

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry PART-I, PAPER-I (Physical Chemistry) Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. What is meant by chain reactions ? What are steps involved in chain reactions ? Explain this reaction with reference to the reaction, $H_2 + Br_2 \rightleftharpoons 2HBr$ and derive a mathematical equation. Give the characteristics of chain reactions.
2. What do you mean by partial molar properties ? How the partial molar properties are determined by Dilatometry method.
3. Explain clausius in equality or verify clausius in equality.
4. What is activity or Fugacity ? What do you mean by the term ionic strength ? Discuss the activity coefficient of ionic strength.
5. What are postulates of lindemann's theory of unimolecular reaction ? Derive mathematical formula for Lindemann's mechanism.
6. Explain and illustrate the following :—
 - (a) Boltzmann distribution law.
 - (b) Concept of Ensembles.
7. What do you mean by the terms overpotential ? What are the factors which affects over potential ? What are significance of over potential.
8. What is half wave potential ? What are its significance.
9. Define Polymers with suitable example. Differentiate between synthetic polymers and natural polymers. How many types of stereoisomers are possible in the polymerization of monomer $CH_2 = CHZ$. Write the name and their structure of each type.
10. Derive an equation relating the internal energy and the molecular partition function of monatomic gas.

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Examination Programme, 2013

M.Sc. Chemistry, Part-I

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Examination Centre</i>
17.07.2013	Paper-I	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
19.07.2013	Paper-II	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
23.07.2013	Paper-III	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
25.07.2013	Paper-IV	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
27.07.2013	Paper-V	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
29.07.2013	Paper-VI	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
31.07.2013	Paper-VII	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna
02.08.2013	Paper-VIII	3.30 PM to 6.30 PM	D.A.V. Public School Punaichak, Patna

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry PART-I, PAPER-II (Inorganic Chemistry) Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- (a) What do you understand by term lanthanides and actinide. The oxidation state of +3 are shown by all lanthanide. Why ?

(b) Discuss the paramagnetic behaviour of lanthanide and give its reason. Why the orbital moment effect in lanthanide is not quenched by ligand field.
- What are Boranes ? How are they classified ? Give the structure and bonding in any four of them.
- State and explain Bent rule with a suitable example. Apply Bent rule in the prediction of bond angles in H - C - H in $\text{CH}_3 - \text{C} \equiv \text{CH}$ molecule.
- (a) Explain the shape and hybridization of the following :—

(i) XeF_6 (ii) SO_3 (iii) NH_4^+ ion

(b) Why two chlorine atoms of PCl_5 are more reactive than the rest three.
- Describe ion exchange method for the separation of lanthanides from one another. Why is the colour of lanthanides compounds are so similar.
- Explain reducible and irreducible representation. Write the Orthogonality theorem and consequences.
- Draw Molecular orbital diagram of CO_2 and CO_3^{2-} . Explain the bond pair and magnetic property on the basis of the M.O. diagram.
- What is Scintillation ? Describe scintillation counter operation to detect radiation caused due to radio active substances. What are its advantages over Geiger-Muller Counter.
- Explain why the molecule of CO_2 and methane presses zero dipole moment.
- Write the Bohr theory of compound nucleus. Discuss the nuclear reaction of different types. Explain the Q-value and cross-section of nuclear reaction.

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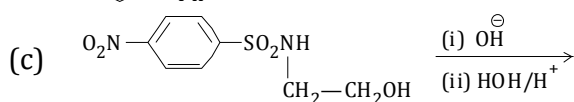
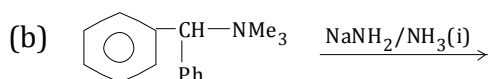
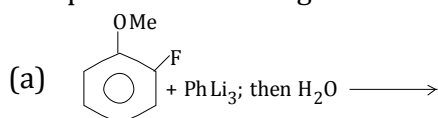
M.Sc. Chemistry PART-I, PAPER-III (Organic Chemistry) Annual Examination, 2013

Time : 3 Hours.

