

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER-I

(Physical Chemistry)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

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

1. Describe Gibb's-Duhem equation thermodynamically and show how this equation is useful ?
2. Explain the following terms :—
 - (a) Entropy is a state reaction.
 - (b) The relation between the chemical potential and composition.
3. What do you mean by the term ionic strength ? Explain the dependence of activity coefficient on ionic strength ?
4. What are postulates of Lindemann's theory of unimolecular reaction ? Derive mathematical formula for Lindemann mechanism.
 - (a) Derive the activated Complex Theory and Compare with Arrhenius Theory.
 - (b) The hydrolysis of an ester in presence of dilute acid follows first order while that in the presence of dilute alkali follows second order kinetics, explain.
6. Derive the equation of Boltzmann Distribution Law ?
7. What is half wave potential ? What are its significance ?
8. What are the basic difference between additive polymer and condensation polymer ? Explain by means of one example for each.
9. What are macromolecules ? What methods are employed for determination of the molecular weights of polymer ? Describe scattering method of defoat.
10. Write notes on any **Two** of the following :—
 - (a) Tafal Plot
 - (b) Polarography
 - (c) Overpotential

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Examination Programme, 2019

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
15.07.2019	Paper-I	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
17.07.2019	Paper-II	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
19.07.2019	Paper-III	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
23.07.2019	Paper-IV	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
25.07.2019	Paper-VI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
27.07.2019	Paper-VII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER-II

(Inorganic Chemistry)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. Draw molecular orbital diagram of CO_2 and CH_2 molecule. Explain their configuration bond order, stability and magnetic property.
2. State and explain Bent rule with suitable examples. Apply bent rule in prediction of bond angles in $H-C-H$ and in $CH_3-C \equiv CH$ molecule.
3. Construct the character table for the point group C_{2v} and C_{3v} .
4. Determine the ground state term symbol and Free Ion Term for d^2 , d^4 and d^5 system. Determine also their no. of microstates.
5. What are Boranes ? How they are classified ? Describe the structure and bonding in any four of them.
6. (a) What are Lanthanides ? Write electronic configuration of all 14 lanthanides elements.
(b) Explain Lanthanide contraction and its consequences ?
7. Explain why the molecule of CO_2 and methane CH_4 possess zero dipole moment.
8. (a) Describe the shell-model and liquid drop model of a nucleus.
(b) Write a note on G-M counter.
9. 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.
10. Write notes on any **Two** of the following :—
 - (a) Carboranes.
 - (b) Application of radioisotopes in medical sciences.
 - (c) Metal-metal multiple bonding.

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Examination Programme, 2019

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
15.07.2019	Paper-I	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
17.07.2019	Paper-II	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
19.07.2019	Paper-III	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
23.07.2019	Paper-IV	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
25.07.2019	Paper-VI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
27.07.2019	Paper-VII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

प्रायोगिक परामर्श कक्षा एवं प्रायोगिक परीक्षा का कार्यक्रम पार पृष्ठ पर देखें /

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER—III

(Organic Chemistry)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. What is Aromaticity ? What are the salient features of Eric Huckel theory of aromaticity with mentioning of Huckel's Rule. Will cyclooctatetraene show aromatic character ?
2. Explain the conformations of Dimethyl Cyclohexanes.
3. What are Carbenes ? How are they generated ? Give the important reactions of Carbenes.
4. (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) Cyclo pentadiene, (iii) Pyrrole.
5. What do you mean by aromatic nucleophilic substitution ? Explain unimolecular Nucleophilic aromatic substitution reaction.
6. Explain conformation of cyclohexane and also discuss the effect of conformation on chemical reactivity.
7. Explain the mechanism of Elimination Bimolecular reaction with suitable examples.
8. Explain the following :—
 - (a) Halogens are ortho and para directing group.
 - (b) Diazonium coupling reaction.
 - (c) NO₂ group is meta-directing group.
9. Write short notes on any **Two** of the following mechanism :—
 - (a) Perkin reaction.
 - (b) Aldol addition reaction.
 - (c) Michael reaction.
 - (d) Mannic reaction.
10. Explain any **Two** term of the following :—
 - (a) Hyper Conjugation.
 - (b) Tautomerism.
 - (c) Element of symmetry.

