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

PGIS-O-1016 B-17

M.Sc. I Semester (CBCS) Degree Examination

CHEMISTRY

(Analytical Chemistry - I)

Paper : SCT 1.1

(Old Syllabus)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

i) Answer all the questions.
ii) All questions carry equal marks.

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

a) List the factors affecting the analytical methods.

b) Differentiate between statistical sampling and random sampling.

c) A chemist obtained the following results for the analysis of magnesium in water sample: 25.4; 25.3; 25.5; 25.7 and 25.8 mg. Calculate the mean and median for the set of measurement.

d) What is gradient elution chromatography? Mention its advantage over isocratic elution.

e) What is the role of spacer arms in affinity chromatography?

f) Give the principle of ultracentrifugation.

g) What are anticonvulsant drugs? Give an example.

h) A 2.0 g food sample was dried at 105°C for 3h to get concurrent weight of 1.9g. Calculate % of moisture present in the food sample.

i) Draw a Conductometric titration graph of :

i) weak acid vs strong base with an example.

j) Write any two applications Coulometric titrations.

2. a) Classify the errors into different types and explain how they can be minimized in the laboratory. (5)

b) Briefly explain the least squares method in the construction of straight line. (5)

c) A chemist developed a new method and analysed calcium content in a pharmaceutical sample and obtained the following results: 29.4; 29.2; 29.5; 29.5; and 29.4 mg. If the theoretical value is 30.8 mg, find whether there is any significant difference between newly developed method and standard method. (t-value at 95% confidence level - 2.776). (6)

OR

Discuss the functions and responsibilities of Quality control and quality assuracne in Pharmaceutical industry. (6)

3. a) Briefly explain the principle and application of ion exchange chromatography in softening of water. (5)

b) Discuss different types of solvent extraction techniques. (5)

c) With the help of schematic diagram, explain the working and different components used in HPLC. (6)

OR

Explain the principle and application of GC in the analysis of highly volatile environmental pollutants. (6)

4. a) What are CNS stimulants? Describe the procedure for finding the assay of Fenflur amine hydrochloride. (5)

b) What is the biological significance of enzymes? Discuss the procedure for the assay of tyropsinase. (5)

c) Why preservatives are added to food? With the help of chemical reactions, explain the procedure for the detection and determination of benzoic acid and benzoates. (6)

OR

Explain the procedure for the determination of lead and mercury in biological samples? (6)

5. a) Describe the procedure for the determination of copper and nickel by Electrogravimetry. **(5)**

b) Explain the principle and different types of titration curves observed in amperometry. **(5)**

c) Discuss the theory of polarography and with the help of a neat sketch, explain the working of dropping mercury electrode. **(6)**

OR

i) Briefly explain the properties and features of ion selective electrodes.

ii) Illustrate the principle and applications of potentiometry with suitable examples. **(6)**

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PGIS-N-1016 B-17

M.Sc. Ist Semester (CBCS) Degree Examination

CHEMISTRY

(Analytical Chemistry)

Paper : SCT 1.1

(2017-18 Syllabus)

(New)

Time : 3 Hours Maximum Marks : 80

Instructions to the Candidates :

*i) Answer **all** the questions.*

*ii) All questions carry **equal** marks.*

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

a) Write the mathematical expression for coefficient of variation and mention the terms there in.

b) A chemist obtained the following results for the analysis of calcium in water sample: 20.8; 20.6;, 20.5; 20.7 and 21.8 mg. Find whether the last result in the set of measurements can be rejected or retained at 95% confidence level. (Given Q-value at 95% = 0.710).

c) What is meant by six sigma concept? Mention its benefits.

d) Why refractive index detector is called as universal detector in HPLC? Give its advantage.

e) What is Rf value and what are the largest and smallest Rf values possible?

f) What is the function of carrier gas? Mention any two carrier gas used in GC.

g) Differentiate between drug and medicine.

h) A 5.0g of food sample was dried at 105°C for three hours and cooled and weighed for concordant weight of 4.6g. Calculate the % of moisture content in food sample.

i) Calculate the potential of the half-reaction for a solution of 10^{-3} M in $Cr_2O_7^{2-}$ and 10^{-2} M in Cr^{3+} and the pH of the solution is 2.0. (E^0 of $Cr_2O_7^{2-}$, Cr^{3+} = 1.33V)

j) What is the effect of concentration on the electrode potential of an electrochemical cell?