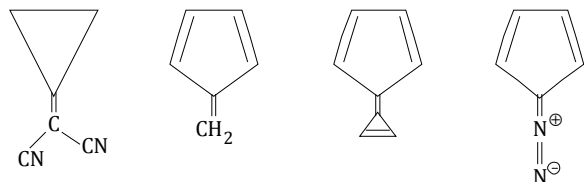
Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. What do you mean by aromatic nucleophilic substitution. Explain aromatic substitution Unimolecular Nucleophilic reaction.
2. Complete the following reaction and outline its mechanism :—



3. Explain conformation of cyclohexane and also discuss the effect of conformation on chemical reactivity.
4. Write note on the following :—
 - (a) Gattermann-Koch reaction.
 - (b) Diazonium coupling reaction.
5. Classify given the following compounds are aromatic or non aromatic. Also, justify your answer.



6. Explain the mechanism of following reaction :—
 - (a) Perking reaction,
 - (b) Benzoin condensation, also describe their application.
7. Explain aromaticity and give details of Huckel molecular orbital theory.
8. What do you understand by carbocations ? Explain their stability.
9. Explain the following :—
 - (a) Aniline is a base.
 - (b) Phenol is an acid.
 - (c) Nitrobenzene gives meta dinitrobenzene on nitration.
 - (d) Phenol reacts with Cl₂ to give ortho chlorophenol and para chlorophenol.
10. Write notes on any **Two** of the following :—
 - (a) Orientation.
 - (b) Regioselectivity.
 - (c) Markonikoff's rule.

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NALANDA OPEN UNIVERSITY
M.Sc. Chemistry
PART-I, PAPER-IV
(Solid State and Quantum Chemistry)
Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. What do you understand by solid state defect ? Derive relation between Frankel defect and temperature. What is meaning of colour centres in alkali metal crystal ?
2. Generally organic solid are electrical insulators but few of them conducts electricity, why ? Discuss organic charge transfer complexes as super conductor.
3. Discuss the postulates of Quantum Mechanics.
4. What do you mean by Hermitian operators ? What are its important characteristics ? On the basis of its characteristic derive the mathematical equation and predict the properties of Hermitian operators.
5. Discuss the Schrödinger's equation and derive Schrödinger wave equation with respect to time.
6. What is the magnitude of total orbital, total spin and total angular momenta for the ground state $4F$ of vanadium.
7. Discuss perturbation theory. Apply perturbation theory to solve Schrödinger equation to determine approximate values of energies and wave function in more than one electron system.
8. Write short notes on **One** of the following :—
 - (a) Condon and Slater Rules.
 - (b) The Huckel Molecular Orbital (HMO) theory.
9. Write the Valence bond Eigen function under perfect pairing scheme for BeH_2 molecule.
10. How the crystal planes are characterized ? How Miller indices helps in determining the inter planner distance ? Calculate the inter planner distances of s.c., b.c.c. and f.c.c. crystals.

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry

PART-I, PAPER-V

(Co-ordination Chemistry)

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. What are the important features (Postulates) of crystal field theory ? How it is different from valence bond theory ? How does the d-orbital split in octahedral field.
2. Explain the origin of magnetic moment in atom, molecule or ion. Derive an equation to determine orbital magnetic moment value. Give its unit.
3. What do you understand by crystal field stabilization energy in complexes ? What are the factors which determine or govern the crystal field stabilization energy. Justify the order $\Delta_{sp} > \Delta_0 > \Delta_t$.
4. Discuss molecular orbital theory of metal ligand bonding in octahedral complexes containing no π bond.
5. Explain Russel and Saunder's coupling scheme. Calculate free ion ground state term for the following :—
(a) Ni^{++} (b) Cr^{3+} (c) Ti^{2+} (d) Co^{2+}
6. Discuss the reaction mechanism of substitution reaction in octahedral complexes along with the factors that causes complication.
7. Find out total microstate term and term symbols of d^2 system and determine the ground state term.
8. (a) How does the ionic radii of M^{2+} vary from d^0 to d^{10} system in the first transition series due crystal field.
(b) S and P term do not split in crystal field but D and F term split, explain.
9. Define stepwise and over all stability constant. How they are related to each other.
10. Write notes on the following :—
(a) Spectro-Chemical Series.
(b) John & Teller Effect.

