

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER-I

(Physical Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. Explain the following terms :—
 - (a) What is entropy and entropy is a state function.
 - (b) The relation between the chemical potential and composition.
2. Derive the equation of Boltzmann Distribution Law ?
3. What is half wave potential ? What are its significance ?
4. What are postulates of Lindermann's theory of unimolecular reaction ? Derive mathematical formula for Lindermann mechanism.
5. What is polymer ? Differentiate between additive polymer and condensation polymer ? Explain by giving examples for each.
6. What are partial molar properties ? Describe Gibbs Duhem equation thermodynamically. Show how this equation is useful ?
7. What is ionic activity ? What do you mean by term ionic strength ? Discuss the activity coefficient of ionic strength.
8. What are macromolecules and explain the mechanism of polymerization ? Describe light scattering method of determination of molecular mass of polymer.
9. What do you understand by the term over potential ? Write notes on :—
 - (a) Oxygen overvoltage, and
 - (b) Hydrogen overvoltage.
10. Write notes on any **Two** of the following :—
 - (a) Tafel Plot
 - (b) Polarography
 - (c) An ensemble and type of ensembles.

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EXAMINATION PROGRAMME-2021
M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
06.05.2022	Paper-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
07.05.2022	Paper-II	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
09.05.2022	Paper-III	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
11.05.2022	Paper-IV	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
13.05.2022	Paper-V	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
17.05.2022	Paper-VI	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
19.05.2022	Paper-VII	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
23.05.2022	Paper-VIII	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER-II

(Inorganic Chemistry)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. Draw molecular orbital diagram of NO_2 , CO_2 and CH_2 molecule. Explain their configuration bond order, stability and magnetic property.
2. Construct the character table for the point group C_{2v} and C_{3v} .
3. Determine the ground state term symbol and Free Ion Term for d^2 , d^4 , d^5 and d^9 system. Determine also their no. of microstates.
4. What are Boranes ? How they are classified ? Describe structure and bonding in B_2H_6 and also explain banana bond ?
5. (a) What are Lanthanides ? Write electronic configuration of all 14 lanthanides elements.
(b) Explain Lanthanide contraction and its consequences.
6. (a) Describe the shell-model and liquid drop model of a nucleus.
(b) Write a note on G-M counter.
7. Describe the ways in which Actinides resemble their counterpart in Lanthanides ? Give an account of the Chemistry of Neptunium and Plutonium ? How are Neptunium and Plutonium are Synthesized.
8. Write notes on any **Two** of the following :—
(a) Atom Bomb.
(b) Application of radioisotopes in medical sciences.
(c) Radiocarbon dating.
9. State and explain Bent rule with suitable examples. Apply bent rule in prediction of bond angles in $H-C-H$ and $CH_3-C \equiv CH$ molecule.
10. (a) What are VSEPR theory ?
(b) Explain the shape and hybridization of the following :—
(i) XeF_6 (ii) IF_7 (iii) NH_4^+

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EXAMINATION PROGRAMME-2021

M.Sc. Chemistry, Part-I

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09.05.2022	Paper-III	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
11.05.2022	Paper-IV	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
13.05.2022	Paper-V	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
17.05.2022	Paper-VI	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
19.05.2022	Paper-VII	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
23.05.2022	Paper-VIII	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER-III (Organic Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- What are Carbenes ? How are they generated ? Give the important reactions of Carbenes.
- Explain Huckel theory of aromaticity with mentioning of Huckel's Rule ? Explain the aromaticity in benzenoid and non-benzenoid compounds.
- What do you mean by aromatic nucleophilic substitution reaction ? Explain unimolecular Nucleophilic aromatic substitution reaction.
- Explain the mechanism of Elimination Bimolecular reaction with suitable examples.
- Explain the following :—
 (a) Halogens are ortho and para directing group. (b) NO₂ group is meta-directing group.
 (c) -NH₂ group is ortho and para directing group.
- Write detail notes with mechanism of any **Two** of the following :—
 (a) Perkin reaction. (b) Aldol addition reaction.
 (c) Mannic reaction. (d) Benzoin condensation.
- Explain any **Two** term of the following :—
 (a) Tautomerism. (b) Hyper Conjugation. (c) Reflection symmetry.
- (a) Explain with mechanism that electrophilic substitution occurs more easily in Toluene than in benzene.
 (b) Which of the following compound will show aromaticity :—
 (i) Benzene (ii) Cyclopentadiene (iii) Pyrrole.
- Explain the conformation of Dimethyl Cyclohexane.
- Discuss the mechanism and stereo chemistry of free radical bromination of (R) - 1 - bromo - 2 methyl butane.

