VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Core Subject : First Semester : Paper – I

ORGANIC CHEMISTRY - I

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 2 = 20)**

1. Carbon-nitrogen bond length in methylamine is 0.147 nm whereas this bond length in urea is only 0.137 nm. Explain.
2. How the p value can give useful information about the reaction mechanism?
3. Explain why triplet methylene is more stable than singlet.
4. How is primary deuterium isotope effect useful in determining reaction mechanism?
5. Give one reaction for enantioselectivity.
6. Differentiate between enantiomers and diastereomers.
7. Explain why trans -1, 3-di-t-butylcyclohexane prefers a boat conformation.
8. State Curtin – Hammett principle.
9. Sucrose is non-reducing sugar. Explain.
10. Formulate the following reactions.

    a) Zingiberene $\xrightarrow{O_3}$

    b) x-Santonine $\xrightarrow[\Delta]{Ba(OH)_2}$

SECTION – B

Answer ALL Questions : **(5 × 5 = 25)**

11. a) Discuss the Taft's work on ortho-effects.

    (OR)

    b) Write short notes on hyperconjugation.
12. a) Give brief account on alternant and non-alternant hydrocarbons.

    (OR)

    b) Explain aromaticity on the basis of perturbation molecular orbital theory.
13. a) With suitable examples, explain the terms enantiotopic and diastereotopic groups and faces. **(OR)**

    b) What is asymmetric synthesis? Describe with example.
14. a) Discuss conformations of cis and trans decalins.

    (OR)

    b) Write an account on the conformational effect in the reduction reactions of cyclohexanones.
15. a) Discuss the nature and linkages in starch and cellulose.

    (OR)

    b) Write a brief note on the aminosugars and their significances.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. a) What are crown ethers? Give any three applications of crown ethers. **(6)**

    b) What is the need for proposing σ^+ and σ^- constants? **(4)**
17. a) Discuss aromaticity of non-benzenoid aromatic compounds. **(5)**

    b) Give a brief account on kinetic and thermodynamic control of chemical reactions. **(5)**
18. a) Write a brief note on spectroscopic methods of determining configuration of geometrical isomers. **(5)**

    b) Discuss optical activity of allenes. **(5)**
19. a) What is conformational free energy difference? Explain how it is calculated by kinetic method? **(5)**

    b) Dehydrochlorination of menthyl chloride takes place slowly and gives only one product, whereas the dehydrochlorination of neomenthyl chloride is much faster and yields two products. Explain. **(5)**
20. Elucidate the structure of quinine.

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M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Core Subject : First Semester : Paper – II

INORGANIC CHEMISTRY – I

Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 2 = 20)**

1. What is electronegativity?
   How it helps to identify the nature of the bonding in compounds?
2. Define the lattice energy and give example.
3. Write the Pearson's principle of HSAB theory.
4. What is Usanovich concept?
5. Find the structure of the following boranes using Wad's rule.
   i) B_8H_{12} ii) B_6H_{12}
6. Write the classification of silicates with molecular formula.
7. Write the name of the following coordination compounds.
   i) $[CoSO_4(NH_3)_4]NO_3$ ii) $[CuCl_2(CH_3NH_2)_2]$
8. Write the Kurnakov's reaction and its uses.
9. What is spectrochemical series?
10. Define the trans-effect with example.

SECTION – B

Answer ALL Questions: **(5 × 5 = 25)**

11. a) Draw MO energy level diagram for O^{2-} and CO. Find out the bond order of these molecules.

(OR)

b) Explain the term "lattice energy" as applied to an ionic solid.

Calculate the lattice energy of caesium chloride using the following data:

$Cs_{(s)} \rightarrow Cs_{(g)}$ $\Delta H = +79.9\ kJmol^{-1}$

$Cs_{(g)} \rightarrow Cs^{+}_{(g)}$ $\Delta H = +374.05\ kJmol^{-1}$

$Cl_{2(g)} \rightarrow 2Cl_{(g)}$ $\Delta H = +241.84\ kJmol^{-1}$

$Cl_{(g)} + e \rightarrow Cl^{-}_{(g)}$ $\Delta H = -397.90\ kJmol^{-1}$

$Cs_{(s)} + 1/2Cl_2 \rightarrow CsCl_{(s)}$ $\Delta H = -623.00\ kJmol^{-1}$

12. a) Explain the details about the chemical consequences of hardness and softness.

(OR)

b) Discuss the characteristic properties and applications of HF and acetic acid as solvents.

13. a) Write the synthesis, properties and structure of the borazine.

(OR)

b) Enumerate the synthesis of various types of silicones and their applications.