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry
PART-I, PAPER-VI
(Chemistry of Biomolecule)
Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. What do you understand by the term terpenoids. Explain isoprene and special isoprene rule and their exception.
2. Discuss the structure of DNA. In what ways the structure of DNA differs from that of RNA.
3. Write notes on the following :—
 - (a) Zwitterion
 - (b) Sphingomyelins.
 - (c) Cephalins
 - (d) Peptidelinkage.
4. Establish the structure of camphor by degradation and synthetic methods.
5. What are lipids. Write and explain the process for the functioning of soap and detergent.
6. How will you establish the primary, secondary and tertiary structure of Protein ?
7. What is carbohydrate ? Establish the ring structure of glucose.
8. Write down the structure and synthesis of any **Two** of the following :—
 - (a) Adenine
 - (b) Thymine
 - (c) Cytosine
9. Discuss the degradative and synthetic evidences leading to the structure of nicotine.
10. What is relation between :—
 - (a) A nucleotide and nucleoside.
 - (b) Nucleotide and nucleic acid.
 - (c) Ribose and deoxyribose.

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NALANDA OPEN UNIVERSITY
M.Sc. Chemistry
PART-I, PAPER-VII
(Reaction Mechanism and Supramolecular Chemistry)
Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. (a) Explain associative and dissociative mechanism with examples.
(b) Discuss the phenomenon of phosphorescence and fluorescence.
2. Define photo substitution and explain with suitable example.
3. How does the reactivity and catalysis represent major feature of functional properties of supramolecular system.
4. Write notes on the following :—
 - (a) Schiff's base metal complexes.
 - (b) Mixed Valence Complexes.
 - (c) Excited electron transfer.
 - (d) Application of Supramolecular Chemistry.
5. Electron transfer between $[Fe(CN)_6]^{3-}$ and $[Fe(CN)_6]^{4-}$ is much more faster than between $[Co(NH_3)_6]^{2+}$ and $[Co(NH_3)_6]^{3+}$, why?
6. Describe the pathway of optical inversion and isomerization.
7. Explain the following statement :—
 - (a) The temperature has little effect on photochemical reaction.
 - (b) Free energy (ΔG) value is not always negative in photochemical reaction.
 - (c) Photo chemical reactions do not need collisions.
 - (d) Photo chemical activation is selective.
8. Give two general methods of preparation of metal alkoxide. Draw the structure of dimeric and tetrameric alkoxides.
9. Name the two stoichiometric mechanism of redox reaction suggested by Henry Taube. Discuss of them with suitable examples.
10. What are complimentary and non-complimentary reactions. What are the main differences between complementary and non-complimentary reactions. Explain by give up example.

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry PART-I, PAPER-VIII (Natural Product) Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Establish the structure of Vitamin B₂ (Riboflavin). Give the synthesis of Vitamin B₂.
2. Name the different individual members of the class flavones, isoflavones, anthocyanins and anthocyanidins. Discuss the general method of determining the structure of flavone.
3. Discuss the structure of Phytol.
4. Discuss the degradative and synthetic evidences leading to the structure of anthocyanins.
5. Write the structure of cholesterol, cholestanol and cholestanone. Write the synthesis of cholesterol.
6. What are porphyrins ? Write the degradative and synthetic evidence for the determination of structure of Haemin.
7. Discuss the point of linkage between quininic acid and meroquinene in quinine.
8. Elucidate the degradative and synthetic evidence that established the structure of zingiberine.
9. (a) Discuss the degradative reactions of narcotine.
(b) Discuss the structure of opianic acid and cotarnine.
10. Elucidate the structure of a fat-soluble vitamin having molecular formula C₂₀H₁₈O and deficiency of which in human diet causes night blindness.

