NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER–I

(Physical Chemistry)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. Explain Boltzmann Distribution Law. Derive its mathematical equation and general form.
2. Explain the following terms :—
   (a) Entropy is a state reaction.
   (b) The relation between the chemical potential and composition.
3. Write notes on any ***Two*** of the following :—
   (a) Flash Photolysis
   (b) Polarography
   (c) What do you mean by reactions with orders (1, 2) and (2, 1).
4. Define and derive the term 'Partition function'. Show the relation between the partition function and the internal energy.
5. Explain the following :–
   (a) An ensemble and types of ensembles.
   (b) Corresponding distribution law by Lagrange's method of undetermined multipliers.
6. Express the term molecular interpretation of second law and third law of thermodynamics. Give atleast one example in each case.
7. What are macromolecules ? What methods are employed for determination of the molecular weights of polymer ? Describe scattering method of its determination.
8. What do you mean by the term ionic strength ? Explain the dependence of activity coefficient of ionic strength.
9. What do you understand by the term over potential ? Write notes on :—
   (a) Oxygen overvoltage and
   (b) Hydrogen overvoltage.
10. What is half wave potential ? What are its significance ?

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EXAMINATION PROGRAMME-2020

M.Sc. Chemistry, Part-I

Date	Papers	Time	Examination Centre
05.04.2021	Paper–I	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
07.04.2021	Paper–II	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
09.04.2021	Paper–III	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
12.04.2021	Paper–IV	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
15.04.2021	Paper–V	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
17.04.2021	Paper–VI	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
22.04.2021	Paper–VII	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
26.04.2021	Paper–VIII	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-I

PAPER–II

(Inorganic Chemistry)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. (a) What are VSPER theory ?
   (b) Explain the shape and hybridization of the following :–
   (i) X_eF_6 (ii) IF_7 (iii) NH_4^+

2. Draw the molecular orbital diagram of following with the parameters of Bond order stability and magnetic properties :–
   (a) No_2 (b) Co_2

3. (a) What are Lanthanide contractions ? Compare it with Actinide Contraction ?
   (b) What are the consequences of Lanthanide Contraction ?

4. Construct the character table of C_{2V} and C_{3V}.

   Or

   Determine the term symbol, ground state and no. of microstates of Cu^{++}, Mn^{+2}, Cr^{+}.

5. Explain why the molecule of Co_2 and CH_4 possess zero dipole moment.

6. (a) Describe the shell model and liquid drop model of a nucleus.
   (b) Write a note on G-M counter.

7. Explain $d\pi - P\pi$ bonding by giving suitable examples and write short notes on Bent rule.

8. Explain the following :–
   (a) Nuclear reactions and their types.
   (b) Nuclear fission and manufacturing of atom bomb.

9. What are Boranes ? How they are classified ? Describe the structure and bonding in any four of them.

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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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, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. Explain the mechanism of Bimolecular Elimination reaction with suitable examples.
2. What do you understand by Carbocation and Carbonion ? Explain their stability.
3. Explain the mechanism of following reaction :—
   (a) Benzoin Condensation
   (b) Gattermann-Koch Reaction.
4. Explain the aromaticity and give details of Huckel molecular orbital theory.
5. Explain the conformations of Dimethyl Cyclohexanes and discus the effect of conformation on chemical reactivity.
6. (a) Explain why aniline is more reactive than acetanilide in electrophilic substitution.
   (b) Chlorobenzene is far less reactive than aniline in electrophilic substitution although chlorine and nitrogen have almost the same electronegalivity.
7. What are Carbenes ? How are they generated ? Give the important reactions of Carbenes.
8. Explain the following :—
   (a) $-NH_2$ group is ortho and para directing group.
   (b) $-NO_2$ group is meta-directing group.
   (c) Halogens are ortho and para directing group.
9. Write notes on any ***Two*** of the following :—
   (a) Aldol addition reaction.
   (b) Benzoin Condensation.
   (c) Perkin Reaction.
   (d) Mannic reaction.
10. Discuss with suitable examples :—
    (a) Plane of symmetry.
    (b) Reflection symmetry.