14. a) Discuss the optical isomerism of the complexes with coordination number 4. Give suitable examples.

(OR)

b) Explain optical activity of square planar and tetrahedral structure of (meso stilbenediamine)(isobutylenediamine)Pt(II) and Pd(II) complexes.

15. a) Explain the following terms with examples.

i) Chelate effect ii) Template effect

(OR)

b) Define the Jahn-Teller effect. Describe the Jahn-Teller effect in octahedral complexes of Cu^{2+}.

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Explain the VSPER theory and its postulates. Draw the structure of the following compounds

i) SF_4 ii) TeF_5^- iii) $XeOF_4$

17. How to correlate the electronegativity with hardness and softness of acid-base? Explain.

18. a) What are carbides? How are they classified? Explain their properties.

b) Write the preparation and properties of phosphazenes. **(5 + 5)**

19. What are the general principles involved in optical rotatory dispersion and circular dichroism? Discuss briefly on ORD and CD curves of octahedral complexes.

20. Explain the determination of the stability constants and composition of a complex by Job's continuous variation method.

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M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Core Subject : First Semester : Paper – III

PHYSICAL CHEMISTRY - I

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 2 = 20)**

1. What is meant by mean free path?
2. Give the definition of heat capacity.
3. What are non-equilibrium thermodynamics?
4. Define: Chemical potential.
5. What are Hermition operators?
6. State the Compton effect.
7. What is meant by angular momentum?
8. Define: Spin momentum.
9. Write the theory of Hinshelwood.
10. What is kinetic isotope effect?

SECTION – B

Answer ALL Questions : **(5 × 5 = 25)**

11. a) Explain the experimental verification of Maxwell distribution law

(OR)

b)Discuss the structure of liquid crystals by X- ray method.

12. a) Derive the Gibbs – Duhem equation. **(OR)**

b) How are activity and activity coefficients determined?

13. a) Write note on the Heisenberg's uncertainty principle. **(OR)**

b) Explain the de-Broglie's wave particle dualism.

14. a) Derive the particle in a ring by using SWE. **(OR)**

b) Discuss the simple harmonic oscillator.

15. a) Write note on the Slater treatments. **(OR)**

b) What are the factors influencing reaction rate in solution?

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Define liquid crystals. Discuss the theory and applications of liquid crystals.
17. Give the fugacity concept. Discuss the determination of fugacity of real gases.
18. List out the postulates of quantum mechanics.
19. Derive the rigid rotator of energy of the molecule by SWE.
20. Compare the absolute reaction rate theory and collision theory.

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M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Core Subject : Third Semester : Paper – I

ORGANIC CHEMISTRY - III

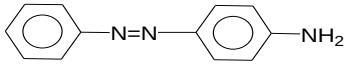
Under CBCS – Credit 4

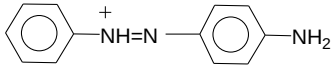
Time: **3** Hours Max. Marks: **75**

SECTION – A

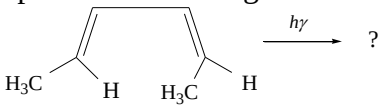
Answer ALL Questions: **(10 × 2 = 20)**

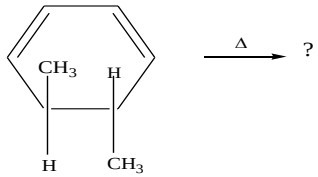
1. Which of the following has a higher UV absorption maximum (λ max) and why?

   a) 

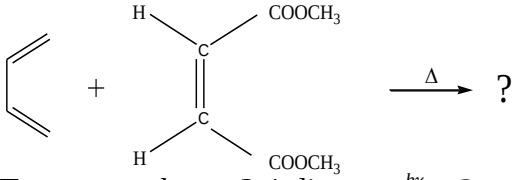
   b) 

2. The O-H stretching value does not change with dilution in the case of 1,2-ethanediol in carbon tetrachloride but that increases in the case of ethanol on dilution. Explain.
3. What do you understand by the term γ -gauche effect?
4. What are chemically equivalent but magnetically non-equivalent protons?
5. Name on blocking group for alcohol and show a method to remove it.
6. What are the requirements of an ideal synthesis?
7. Complete the following reactions.

   a) 

   b) 

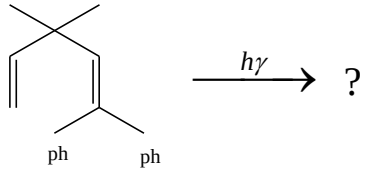
8. Predict the products in the following reactions.

a) 

b) Trans, trans-hexa- 2,4-diene $\xrightarrow{h\gamma}$?