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry

PART-II, PAPER-IX

(Spectroscopy)

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Describe and explain (a) K-band (Konjugierte), (b) R-band (Radikalartig), (c) B-band (Benzenerid band) and (d) E-band (Ethylenic band) in electronic spectra.
- Write in details the application of Mossbauer spectra to some of compounds of ^{57}Fe .
- What are the necessary conditions for a compound to be infra red active ?
 - Distinguish between the following on the basis of I.R. Spectroscopy
 - $\text{CH}_3\text{CH}_2\text{CHO}$
 - CH_3COCH_3
- What are the applications of ESR in the study of organic and simple inorganic radicals.
- State & explain the Franck-Condon principle. How is Franck-Condon principle helpful in predicting the relative intensities of vibronic transition ?
- What is meant by the chemical shift in *nmr* spectroscopy. Describe the factors affecting chemical shift. Explain the fine structure (Spin-Spin-Coupling).
- How you will distinguish between cis and trans-isomers with the help of *nmr* ?
 - Why do atoms gives rise to line spectra while molecules show band spectra ?
- Which of the following molecules may show pure rotational spectra ? Give reasons for your answer.
 CH_4 , H_2O , NH_3 , BF_3 , HCl , Cl_2
- Write notes on any **Two** of the following :—
 - Vibrational Raman Spectra
 - Lambert's Law
 - Charge transfer complexes (C-T Bands)
- Discuss the application of UV visible spectroscopy in,
 - Identification of functional group
 - Study of strain
 - Geometrical isomeric
 - Hydrogen body.

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry

PART-II, PAPER-X

(Advance Chemical Dynamics)

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Describe the Kinetics of photochemical reaction. Discuss kinetically the photochemical decomposition of H₂.
2. Write notes on the following :—
 - (a) Oxidation Corrosion.
 - (b) Rate of electrocatalysis.
3. What is faradaic and non faradaic process ? Explain stoichiometric number and transfer coefficients ?
4. Discuss the NMR method or flow method for the study of fast reactions.
5. What is kinetic salt effect ? Describe the Bronsted Bjerrum equation.
6. What do you understand by transition state for bimolecular reactions. Discuss the dynamic calculation of transition state expression for bimolecular reaction.
7. Write notes on the following :—
 - (a) Belousov-Zhabatinskii reaction.
 - (b) Theory of Acid-Base catalysis.
8. Explain general mechanism of catalytic reactions. Describe the Arrhenius and Van't Hoff intermediate for the kinetics of catalysis reaction.
9. What do you understand by rates of electrochemical reactions ? Describe the factors affecting rates of electro-chemical reaction.
10. Describe the direct chemical attack and electro chemical theory of Corrosion. How can a metal be prevented from metallic corrosion ?

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NALANDA OPEN UNIVERSITY

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

(Molecular Thermodynamics)

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Derive Boltzmann distribution law for non-degenerate energy level. What the condition of applicability of Boltzmann statistics.
2. Derive expression for vibrational partition function for ideal monoatomic gas.
3. What is specific heat of solid ? Describe Einstein theory of specific heat of solid and derive Einstein equation for specific heat of solid. What are merits and limitation of the Einstein theory ?
4. What is meant by the term flux used in transport phenomenon ? Give expression for the various phenomenological law involved in transport phenomenon. What do these law describe ?
5. (a) Explain what do you mean irreversible thermodynamics. What are its features and postulate of irreversible thermodynamics ?
(b) How the entropy a thermodynamics function is related to the partition function.
6. What is an ensemble ? Discuss various type of ensembles ? Compare them with each other. What is the importance of ensemble concept ?
7. Write notes on the following :—
 - (a) Liouville Theorem.
 - (b) Dulong and Petit's Law.
8. (a) Compare among Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.
(b) How the values of Boltzmann constant α and β are evaluated.
9. What are Onsager reciprocal relation ? What is the basic of these relationship ? Discuss the utility of these relations in a coupled flow system.
10. Explain, why the values of specific heat of molecular hydrogen evaluated by using third law of thermodynamics ?