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Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. : All Old Batch Students and 200250001 to 200250010

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
31.05.2022	11.00 AM to 5.00 PM	I	01.06.2022	11:00 AM to 2:00 PM
		II	01.06.2022	2:30 PM to 5:30 PM
		III	02.06.2022	11:00 AM to 2:00 PM
		V	02.06.2022	2:30 PM to 5:30 PM

For Enrollment No. 200250011 to 200250100

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
03.06.2022	11.00 AM to 5.00 PM	I	04.06.2022	11:00 AM to 2:00 PM
		II	04.06.2022	2:30 PM to 5:30 PM
		III	06.06.2022	11:00 AM to 2:00 PM
		V	06.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250101 to 200250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
07.06.2022	11.00 AM to 5.00 PM	I	08.06.2022	11:00 AM to 2:00 PM
		II	08.06.2022	2:30 PM to 5:30 PM
		III	09.06.2022	11:00 AM to 2:00 PM
		V	09.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250201 to 200250300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
10.06.2022	11.00 AM to 5.00 PM	I	11.06.2022	11:00 AM to 2:00 PM
		II	11.06.2022	2:30 PM to 5:30 PM
		III	13.06.2022	11:00 AM to 2:00 PM
		V	13.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250301 to 200250700

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
15.06.2022	11.00 AM to 5.00 PM	I	16.06.2022	11:00 AM to 2:00 PM
		II	16.06.2022	2:30 PM to 5:30 PM
		III	17.06.2022	11:00 AM to 2:00 PM
		V	17.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250701 to 200251300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
18.06.2022	11.00 AM to 5.00 PM	I	20.06.2022	11:00 AM to 2:00 PM
		II	20.06.2022	2:30 PM to 5:30 PM
		III	21.06.2022	11:00 AM to 2:00 PM
		V	21.06.2022	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER–IV (Solid State Chemistry & Quantum Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Explain intrinsic and extrinsic semiconductors. What are the application of semiconductors ? What is doping semiconductors ?
2. Discuss solid state defect with special reference to :— (a) Schottky defect (b) Frenkel defect
3. Derive the Schrödinger wave equation with respect to space. Derive the equation also for H-atom.
4. (a) Discuss the postulates of Quantum mechanics.
(b) What is Eigen function and Eigen value ?
5. What is maximum electron density in H-atom in the 1s, 2s and 2p orbitals ?
6. Determine the term symbol, ground state term and no. of microstates of following configuration :—
(a) d^2 system (b) d^6 system (c) d^9 system
7. Explain the following terms :—
(a) Perfect and Imperfect Crystals. (b) Non-conductor and Semi-conductor.
(c) Super conductor.
8. Explain any **Two** of the following :—
(a) Operators. (b) Pauli Exclusion Principle.
(c) Hund's Rule of maximum spin multiplicity.
9. State Hermitian operator. Discuss its two important properties and explain that.
10. Write notes on any **Two** of the following :—
(a) Cohesive Energy (b) Zero-point Energy
(c) Basic assumption of the Huckel theory of conjugated system.

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Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. : All Old Batch Students and 200250001 to 200250010

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
31.05.2022	11.00 AM to 5.00 PM	I	01.06.2022	11:00 AM to 2:00 PM
		II	01.06.2022	2:30 PM to 5:30 PM
		III	02.06.2022	11:00 AM to 2:00 PM
		V	02.06.2022	2:30 PM to 5:30 PM

For Enrollment No. 200250011 to 200250100

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
03.06.2022	11.00 AM to 5.00 PM	I	04.06.2022	11:00 AM to 2:00 PM
		II	04.06.2022	2:30 PM to 5:30 PM
		III	06.06.2022	11:00 AM to 2:00 PM
		V	06.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250101 to 200250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
07.06.2022	11.00 AM to 5.00 PM	I	08.06.2022	11:00 AM to 2:00 PM
		II	08.06.2022	2:30 PM to 5:30 PM
		III	09.06.2022	11:00 AM to 2:00 PM
		V	09.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250201 to 200250300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
10.06.2022	11.00 AM to 5.00 PM	I	11.06.2022	11:00 AM to 2:00 PM
		II	11.06.2022	2:30 PM to 5:30 PM
		III	13.06.2022	11:00 AM to 2:00 PM
		V	13.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250301 to 200250700