9. What is Barton reaction? Explain with an example.

10. Predict the product and name of the following reaction.



SECTION – B

Answer ALL Questions: **(5 × 5 = 25)**

11. a) i) The band due to $n \rightarrow \pi^*$ transition in amine disappears in acid solution. Explain why? **(2.5)**

ii) Explain why 1,3-butadiene exhibits a higher value of λmax for $\pi \rightarrow \pi^*$ transition than that of ethylene. **(2.5)**

(OR)

b) Discuss the various vibrational modes in a molecule.

12. a) Write a brief note on NOE.

(OR)

b) Write briefly on the principles of ^{13}C NMR spectroscopy.

13. a) Write short notes on retro-synthetic analysis.

(OR)

b) Narrate the linear approach to total synthesis.

14. a) Discuss the stereochemistry of sigmatropic reactions.

(OR)

b) Using FMO explain the conversion of cyclobutene $\rightleftharpoons$ butadiene

15. a) Discuss in detail the mechanism of Paterno - Buchi reaction.

(OR)

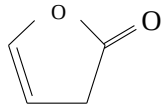
b) Describe in detail Norrish type II reactions.

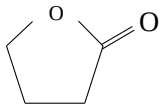
SECTION – C

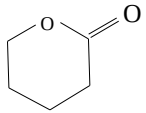
Answer any THREE Questions : **(3 × 10 = 30)**

16. a) The position of absorption of acetone in different solvents (279 nm in hexane, 272 nm in ethanol and 265 nm in water) is different. Explain why?

b) Giving suitable reason, arrange the following lactones in order of their decreasing $\gamma_c = 0$ frequency.

i) 

, ii) 

, iii) 

c) Ethylacetate shows $\gamma_c = 0$ absorption at 1735 cm^{-1}, whereas phenylacetate at 1770 cm^{-1}. Explain. **(5+3+2)**

17. a) Discuss chemical shift in NMR and factors affects chemical shift.

b) An organic compound with a molecular formula of C_9H_{12} Showed the following spectral features.

H NMR= δ values 1.15 (doublet, 6H); 2.75 (Septet,1H) and 7.15 (multiplet, 5H). Suggest a suitable structure for the original compound. **(6+4)**

18. Write short notes on:

a) Stereoselectivity,

b) Reaction involving functional group modifications. **(5+5)**

19. Discuss the cycloaddition reaction of 1,3 – butadiene and ethylene with correlation diagram.

20. Write short notes on:

a) Photochemical cis – trans isomerisation of olefins.

b) Photochemical oxidation reactions.

c) Photochemical reduction reactions. **(3+3.5+3.5)**

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M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Core Subject : Third Semester : Paper – II

INORGANIC CHEMISTRY - III

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 2 = 20)**

1. What are the essential and trace elements in biological system?
2. Write the biological role of Na^+ ions.
3. What is nitrogen fixation?
4. Define photosynthesis.
5. What do you understand by the term semiconductors?
6. Explain the following i) Space groups ii) Lattices
7. Define contact shifts.
8. What are quadrupole interactions in Mossbauer spectroscopy?
9. What is the consequence of lanthanide contraction on the basic strength of lanthanide hydroxides?
10. Actinides have a greater tendency to form complexes than lanthanides. Explain.

SECTION – B

Answer ALL Questions: **(5 × 5 = 25)**

11. a) Explain the cooperativity in haemoglobin. Suggest the mechanism for cooperativity. **(OR)**

    b) Describe the role of carbonic anhydrase in biological systems.

12. a) Discuss the iron-sulphur proteins and non –heme iron with suitable examples. **(OR)**

    b) Explain the structure and mechanism of photosystem II.

13. a) Derive Bragg's equation. **(OR)**

    b) Explain the band theory of solids.

14. a) Describe the NMR studies on exchange reactions between ligands and metal ions. **(OR)**

    b) Draw and explain the ESR spectrum of Mn (II) complexes.

15. a) Discuss the magnetic properties of actinides.

    (OR)

    b) Describe the use of lanthanide complexes as shift agents.

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Discuss the following with suitable examples i) Calcium biochemistry ii) Carboxypeptidases
17. i) Write short notes on Marcus theory.

    ii) Explain the chemistry of vitamin B_{12}
18. Explain the Schottky defect, Frenkel defect and three-dimensional dislocations.
19. Describe the applications of metal carbonyls and nitrosyls by using Mossbauer spectroscopy.
20. List out the comparative account of lanthanides and actinides.