2. a) Discuss the application of Linear least squares method in the construction of straight line in deriving calibration curve. **(5)**

b) What is sampling? Briefly explain the sampling and storage of solid and liquid samples. **(5)**

c) A chemist developed a new method and analysed iron content in a pharmaceutical sample and obtained the following results : 49.4; 49.2; 49.5; 49.5; and 49.4mg. If the theoretical value is 50.8mg. Find whether there is any significant difference between newly developed method and standard method. (t-value at 95% confidence level=2.776)

OR

Discuss the functions and responsibilities of Quality assurance in pharmaceutical industry. **(6)**

3. a) With the help of a neat schematic diagram of HPLC, explain the principle and functions of each component in HPLC. **(5)**

b) Describe the principle and application of ion exchange chromatography in demineralization of water. **(5)**

c) Explain the principle and applications of gas chromatography in the separation of volatile organic compounds with suitable examples.

OR

State Distribution Law. With the help of chemical reactions, explain the separation and determination of Fe(II) in a sample by solvent extraction and photometry. **(6)**

4. a) Describe the application of gas chromatography in the screening and evaluation of drug molecules. **(5)**

b) With the help of chemical reactions, explain the principle and procedure for the determination of sodium and calcium in food sample. **(5)**

c) Why preservatives are used in food? Describe the procedure for the detection and determination of benzoates in food sample.

OR

What are the functions of antianxiety agents? Explain the chemical procedure for the assay of diazepam. **(6)**

5. a) What are reference electrodes? Sketch neatly the calomel electrode and explain its working. **(5)**

b) Explain the principle and working of different types of coulometric titrations. **(5)**

c) What are conductometric titrations? Discuss the application of conductometric titration in titration of :

i) Strong acid with a weak base and

ii) Weak acid with a weak base with examples.

OR

Describe the principle and applications of potentiometric titrations with suitable examples. **(6)**

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

PGIS-O-1014 B-17

M.Sc. Ist Semester (CBCS) Degree Examination

CHEMISTRY

(Physical Chemistry - I)

Paper : HCT 1.3

(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 : **(2×8=16)**

a) What are operators? Explain.

b) Explain Kronecker's delta.

c) Calculate the ionic strength of 0.008N Bach solution at room temperature.

d) Explain buffer capacity.

e) Give any four applications of polymers.

f) Explain glass transition and melt temperature.

g) Define report unit and degree of polymerisation.

h) State steady state approximation.

i) Define fagality. give its unit.

j) What is relaxation time?

2. a) Explain black body radiation. (5)

b) What are Eigen functions and Eigen values? Explain. (5)

c) Write a note on particle in one dimensional box. (6)

OR

c) Give an account of orthogonality and normalization of wave function. (6)

3. a) What are activity and activity coefficients? Calculate mean Tonic activity coefficients 0.01N NaCl solution at room temperature. (5)

b) Define handersch-Hasselback equation. (5)

c) Explain : (6)

i) Ton-Ton

ii) Ton-dipole moment

iii) Catenanes and rotaxanes

OR

c) Give an account of biological applications of buffer solutions. (6)

4. a) Discuss ultracentrifugation method of determining polymer molecular weight. (5)

b) Explain number average. weight average and Z-average molecular weights. (5)

c) Discuss Zim's plot method of determining polymer molecular weight. (6)

OR

c) Discuss super absorbent polymers for contactles and polymers used in artificial heart. (6)

5. a) Discuss Lindemann theory of unimolecular reaction. (5)

b) Explain stopped flow method of studying fast reactions. (5)

c) Derive expression for rate of a reaction based on bimolecular collision. (6)

OR

c) Discuss primary salt effect. (6)

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PGIS-O-1010A B-17

M.Sc. Ist Semester (CBCS) Degree Examination

CHEMISTRY

(Inorganic Chemistry-I)

Paper : HCT 1.1

(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to the Candidates :

*Answer **all** questions all questions carry **equal** marks.*

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

a) What do you mean by bent rule? Mention its applications.