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
15.06.2022	11.00 AM to 5.00 PM	I	16.06.2022	11:00 AM to 2:00 PM
		II	16.06.2022	2:30 PM to 5:30 PM
		III	17.06.2022	11:00 AM to 2:00 PM
		V	17.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250701 to 200251300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
18.06.2022	11.00 AM to 5.00 PM	I	20.06.2022	11:00 AM to 2:00 PM
		II	20.06.2022	2:30 PM to 5:30 PM
		III	21.06.2022	11:00 AM to 2:00 PM
		V	21.06.2022	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER-V (Co-ordination Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- (a) What do you understand by crystal field stabilization energy in complexes ? What are the factors which determine the crystal field stabilization energy.
- (b) Calculate the CFSE for d^3 , d^4 and d^6 ion in octahedral field with strong and weak ligands.
- Explain the multiplet width. Explain the population of J level in context to KT.
- (a) Explain magnetic moment and magnetic susceptibility and establish relationship between them.
- (b) Calculate the free ion term, ground state term and no. of microstates for Fe^{+2} , Cu^{+1} and Cr^{+1} ion ?
- Draw Molecular Orbital diagram of $[Co(CN)_6]^{-3}$.
- Define stepwise and over all stability constant. How they are related to each other ?
- What is Trans-effect ? Explain the theory of Trans-effect.
- S and P terms do not split in crystal field but D and F term split. Explain.
- Discuss the reaction mechanism of substitution reaction in octahedral complex along with the factors that causes complication.
- Explain any **Two** of the following :—
 (a) Limitation of Crystal Field Theory. (b) John-Teller Effect.
 (c) Quenching of Orbitals.
- Write notes on any **Two** of the following :—
 (a) Labile and inert complex. (b) Acid Hydrolysis reaction.
 (c) Spectro chemical series.

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Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. : All Old Batch Students and 200250001 to 200250010

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
31.05.2022	11.00 AM to 5.00 PM	I	01.06.2022	11:00 AM to 2:00 PM
		II	01.06.2022	2:30 PM to 5:30 PM
		III	02.06.2022	11:00 AM to 2:00 PM
		V	02.06.2022	2:30 PM to 5:30 PM

For Enrollment No. 200250011 to 200250100

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
03.06.2022	11.00 AM to 5.00 PM	I	04.06.2022	11:00 AM to 2:00 PM
		II	04.06.2022	2:30 PM to 5:30 PM
		III	06.06.2022	11:00 AM to 2:00 PM
		V	06.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250101 to 200250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
07.06.2022	11.00 AM to 5.00 PM	I	08.06.2022	11:00 AM to 2:00 PM
		II	08.06.2022	2:30 PM to 5:30 PM
		III	09.06.2022	11:00 AM to 2:00 PM
		V	09.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250201 to 200250300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
10.06.2022	11.00 AM to 5.00 PM	I	11.06.2022	11:00 AM to 2:00 PM
		II	11.06.2022	2:30 PM to 5:30 PM
		III	13.06.2022	11:00 AM to 2:00 PM
		V	13.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250301 to 200250700

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
15.06.2022	11.00 AM to 5.00 PM	I	16.06.2022	11:00 AM to 2:00 PM
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		III	17.06.2022	11:00 AM to 2:00 PM
		V	17.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250701 to 200251300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
18.06.2022	11.00 AM to 5.00 PM	I	20.06.2022	11:00 AM to 2:00 PM
		II	20.06.2022	2:30 PM to 5:30 PM
		III	21.06.2022	11:00 AM to 2:00 PM
		V	21.06.2022	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER-VI
 (Chemistry of Biomolecule)
 Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- What are the classification of carbohydrates ? Establish the structure of D-glucose.
- How will you establish the Primary, Secondary and Tertiary structure of protein ?
- Discuss the degradative and synthetic evidences leading to the structure of nicotine.
- Name the important lipids. Write details about biological functions of lipids and its metabolism.
- Discuss the structure of DNA. In what ways the structure of DNA differs from that of RNA ?
- Write notes on any **Two** of the following :—
 (a) Inversion of Sucrose. (b) Peptides Linkage. (c) Isoprene Rule.
- How you will carry the following conversions :—
 (a) Glucose to Fructose (b) Citral to Cyclocitral (c) Fructose to Glucose
- Name the products of the reaction of D-glucose with the following reagents :—
 (a) NH_2OH (b) $C_6H_5NHNH_2$ (c) Br_2 / H_2O (d) CH_3OH / HCl (e) CH_3I / Ag_2O
- Write down the structure and synthesis of any **Two** of the following :—
 (a) Adenine (b) Guanine (c) Uracil
- What are Glycosides ? Give classification of glycosides. Determine the structure of glycosides by its synthesis ?

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Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna
For Enrollment No. : All Old Batch Students and 200250001 to 200250010

Counselling Class Programme		Practical Examination Programme		
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31.05.2022	11.00 AM to 5.00 PM	I	01.06.2022	11:00 AM to 2:00 PM
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		V	02.06.2022	2:30 PM to 5:30 PM

For Enrollment No. 200250011 to 200250100

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
03.06.2022	11.00 AM to 5.00 PM	I	04.06.2022	11:00 AM to 2:00 PM
		II	04.06.2022	2:30 PM to 5:30 PM
		III	06.06.2022	11:00 AM to 2:00 PM
		V	06.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250101 to 200250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
07.06.2022	11.00 AM to 5.00 PM	I	08.06.2022	11:00 AM to 2:00 PM
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		III	09.06.2022	11:00 AM to 2:00 PM
		V	09.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250201 to 200250300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
10.06.2022	11.00 AM to 5.00 PM	I	11.06.2022	11:00 AM to 2:00 PM
		II	11.06.2022	2:30 PM to 5:30 PM
		III	13.06.2022	11:00 AM to 2:00 PM
		V	13.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250301 to 200250700

