

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential) [Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, November 2015 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 :

 $(10 \times 2 = 20)$

1. The boiling point of ethanol is 78.5° C, compared to dimethylether

 -24.9° C. Account it.

- 2. Define cryptands and how it helps in organic reactions.
- 3. t-butyl cation is more stable than ethyl cation.Rationalize.
- 4. What is Hammond postulate?
- 5. Draw the least stable Newman and Sawhorse projection of 2-chloropentane (C₂-C₃ bond only). Note : non essential groups can be abbreviated as CH₃, CH₂ CH₃.
- 6. Define prochiral centre and give example of a molecule that possess prochiral centre.
- 7. Draw the anti and gauche conformation of n-propyl chloride. Which is stable.
- 8. What is meant by 1, 3 diaxial interaction?
- 9. What happens when zingiberene is ozonolysied.
- 10. Write down the structure of maltose indicating the reducing and non reducing part.

SECTION – B

 $(5 \times 5 = 25)$

 (\mathbf{OR})

11.a) Write a note on hyperconjugation.

b) Discuss crown ethers.

Answer ALL Questions :

12. a) Discuss alternant and non-alternant hydrocarbons.

(OR)

- b) Explain the application of primary isotopic effect in elucidation of reaction mechanism.
- 13.a) Discuss the stereochemistry of truxillic acid and truxinic acid. (**OR**)
 - b) Write a brief notes on heterotopic ligands and faces.
- 14.a) Account on Eliel Ro equation.

(**OR**)

- b) Draw and explain the various conformations of acyclic n-butane system.
- 15.a) Write notes on starch.

(\mathbf{OR})

b) Establish the constitution of quinine.

SECTION – C

Answer any THREE Questions :

 $(3 \times 10 = 30)$

- 16. Give the significance of σ and ρ in Hammett equation.
- 17. a) Using energy profile diagram explain the term "Kinetically controlled" and "thermodynamically controlled" products with example.
 - b) Cyclopentadiene is one of the most acidic hydrocarbons known. Why?
- 18. Discuss
 - a) stereospecific reaction with respect to addition of Br₂ to cis and trans-2-butene.
 - b) stereoselective reaction with respect to addition of CH₃MgI to 2-phenyl proponal.
- 19. Explain conformational features of disubstituted cyclohexanes.
- 20. Elucidate the structure of α santonine.

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(Autonomous & Residential) [Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, November 2015 Part - III : Core Subject : First Semester : Paper - II

INORGANIC CHEMISTRY – I

Under CBCS - Credit 4

Max. Marks: 75

SECTION – A

Answer ALL Questions :

Time: 3 Hours

 $(10 \times 2 = 20)$

- 1. What is meant by hydrogen bonding? How is it classified?
- 2. Write the Radius ratio rules.
- 3. What are solvents? How are they classified? Give examples for each type.
- 4. What are hard acids? Give examples.
- 5. Mention the uses of ultramarine blue and zeolites.
- 6. What are carboranes? Give example?
- 7. What are Co-ordination compounds? Give examples.
- 8. Write the IUPAC name of the following complexes. i) [Co (NH₃)₆]Br₃ ii) [Pt (NH₃)₄ (NO₂)Cl]So₄
- 9. What is Template effect?
- 10. What is meant by CFSE?

SECTION – B

Answer ALL Questions :

 $(5 \times 5 = 25)$

- 11.a) Give an account of Born-Haber cycle with a suitable example. (\mathbf{OR})
 - b) What are the postulates of VSEPR theory?
- 12. a) Explain the Usanovich concept of acids and bases.

(\mathbf{OR})

b) Liquid ammonia behaves as a non-aqueous solvent. Explain briefly.

- 13.a) Discuss about synthesis, properties and structure of boranes. (**OR**)
 - b) i) What are carbides? How are they classified? Give an example for each type.
 - ii) What are isopoly and heteropoly acids?
- 14. a) What is meant by ORD and CD?