b) Calculate the lattice energy of NaCl using Kapustinskil equation (Given $r^- = 162pm$ and $r^+ = 112pm$).

c) Classify the following into Hard and Soft acids and bases Cr^{3+}, SO_3, Cd^{2+}, Tl^+, CO_3^{2-}, SO_4^{2-}, CN^- and C_6H_5.

d) How does HF reacts with anhydrous sulphuric acid and liquid ammonia.

e) Predict the solubility of NaI and NaF in acetonitrile.

f) Write MO energy configuration for H_2^+ and predicts its bond order and magnetic behaviour.

g) Explain how base is considered as hard or soft based on equilibrium constant value.

h) How do the pi-bonding ligands help in the stabilization of metal complex.

i) Calculate the spin only magnetic moment of Cobalt (II) complex if $\Delta_0 = 18{,}200 cm^{-1}$ and $P = 21{,}000\ cm^{-1}$.

j) Octahedral complexes of Ti(III) with ligands a, b, c and d exhibited their λ_{max} values at 430, 510, 460 and 390nm respectively. Arrange these ligands in accordance with spectrochemical series.

2. a) Derive Born-Lande equation for a mole of MX type of solid and what are the conclusions that can be drawn from the equation?

b) Calculate limiting radius ratio for tetrahedral and octahedral arrangement.

c) Write the Molecular orbital diagram for NO and predict the stability and magnetic behaviour of NO^+, NO^{2+}, NO^-.

OR

Explain the structures of following using VSEPR theory; ClF_3, BrF_5, SF_4.

(5+5+6=16)

3. a) Give the meaning of synergic effect and how does it correlate to metal-carbonyl bonding? Explain.

b) Discuss the synthesis, structure and bonding in metal nitrosyls.

c) Discuss the band theory of solids and explain it can be used in classification of solids into metals insulators and semiconductor.

(OR)

Discuss the preparation, structure and bonding of dinitrogen and dioxygen metal complexes.

(5+5+6=16)

4. a) Draw MO energy level diagram for an octahedral $[CoF_6]^{3-}$ complex involving only sigma bonding system and explain its magnetic properties.

b) The spin only magnetic moment value of Ni^{2+} is 2.38 BM whereas, experimental value for Ni(II) octahedral complexes range from 2.8 to 3.3 BM and for tetrahedral around 4.0 BM. How do you account for these observations?

c) What is Jahn-Teller effect? Which are the systems that are susceptible to this effect?

OR

Discuss the determination of magnetic susceptibility of metal complexes by Gouy method.

(5+5+6=16)

5. a) Define solvation energy. Highlights its usefulness in determining solubility of ionic solids.

b) With the help of suitable examples, write the meaning of levelling effect and differentiating ability of solvent.

c) What are the postulates of HSAB concepts? Give its applications

OR

Explain in detail factors affecting the strengths of acid and base. **(5+5+6=16)**

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PGIS-N-1009 B-17

M.Sc. Ist Semester (CBCS) Degree Examination

CHEMISTRY

(Inorganic Chemistry-I) (2017-18)

Paper : HCT 1.1

(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

All questions are compulsory.

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

a) Write Kapustinskii equation and explain the terms.

b) List the important properties of ionic compounds.

c) What are the intrinsic semiconductors? Give examples.

d) In edge shared bioctaheadra the metal-metal bond order cannot be more than two why?

e) Define 'isolobal' relation between two species with examples.

f) Why square planar complexes do not show optical isomerism?

g) Calculate the spin-only magnetic moment values for high-spin complexes of cobalt(iii) and iron(ii).

h) What is symbiosis? Give example.

i) Solutions of alkali metals in liquid ammonia are good reducing agents. Why?

j) Among $M_r(CO)_5$ and $[M_n(CO)_5]^-$ which one is more stable? Explain using 18 election rule.

2. a) Derive Born-Lande equation and explain its draw backs. **(5)**

b) Calculate the limiting ∂^+/∂^- for coordination number numbers 4 and 6. **(5)**

c) Based on band theory, explain how solids can be classified as conductors, semiconductors and insulators. **(6)**

OR

Sketch the M.O energy level diagram of O_2^-, calculate bond order and comment on magnetic behaviour.