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M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Core Subject : Third Semester : Paper – III

PHYSICAL CHEMISTRY - III

Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions : **(10 × 2 = 20)**

1. List the symmetry operation in water molecule.
2. Give the group multiplications table for ammonia molecule.
3. Define projection operator.
4. What is meant by normal mode analysis?
5. What is spin decoupling?
6. What are relaxation processes?
7. What is meant by zero field splitting?
8. Write any two applications of NQR spectroscopy.
9. Write the action of buffering of blood.
10. What is viscosity?

SECTION – B

Answer ALL Questions : **(5 × 5 = 25)**

11. a) State and explain the great orthogonality theorem.

(OR)

b) Write note on the symmetry operation.

12. a) Explain the symmetry selection rule for electronic transition for benzene molecule.

(OR)

b) Apply group theory to sp^2 hybridization molecule with example.

13. a) Outline the principle of ^{13}C NMR.

(OR)

b) Give the advantages of FT NMR spectroscopy.

14. a) What are factors affecting the g value?

(OR)

b) Explain the coupling constant and electric field gradient in NQR spectroscopy.

15. a) Explain the Danieli and Davson model.

(OR)

b) Write the clinical applications of isotopes in biology.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Write the character table for C_{2h} molecule and explain its construction.
17. Explain in detail the HMO's for ethylene molecule.
18. Define chemical shift. Write the measurements and factors influencing of chemical shift.
19. Discuss the principles and applications of ESR spectroscopy.
20. Discuss the general requirements, advantages and limitations of tracer technique.

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M.Sc. Chemistry Degree (Semester) Examinations, November 2017

Part – III : Elective Subject : First Semester : Paper – I

COMPUTER APPLICATIONS IN CHEMISTY

Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. What are constants?
2. What is computer?
3. Define the term "Array".
4. What is meant by function?
5. What do you know about satellites?
6. What is ISDN?
7. Write any two advanced concepts in MS word.
8. Write any two significances of chemdraw.
9. Write any two uses of internet to the people.
10. Define WWW.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) What is meant by character set? Write about variables and data types.

(OR)

b) Describe the formatted input and output in C.

12. a) Define the term function. Explain the various types of functions.

(OR)

b) Write a program to calculate the

i) rate constant of a first order reaction.

ii) Normality.

iii) P^H of a solution.

13. a) Briefly explain the basic concept of communication system.

(OR)

b) Explain about RADAR and MODEMS.

14. a) What are the salient features of windows?

(OR)

b) How will you draw chemical structures using chemdraw?

15. a) What is extranet? Explain the characteristics and uses of it.

(OR)

b) i) Explain the basic concept of internet. **(2)**

ii) Write a note on web page and search engine. **(3)**

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. What are the different types of operators?
17. a) What are pointers? Explain its function? **(4)**

    b) Write a C program to calculate cell parameters and concentration of Beer-Lambertz law. **(6)**
18. Describe the network architecture with neat sketch.
19. Explain the basic concept of creating and accessing data bases using MS access.
20. Describe the basic concept of internet and various applications of internet in chemistry.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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M.Sc./M.Com Degree (Semester) Examinations, November 2017

Part – IV : NME Subject : Third Semester : Paper – I

FORENSIC CHEMISTRY

Under CBCS – Credit 5

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 2 = 20)**

1. Define forensic department sector.
2. Define the term forensic chemistry.
3. What are corrosive poisons? Give an example.
4. Write the types of poison.
5. What do you mean by finger print?
6. What do you mean by ridges?
7. What is mean by Forensic Serology?
8. What is mean by blood "SPATTER"?
9. Which types of questions asked in polygraph test?
10. What is mean by blood transfer?

SECTION – B

Answer ALL Questions: **(5 × 5 = 25)**

11. a) Discuss about forensic physics department.

(OR)

b) Write short notes on various division of forensic lab?

12. a) Explain diagnosis of poisons in living system.

(OR)

b) Write note on Mercury poison.

13. a) Write a note on patent fingers prints.

(OR)

b) How will you detect the crime by using fingers prints on non-porous surface?

14. a) Write note on blood stain analysis and blood flight characteristics. **(OR)**

b) Discuss confirmatory tests for semen identification.

15. a) Discuss following terms (i) Polygraph (ii) Polygraph instrument setup. **(OR)**

b)Write note on DNA Fingerprint.

SECTION – C

Answer any THREE Questions: **(3×10 = 30)**

16. Explain the following. (i) Developing fingerprint with siver nitrates (ii) casts of scratcher on metal.
17. Discuss the symptoms and treatment of arsenic poison and how will you detect the arsenic poison?
18. Discuss the value of expert evidences.
19. Briefly explain questioning techniques of "lie detector".
20. Discuss following terms (i) Blood types (ii) paternity tests (iii) using blood type in determining paternity.