Answer any THREE Ouestions :

(\mathbf{OR})

- b) What is meant by stereoisomerism? Explain ligand, hydrate and ionization isomerism with suitable examples.
- 15.a) What is meant by stability constants of complexes? How it is determined by Job's continuous variation method?

(\mathbf{OR})

b) i) Explain MOT ii) What is mean by Trans effect? (3+2)

SECTION – C

$(3 \times 10 = 30)$

(3+2)

- 16. a) Draw and explain the MO diagram of NO molecules. (4+2+4)b) Define lattice energy.
 - c) Discuss about Born-Lande equation and Kapustinkii equation.
- 17. a) Explain the HSAB principle and its applications. (6 + 4)b) Liquid SO₂ and acetic acid behaves as a non-aqueous solvent. Explain.
- 18. a) What are silicates? How are they classified? Explain briefly. b) Explain the preparation, properties and structure of S_4N_4 and S_2N_2 . c) State Wade's rule. (5+3+2)
- 19. a) Discuss the geometrical isomerism in 4-co-ordinate complexes with suitable examples. (4+6)
 - b) Discuss optical isomerism in 4 and 6 co-ordinate complexes with suitable examples.
- 20. a) Explain the salient features of CFT. (4+2+4)
 - b) What is Jahn-Teller effect?
 - c) Compare VBT and CFT.



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(Autonomous & Residential) [Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, November 2015 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 :

 $(10 \times 2 = 20)$

- 1. Calculate the root mean square velocity of CO_2 molecule at 1000°C.
- 2. Define Mean free path.
- 3. What are partial molar quantities?
- 4. Define non-equilibrium thermodynamics.
- 5. What are Hermitian operators? Give an example.
- 6. Explain the following terms i) Eigen function ii) Eigen value
- 7. What is transmission coefficient?
- 8. What are angular momentum and spin momentum?
- 9. What is steady state approximation? What is its use?
- 10. Define kinetic isotope effect.

SECTION – B

Answer ALL Questions :

 $(5 \times 5 = 25)$

- 11.a) Derive an expression for Maxwell distribution of molecular (\mathbf{OR}) velocities.
 - b) Describe the theory and applications of liquid crystals.
- 12.a) How will you determine the fugacity of real gases?

(\mathbf{OR})

- b) Write short notes on
- i) Onsager reciprocal relationships ii) Microscopic reversibility

13.a) Explain the following i) Compton effect

ii) Heisenberg's uncertainty principle

(\mathbf{OR})

- b) What is an operator? Explain the with suitable example of linear and non-linear operators.
- 14.a) Apply the Schrödinger equation to a particle in a one dimensional box in which the potential is zero when 0 < x < a. Obtain the expression for energy of the particle.

(OR)

- b) Derive an expression for simple harmonic oscillator.
- 15.a) Discuss the absolute reaction rate theory.

(OR)

b) Write a note on RRKM and Slater treatments.

SECTION – C

Answer any THREE Questions :

 $(3 \times 10 = 30)$

- 16. a) Derive Maxwell-Boltzmann distribution law. b) Explain any two transport properties.
- 17. a) Derive Gibbs- Duhem equation.

b) How can you determine experimentally the activity and activity coefficients?

- 18. a) Write the postulates of quantum mechanics. b) Write a note on Expansion theorem.
- 19. Derive an expression for the energy of a rigid rotor using the Schrödinger wave equation.
- 20. a) Discuss the Lindeman theory of unimolecular reactions b) Write a note on Salt effect.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

 (Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]
M.Sc. Chemistry Degree (Semester) Examinations, November 2015 Part – III : Core Subject : Third Semester : Paper – I

ORGANIC CHEMISTRY – III Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

$\underline{SECTION-A}$

Answer ALL Questions :

 $(10 \times 2 = 20)$

1. Using Woodward – Fieser rules calculate the λ_{max} value for the following compounds. (1 + 1)



- 2. How will you distinguish o nitrophenol from p nitrophenol by infra red studies?
- 3. What do you understand by term coupling constant?
- 4. What is $\mathbf{\overline{\gamma}}$ gauche effect?
- 5. What is meant by convergent synthesis?
- 6. What are the requirements of an ideal synthesis?
- 7. Complete the following reactions.