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Examination Programme, 2019

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
15.07.2019	Paper-I	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
17.07.2019	Paper-II	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
19.07.2019	Paper-III	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
23.07.2019	Paper-IV	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
25.07.2019	Paper-VI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
27.07.2019	Paper-VII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

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M.Sc. Chemistry, Part-I
PAPER-IV

(Solid State Chemistry & Quantum Chemistry)
Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

- Determine the term symbol, ground state term and no. of microstates of following configuration :-
(a) d^2 system (b) d^5 system (c) d^7 system
- Explain intrinsic and extrinsic semiconductors. What are the application of semiconductors ? What is doping semiconductors ?
- Discuss solid state defect with special reference to :—
(a) Schottky defect (b) Frenkel defect
- Derive the Schrödinger wave equation with respect to space. Derive the equation also for H-atom.
- (a) Discuss the postulates of Quantum mechanics.
(b) What is Eigen function and Eigen value ?
- What is maximum electron density in H-atom in the 2s and 2p states ?
- To hybrid orbitals has 20% and 80% p-character. Give the expression for the hybrid orbitals and determine the angle between them.
- How the crystal planes are characterized ? How Miller indices helps in determining the interplanar distance ? Calculate the interplanar distances of b.c.c. and f.c.c. crystals.
- Explain the following terms :—
(a) Perfect and Imperfect Crystals.
(b) Non-conductor and Semi-conductor.
(c) Super conductor.
- Explain any **Two** term of the following :—
(a) Hybridisation and Molecular Geometry..
(b) Pauli Exclusion Principle.
(c) Operators.

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Examination Programme, 2019
M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
25.07.2019	Paper-VI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
27.07.2019	Paper-VII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

<i>प्रायोगिक परामर्श कक्षा एवं प्रायोगिक परीक्षा का कार्यक्रम पार पृष्ठ पर देखें ।</i>

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I
PAPER-V

(Co-ordination Chemistry)
Annual Examination, 2019

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 terms, ground term and no. of microstates for Fe^{+3} , Sc^{++2} and Cu^{+1} ion.
- Draw molecular orbital diagram of $[\text{Co}(\text{CN})_6]^{-3}$.
- Discuss the reaction mechanism of substitution reaction in octahedral complex along with the factors that causes complication.
- What do you understand by crystal field stabilization energy in complexes ? What are the factors which determine the crystal field stabilization energy. Justify the order $\Delta_{sp} > \Delta_o > \Delta_t$.
- Explain the multiplet width. Explain population of J level in context to KT.
- Determine CFSE value for d^2 , d^3 , d^8 and d^{10} configuration with d-orbital occupancy diagrams.
- Explain Russel and Saunder's coupling scheme. Calculate free ion ground state term and no. of microstates for the d^2 and d^9 systems ?
- Define stepwise and over all stability constant. How they are related to each other ?
- Explain any **Two** of the following terms :-
 - Limitation of Crystal Field Theory.
 - John & Teller Effect.
 - Quenching of orbitals.
- Write notes on any **Two** of the following :-
 - Labile and inert complex.
 - Trans effect.

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प्रायोगिक परामर्श कक्षा एवं प्रायोगिक परीक्षा का कार्यक्रम पार पृष्ठ पर देखें ।

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER-VI

(Chemistry of Biomolecule)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. What is carbohydrate ? Establish the ring structure of glucose.
2. Discuss and derive the structure of atropine ? Establish its structure by synthesis.
3. What do you understand by the term terpenoids ? Explain isoprene and special isoprene rule and their exception.
4. How will you establish the Primary, Secondary and Tertiary structure of protein ?
5. Discuss the degradative and synthetic evidences leading to the structure of nicotine.
6. Name the important lipids. Write details about biological functions of Lipids and its metabolism.
7. Discuss the structure of DNA. In what ways the structure of DNA differs from that of RNA ?
8. Write notes on any **Two** of the following :—
 - (a) Enzymatic hydrolysis of Nucleic acid.
 - (b) Inversion of sucrose.
 - (c) Peptides linkage.
9. What is relation between in the following set ?
 - (a) A nucleotide and nucleoside.
 - (b) Ribose and Deoxyribose.
 - (c) Fructose and Glucose.
10. 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

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Examination Programme, 2019

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
25.07.2019	Paper-VI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
27.07.2019	Paper-VII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

