

# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry PART-I, PAPER-I (Physical Chemistry) Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Explain the term entropy. Give the physical significance of entropy.
2. What are partial molar properties ? Describe Gibb's Duhem equation thermodynamically. Show how this equation is useful.
3. Define the term adsorption and absorption. Give B.E.T. theory of adsorption and what are its limitations.
4. Describe an expression for activated complex theory and compare with (a) Collision theory and (b) Arrhenius theory.
5. What are the assumption of Debye-Huckel treatment of strong electrolyte theory ? Give Debye-Huckel limiting law and give the interpretation of the law.
6. What does you mean by the term polarography ? What is Iskovie equation. Derive it giving the meaning of the terms.
7. What are macromolecules ? What are methods employed for the determination of the molecular weights of Polymer ? Describe Scattering method of defoit.
8. Write notes on any **Two** of following with suitable examples :—
  - (a) Rotational partition function and vibrational partition function of diatomic molecule.
  - (b) Number Average Molecular Mass ( $\bar{M}_n$ ) and Mass (or weight) Average Molecular Mass ( $\bar{M}_m$ ).
  - (c) Therenoo dynamic Probability.
9. What is Corrosion ? Give the mechanism of process of the Corrosion. How Corrosion is prevented ?
10. What do you mean by Gibb's function of Gibb's free energy ? How Gibb's free energy vary with pressure and temperature.

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### Examination Programme, 2014

#### M.Sc. Chemistry, Part-I

Date	Paper	Time	Examination Centre
05.07.2014	Paper-I	3.30 PM to 6.30 PM	Nalanda Open University, Patna
07.07.2014	Paper-II	3.30 PM to 6.30 PM	Nalanda Open University, Patna
09.07.2014	Paper-III	3.30 PM to 6.30 PM	Nalanda Open University, Patna
11.07.2014	Paper-IV	3.30 PM to 6.30 PM	Nalanda Open University, Patna
15.07.2014	Paper-V	3.30 PM to 6.30 PM	Nalanda Open University, Patna
17.07.2014	Paper-VI	3.30 PM to 6.30 PM	Nalanda Open University, Patna
19.07.2014	Paper-VII	3.30 PM to 6.30 PM	Nalanda Open University, Patna
21.07.2014	Paper-VIII	3.30 PM to 6.30 PM	Nalanda Open University, Patna

# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry PART-I, PAPER-II (Inorganic Chemistry) Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

- (a) Describe the shell-model and liquid-drop model of a nucleus.  
(b) Write a note on Geiger-Muller counter.
- Draw the molecular orbital diagrams of  $NO_2^-$  ion and  $CO_2$ . Discuss the bond order and magnetic property on the basis of M.O. diagram.
- Describe Wade's Rule in short and use this rule to establish the structure of  $[B_6H_6]^{2-}$  from its formula and from its electron count.
- How are the lanthanide separated by Solvent Extraction method ? Discuss spectral properties of lanthanides and actinides.
- Construct the character table for the point group  $C_{2v}$  and  $C_{3v}$ .
- Describe the ways in which the actinides resemble their counterpart in lanthanides ? Give an account of the chemistry of Neptunium and Plutonium ? How are Neptunium and Plutonium Synthesized.
- Explain the terms Moderator and Reflector, Reactor Coolant and control Materials with examples.
- Write notes on the following :—
  - Carboranes
  - Uses of some radioisotopes in medical science.
- Write symmetry operations in the following molecules :—  
 $H_2O$ ,  $BF_3$ ,  $H_2$ ,  $CH_3Cl$ ,  $HCl$ ,  $CH_4$ ,  $NH_3$
- Explain  $d\pi - P\pi$  bonding by giving suitable examples and write short notes on Bent Rule.