(1+1)



8. Illustrate di – pi methane rearrangement with an example.

- 9. Explain the phenomenon of circular dichroism.
- 10. Explain Cottton effect.

SECTION – B

Answer ALL Questions :

 $(5 \times 5 = 25)$

- 11.a) Account for the following observations.
 - i) cis-stiblene has λ_{max} 278 nm (ϵ 9350) while its trans isomer has λ_{max} 294 nm.
 - ii) o Hydroxy acetophenone has lower carbonyl stretching frequency than acetophenone. $(2^{1/2} + 2^{1/2})$ (\mathbf{OR})
 - b) i) Aniline absorbs at 230 nm (£ 8600). However in acid solution the main absorption band is seen at 203 nm (ϵ 7500). Account.
 - ii) Which of the compounds (I or II) is expected to show lower stretching frequency. Give reason for your answer.



- 12. a) i) Three isomeric dimethyl cyclopropanes giving respectively two, three and four ¹H NMR signals. Draw a stereoisomeric formula for the isomer giving rise to each number of signal.
 - ii) Give a structure consistent with the following CMR data. Molecular formula : C₉H₁₂ (3+2)(II) 127.1 (d) and (I) 21.2 (q) (III) 137.6 (s) (\mathbf{OR})
 - b) Predict the position, number and nature of PMR absorptions for the following $(2^{1/2} + 2^{1/2})$
- (i) Acetophenone (ii) p – methoxytoluene 13.a) Analyse the synthetic plan for preparing
 - 2, 3 dimethyl 2 hydroxypentanoic acid.

(\mathbf{OR})

b) Applying retro synthetic analysis, suggest a method of synthesizing the following compounds. $(2^{1/2} + 2^{1/2})$



14.a) Using correlation diagram approach show that dimerisation of ethylene is a photochemically allowed process.

(OR)

- b) Using orbital correlation diagram show that for the photochemical ring closure of 1, 3 – butadiene disrotation is required.
- 15.a) An organic compound with molecular formula C₈H₈O gave ions of m/e: 120, 105, 77 and 51. Discuss the mode of fragmentation.

(**OR**)

b) Write a note on Mc Lafferty rearrangement.

SECTION – C

Answer any THREE Questions :

 $(3 \times 10 = 30)$

16. Discuss in detail : (6 + 4)a) Effect of reaction medium and pH on the absorption maxima of molecules. b) Finger print region.

- 17. a) Write notes on i) Broad band decoupling (3+3)ii) Off resonance decoupling
 - b) An organic compound of molecular formula $C_9H_{10}O_2$ shows the following sharp unsplit ¹H NMR signals. δ 7.22 (5H), δ 5.00 (2H) and δ 1.96 (3H). Identify the compound. (4)
- 18. a) Discuss in detail the role and applications of blocking and deblocking agents for functional groups in organic synthesis. b) Explain stereoselectivity with an example. (7 + 3)
- 19. Write briefly on : a) Paterno – Buchi reaction (3+4+3)
 - b) Norrish type I and type II reaction c) Photoreduction of carbonyl compounds.
- 20. a) Anisole shows the following peaks in its mass spectrum m/e : 108, 93, 78, 77 and 65. Explain the above fragmentation pattern with the help of the structures. (5+5)
 - b) State and illustrate the use of axial α haloketone rule.

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(Autonomous & Residential) [Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, November 2015 Part - III : Core Subject : Third Semester : Paper - II

INORGANIC CHEMISTRY – III

Under CBCS - Credit 4

Max. Marks: 75

SECTION – A

Answer ALL Questions :

Time: 3 Hours

 $(10 \times 2 = 20)$

- 1. Name four transition and two non transition metal that play important roles in biological process.
- 2. What is the role of calcium in biological system?
- 3. List the important metals used in medicine.
- 4. What is cytochrome P 450 enzyme?
- 5. What is meant by point groups?
- 6. What is space lattice?
- 7. What do you know about contact shift?
- 8. Write Mossbauer active nuclides.
- 9. The electronic configuration and position of most of the actinide element are controversial. Comment.
- 10. Discuss spectral properties of lanthanides.