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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–IV
(Solid State Chemistry & Quantum Chemistry)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. Calculate the average distance of the electron from nucleus of Hydrogen atom in the 2s configuration.
2. What are perfect and imperfect crystals ? Write note on the cohesive energy.
3. What are intrinsic and extrinsic semiconductors ? Write short note on doping of a crystal.
4. State Hermitian operator. Discuss its two important properties and explain it.
5. Write notes on the following :—
   (a) Zero-point energy.
   (b) Basic assumption of the Hückel theory of conjugated system.
6. Determine the term symbol and no. of microstates of following & configuration :–
   (a) d^2 system
   (b) d^5 system
   (c) p^2 system
7. Write notes on any ***Two*** of the following :–
   (a) Difference between conductor, semi-conductor and non-conductor.
   (b) Pauli exclusion principle.
   (c) Hunds rule of maximum spin multiplicity.
8. Discuss the postulates of Quantum mechanics.
9. Derive the Schrödinger wave equation with respect to space.
10. Discuss solid state defect with special reference to :—
    (a) Schottcky defect
    (b) Frenkel defect

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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–V

(Co-ordination Chemistry)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. Calculate the free ion ground state term and no. of microstates of following configuration :—
   Ti^{+3}, Cr^{+}, Fe^{++}, Sc^{++}

2. (a) How does the d-orbital split in octahedral crystal field ?
   (b) Calculate the CFSE for d^3, d^4 and d^6 ion in octahedral field with strong and weak ligands.

3. S and P terms do not split in crystal field but D and F term split. Explain.

4. Draw the MO diagram of $[C_0(CN)_6]^{-3}$.

5. Explain the following :–
   (a) Labile and inert complex
   (b) Acid hydrolysis reaction

6. Discuss the reaction mechanism of substitution reaction in octahedral complex along with the factors that causes complication.

7. (a) Explain magnetic moment and magnetic susceptibility and establish relationship between them.
   (b) Calculate the free ion ground terms and no. of microstate of following :—
   Mo^{++}, Mn^{+2}, Co^{+2}, V^{+2}

8. Explain the multiplet width. Explain population of J level in context to KT.

9. Write notes on the following :—
   (a) Limitation of Crystal Field Theory
   (b) John and Teller Effect..

10. (a) Explain magnetic moment and magnetic susceptibility and establish relation between them.
    (b) Determine the magnetic moment (μ) of following ions :–
    Fe^{+3}, V^{+2}, Co^{+2}, Fe^{+2}

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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, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. What are Carbohydrates ? Establish the ring structure of glucose.
2. What are aminoacids ? Discuss the chemical reaction of aminoacids involving the both functional groups present in the molecule.
3. Write down the structure and synthesis of any ***Two*** of the following :—
   (a) Adenine
   (b) Guanine
   (c) Uracil
4. What are alkaloids ? How are they classified ? Give details of Quinine.
5. What are Glycosides ? Give classification of glycosides. Determine the structure of glycosides by its synthesis ?
6. What are important Lipids ? Write details about biological functions of Lipid and its metabolism ?
7. How you will carry the following conversions :–
   (a) Glucose to Fructose
   (b) Citral to Cyclocitrals
   (c) Fructose to Glucose
8. Discuss the structure of DNA. In what ways the structure of DNA differs from that of RNA.
9. Discuss and derive the structure of atropine. Establish its structure by synthesis.
10. Write notes on any ***Two*** of the following :—
    (a) Inversion of sucrose.
    (b) Peptides linkage
    (c) Blanc rule.

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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–VII

(Reaction Mechanism and Super Molecular Chemistry)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. (a) Describe inner and outer sphere mechanism of electron transfer reaction in complexes. Give examples.
   (b) What are non-complimentary reaction.
2. (a) Explain association and dissociative mechanism. Give examples ?
   (b) Explain $S_N CB$ mechanism by giving examples.
3. (a) What do you mean by prompt and delayed photochemical reaction ? Give examples.
   (b) Define photo substitution and explain with suitable examples.
4. Write special features of anionic bonding. Write the synthesis of crown ether ?
5. Write in detail about the following :–
   (a) Metal alkoxides
   (b) Acetylacetonate complexes
6. Describe the path way of optical inversion and isomerization.
7. Write notes on Helicate, Rosettes, Cage in Supramolecular chemistry.
8. How the supramolecular catalysts are similar to enzyme catalyst ? What are differences between them ?
9. Explain the following :—
   (a) Bailar twist mechanism.
   (b) Marcus-Husch theory.
10. Explain the Free-ion ground state terms of d^2, d^7, d^3 configuration with its no. of microstates.