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**NALANDA OPEN UNIVERSITY**

**M.Sc. Chemistry**  
**PART-I, PAPER-III**  
**(Organic Chemistry)**  
**Annual Examination, 2014**

**Time : 3 Hours.**

**Full Marks : 80**

*Answer any FIVE Questions. All questions carry equal marks.*

- Discuss aromaticity of non-benzenoid aromatic compounds.
  - Resonance energy of benzene is much more higher than 1, 3-butadiene. Why ?
- What are carboanions ? How they are generated ? Discuss their characteristics.
- Write brief notes on :—
  - Curtin-Hammett Principle.
  - Hammond's Postulates.
- Explain why aniline is more reactive than acetanilide in electrophilic substitution.
  - Chlorobenzene is far less reactive than aniline in electrophilic substitution although chlorine and nitrogen have almost the same electronegativity.
- Write the mechanism of  $ArSN_1$  Reaction. Give atleast three examples.
- Explain the mechanism of Elimination Bimolecular reaction with suitable examples.
- Explain the following :—
  - $-NH_2$  group is ortho and para directing group.
  - $-NO_2$  group is meta-directing group.
  - Halogens are ortho and para directing group.
- Write notes on any **Two** of the following :—
  - Aldol addition reaction.
  - Mannich reaction.
  - Benzoin Condensation.
  - Perkin Reaction.
- Discuss the mechanism and Stereo Chemistry of free radical bromination of (R) - 1 - bromo - 2 methyl butane.
- What are the conditions that favour  $E1cb$  mechanism in an elimination reaction ? Illustrate with two examples.

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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Chemistry**  
**PART-I, PAPER-IV**  
**(Solid State and Quantum Chemistry)**  
**Annual Examination, 2014**

**Time : 3 Hours.**

**Full Marks : 80**

*Answer any FIVE Questions. All questions carry equal marks.*

1. What are the laws of crystallography ? How does it help in the study of crystal structure.
2. What is perfect and imperfect crystal ? Derive a relation between scottly defect and temperature.
3. Explain in trinsic and extrinsic semiconductors. What are the applications of semiconductors ? Explain hysteresis.
4. State and explain organic solid with reference to poly acetylene. Explain poly acetylene is semiconductor.
5. Prove that an operator  $\frac{h}{2\pi i}x\left(-\frac{d}{dx}\right)$  is not Hermitian.
6. Derive the Schrödinger wave equation with respect to space.
7. Calculate the average distance of the electron from nucleus of Hydrogen in the 2s atom.
8. Discuss Hartree-Fock self consistent field theory. What is its demerit.
9. A hybrid orbitals has 20%*s* and 80% *p* character. Give the expressions for the hybrid orbital and determine the angle between them.
10. Write notes on the following :—
  - (a) Stoichiometric line defect.
  - (b) Angular Momentum Operator.

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# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry

### PART-I, PAPER-V

### (Co-ordination Chemistry)

Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Explain magnetic moment and magnetic susceptibility and establish relationship between them.
  - Calculate the free ion ground term for :—  
 $\text{Re}^{++}$ ,  $\text{Mo}^{++}$ ,  $\text{Mn}^{2+}$ ,  $\text{Sc}^{++}$
- What are selection rules for d-d transition ?
  - How do hydration energy vary from  $d^0$  to  $d^{10}$ . (in 1<sup>st</sup> transition series) configuration in octahedral complex.
- What do you mean by splitting of d-orbital under the influence of ligand. How does the d-orbital split in Tetrahedral crystal field ? Compare it with splitting in octahedral field.
- A convincing evidence of metal-ligand overlap is obtained from Nephelauxetic effect. Explain it.
  - How the conclusion obtained from Nephelauxetic effect is supported by Electron Paramagnetic- Resonance (EPR) and Nuclear Magnetic Resonance.
- What is meant by microstate ? What is the possible maximum number of possible microstates for  $p^2$  configuration ? Derive the possible Russell saunders's microstate for  $p^2$  and according to Hund Rule, arrange them in increasing order of energy and identify the ground state term symbol.
- Why magnetic moment of first transition series metal complex often approaches the  $\mu_S$  value but the same result not obtained in case of lanthanides metal complexes.
- Write note on the :—
  - Magnetic behaviour of ferromagnetism and anti ferromagnetism.
  - Charge Transfer Transition.
  - Electron Paramagnetic Resonance (EPR)
- Discuss the labile and inert octahedral complexes on the basis of CFT.
- Explain the factors which affect the acid hydrolysis reactions in octahedral complex.
- Discuss electronic spectra of  $d^1$  and  $d^2$  system in octahedral & tetrahedral electrostatic field.
  - Explain, by giving examples, Jahn Teller distortions.

