OR

Discuss crystal field approach and valence bond approach in explaining magnetic behaviour of complexes.

5. a) Discuss solvent system concept of acids and bases and also add a note on its limitations. **(5)**

b) Briefly discuss the reactions in anhydrous H_2SO_4. **(5)**

c) Explain the effect of substituents on relative strengths of acids and bases. **(6)**

OR

What are the characteristics of hard base, hard acids, soft base and soft acids, giving one example each.

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Roll No. _____ [Total No. of Pages : 3

PGIS-N-1009 B-18

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

(Inorganic Chemistry - I)

Paper - HCT 1.1

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

1) Answer all questions.

2) All questions carry equal marks.

1. Answer any **EIGHT** questions. **(8×2=16)**

a) What is solvation energy? How is different from hydration energy.

b) Define resonance with examples.

c) What are semiconductors? Write their significance.

d) What are isoelectronic structures? Give examples.

e) Define Quadrupole bond.

f) What are chevrel phases? Write its applications.

g) What is a metal cluster? Illustrate giving suitable examples.

h) Define spin-orbital coupling.

i) What are super acids? Give example.

j) LiCl is soluble in alcohol, while all other alkali metal chlorides are insoluble. Why?

2. a) What is lattice energy? How is it evaluated from Born-Haber cycle? **(5)**

b) Explain the structure of the following using VSEPR theory ClF_3, BrF_5 and SF_4. **(5)**

c) Set up molecular orbital energy level diagram for O_2^{2-}. Predict its bond order and magnetic properties. **(6)**

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OR

c) What do you mean by defects in solids? Describe the nature of Frankel and Schottky defects.

3. a) Explain Isolobal concept. Write the organic fragments which are isolabal with the following species. **(5)**

i) $Re(PR_3)_5$

ii) $Os(CO)_4$

iii) NiC_p

iv) $Cr(CO)_5$

b) Discuss different types of bonding in bent and straight nitrosyls. **(5)**

c) What are low nuclearity and high nuclearity carbonyl clusters? Discuss with suitable examples. **(6)**

OR

c) Discuss the structure of $[Re_2Cl_8]^{2-}$ on the basis of molecular orbital theory.

4. a) Discuss briefly on static and dynamic John-Teller effect with suitable examples. **(5)**

b) Set up the molecular energy level diagram for $[PtCl_4]^{2-}$ involving only π-bonding comment on its magnetic properties. **(5)**

c) What is magnetic susceptibility? How do you measure by Gouy's method? Write the advantages of this method. **(6)**

OR

c) What do you understand by optical isomers? Discuss the optical isomerism exhibited by complexes of coordination number 4 and 6.

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5. a) Discuss the principle and application of HSAB concept. Give examples. (5)

b) With suitable examples, explain ionization, precipitation and complexation reactions in liq.ammonia medium. (5)

c) Differentiate the Bronsted-Lowry and Lewis interpretations of acids and bases. (6)

OR

c) Discuss the role of solvent in acid-base titrations with suitable examples.

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Roll No. _____ [Total No. of Pages : 2

PGIS-O-1016 B-18

M.Sc. I - Semester (CBCS) Degree Examination

CHEMISTRY

(Analytical Chemistry - I)

Paper - SCT 1.1

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

1. *Answer **all** the questions.*
2. *All questions carry **equal** marks.*

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

a) List any two limitations of the analytical methods.

b) Differentiate between cation and anion exchange resin

c) What are Antipsychotic agents? Give an example

d) Write the principle of amperometry.

e) Differentiate between enzyme and hormone.

f) Write the advantages of gradient elution over isocratic elution.

g) Sketch the graph for conductometric titration of strong acid V/S weak base with an example.

h) Mention any two applications of affinity chromatography.

i) What are significant figures? Give examples

j) Define the terms :

i) Accuracy and

ii) Precision

2. a) Discuss in detail the classification of errors. **(5)**

b) Explain the various methods for sampling of solid, liquid and gaseous samples. **(5)**

c) Discuss the significance and importance of :

i) Six sigma concept

ii) F - test

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(OR)

A chemist analysed calcium in limestone using a new method and obtained the following results : 20.4, 20.8, 21.4 and 19.6 mg. If the label on the limestone indicates presence of 20 mg of calcium, find whether the newly developed method has any significant difference from the standard method at 95% confidence level. (Given t - value at 95% confidence level = 30182). (6)

3. a) Explain the instrumentation and working principle of gas chromatography. (5)

b) Account on the advantages and applications of HPLC. (5)

c) Discuss the principle and factors affecting solvent extraction.