3. a) Discuss the methods of preparation, properties and structures of some metal nitrosyl. **(5)**

b) Discuss the structure and bonding in $[Re_2\ C/8]^{2-}$. **(5)**

c) What are LNCC and HNCC? Taking suitable examples discuss the structure and bonding in carbonyl clusters. **(6)**

OR

Write a note on :

i) Chevalier phases and

ii) Bonding in metal dinitrogen complexes.

4. a) Discuss the optical isomerism in complexes with coordination numbers 4 and 6 with examples. **(5)**

b) Discuss the Gouy's method for the determination of magnetic susceptibility of the metal complexes. **(5)**

c) Write a note on : **(6)**

i) Jahn-Teller distortion and its significance.

ii) Spectrochemical series.

OR

Distinguish between:

i) Antiferro and ferromagnetism and

ii) Dia and paramagnetism. How does magnetic susceptibilities of these compounds vary with temperature?

5. a) Giving suitable examples explain the influence of steric and solvation effects on acid-base strength. **(5)**

b) Illustrate the applications of acid-base tetrimetry in non a queens medium **(5)**

i) Carboxylic acids

ii) Phenole

c) Explain with examples the types of reactions in liquid SO_2 and ammonia. **(6)**

OR

Write a note on :

i) Role of solvenk in acid-base litration.

ii) Irving WilliamSeries.

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PGIS-N-1011 B-17

M.Sc. I Semester Degree Examination

CHEMISTRY / ORGANIC CHEMISTRY

(Organic Chemistry - I)

Paper : HCT - 1.2

(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

i) All questions are compulsory.

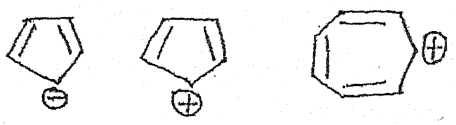
ii) All questions carry equal marks.

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

a) What is hydrogen bonding? Give examples.

b) Define the term hyper conjugation with suitable example.

c) State whether the following compounds are aromatic or non-aromatic?



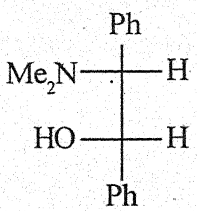
d) Define the terms order and molecularity of a reaction.

e) What is SN^i reaction? Write its mechanism.

f) Formulate a reaction involving enamine intermediate.

g) Define the terms diastereomers and enantiomers with suitable examples.

h) Convert the following Fisher projection formula into a stable Sawhorse and Newman projection formulae.



i) What is Neber rearrangement? Formulate its mechanism.

j) Sketch the mechanism of Baker-Venkataraman reaction.

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PGIS-N-1011 B-17

M.Sc. I Semester Degree Examination

CHEMISTRY / ORGANIC CHEMISTRY

(Organic Chemistry - I)

Paper : HCT - 1.2

(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

i) All questions are compulsory.

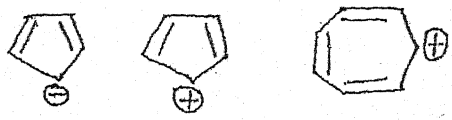
ii) All questions carry equal marks.

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

a) What is hydrogen bonding? Give examples.

b) Define the term hyper conjugation with suitable example.

c) State whether the following compounds are aromatic or non-aromatic?



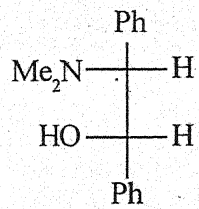
d) Define the terms order and molecularity of a reaction.

e) What is SN^i reaction? Write its mechanism.

f) Formulate a reaction involving enamine intermediate.

g) Define the terms diastereomers and enantiomers with suitable examples.

h) Convert the following Fisher projection formula into a stable Sawhorse and Newman projection formulae.



i) What is Neber rearrangement? Formulate its mechanism.

j) Sketch the mechanism of Baker-Venkataraman reaction.

2. a) Discuss the aromaticity of benzenoid and non-benzenoid compounds

b) Write the account of delocalized chemical bonding and tautomerism.

c) Explain any two physical methods for determining aromaticity of compounds.

OR

Write notes on :

i) Bonding in fullerenes.

ii) Alternant and non-alternant hydrocarbons.