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**For Practical Counselling Class & Practical Examination Programme  
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# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry PART-I, PAPER-VI (Chemistry of Biomolecule) Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

1. What glycosides ? Give classification of glycosides. Determine the structure of glycoside by its synthesis.
2. What is Maltose ? Establish the structure of maltose by degradative & synthistic methods.
3. Give the synthesis of the following :—
  - (a) Adenine.
  - (b) Uracil.
  - (c) Guanine.
4. What are amino acids ? Discuss chemical reactions of amino acids involving both functional groups present in the molecule.
5. What are alkaloids ? How are they extracted from plants ? Discuss the structure of Piperine.
6. Write about **Two** essential function of tri-acylglycerols :—
  - (a) Hydrogenation of triacylglycerols.
  - (b) Biological function of triacylglycerols.
  - (c) Saponification of triacylglycerols.
7. How will you effect any **Three** of the following conversions :—
  - (a) Geranial to  $\alpha$ -terpinol.
  - (b) Citral to cyclocitrals.
  - (c) Citral to p-cymene.
  - (d) Citral to imones.
8. Write down the structure of cytosine and thymine. Give synthesis of each of one purinebase and pyrimidine base.
9. Write notes on any **Two** of the following :—
  - (a) Wanger-Mecrowein rearrangments.
  - (b) Blanc rule.
  - (c) Inversion of sucrose.
  - (d)  $\beta$ -oxidation of fatty acids.
10. Name the important Lipids. Write details about biological functions of Lipid and its metabolism.

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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Chemistry**  
**PART-I, PAPER-VII**  
**(Reaction Mechanism and Supramolecular Chemistry)**  
**Annual Examination, 2014**

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

1. (a) Explain associative mechanism (conjugate base mechanism) with suitable examples.  
(b) Write a note on 'Twist Mechanism'.
2. Enumerate the concept in Supramolecular Chemistry. Explain any three of these concepts.
3. Discuss all possible path ways of racemization of optical isomers of octahedral complexes with suitable examples.
4. Write notes on the following :—  
(a) Applications of Supra Molecular Chemistry.  
(b) Excited Electron Transfer.
5. Describe the electron transfer reaction by inner and outer Sphere Mechanism. Give examples.
6. (a) Discuss Marcus theory for the electron reaction.  
(b) Discuss and explain electron transfer reactions in following reaction,  
$$\left[ \overset{III}{Cr}(NH_3)_5Cl \right]^{2+} + \left[ \overset{II}{Cr}(H_2O)_6 \right]^{2+} \rightarrow \left[ \overset{II}{Co}(NH_3)_5H_2O \right]^{2+} + \left[ \overset{III}{Cr}(H_2O)_5Cl \right]^{2+}$$
7. Draw the structure of mononuclear Schiff's base complex of Ruthenium and binuclear Schiff base complex of cobalt. Discuss bidentate Schiff's metal complexes.
8. What do you understand by metal alkoxides ? Give at least two methods to prepare metal alkoxides. Draw the structure of tetrameric alkoxide and discuss it. What are important applications of metal alkoxides ?
9. Draw Tanabe Sugano energy level diagram of *Cr(III)* octahedral complexes and describe associated photochemical process.
10. (a) Describe photo oxidation and photo reduction process.  
(b) What do you mean by prompt and delayed photochemical reaction ? Give examples.

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**NALANDA OPEN UNIVERSITY**

**M.Sc. Chemistry**  
**PART-I, PAPER-VIII**  
**(Natural Product)**  
**Annual Examination, 2014**

**Time : 3 Hours.**

**Full Marks : 80**

*Answer any FIVE Questions. All questions carry equal marks.*

1. What do you understand by Terpenoids ? Establish the structure of abietic acid.
2. Discuss the structure of morphine.
3. Establish the structure of B<sub>6</sub> and support your answer by giving synthetic evidences.
4. Elucidate the structure of Vitamin C and discuss its synthesis.
5. What are Vitamins ? Discuss the classification of vitamins and write the important sources and their deficiency diseases.
6. What are Harmones ? Discuss the structure Estrone.
7. Write the Wood Synthesis of Chlorophyll-a and also give degradative evidences for the elucidation of the structure of Chlorophyll-a.
8. How is a flavone related to isoflavone ? Give critical account of the structure determination and synthesis of isoflavone.
9. Write notes on the following :—
  - (a) Presence of phenanthrene nucleus in morphine.
  - (b) Pyridoxal and Pyridoxamine.
10.
  - (a) Discuss the nature and position of side chain in cholesterol.
  - (b) Discuss the position of the two angular methyl group in Cholesterol.