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
15.06.2022	11.00 AM to 5.00 PM	I	16.06.2022	11:00 AM to 2:00 PM
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		III	17.06.2022	11:00 AM to 2:00 PM
		V	17.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250701 to 200251300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
18.06.2022	11.00 AM to 5.00 PM	I	20.06.2022	11:00 AM to 2:00 PM
		II	20.06.2022	2:30 PM to 5:30 PM
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		V	21.06.2022	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER–VII (Reaction Mechanism and Super Molecular Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Define photo substitution and explain with suitable example. Explain photo oxidation and photo reduction theory.
- Explain any **Two** of the following :—
 (a) No. of ground state term and no. of microstates in Fe^{+3} ion.
 (b) Magnetic Properties of Lanthanides. (c) Photochemical reaction.
- How the supramolecular catalysts are similar to enzyme catalyst ? What are differences between them ?
- Give two general methods of preparation of metal alkoxide. Draw the structure of dimeric and transmeric alkoxides.
- Mention substitution reaction which undergoes without Cleavage of metal-ligand bond. Give mechanism with suitable examples.
- Explain the isomerisation of octahedral complexes and intermolecular rearrangement.
- (a) The electron exchange reaction in $[Co(NH_3)_6]^{+2}$ to $[Co(NH_3)_6]^{+3}$ is slower than $[Fe(CN)_6]^{4-}$ to $[Fe(CN)_6]^{3-}$. Why ?
 (b) Explain mixed valence complexes.
- Write special features of anionic bonding. Write the synthesis of crown ether ?
- Write short notes on any **Two** of the following :—
 (a) Excited electron transfer. (b) Reaction of 2-2' bipyridines. (c) Optical inversion.
- Write in detail about the following :—
 (a) Acetylacetonate complexes
 (b) Structure of Schiff's base derived from the reaction of salicylaldehyde and ethylene diamines.

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Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. : All Old Batch Students and 200250001 to 200250010

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For Enrollment No. 200250011 to 200250100

Counselling Class Programme		Practical Examination Programme		
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For Enrollment No. : 200250101 to 200250200

Counselling Class Programme		Practical Examination Programme		
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07.06.2022	11.00 AM to 5.00 PM	I	08.06.2022	11:00 AM to 2:00 PM
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		III	09.06.2022	11:00 AM to 2:00 PM
		V	09.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250201 to 200250300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
10.06.2022	11.00 AM to 5.00 PM	I	11.06.2022	11:00 AM to 2:00 PM
		II	11.06.2022	2:30 PM to 5:30 PM
		III	13.06.2022	11:00 AM to 2:00 PM
		V	13.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250301 to 200250700

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
15.06.2022	11.00 AM to 5.00 PM	I	16.06.2022	11:00 AM to 2:00 PM
		II	16.06.2022	2:30 PM to 5:30 PM
		III	17.06.2022	11:00 AM to 2:00 PM
		V	17.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250701 to 200251300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
18.06.2022	11.00 AM to 5.00 PM	I	20.06.2022	11:00 AM to 2:00 PM
		II	20.06.2022	2:30 PM to 5:30 PM
		III	21.06.2022	11:00 AM to 2:00 PM
		V	21.06.2022	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-I
PAPER-VIII
 (Natural Product)
 Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Discuss the structure of Phytol.
- What are Vitamins ? Discuss the classification of Vitamins. Write the important sources of Vitamin and mentioned deficiency Diseases.
- Establish the structure of Vitamin B_{12} . Give the synthesis of Vitamin B_{12} .
- Discuss the structure of abietic acid and conformed by synthetic method.
- Discuss the structure of Vitamin C and discuss its synthesis.
- Explain any **Two** of the following :—
 (a) Santonin (b) Structure of Estrone (c) Synthesis of Chlorophyll-a
- (a) Discuss the position of the two angular methyl group in cholesterol.
 (b) Establish the structure of Vitamin B_6 .
- Discuss the biosynthesis of isoflavones.
- What are Hormones ? Draw the structure of cholesterol, cholestanol and cholestanone.
- Write shorts notes on any **Two** of the following :—
 (a) Morphine (b) Quinine (c) Structure of Zingiberene

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Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. : All Old Batch Students and 200250001 to 200250010

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
31.05.2022	11.00 AM to 5.00 PM	I	01.06.2022	11:00 AM to 2:00 PM
		II	01.06.2022	2:30 PM to 5:30 PM
		III	02.06.2022	11:00 AM to 2:00 PM
		IV	02.06.2022	2:30 PM to 5:30 PM
		V	02.06.2022	2:30 PM to 5:30 PM