प्रायोगिक परामर्श कक्षा एवं प्रायोगिक परीक्षा का कार्यक्रम पार पृष्ठ पर देखें ।

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I PAPER-VII

(Reaction Mechanism and Super Molecular Chemistry)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. Explain any Two of the following :—
 - (a) Marcus-Husch Theory.
 - (b) Bailar Twist Mechanism.
 - (c) Complimentary and Non-complimentary Reaction.
2. Define photo substitution and explain with suitable example. Explain photo oxidation and photo reduction theory.
3. Mention substitution reaction which undergoes without Cleavage of metal-ligand bond. Give mechanism with suitable examples.
4. Why certain electron transfer reaction proceed by inner sphere mechanism and some by outer sphere mechanism ? Explain.
5. Explain any **Two** of the following :—
 - (a) No. of ground state term and microstates in Co^{+2} ion.
 - (b) Magnetic Properties of Lanthanides.
 - (c) Mixed Valence Complexes and other electron transfer model.
6. How the supramolecular catalysts are similar to enzyme catalyst ? What are differences between them ?
7. Give two general methods of preparation of metal alkoxide. Draw the structure of dimeric and transmeric alkoxides.
8. Describe the energy state of octahedral Chromium(III) complex and associated photochemical process.
9. Explain the isomerisation of octahedral complexes and intermolecular rearrangement ?
10. Write notes on any **Two** of the following :—
 - (a) Schiff base metal complexes.
 - (b) $\text{S}_{\text{N}}\text{CB}$ mechanism.
 - (c) Photochemical reaction.
 - (d) Reaction of geometrical and optical isomers.

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Examination Programme, 2019

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
25.07.2019	Paper-VI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
27.07.2019	Paper-VII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

प्रायोगिक परामर्श कक्षा एवं प्रायोगिक परीक्षा का कार्यक्रम पार पृष्ठ पर देखें ।

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER-VIII

(Natural Product)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions.
All questions carry equal marks.

1. Establish the structure of Vitamin B_{12} . Give the synthesis of Vitamin B_{12} .
2. Discuss the structure of Phytol.
3. How flavone is related to isoflavone ? Give critical account of the structure determination and synthesis of isoflavone.
4. What are Vitamins ? Discuss the classification of vitamins. Write the important sources of vitamin and mentioned deficiency diseases.
5. Discuss the point linkage between quinic acid and mesoquinene of quinine.
6. Write notes on any **Two** of the following :—
 - (a) Presence of phenanthrene nucleons in morphine.
 - (b) Structure of cholesterol and chlostenal.
 - (c) Narcotine.
7. Discuss the structure of abietic acid and conformed by synthetic method.
8. What are porphyrins ? Write the degradative and synthetic evidence for the determination of structure of Haemin.
9. Discuss the structure of Vitamin C and discuss its synthesis.
10. Explain any **Two** of the following :—
 - (a) Synthesis of Chlorophyll-a.
 - (b) Structure of Eestron.
 - (c) Santonin.

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Examination Programme, 2019

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
29.07.2019	Paper-VIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
31.07.2019	Paper-V	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

प्रायोगिक परामर्श कक्षा एवं प्रायोगिक परीक्षा का कार्यक्रम पार पृष्ठ पर देखें ।

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER-IX

(Spectroscopy)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- (a) State and explain the Franck-Condon principle. How is Franck-Condon principle helpful in predicting the relative intensities of vibronic transition ?
(b) Explain Bond length calculation.
- Distinguish between pure rotational spectrum and vibration rotation spectrum of molecule. How are they different from electronic spectrum ?
- Explain the following :—
(a) Stark effect.
(b) Isotopic effect.
- What are the application of ESR in the study of organic and simple inorganic radicals ?
- What is meant by the chemical shift in *NMR* spectroscopy. Describe the factors affecting chemical shift. Explain the fine structure.
- Derive spectroscopic terms for p^2 configuration and write down Hund's rule to find out ground state term and no. of microstates for this configuration.
- Explain the following :—
(a) Why TMS (Tetramethylsilane) is used as a reference compound in NMR spectroscopy.
(b) For the detection of aldehydes and ketones which transition is more authentic : $\pi \rightarrow \pi^*$ or $n \rightarrow \pi^*$ give the answer with reasons.
(c) Which of the following diatomic molecules do not absorb in the infra-red region :
HCl, ClBr, N_2 , H_2 , O_2
(d) Which of the following are microwave active ?
(i) HCl (ii) CO_2 (iii) H_2 (iv) O_2
- Write notes on any **Two** of the following :—
(a) Selection rule in I.R. Spectroscopy.
(b) Quantum theory.
(c) Steric effect in biphenyls.
- Explain the following :—
(a) Beer Lambert Law.
(b) Red and Blue shift.
(c) Nuclear ion peak and metastable peak.
- Determine the ground state term and no. of microstates of
(a) Fe^{+2} (b) Cu^{+2} (c) Mn^{+3} (d) Co^{+2}