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# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry

### PART-II, PAPER-IX

#### (Spectroscopy)

Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Distinguish between pure rotational spectrum and vibration rotational spectrum of molecule. How are they different from electronic spectrum ?
2. What is electron spin resonance ? Give detail experiment technique.
3. Answer the following :—
  - (a) Define infrared spectrum.
  - (b) Infrared active and inactive vibration.
4. Give an account of how the Raman spectra of diatomic molecule give valuable information about their molecular structure and other parameter.
5. Write notes on any **Two** of the following :—
  - (a) Quantum theory
  - (b) Radioactivity
  - (c) B-Z-Reaction.
6. Taking suitable examples, explain the mechanism of McLafferty rearrangement by taking suitable examples.
7. What do you mean by zero point energy ? Draw the Potential energy curve of diatomic molecule undergoing an harmonic oscillation and write P.E. expression.
8. Answer the following :—
  - (a) I.R. Selection rule in I.R. spectroscopy.
  - (b) Explain d-d transition.
  - (c) In UV spectrum, the electronic band is usually broad.
9. Discuss the principle of NMR spectroscopy and explain how this technique is big used in elucidating of the structure of the molecules ?
10. Discuss various type of electronic transition. Explain the effect of solvent in this transitions, if any. Identify the type of transition possible in following compounds :—
  - (a) Acetone
  - (b) Transition Metal Complex
  - (c) Aromatic Carbonyl.

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Examination Programme, 2014

M.Sc. Chemistry, Part-II

Date	Paper	Time	Examination Centre
14.08.2014	Paper-IX	8.00 AM to 11.00 AM	Nalanda Open University, Patna
16.08.2014	Paper-X	8.00 AM to 11.00 AM	Nalanda Open University, Patna
20.08.2014	Paper-XI	8.00 AM to 11.00 AM	Nalanda Open University, Patna
22.08.2014	Paper-XII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
26.08.2014	Paper-XIII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
28.08.2014	Paper-XIV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
30.08.2014	Paper-XV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
01.09.2014	Paper-XVI	8.00 AM to 11.00 AM	Nalanda Open University, Patna

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Chemistry**  
**PART-II, PAPER-X**  
**(Advance Chemical Dynamics)**  
**Annual Examination, 2014**

**Time : 3 Hours.**

**Full Marks : 80**

*Answer any FIVE Questions. All questions carry equal marks.*

1. Discuss Lotka-Volterra model to explain the oscillatory reaction.
2. Write note on the following :—
  - (a) Bronsted Catalysis Reaction.
  - (b) General Mechanism of Catalytic Reaction.
3. Explain relaxation method for the study of fast reaction with reference to a reversible reaction of first order.
4. What is flash Photolysis ? How can flash photolysis method can be used for the study of fast reaction ?
5. Describe the transition state theory of reactions in solutions. Explain the collisions on the solution encounters.
6. Explain the kinetics of reaction in liquid and gas phase. What is diffusion controlled reaction ?
7. Explain Corrosion ? Describe the theories of Corrosion. How a metal can be protected from corrosion.
8. Discuss the effect of ionic strength and dielectric constant of the medium on the rate constant of the reaction.
9. What do you understand by the dynamics of reaction ? What is mechanism of activation ? Discuss potential energy surfaces.
10. Write notes on the following :—
  - (a) Stoichiometric number and transfer co-efficients.
  - (b) Oscillatory reaction.

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# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry PART-II, PAPER-XI