For Enrollment No. 200250011 to 200250100

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
03.06.2022	11.00 AM to 5.00 PM	I	04.06.2022	11:00 AM to 2:00 PM
		II	04.06.2022	2:30 PM to 5:30 PM
		III	06.06.2022	11:00 AM to 2:00 PM
		IV	06.06.2022	2:30 PM to 5:30 PM
		V	06.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250101 to 200250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
07.06.2022	11.00 AM to 5.00 PM	I	08.06.2022	11:00 AM to 2:00 PM
		II	08.06.2022	2:30 PM to 5:30 PM
		III	09.06.2022	11:00 AM to 2:00 PM
		IV	09.06.2022	2:30 PM to 5:30 PM
		V	09.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250201 to 200250300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
10.06.2022	11.00 AM to 5.00 PM	I	11.06.2022	11:00 AM to 2:00 PM
		II	11.06.2022	2:30 PM to 5:30 PM
		III	13.06.2022	11:00 AM to 2:00 PM
		IV	13.06.2022	2:30 PM to 5:30 PM
		V	13.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250301 to 200250700

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
15.06.2022	11.00 AM to 5.00 PM	I	16.06.2022	11:00 AM to 2:00 PM
		II	16.06.2022	2:30 PM to 5:30 PM
		III	17.06.2022	11:00 AM to 2:00 PM
		IV	17.06.2022	2:30 PM to 5:30 PM
		V	17.06.2022	2:30 PM to 5:30 PM

For Enrollment No. : 200250701 to 200251300

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
18.06.2022	11.00 AM to 5.00 PM	I	20.06.2022	11:00 AM to 2:00 PM
		II	20.06.2022	2:30 PM to 5:30 PM
		III	21.06.2022	11:00 AM to 2:00 PM
		IV	21.06.2022	2:30 PM to 5:30 PM
		V	21.06.2022	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER-IX
 (Spectroscopy)
 Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- What are the application of ESR in the study of organic and simple inorganic radicals ?
- What are meant by chemical shift in *NMR* spectroscopy ? Describe the factors affecting chemical shift.
 - What are the formula of chemical shift and what increases chemical shift ?
- Distinguish between pure rotational spectrum and vibration rotation spectrum of molecule. How are they different from electronic spectrum ? Which type of molecule give pure rational spectra ?
- State and explain the Franck-Condon principle. How is Franck-Condon principle helpful in predicting the relative intensities of vibronic transition ?
 - Explain bond length calculation. How is bond length related to bond order ?
- Explain the following :—
 - Stark effect.
 - Hyperfine structure in ESR spectra.
- Explain the Zero-field splitting in ESR Spectroscopy. What causes zero field splitting ?
- Determine the ground state term and no. of microstates of
 - Fe⁺³
 - Ni⁺²
 - Mn⁺³
 - Co⁺²
- Explain the following :—
 - Why TMS (Tetramethylsilane) is used as a reference compound in NMR spectroscopy.
 - For the detection of aldehydes and ketone which transition is more authentic : $\pi \rightarrow \pi^*$ or $n \rightarrow \pi^*$ give the answer with reasons.
 - Which of the following nuclei do not show nuclear magnetic resonance :—
¹H, ¹²C, ¹⁴N, ¹⁶O, ¹⁹F and ⁴He.
 - Which of the following are microwave active ?
 - Hcl
 - Co₂
 - H₂
 - O₂
 - HF
- Write notes on any **Two** of the following :—
 - Solution rule in I-R spectroscopy.
 - Steric effect in biphenyls.
 - Beer Lambert Law.
- Explain the following :—
 - Red and Blue shift.
 - Nuclear ion peak and metastable peak.
 - Pascal Triangle and its significance.

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EXAMINATION PROGRAMME-2021
M.Sc. Chemistry, Part-II

Date	Papers	Time	Examination Centre
26.07.2022	Paper-IX	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
28.07.2022	Paper-X	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
30.07.2022	Paper-XI	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
01.08.2022	Paper-XII	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
03.08.2022	Paper-XIII	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
05.08.2022	Paper-XIV	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
06.08.2022	Paper-XV	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
08.08.2022	Paper-XVI	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II
PAPER-X

(Advance Chemical Dynamics)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. Explain the kinetic of reaction in liquid and gas phase. What is diffusion controlled reaction ?
2. What is Faradaic and non-Faradaic process ? Explain stoichiometric number and transfer co-efficients ?
3. Discuss the effect of ionic strength and dielectric constant of the medium on the rate constant of the reaction.
4. Discuss the NMR method for study of fast reaction.
5. Explain the following :—
 - (a) Photo dissociation and recombination reaction.
 - (b) Dynamic calculation vs Transition state theory.
6. Explain Corrosion ? Describe the theories of Corrosion. Discuss the various factors which influence the corrosion.
7. Answer the following :—
 - (a) General Mechanism of Catalytic reaction.
 - (b) Bronsted Catalysis reaction and Oscillatory reaction.
8. Write notes on any **Two** of the following :—
 - (a) Laser Flash Photolysis.
 - (b) Primary and Secondary salt effect.
 - (c) Theory of acid-base catalyst.
9. Describe the postulates of the Transition state theory. Compare between the collision and the transition state theory.
10. Explain the following :—
 - (a) Ground state terms and no. of microstates of d^8 configuration.
 - (b) Activation Controlled Reaction.