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry PART-II, PAPER-XII (Ligand Field Theory) Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Explain Tanabe and sugano diagram of d^2 electronic system.
 - How does Tanabe and sugano diagram differ from correlation diagram.
- What do you understand by d-d transition ? And explain the phenomenon of electronic transition from ligand to metal ion and vice versa. How does the above two type of electronic transitions mainly contribute to explain the colour and spectra produced in the formation of transition metal compounds in complexes.
- Write explanatory notes on the following :—
 - Jahn Teller Distortion effect.
 - Vibronic Coupling.
- Write selection rules observed in IR spectra of diatomic molecules.
 - How IR spectra can be used to distinguish Fe(II) from Fe(III) ions ?
- Derive term symbol for d^2 electronic system and determine the ground state term.
- Discuss the condition for the cross-over point from weak field to strong field limits.
 - What are the ground state term for Ni^{++} , Mn^{2+} , Fe^{++} and V^{2+} ion system.
- How does Nephelaxetic effect explain the limitation of crystal field theory and is an evidence for ligand field theory for complex formation ? Write down the nephelaxetic series for the ligands and metals separately and explain them.
- Write in details about the application of IR spectroscopy in determining the structure of metal carbonyls.
- What are the condition for Mossbauer spectra to occur. Discuss its important application.
- Write down the following :—
 - Hund's Rule for the determination of ground state term.
 - Explain non crossing rule.

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NALANDA OPEN UNIVERSITY
M.Sc. Chemistry
PART-II, PAPER-XIII
(Organotransition Metal Chemistry and Metal Cluster)
Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. (a) What do you understand by metal nitrosyl ? How are nitroferrous sulphate and sodium nitroprusside prepared ?
(b) How carbonyl is supported by E.A.N. and 18 electrons rule ? Explain it.
2. How ethylene is polymerised to produce useful materials like plastic, fibres and other materials by using Ziegler-Natta catalyst ? Discuss mechanism involved in it ?
3. Write notes on zentl ion and chevrel phases.
4. Define and explain organo metallic compounds. Write the classification of organo metallic compounds with suitable examples. Write the synthetic application of organo copper compound.
5. How you can prepare chromium-benzene complex ? Write its properties and bonding.
6. Give an account of chemistry, structure and bonding π -allyl complexes of transition metals. Show the aromatic behaviour of cyclopentadienyl complexes.
7. What is ZSM-5 ? How methanol can be transformed into gasoline using ZSM-5 ?
8. Prepare dinuclear clusters $(\text{Re}_2 X_8)^{2-}$ from ReO_4^- . How $\sigma_1\pi$ and δ bonds are formed in $(\text{Re}_2 \text{Cl}_8)^{2-}$? Explain in details.
9. Discuss fluxionality in cyclopentadienyl complexes. How will judge that molecule is stereochemical non rigid ?
10. What are the factors determining the stability of transition metal alkyls. Why the aryl organometallic compounds are more stable than alkyl organometallic compounds.