### (Molecular Thermodynamics)

Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

1. Write down Debye theory and derive Debye equation for evaluating the atomic heat of solid. How does Debye equation explain the variation of specific heat of solid at higher temp and lower temp.
2. (a) Define canonical ensemble in statistical thermodynamics.  
(b) Mentioned various types of ensembles.
3. Derive expression for any **Two** of the following :—  
(a) Translational partition function.  
(b) Rotational partition function.  
(c) Vibrational partition function.
4. What is the limitation of Maxwell-Boltzmann Statics ? How are these limitation were overcome by Bose-Einstein and Fermi Deric statics.
5. What do you mean by entropy production ? Derive the expression for the rate of entropy production resulting from heat of mass flow in the system.
6. What is classical statistical mechanics ? How is it related with statistical thermodynamics.
7. What is Langrangian multipliers ? Use Langrage method of undetermined multiplier. Obtain an expression for Boltzmann distribution law.
8. What are the silent features of irreversible process ? Mentioned the types of irreversibility. Explain the postulates of irreversible thermodynamics.
9. (a) What are stationary state of a system. Explain with examples.  
(b) Show that the entropy production is minimum for stationary state system.
10. Write notes on any **Two** of the following :—  
(a) Electronic partion function.  
(b) Nuclear partion function.  
(c) Entropy of ortho and parahydrogen.

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# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry PART-II, PAPER-XII (Ligand Field Theory) Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

1. Give an account of the role played by I.R. Spectra in structure determination of metal nitrosyls.
2. Application of E.S.R. spectroscopy in the study of Inorganic Chemistry.
3. Explain the transition and different bands in  $Co^{2+}$  ion in octahedral complexes.
4. Write down the type of splitting that Russell-Saunders term undergo under the influence of octahedral field. Explain why  $Mn(II)$  complexes magnetic moment value equal to spin only.
5. Write notes on the following :—
  - (a) Nephelauxetic Ratio.
  - (b) Explain Vibronic Coupling.
6. How is the structure of metal Carbonyl deduced with the help of I.R. spectra.
7.
  - (a) What are Condon-Shortly parameter.
  - (b) L-S and J-J coupling schemes.
8.
  - (a) What are ground state term for  $Mn^{2+}$ ,  $Fe^{+}$  and  $V^{2+}$  ion.
  - (b) Derive that term symbol for  $p^2$  electronic system and determine ground state term.
9. Explain Jahn-Teller Distortion and spectra with reference to  $[Ti(H_2O)_6]^{3+}(d^1)$  and  $[Cu(H_2O)_6]^{++}(d^9)$ .
10. Write short notes on the following :—
  - (a) Spin Cross over phenomena.
  - (b) Non Crossing rule.

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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Chemistry**  
**PART-II, PAPER-XIII**  
**(Organotransition Metal Chemistry and Metal Clusters)**  
**Annual Examination, 2014**

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

1. Write the general method of preparation of metal carbonyl and properties.
2. Write the mechanism of Fischer-Tropsch reaction.
3. Discuss the mechanism of oxidation of ethylene using wacker process.
4. Explain the formation of multiple metal-metal bonds.
5. Explain non-rigid coordination compounds of different coordination number.
6. (a) Write the synthetic application of organocopper compounds.  
(b) Why the aryl organometallic application of organocopper compounds.
7. Discuss the nature of bonding in following compounds,  
(a)  $Fe(\eta^5-C_6H_5)_2$   
(b)  $Cr(\eta^6-C_6H_5)_2$
8. Write the methods of preparation, properties, structure and bonding of Zeise's salt.
9. How you will synthesize the  $\sigma$  bonded organotransition metal compounds ?
10. Write notes on any **Two** of the following :—  
(a) Bonding of  $\pi$  allyl complexes of transition metals.  
(b) ZSM-5  
(c) Classification of organometallic compounds.

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<b><i>For Practical Counselling Class &amp; Practical Examination Programme Please See on Back Page.</i></b>
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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Chemistry**  
**PART-II, PAPER-XIV**  
**(Photochemistry and Pericyclic Reaction)**  
**Annual Examination, 2014**

**Time : 3 Hours.**

**Full Marks : 80**

*Answer any FIVE Questions. All questions carry equal marks.*

1. Discuss Zimmerman mechanism for the rearrangement given by 2, 5-dienones.
2. Give mechanism of Norrish type I process. How many types of Carbonyl Compounds gives this reaction ?
3. Write notes on the following :—
  - (a) Singlet and triplet state.
  - (b) Frank Condon principle.
  - (c) Quenching.
4. Explain Barton reaction. Give its Synthetic use and application.
5. Give  $\pi$  molecular diagram of
  - (a) 1, 3, Pentadiene
  - (b) 1, 3, 5 hatatriene.
6. Write a note on Controtatory motion and disrotatory motion.
7. Explain rearrangements of Cyclo dienoners involving diradical intermediate in presence of hydrogen donor and absence of hydrogen donor.
8. Ketones mainly give four types of Photochemical reactions. Give name of the reactions with examples.
9. Discuss Photochemistry of interamolecular climerisatin of alkene by (2 + 2) cycloaddition.
10. Write notes on the following :—
  - (a) Photochemistry of Aromatic Compounds.
  - (b)  $A_{za}$  Cope Rearrangement.