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NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XI
(Molecular Thermodynamics)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Explain statistical interpretation of entropy and heat capacity of gases ?
2. Explain the following :—
 (a) Bose-Einstein distribution.
 (b) Fermi-Dirac distribution.
3. Describe the Liouville's theorem and its mathematical interpretation. Why Liouville's theorem is important ?
4. 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.
5. What is Onsegar reciprocal relation ? What is basic of this relationship ? Discuss the unity of these relations in couples flow system.
6. Explain the following :—
 (a) Micro-canonical ensembles.
 (b) Canonical and grand canonical ensembles.
 (c) Comparison of various ensembles.
7. Write notes on any **Two** of the following :—
 (a) Nuclear partition function.
 (b) Entropy of ortho and para hydrogen and their ratio.
 (c) Electronic partition function.
8. State and derive the Bose-Einstein statistic.
9. Entropy production due to heat flow inside the system in irreversible process. Explain.
10. Explain the following :—
 (a) Dulong and Petits law.
 (b) Thermodynamic Reversibility.
 (c) Specific heat of solids.

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 170250001 to 170250200, 180250001 to 180250400 & 190250001 to 190250150

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
11.08.2022	11.00 AM to 5.30 PM	XII	13.08.2022	11:30 AM to 2:30 PM
		XIII	13.08.2022	2:45 PM to 5:45 PM
		XV	16.08.2022	11:30 AM to 2:30 PM
		XVI	16.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250151 to 190250350

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
17.08.2022	11.00 AM to 5.30 PM	XII	18.08.2022	11:30 AM to 2:30 PM
		XIII	18.08.2022	2:45 PM to 5:45 PM
		XV	20.08.2022	11:30 AM to 2:30 PM
		XVI	20.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250351 to 190250600

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
22.08.2022	11.00 AM to 5.30 PM	XII	23.08.2022	11:30 AM to 2:30 PM
		XIII	23.08.2022	2:45 PM to 5:45 PM
		XV	24.08.2022	11:30 AM to 2:30 PM
		XVI	24.08.2022	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XII
(Ligand Field Theory)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Explain charge transfer Bands and their assignment in both octahedral and tetrahedral field.
2. Derive the free ion term, ground state term and no. of microstates of following ions configuration : Fe^{+3} , Fe^{+2} , Cu^{+} , Ni^{+2}
3. Explain the application of ESR spectroscopy in the study of Inorganic Chemistry.
4. (a) How does the term 4F split by spin orbit coupling.
(b) What is Vibronic coupling ?
5. Explain the application of IR spectroscopy in metal carbonyl and nitrosyl.
6. Explain the following :-
(a) Racah Parameters.
(b) Non-crossing Rule.
7. (a) Explain Hund's Rule of maximum spin multiplicity.
(b) Calculate spin orbit coupling constant λ in a d^2 system.
(c) Find out ground state term and no. of microstates in V^{+3} .
8. (a) How IR spectra can be used to distinguish $Fe(II)$ and $Fe(III)$ ion ?
(b) Write selection rules observed in IR spectra of diatomic molecules.
9. Explain the following :-
(a) Nephelauxetic Ratio.
(b) Distinguish between NO^+ and NO by IR spectroscopy.
10. Write notes on any **Two** of the following :-
(a) Spin cross over phenomenon.
(b) Condon Shortley parameters.
(c) Correlation diagram for d^1 and d^8 system.

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 170250001 to 170250200, 180250001 to 180250400 & 190250001 to 190250150

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
11.08.2022	11.00 AM to 5.30 PM	XII	13.08.2022	11:30 AM to 2:30 PM
		XIII	13.08.2022	2:45 PM to 5:45 PM
		XV	16.08.2022	11:30 AM to 2:30 PM
		XVI	16.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250151 to 190250350

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
17.08.2022	11.00 AM to 5.30 PM	XII	18.08.2022	11:30 AM to 2:30 PM
		XIII	18.08.2022	2:45 PM to 5:45 PM
		XV	20.08.2022	11:30 AM to 2:30 PM
		XVI	20.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250351 to 190250600