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NALANDA OPEN UNIVERSITY
M.Sc. Chemistry
PART-II, PAPER-XIV
(Photo Chemistry and Pericyclic Reaction)
Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Write down the explanatory notes on Cope-Rearrangement and Aza-Cope Rearrangement. Write down the selection rules for sigmatropic rearrangement.
2. Give the mechanism of the Chelotropic Cycloaddition reaction between,
(a) Alkene and Carbene
(b) Alkene and SO₂
3. What is the endo-rule as applied to Diel-Alder reaction ?
4. Give the mechanism for the rearrangement of cyclo dienones. And explain the rearrangement of cyclo dienones involving diradical intermediate in presence of hydrogen donor and in absence of hydrogen donor.
5. Explain the photolysis of nitrites having primary δ -carbon, secondary δ -carbon and no hydrogen at δ -carbon.
6. What do you mean by Pericyclic Reactions ? What are the types of Pericyclic Reactions ? Write them with suitable examples.
7. Answer the following question for π molecular orbitals of 1, 3, 5-hexatriene,
(a) Which are the bonding orbitals and antibonding orbitals.
(b) Which orbitals are HOMO and LUMO in ground state and excited state.
(c) Which orbitals are symmetric and asymmetric with respect to mirror plane and C₂ axis.
8. Give the mechanism of Norrish type (II) process. Which ketones are most common class of compound for β -cleavage and why ?
9. Explain and discuss the photo chemistry of intra molecular dimerisation of alkene by (2+2) cyclo addition.
10. What do you understand by Frontier molecular orbital and orbital symmetry ?

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry PART-II, PAPER-XV (Organic Synthesis) Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Discuss the mechanism of Baeyer-Villiger oxidation and Dakin reaction.
 - What is haloform reaction? How methyl ketones are converted into carboxylic acids? Give mechanism.
- Write notes on the following :—
 - Silanes
 - Prevost reaction
- How organolithium compounds are prepared? How does it react with, (a) α, β unsaturated ketone, (b) Aryl halide, (c) Alkyl-aryl ether, in these reactions indicate the intermediate products and mechanism involved.
- Explain the mechanism of the following :—
 - Benzil-Benzilic acid rearrangement
 - Arndt Eistert synthesis
- How thio alcohol may be prepared from alcohol? How does it react with, (a) Acetone, (b) Mercuric oxide, (c) Lead acetate and (d) Acetyl chloride?
- Explain the synthetic use of NaBH_4 . Compare reductions with NaBH_4 and LiAlH_4 .
- Discuss reduction of alkynes i.e. hydrogenation by using any one of the following a catalyst/reagent.
 - Lindlar-catalysts
 - LiAlH_4
 - Dibal H
 - Write the mechanism for the reduction of cyclopentanone with sodium borohydride in water.
- Explain Synthons and Synthetic equivalent. Discuss Retrosynthetic analysis of C-C disconnection and C-N disconnection.
- Compare relative acidities of the following pair.
 - Benzene sulphonic acid and benzoic acid
 - Alcohol and thio alcohol.
 - Discuss preparation properties and use of sulphonal, mustard gas and sulphonol.
- Write the synthetic use of following reagents;
 - SeO_2
 - $\text{Pb}(\text{OCOCH}_3)_4$

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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, 2013

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. What are different parameters which determine water quality ? How you will estimate total solid in water ?
2. What do you understand by environment ? What are its segments. Name them and describe in details.
3. Explain Dissolved Oxygen (DO) in water, Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Write a method for the determination of dissolved oxygen in water.
4. What do you understand by the term Smog ? What is its mechanism of formation ? How does it harm to human being and other livingkingdom ?
5. Write notes on the following :—
 - (a) Rf Value
 - (b) Green House Effect
6. What do understand by micro and macronutrient of soil. Explain the role of these two type of nutrients in the soil.
7. What are the chemical species present in atmosphere what are photochemical reactions taking place in the atmosphere at different altitude ? Write equations and condition to explain your answer.
8. How is soil polluted by the regular addition of pesticides and fertilizers. What is effect of these two on the fertility of the soil.
9. Write the basic principle of Thermo Gravimetric Analysis (TGA) with example. How you will analyze D.T.A. curve ? Write its application.
10. What are heavy metals which pollute drinking water ? What are the toxic effect of these metals ? How will you estimate Hg and Cd in the sample of Water ?

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