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Examination Programme, 2019

M.Sc. Chemistry, Part-II

Date	Paper	Time	Examination Centre
06.08.2019	Paper-IX	8.00 AM to 11.00 AM	Nalanda Open University, Patna
08.08.2019	Paper-X	8.00 AM to 11.00 AM	Nalanda Open University, Patna
10.08.2019	Paper-XI	8.00 AM to 11.00 AM	Nalanda Open University, Patna
12.08.2019	Paper-XII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
14.08.2019	Paper-XIII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
16.08.2019	Paper-XIV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
20.08.2019	Paper-XV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
22.08.2019	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, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Explain Corrosion ? Describe the theories of Corrosion. How a metal can be protected from corrosion ?
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. What do you understand by the dynamics of reaction ? What is mechanism of activation ? Discuss rate of reaction on theoretical potential energy surfaces.
5. What is Kinetic primary and secondary salt effect ? Describe the Bronsted Bjerrum equation.
6. Answer the following :—
 - (a) General Mechanism of Catalytic reaction.
 - (b) Bronsted Catalysis reaction and Oscillatory reaction.
7. Discuss the NMR method for study of fast reaction.
8. Write notes on any **Two** of the following :—
 - (a) Oscillatory reaction.
 - (b) Arrhenius Intermediates.
 - (c) Laser Flash Photolysis.
9. Explain the following :—
 - (a) Photo dissociation and recombination reaction.
 - (b) Dynamic calculation vs Transition state theory.
10. Explain the kinetic of reaction in liquid and gas phase. What is diffusion controlled reaction ?

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M.Sc. Chemistry, Part-II

Programme for Practical Counselling Classes and Practical Examination, 2019

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

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER–XI

(Molecular Thermodynamics)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. 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.
2. What is Onsegar reciprocal relation ? What is basic of this relationship ? Discuss the unity of these relations in couples flow system.
3. Explain the following :—
(a) Comparison of various ensembles. (b) Canonical and grand canonical ensembles.
(c) Micro-canonical ensembles.
4. Derive Boltzmann distribution Law for non-degenerate energy level. What is condition of applicability of Boltzmann statistics ?
5. Derive expression for any **Two** of the following :—
(a) Rotational partition function. (b) Translational partition function.
(c) Vibrational partition function.
6. What is specific heat of solid ? Describe the Einstein theory of specific heat of solid and derive Einstein equation for specific head of solid. What are merits and limitation of the Einstein theory ?
7. Describe the Liouville's theorem and its mathematical interpretation.
8. Explain the following :—
(a) Bose-Einstein distribution. (b) Fermi-Dirac distribution.
9. Write notes on any **Two** of the following :—
(a) Nucelar partition function. (b) Flory's theory of liquid visosity.
(c) Entropy of ortho and para hydrogen and their ratio.
10. Explain statistical interpretation of entropy and heat capacity of gases ?

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M.Sc. Chemistry, Part–II

Programme for Practical Counselling Classes and Practical Examination, 2019

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

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER-XII

(Ligand Field Theory)

Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Derive the free Ion term, ground state term and no. of microstates of following configuration : Fe^{+3} , Fe^{+2} , Cu^+ , Cu^{+2}
2. Explain the application of E.S.R. Spectroscopy in study of Inorganic Chemistry.
3. What are the condition to occur for Mossbauer spectra ? Discuss its important application.
4. Explain charge transfer Bands and their assignment in both octahedral and tetrahedral field.
5. (a) Assign the ground state term for Mn^{+2} and V^{+2} ions. What are the no. of microstate of these two ions ?
(b) How does the term 4F split by spin orbit coupling.
6. (a) Explain Tanabe-Sugano diagram of d^2 system.
(b) What is vibronic coupling.
7. (a) Explain John-Teller distortion giving example of the spectra of $[Ti(H_2O)_6]^{+3}$ and $[Cu(H_2O)_6]^{+2}$.
(b) What is Racah parameters.
8. Explain the application of IR spectroscopy in metal carbonyls and nitrosyls.
9. Explain the following :-
(a) Cross Over Points.
(b) Correlation diagrams for d^1 and d^8 systems.
10. Write short notes on any **Two** of the following :-
(a) Condon-shortly parameters. (b) Transfer Bands and their assignments.
(c) Lande Interval rule.

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M.Sc. Chemistry, Part-II

Programme for Practical Counselling Classes and Practical Examination, 2019

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

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	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, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Write the general method of preparation of metal carbonyl and its properties.
- (a) Explain molecular orbital diagram of CO.
(b) What is 10 electrons rule ?
- Explain non-rigid coordination compound of different co-ordination number.
- Define and explain metal clusters. What are basis on which metal clusters have been categorized ? Give important methods of synthesis.
- What is ZSM-5 ? How methanol can be transformed into gasoline using ZSM-5 ?
- Discuss the nature of bonding in following compounds,
(a) $Fe(\eta^5 - C_6H_5)_2$
(b) $Cr(\eta^6 - C_6H_5)_2$
- What is Zeigler-Natta catalyst ? How ethylene is polymerized to produce useful material like plastic, fibres and PVC ? Discuss mechanism involved in it ?
- How you will synthesize the δ bonded organo-transition metal compound.
- What are the factors determining the stability of transition metal alkyls ? Why organometallic compounds are more stable than alkyl organometallic compounds.
- Write notes on any **Two** of the following :–
(a) Polyatomic Zinotheanions and Cation.
(b) Oxo Process.
(c) Fischer-Tropsch reaction.

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2019
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER-XIV

(Photochemistry and Pericyclic Reaction)
Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

1. Give mechanism of Norrish type I process. How many types of Carbonyl compounds gives this reaction ?
2. Write notes on the following :—
 (a) Controtatory motion.
 (b) Frank Condon principle.
3. What do you mean by Pericyclic reaction ? What are the types of Pericyclic reaction ? Write them with suitable examples.
4. Write down the explanatory notes on Cope-rearrangement and Aza-Cope rearrangement. Write down the selection rules for sigmatropic rearrangement.
5. Give the mechanism of Norrish type II process. Which Ketones are most common class of compound of β -cleavage and why ?
6. Explain and discuss photochemistry of intermolecular dimerisation of alkene by (2+2) cycloaddition.
7. What is the endo-rule as applied to Diel-Alder reaction ?
8. Give the mechanism for the rearrangement of cyclo dienones and explain the rearrangement of cyclodieneones involving diradical intermediate in presence of hydrogen donor or in absence of hydrogen donor.
9. Explain the stereochemistry of [3, 3] sigmatropic rearrangement under thermal and photochemical method.
10. Explain Barton reaction. Give its synthetic use and application.

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M.Sc. Chemistry, Part-II
Programme for Practical Counselling Classes and Practical Examination, 2019
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

<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>
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

<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>
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

<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>
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

<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>
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	2:45 PM to 5:45 PM