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
22.08.2022	11.00 AM to 5.30 PM	XII	23.08.2022	11:30 AM to 2:30 PM
		XIII	23.08.2022	2:45 PM to 5:45 PM
		XV	24.08.2022	11:30 AM to 2:30 PM
		XVI	24.08.2022	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XIII
(Organotransition Metal Chemistry and Metal Clusters)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- What is the formula of Zeigler-Natta catalyst ?
 - How Zeigler-Natta catalyst is prepared ?
 - What type of polymerisation is Ziegler-Natta ?
 - What is the coordination polymerisation ? Explain with suitable examples.
- What is the concept of organometallic compounds ?
 - Explain the preparation and structure of Zeise's salt ?
 - What are the application of Zeise's salt ?
- What is metal nitrosyl ? Explain the structure of nitrosyl ? Explain the EAN for central metal atom in Nitrosyl with the example of
 - $[Fe^{-2}(NO^+)_2(CO_2)]$
 - $[Co^{+3}(NO^-)(CN)_5]^{-3}$
- Write the general method of preparation of metal carbonyl and its properties.
- Explain MO diagram of CO.
 - What is 10 electrons rule ?
 - What is naked cluster ?
- Define and explain metal clusters. What are basis on which metal clusters have been categorized ? Give important methods of synthesis.
- Write short notes on any **Two** of the following :-
 - Zintl ions.
 - MO diagram for NO and NO⁺.
 - Gasoline of four types.
- What is ZSM-5 ? How methanol can be transformed into gasoline using ZSM-5 ?
- How you will synthesize the δ -bonded organo-transition metal compounds ?
- Write notes on any **Two** of the following :-
 - MO treatment for 3 centres-2 electron Bond formation in B_2H_6 molecule.
 - Oxo Process.
 - Fischer-Tropsch reaction.

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M.Sc. Chemistry, Part-II
Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 170250001 to 170250200, 180250001 to 180250400 & 190250001 to 190250150

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
11.08.2022	11.00 AM to 5.30 PM	XII	13.08.2022	11:30 AM to 2:30 PM
		XIII	13.08.2022	2:45 PM to 5:45 PM
		XV	16.08.2022	11:30 AM to 2:30 PM
		XVI	16.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250151 to 190250350

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.08.2022	11.00 AM to 5.30 PM	XII	18.08.2022	11:30 AM to 2:30 PM
		XIII	18.08.2022	2:45 PM to 5:45 PM
		XV	20.08.2022	11:30 AM to 2:30 PM
		XVI	20.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250351 to 190250600

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
22.08.2022	11.00 AM to 5.30 PM	XII	23.08.2022	11:30 AM to 2:30 PM
		XIII	23.08.2022	2:45 PM to 5:45 PM
		XV	24.08.2022	11:30 AM to 2:30 PM
		XVI	24.08.2022	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XIV
 (Photochemistry and Pericyclic Reaction)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Explain Barton reaction. Give its synthetic use and application.
2. Explain the stereochemistry of [3, 3] sigmatropic rearrangement under thermal and photochemical method. What is meant by sigmatropic rearrangement ?
3. What is the endo-rule as applied to Diel-Alder reaction ?
4. Give mechanism of Norrish Type-I process. How many types of carbonyl compounds give this reaction ?
5. (a) What do you mean by Pericyclic reaction ? What are the types of Pericyclic reaction ?
 (b) What characterises a Pericyclic reaction ?
 (b) Give Pericyclic reaction examples.
6. Give π molecular diagram of
 (a) 1, 3 – Pentadiene
 (b) 1, 3, 5 – Heptatriene
7. Give the photochemistry of intermolecular dimerisation (2 + 2) cycloaddition ?
8. Discuss Zimmerman mechanism for the rearrangement given by 2, 5-dinones.
9. Explain the following :–
 (a) Photochemistry of aromatic compounds.
 (b) Franck Condon Principle.
10. Write notes on any **Two** of the following :–
 (a) Quenching.
 (b) Singlet and Triplet State.
 (c) Cape rearrangement and Aza Cape rearrangements.

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 170250001 to 170250200, 180250001 to 180250400 & 190250001 to 190250150

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
11.08.2022	11.00 AM to 5.30 PM	XII	13.08.2022	11:30 AM to 2:30 PM
		XIII	13.08.2022	2:45 PM to 5:45 PM
		XV	16.08.2022	11:30 AM to 2:30 PM
		XVI	16.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250151 to 190250350

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.08.2022	11.00 AM to 5.30 PM	XII	18.08.2022	11:30 AM to 2:30 PM
		XIII	18.08.2022	2:45 PM to 5:45 PM
		XV	20.08.2022	11:30 AM to 2:30 PM
		XVI	20.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250351 to 190250600

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
22.08.2022	11.00 AM to 5.30 PM	XII	23.08.2022	11:30 AM to 2:30 PM
		XIII	23.08.2022	2:45 PM to 5:45 PM
		XV	24.08.2022	11:30 AM to 2:30 PM
		XVI	24.08.2022	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER—XV