(OR)

c) Write a note on principle, methodology and applications of ultracentrifugation. (6)

4. a) Discuss the methods for the determination of moisture and crude fiber contents of food. (5)

b) What are CNS stimulants? Explain the procedure for the assay of Morphine sulphate. (5)

c) Explain the mode of action of cyanide and organophosphates on human beings.

(OR)

Write notes on :

i) Pesticide residues in food &

ii) Analysis and assay of Vitamin C. (6)

5. a) Briefly explain the theory and cell processes in electrogravimetric method. (5)

b) Describe the principle and applications of controlled potential coulometry. (5)

c) Discuss the basic principle and working of membrane electrode with an example.

(OR)

c) Write notes on applications of :

i) Stripping votammetry &

ii) Cyclic voltametry. (6)

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Roll No. _____ [Total No. of Pages : 3

PGIS-N- 1016 B-18

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

(Analytical Chemistry - I)

Paper - SCT 1.1

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to candidates:

1. *Answer all the* ***questions.***
2. *All questions carry* ***equal*** *marks.*

1. Answer any **eight** questions: **(8×2=16)**

a. What is sampling? Mention its significance.

b. A chemist analyzed Fe(II) in mustard seeds by dichrometry method and found the following results for a set of measurements: 22.42; 22.68; 21.97 and 25.26 mg. Find whether the last result in the set of measurement should be rejected or accepted at 95% confidence level. (Given Q value at 95% confidence level= 0.829)

c. What are significant figures? List the significant figures in the following number: 224.0362g.

d. Calculate the number of theoretical plates of a column which showed retention time of 20s and width of peak at its base 4s for the elution of an analyte.

e. List the properties of carrier gas used in Gas chromatography.

f. State the distribution law.

g. Write the difference between adulterant and contaminant with suitable examples.

h. What are antianxiety agents? Mention its significance.

i. Why the supporting electrolyte concentration is taken in excess compared to the analyte in cyclic voltametry?

j. Write the Ilkovic equation and name the notations.

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2. a. Explain the linear regression method in the construction of the best possible straight line through the set of data points for a calibration curve. (5)

b. Discuss the responsibilities and functions of quality control in a pharmaceutical industry. (5)

c. What is the significance of F test? A chemist developed a new method for the analysis of iron (Fe) in a sample and obtained the following results: 5.8, 5.9, 6.8, 4.6, 5.0 mg and if the standard deviation obtained from the standard method is 0.43 for the analysis of same sample. Find whether the developed method is having significant difference from the standard method or not at 95% confidence level (F value at 95% confidence level is 6.59).

(OR)

Classify the errors and explain the distribution of random errors. How the errors can be minimized in the laboratory? (6)

3. a. Briefly explain the different techniques employed in ion exchange chromatography. (5)

b. Illustrate the applications of HPLC in synthetic chemistry. (5)

c. Discuss the principle and various detectors used in gas chromatography.

(OR)

With the help of chemical reactions, describe the separation and determination of Fe(II) using 1,10- phenanthroline by solvent extraction. (6)

4. a. Describe the procedure for the determination of organophosphate insecticide adulteration in food products by HPLC. (5)

b. What are chemical preservatives? Explain the procedure for the determination of sulphur dioxide added to food sample. (5)

c. What are anticonvulsants? Write the structure of phenytoin and describe the procedure involved in the determination of its essay.

(OR)

What is the importance of Ca in food. With the help of chemical reaction, explain the procedure for the determination of Ca in food samples. (6)

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5. a. Neatly sketch the glass electrode and explain its functioning. **(5)**

b. Explain the principle of cyclic voltammetry. Sketch and explain the salient features for the cyclic voltammagram of K_4 [Fe $(CN)_6$] system. **(5)**

c. Discuss the principle and types of coulometric methods.