SECTION – B

Answer ALL Questions :

 $(5 \times 5 = 25)$

- 11.a) Compare the functions and structures of haemoglobin and myoglobin. (OR)
 - b) Name two zinc metalloenzymes and explain each.
- 12. a) Draw and explain the structure of chlorophy II.

(**OR**)

b) Write a note on nitrogen fixation.

13.a) What are semiconductors?

Explain what is meant by n-type and p-type semiconduction. (\mathbf{OR})

- b) Briefly explain how X-ray studies are helpful in determining the structure of a crystal?
- 14.a) Explain the following i) Nuclear electric quadrupole splitting ii) Nuclear Zeeman Spilliting

(\mathbf{OR})

b) How NMR is useful for structural determination?

15.a) Actinides have a greater tendency to form complexes than lanthanides. Explain.

(\mathbf{OR})

b) Chemistry of all lanthanides is so identical. Explain.

SECTION – C

Answer any THREE Questions :

 $(3 \times 10 = 30)$

16. Explain the terms :

ii) Bohr effect iii) co-operative effect i) Hills constant

- 17. a) What are iron sulphur proteins? Explain the structure of rubredoxins. b) Draw the structure of cyanocobalamin. Explain its function.
- 18. Discuss in detail the following types of defects in crystals : i) Schottky defect ii) Frenkal defect iii) metal deficiency defect iv) metal excess defect
- 19. What is hyperfine splitting? Explain the hyperfine splitting involved i) bis – (salicylaldiminiecopper(II)) complex in the following : ii) Mn(II) complex
- 20. i) What are lanthanide contraction? Actinide contraction is similar to that of lanthanide contraction. Explain. ii) Why do actinides show higher oxidation states than lanthanides?

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST (Autonomous & Residential)

[Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, November 2015 Part – III : Core Subject : Third Semester : Paper – III

PHYSICAL CHEMISTRY – III

Under CBCS – Credit 4 Time: **3** Hours

Max. Marks: **75**

$\underline{SECTION-A}$

Answer ALL Questions :

 $(10 \times 2 = 20)$

- 1. List the symmetry operation in water molecule.
- 2. Give the group multiplications table for ammonia molecule.
- 3. What is projection operator?
- 4. Write the symmetry selection rules for electronic transition.
- 5. What is meant by spintickling?
- 6. What are spin-spin interactions?
- 7. What is meant by Kramer's degeneracy?
- 8. Explain in briefly anisotropy in g value.
- 9. Write any two significance of viscosity in biological systems.
- 10. What is buffering of blood?

<u>SECTION – B</u>

Answer ALL Questions :

 $(5 \times 5 = 25)$

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

(OR)

b) Write note on the point groups.

12. a) State and explain the symmetry selection rule for IR and Raman spectra.

(OR)

- b) Apply group theory on the electronic spectra of formaldehyde molecule.
- 13.a) Outline the principle of chemical shift.

(OR)

b) Write the advantages of FT NMR spectroscopy.

14. a) Explain the coupling constant in NQR spectroscopy.

(**OR**)

- b) Define and explain zero field splitting.
- 15.a) Write the role of pulmonary surfactant.

(OR)

b) Derive Henderson – Hasselbach equation.