(Organic Synthesis)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- How are Organo Lithium Compounds prepared ? Explain that Organo Lithium compounds give α, β unsaturated alcohol with α, β unsaturated ketones whereas Grignard reagent give saturated ketones under same conditions.
- Compare relative acidities of the following pair.
 - Benzene sulphonic acid and Benzoic acid.
 - Alcohol and thio alcohol.
- Explain the synthetic use of NaBH_4 . Compare reductions with NaBH_4 and LiAlH_4 .
- How thio alcohol may be prepared from alcohols ? How thiols reacts with :—
 - Acetone
 - Acetyl Chloride
 - HgCl_2
 - NaOH
- Write mechanism of each of the following rearrangements :—
 - Claisens Rearrangement
 - Etard Reaction
- Explain the reduction reaction of the following compound with examples :—
 - Reduction of Aldehydes.
 - Reduction of Ketones.
 - Reduction of Nitro Compounds.
- Write notes on the following :—
 - Sulpha Drug
 - Mustard Gas
 - Barton Reaction
- Explain the synthetic use of H_2O_2 and OsO_4 in the oxidation of alkene to glycol.
- How organo magnesium compound is prepared ? How does Grignard reagent react with
 - Acetaldehyde
 - Formaldehyde
 - Acetone
 - CO_2
 - H_2O
- Discuss preparation and five properties of thioether ?

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M.Sc. Chemistry, Part-II

Programme for Practical Counselling Classes and Practical Examination, 2021

Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 170250001 to 170250200, 180250001 to 180250400 & 190250001 to 190250150

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
11.08.2022	11.00 AM to 5.30 PM	XII	13.08.2022	11:30 AM to 2:30 PM
		XIII	13.08.2022	2:45 PM to 5:45 PM
		XV	16.08.2022	11:30 AM to 2:30 PM
		XVI	16.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250151 to 190250350

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.08.2022	11.00 AM to 5.30 PM	XII	18.08.2022	11:30 AM to 2:30 PM
		XIII	18.08.2022	2:45 PM to 5:45 PM
		XV	20.08.2022	11:30 AM to 2:30 PM
		XVI	20.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250351 to 190250600

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
22.08.2022	11.00 AM to 5.30 PM	XII	23.08.2022	11:30 AM to 2:30 PM
		XIII	23.08.2022	2:45 PM to 5:45 PM
		XV	24.08.2022	11:30 AM to 2:30 PM
		XVI	24.08.2022	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER-XVI
 (Environmental Chemistry and Analytical Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- What are heavy metals which pollute drinking water ? How will you estimate Hg and Pd in water sample ?
- Explain the following :—
 (a) Green House Effect.
 (b) Arsenic in drinking water and its hazardous effect on your health.
- How SO₂, CO₂, CO, NO₂ pollutants gas are measured ? How these gasses damage our health system in society ?
- Explain the following :—
 (a) Rf Value (b) TLC (c) TGA
- Explain biogeochemical cycles in Environment. How do they sustain life in biosphere ?
- What is smog ? What are its mechanism ? How does it harm the human life and other living World ?
- Write notes on any **Two** of the following :—
 (a) Micro and Macronutrients of Soil
 (b) Estimation of total solid in Water.
 (c) Estimation of Protein in given sample.
- (a) What is gasoline ? What are its types on the basis of octane number ?
 (b) Is gasoline a gas or oil ?
 (c) What is a gasoline made of ?
- Write notes on any **Two** of the following :—
 (a) Acid rain
 (b) Measuring of BOD and COD
 (c) Photochemical Reaction in Atmosphere
- What are the basis of following type of chromatography :—
 (a) Paper chromatography.
 (b) Ion exchange chromatograph.
 (c) Column chromatography.

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M.Sc. Chemistry, Part-II
Programme for Practical Counselling Classes and Practical Examination, 2021
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 170250001 to 170250200, 180250001 to 180250400 & 190250001 to 190250150

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
11.08.2022	11.00 AM to 5.30 PM	XII	13.08.2022	11:30 AM to 2:30 PM
		XIII	13.08.2022	2:45 PM to 5:45 PM
		XV	16.08.2022	11:30 AM to 2:30 PM
		XVI	16.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250151 to 190250350

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.08.2022	11.00 AM to 5.30 PM	XII	18.08.2022	11:30 AM to 2:30 PM
		XIII	18.08.2022	2:45 PM to 5:45 PM
		XV	20.08.2022	11:30 AM to 2:30 PM
		XVI	20.08.2022	2:45 PM to 5:45 PM

For Enrollment No. 190250351 to 190250600

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
22.08.2022	11.00 AM to 5.30 PM	XII	23.08.2022	11:30 AM to 2:30 PM
		XIII	23.08.2022	2:45 PM to 5:45 PM
		XV	24.08.2022	11:30 AM to 2:30 PM
		XVI	24.08.2022	2:45 PM to 5:45 PM