(OR)

Write notes on:

i. Theory of conductometric titrations.

ii. Advantages and disadvantages of DME. **(6)**

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Roll No. _____ [Total No. of Pages : 2

PGIS-N- 1013 B-18
M.Sc. I Semester (CBCS) Degree Examination
CHEMISTRY
(Physical Chemistry-I)
Paper - HCT 1.3
(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidate:

1. *All Questions are compulsory.*
2. *All questions carry equal marks.*

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

   a. Calculate ionic strength of 0.001 M $CuSO_4$ aqueous solution.

   b. What are Lewis acids and bases?

   c. Define relaxation time.

   d. Explain thermoplastics and thermosetting polymers.

   e. If equal number of molecules with $M_1 = 10,000$ and $M_2 = 50,000$ are mixed. Calculate number average molecular weight

   f. What are θ - temperature and θ - solvents?

   g. Explain activity and mean activity coefficients.

   h. Explain buffer action and buffer capacity.

   i. Define black body radiation.

   j. Explain how associative property is operator in quantum mechanics?

(4×16=64)

2. a. What are fast reactions? Explain the flash photolysis method of studying Fast reactions. **(05)**

   b. Derive the rate expression for bimolecular gaseous reaction based on collision theory. **(05)**

   c. Give the comparison between collision theory and transition state theory. **(06)**

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(OR)

c. i. What are primary and secondary salt effects?

ii. Explain fugacity and give its significance. (06)

3. a. What is Svedberg? Discuss the sedimentation equilibrium method of determining polymer molecular weight. (05)

b. Discuss Debye method of determining polymer molecular weight. (05)

c. Explain: i. Monomer unit

ii. Weight average molecular weight

iii. Optical Isomerism (06)

(OR)

c. Explain uses of polymers in artificial kidney and in contact lens. (06)

4. a. What are buffer solutions? Discuss acidic and basic buffer solutions. (05)

b. Explain use of Handerson-Hasselbalch equation in preparation of buffer solutions. (05)

c. Explain:

i. Ionic atmosphere

ii. Ionic strength

iii. Buffer capacity (06)

(OR)

c. Write a note on catenanes and rotaxanes. (06)

5. a. Discuss the elementary applications of particle in one dimensional box. (05)

b. Explain the concept of commuting and non-commuting operators with suitable examples. (05)

c. Discuss the eigen values and eigen functions with respect to Schrodinger wave equation. (06)

(OR)

c. Discuss the condition for orthogonality of wave function. (06)

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PGIS-O- 1014 AB-18
M.Sc. I Semester (CBCS) Degree Examination
CHEMISTRY
(Physical Chemistry-I)
Paper - HCT 1.3
(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidate:

1. *All Questions are compulsory.*
2. *All questions carry equal marks.*

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

a) What are operators?

b) What are eigen values and eigen functions.

c) Define Ionic Strength.

d) What is buffer action?

e) Explain monomer unit and degree of polymerization.

f) What are Network and IPN polymers?

g) Explain

1. Order of reaction 2. Molecularity reactions.

h) Define relaxation time.

i) What is reaction coordinates?

j) Define fugacity.

2. a) Explain black body radiation. **(05)**

b) State the postulates of quantum mechanics. **(05)**

c) Give an account of particle in one dimensional box. **(06)**

(OR)

c) Give the comparison between M.O. and V.B. theories **(06)**

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3. a) Derive Duhem-Margulus equation. **(05)**

b) State the laws of Debye-Huckel limiting law. **(05)**

c) Give the importance and buffers in biological systems. **(06)**

(OR)

c) Derive Habbelbalch-Handerson equation. **(06)**

4. a) Explain linear branched and cross linked polymers. **(05)**

b) Discuss the Zimmi's Plot method of determining polymer molecular weight. **(05)**

c) What are number average, weight average and viscosity average molecular weights? **(06)**

(OR)

c) Discuss osmotic pressure method of determining polymer molecular weight. **(06)**

5. a) Discuss the Lindemann theory of unimolecular reactions. **(05)**

b) Derive expression for Arrhenius equation. **(05)**

c) Explain primary salt effect. **(06)**

(OR)

c) Discuss Flash photolysis technique of studying fast reactions. **(06)**

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