<u>SECTION – C</u>

Answer any THREE Questions :

 $(3 \times 10 = 30)$

- 16. Discuss the symmetry elements and symmetry operation with matrix representation.
- 17. Discuss in detail the delocalisation for butadiene molecule.
- 18. Write note on i) NOE ii) Relaxation processes in NMR
- 19. Discuss the principle and applications of ESR spectroscopy.
- 20. Discuss in detailed the requirements, advantages and limitations of tracer technique.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST (Autonomous & Residential)

[Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, November 2015 Part – III : Elective Subject : First Semester : Paper – I

COMPUTER APPLICATIONS IN CHEMISTRY

Time: 3 Hours

Under CBCS – Credit 5

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL Questions :

 $(10 \times 2 = 20)$

- 1. What is meant by data type?
- 2. What are variables?
- 3. What is meant by array?
- 4. What do you understand by pointers?
- 5. Write short note on Modems.
- 6. Give the definition of satellites.
- 7. Write the significance of chemdraw.
- 8. Write the any two salient features of windows.
- 9. What are internet protocols?
- 10. Write a brief note on web page.

<u>SECTION – B</u>

Answer ALL Questions :

 $(5 \times 5 = 25)$

11.a) Write a short note on, keywords and identifiers in 'C' programming.

(**OR**)

b) Explain in briefly arithmetic expression and evaluation of expression.

- 12.a) i) Distinguish between the one-dimensional and two-dimensional array.
 - ii) What are the type's functions?

(**OR**)

- b) Write the role of library function.
- 13. a) List out the advantage and disadvantages of communication system.

(OR)

- b) Explain about the computer networks an overview.
- 14.a) Discuss Ms-Word for typing texts and equation in chemistry. (OR)
 - b) Describe the basic concept of creating and accessing databases using Ms Access.
- 15.a) Write a brief account of email.

(**OR**)

b) List out the website in literature survey in chemistry.

SECTION – C

Answer any THREE Questions :

 $(3 \times 10 = 30)$

- 16. Describe in detail the operators.
- 17. Obtain a 'C' program to compute rate constants in kinetics and pH.
- 18. Discuss detailed about the telecommunications system.
- 19. a) Write the advanced concepts in Ms Word.
 - b) How will you draw chemical structure using Chemdraw?
- 20. Discuss the applications of internet in chemistry.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST (Autonomous & Residential)

[Affiliated to Madurai Kamaraj University] M.A. / M.Sc. / M.Com. Degree (Semester) Examinations, November 2015 Part – III : NME Subject : Third Semester : Paper – I

FORENSIC CHEMISTRY

Time: 3 Hours

Under CBCS - Credit 5

Max. Marks: 75

SECTION – A

Answer ALL Questions :

 $(10 \times 2 = 20)$

- 1. Define the term Forensic Chemistry?
- 2. List out the various division of Forensic Laboratory?
- 3. What are corrosive poisons? Give an example.
- 4. What are requirements for a good Antidote?
- 5. What do you mean by Finger Print?
- 6. What are causes of fingerprint?
- 7. What is blood?
- 8. What is role of Hemoglobin in blood?
- 9. What is polygraph technique?

Answer ALL Questions :

10. Write a note an analysis of polygraph chart?

SECTION – B

11.a) Write short note on various divisions of forensic laboratory?

 (\mathbf{OR})

b) Write a note on forensic science?

12. a) Discuss the various types of poisons?

(\mathbf{OR})

b) Explain diagnosis of poisons in living system?

13.a) Write a note Fingerprint on absorbent surface?

(**OR**)

b) What kind of results can expect from finger print analysis?

14.a) Write a note on WBC and RBC.

(\mathbf{OR})

b) Discuss the collection and examination of blood stains.

15.a) Explain the polygraph – principle, the instrument and environmental condition?

(**OR**)

b) Explain the vice identification spectrograph – principle and technique.

SECTION – C

Answer any THREE Questions :

 $(3 \times 10 = 30)$

- 16. Write a note on a) Forensic science expert b) relevancy of expert opinion
- 17. Define Poison. Explain the symptoms and treatment of mercury and Lead poisons?
- 18. Discuss in detail about the Finger Print in blood?
- 19. Write a note on Semen stains and examination.
- 20. Define DNA Finger Printing. Sources of DNA, technique, Forensic applications of DNA test.

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