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<p><b><i>For Practical Counselling Class &amp; Practical Examination Programme</i></b> <b><i>Please See on Back Page.</i></b></p>
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# NALANDA OPEN UNIVERSITY

## M.Sc. Chemistry PART-II, PAPER-XV (Organic Synthesis) Annual Examination, 2014

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Discuss the preparation and four properties of thio-ether.
2. Compare the reduction using  $LiAlH_4$  and  $NaBH_4$ . Write the mechanism for the reduction of cyclopentanone with sodium hydroxide in water.
3. Write the mechanism of each of the following rearrangements :—
  - (a) Wegner-Meerwein Rearrangement.
  - (b) Arndt-Eistert Synthesis.
  - (c) Favorskii Rearrangement.
  - (d) Claisen Rearrangement.
4. How are organomagnesium compounds prepared? How does Grignard reagent react with :—
  - (a) Acetone
  - (b) Acetaldehyde
  - (c) Formaldehyde
  - (d) Carbon dioxide
5. Elaborate the role of functional group interconversion in synthesis.
6. Explain the synthetic use of  $H_2O_2$  and  $O_5O_4$  in the oxidation of alkene to glycol.
7. Give your reasons, predict the structure of the principal product from pinacol rearrangement of pinacol :—
  - (a) 2-Methyl-2,3-pentanediol.
  - (b) 2-Methyl-3-phenyl-2,3-butanediol.
  - (c) 3,4-diphenyl-3,4-hexanediol.
  - (d) 1,2-diphenyl-2-methyl-1,2-propanediol.
8. How is sulphonic acid prepared in the laboratory? Give the reaction and its mechanism. How does it react with the following when fused at  $200-300^\circ C$ ?
  - (a) Sodium hydroxide
  - (b) Sodamide.
9. Write notes on the following :—
  - (a) Eibbs reaction
  - (b) Oppenauer oxidation
  - (c) Etard reaction
  - (d) Barton reaction
10. What is silane? How are they named? Name the following compounds :—
  - (a)  $CH_3HSi(NH_2)_2$
  - (b)  $(CH_3)_2SiCl_2$
  - (c)  $(C_2H_5)_2SiHCOOCH_3$
  - (d)  $C_2H_5Si(OH)_3$
  - (e)  $H_3Si(SiH_2)_3SiH_3$

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**For Practical Counselling Class & Practical Examination Programme  
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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Chemistry**  
**PART-II, PAPER-XVI**  
**(Environmental Chemistry and Analytical Chemistry)**  
**Annual Examination, 2014**

Time : 3 Hours.

Full Marks : 80

*Answer any FIVE Questions. All questions carry equal marks.*

1. Explain defluorination and fluoridation ? How will you estimate the fluoride in the sample of water.
2. How  $\text{SO}_2$  is measured in air ? What are the effect of  $\text{SO}_2$  if its value in air higher than the standard value.
3. How the Polymer and Cement industry pollute our environments ? Explain it.
4. Explain composition of soil ? Discuss the organic and inorganic components of soil. Write a note on waste treatment of soil.
5. Explain biogeochemical cycles in environments ? How do they sustain life in biosphere.
6. Write notes on the following :—
  - (a) Green House Effect.
  - (b) Micro and Macronutrient of Soil.
7. How are heavy metals which pollute drinking water ? How will you estimate Hg and Cd in the sample of water.
8. Explain D.T.A. Write instrumental method for D.T.A. Explain the D.T.A. curve of Leonite  $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ .
9. What 5 TGA technique ? Write the basic principle of thermo-gravimetric analysis (TGA) with examples. Also discuss its principle and application.
10. Write the principle of colorimetry. Derive Lambert-Beer's equations. Write the derivations from Lambert-Beer law.

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<p><b><i>For Practical Counselling Class &amp; Practical Examination Programme</i></b> <b><i>Please See on Back Page.</i></b></p>
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