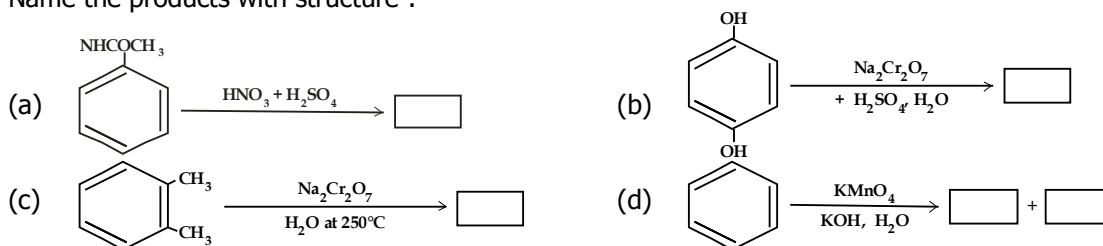
NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XV
 (Organic Synthesis)
 Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- Write notes on the following :—
 (a) Sulpha drugs (b) Barton reaction (c) Mustard gas (d) Etard reaction
- How are Organolithium Compounds Prepared ? Explain that Organolithium compounds give α , β -unsaturated alcohol with α , β -unsaturated ketones whereas Grignard reagents give saturated ketones under similar conditions.
- Compare relative acidities of the following pair.
 (a) Benzene sulphonic acid and Benzoic acid. (b) Alcohol and thio alcohol.
- Explain the synthetic use of NaBH_4 . Compare reductions using NaBH_4 and LiAlH_4 .
- How thio alcohol may be prepared from alcohol ? How does this alcohol react with
 (a) Acetone, (b) Mercuric oxide, (c) Lead acetate, and (d) Acetyl Chloride.
- Write mechanism of each of following rearrangements :—
 (a) Claisen Rearrangement. (b) Arndt Eistert Reaction.
- (a) Discuss the mechanism of Baeyer-Villiger oxidation and Dakin reaction.
 (b) What is the Haloform reaction ? How methyl ketones are converted into carboxylic acids ? Give mechanism.
- Write notes on any **Two** :— (a) Silanes (b) Prevost reaction. (c) Friedal craft reaction
- Explain, why an α -monobromocarbonyl compounds cannot be prepared by treating a carbonyl compound.
- Name the products with structure :—



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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2019
Venue : Chemistry Lab, 4th Floor, Biscamaun Bhawan, Patna

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

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

(Environmental Chemistry and Analytical Chemistry)
Annual Examination, 2019

Time : 3 Hours.

Full Marks : 80

Answer any FIVE Questions. All questions carry equal marks.

- What are different parameters which determine water quality ? How you will estimate total solid in water.
- Explain composition of soil. Discuss the organic and inorganic components of soil. Write a note on waste treatment of soil.
- How will you estimate (a) Protein and (b) Ascorbic Acid in the given sample ? Describe it.
- What do you understand by the term smog ? What is its mechanism ? How does its harm to human beings and other living kingdom ?
- Explain biogeochemical cycles in Environment ? How do they sustain life in biosphere ?
- Explain the following :—
(a) Rf Value (b) TLC (c) TGA
- How SO₂, CO₂, CO, NO₂ pollutants gas are measured. How these gasses damage our health system in society ?
- Explain the following :—
(a) Green House Effect.
(b) Arsenic in drinking water and its hazardous effect on our health.
- What are heavy metals which pollute drinking water ? How will you estimate Hg and Pd in water sample ?
- Write notes on any **Two** of the following :—
(a) Acid rain
(b) Measuring of COD and BOD
(c) Micro and Macronutrient of Soil

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M.Sc. Chemistry, Part-II

Programme for Practical Counselling Classes and Practical Examination, 2019

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

For Enrollment No. 140250001 to 140250020, 150250001 to 150250330 & 160250001 to 160250200

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
02.09.2019 & 03.09.2019	11.00 AM to 5.00 PM	XII	04.09.2019	11:30 AM to 2:30 PM
		XIII	04.09.2019	2:45 PM to 5:45 PM
		XV	05.09.2019	11:30 AM to 2:30 PM
		XVI	05.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 160250201 to 160250500 & 170250001 to 170250050

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
06.09.2019 & 07.09.2019	11.00 AM to 5.00 PM	XII	09.09.2019	11:30 AM to 2:30 PM
		XIII	09.09.2019	2:45 PM to 5:45 PM
		XV	11.09.2019	11:30 AM to 2:30 PM
		XVI	11.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250051 to 170250250

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
12.09.2019 & 13.09.2019	11.00 AM to 5.00 PM	XII	14.09.2019	11:30 AM to 2:30 PM
		XIII	14.09.2019	2:45 PM to 5:45 PM
		XV	16.09.2019	11:30 AM to 2:30 PM
		XVI	16.09.2019	2:45 PM to 5:45 PM

For Enrollment No. 170250251 to 170250480

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
17.09.2019 & 18.09.2019	11.00 AM to 5.00 PM	XII	19.09.2019	11:30 AM to 2:30 PM
		XIII	19.09.2019	2:45 PM to 5:45 PM
		XV	20.09.2019	11:30 AM to 2:30 PM
		XVI	20.09.2019	2:45 PM to 5:45 PM