(5+5+6=16)

3. a) Discuss the stereochemistry of SN^1 and SN^2 reactions by taking suitable examples.

b) Give any two methods for the generation of carbanions. Discuss its geometry, stability and reactions.

c) Explain with appropriate examples how the cross-over experiments and study of intermediates is useful in determining the mechanism of a reaction?

OR

Write notes on :

i) Generation, stability and reactions of non-classical carbocations.

ii) Generation and reactions of nitrenes.

(5+5+6=16)

4. a) Discuss the sequence rules and Chirality rule for the nomenclature of compounds containing one chiral carbon.

b) Explain one chemical and one physical method for determining the configuration of geometrical isomers.

c) Discuss the conformational analysis of cyclohexane with energy profile diagram.

OR

Write notes on :

i) Curtin-Hammett principle and its applications.

ii) E-Z nomenclature.

(5+5+6=16)

5. a) What is Wagner-Meerwien rearrangement? Write its mechanism and mentions its applications in organic synthesis.

b) Explain the mechanism of Witting rearrangement. Discuss its applications in synthetic organic chemistry.

c) Write notes on :

i) Benzil-benzilic acid rearrangement

ii) Shapiro reaction

OR

Write notes on :

i) Dakin's Reaction

ii) Hoffmann rearrangement

(5+5+6=16)

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PGIS-O-1012 B-17

M.Sc. Ist Semester (CBCS) Degree Examination

CHEMISTRY / ORGANIC CHEMISTRY

(Organic Chemistry - I)

Paper : HCT 1.2

(Old Syllabus 2011-12)

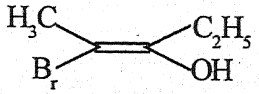
Time : 3 Hours Maximum Marks : 80

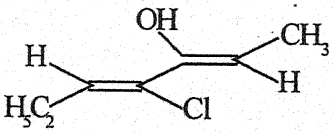
Instructions to Candidates :

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

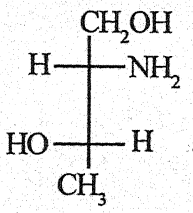
1. Answer any **Eight** of the following. **(8×2=16)**

a) What is hyper conjugation? Give an example.
b) Why C–C bond length in CH_3–CN is shorter than 1.5 A°?
c) Give any two methods for the generation of carbenes.
d) Define the terms order and molecularity of a reaction.
e) Define the term epimers with suitable example.
f) Give the E/Z nomenclature for the followings:

i) 

ii) 

g) What is Favorskii rearrangement? Give an example.
h) Write the mechanism of Fries rearrangement with suitable example.
i) Write the most stable Newman and Sawhorse formulae for the following compound.



j) Define the term hybridization index with appropriate example.

2. a) Write an account on alternant and non-alternant hydrocarbons.

b) Discuss with suitable examples non-aromatic, anti-aromatic and homo-aromatic systems.

c) Explain with suitable examples delocalised chemical bonding and cross conjugation.

OR

c) Discuss the aromaticity of 3 to 8 membered charged rings.

(5+5+6=16)

3. a) Write an account of the generation, stability and reactions of carbanions..

b) Explain with suitable examples how the study of intermediates and kinetic isotope effect is useful in determining the mechanism of a reaction?

c) Discuss the stereochemistry of SN1 and SN2 reactions.

OR

c) Write notes on :

i) Non-classical carbocations and their reactions.

ii) Generation and reactions of ylides and enamines.

(5+5+6=16)

4. a) Write an account of R/S nomenclature of compounds containing one and more than one chiral carbons.

b) Explain one chemical and one physical method for determining the configuration of geometrical isomers.

c) Write note on :

i) Pseudo-asymmetric compounds.

ii) Curtin-hammett principle.

OR

c) Discuss the relationship between the elements of symmetry and chirality.

(5+5+6=16)

5. a) What is Dienone-phenol rearrangement? Write the reaction and discuss its mechanism by taking suitable example.

b) Discuss the mechanism of Beckmann rearrangement. Give its synthetic applications.

c) Explain the mechanism and synthetic applications of the following:

i) Fritzch-Butenburg-Wiechell rearrangement.

ii) Curtius rearrangement.

OR

c) i) Shapiro reactions.

ii) Baeyer-Villiger rearrangement.

(5+5+6=16)

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