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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–VIII

(Natural Product)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. What are Terpenoids ? How are they classified ? Establish the structure of Phytol.
2. Write shorts notes on the following :–
   (a) Morphine
   (b) Quinine
3. What are Hormones ? Draw the structure of cholesterol, cholestanol and cholestanone.
4. Discuss biosynthesis of isoflavones.
5. Discuss the structure of Vitamin C and its synthesis.
6. Discuss the structure of abietic acid and conformed by synthetic method.
7. What are porphyrins ? Write the degrative and synthetic evidence for the determination of structure of Haemin.
8. Establish the structure of Vitamin B_2. Give the synthesis of Vitamin B_2.
9. Write the Wood Synthesis of Chlorophyll-a and also give degradative evidences for the elucidation of the structure of Chlorophyll-a.
10. Discuss the point linkage between quininic acid and meroquinene of quinine.

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M.Sc. Chemistry, Part–I

Programme for Practical Counselling Classes and Practical Examination, 2020

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

For Enrollment No. : All Old Batch Students and 190250001 to 190250030		
Paper	***Date***	***Time***
I	15.09.2021	11:00 AM to 2:00 PM
II	15.09.2021	2:30 PM to 5:30 PM
III	16.09.2021	11:00 AM to 2:00 PM
V	16.09.2021	2:30 PM to 5:30 PM

For Enrollment No. 190250031 to 190250130		
Paper	***Date***	***Time***
I	18.09.2021	11:00 AM to 2:00 PM
II	18.09.2021	2:30 PM to 5:30 PM
III	20.09.2021	11:00 AM to 2:00 PM
V	20.09.2021	2:30 PM to 5:30 PM

For Enrollment No. : 190250131 to 190250210		
Paper	***Date***	***Time***
I	21.09.2021	11:00 AM to 2:00 PM
II	21.09.2021	2:30 PM to 5:30 PM
III	22.09.2021	11:00 AM to 2:00 PM
V	22.09.2021	2:30 PM to 5:30 PM

For Enrollment No. : 190250211 to 190250300		
Paper	***Date***	***Time***
I	23.09.2021	11:00 AM to 2:00 PM
II	23.09.2021	2:30 PM to 5:30 PM
III	24.09.2021	11:00 AM to 2:00 PM
V	24.09.2021	2:30 PM to 5:30 PM

For Enrollment No. : 190250301 to 190250450		
Paper	***Date***	***Time***
I	25.09.2021	11:00 AM to 2:00 PM
II	25.09.2021	2:30 PM to 5:30 PM
III	27.09.2021	11:00 AM to 2:00 PM
V	27.09.2021	2:30 PM to 5:30 PM

For Enrollment No. : 190250451 to 190250600		
Paper	***Date***	***Time***
I	29.09.2021	11:00 AM to 2:00 PM
II	29.09.2021	2:30 PM to 5:30 PM
III	30.09.2021	11:00 AM to 2:00 PM
V	30.09.2021	2:30 PM to 5:30 PM

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER–IX

(Spectroscopy)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. Explain the following :—
   (a) Why Tetramethylsilane (TMS) is used as a reference compound in NMR spectroscopy.
   (b) For the detection of aldehydes and ketones, which transition is more authentic :– $\pi \rightarrow \pi^*$ *on* $n \rightarrow \pi^*$, give the answer with reason.
   (c) Which of the following nuclei do not show nuclear magnetic resonance :– ^1H, ^{12}C, ^{14}N, ^{16}O, ^{19}F, ^4He
   (d) Which of the following are microwave active ?
   (i) Hcl (ii) Co_2 (iii) H_2 (iv) O_2
2. Write notes on any ***Two*** of the following :—
   (a) Selection rules for pure rotational Raman spectra of a diatomic molecules
   (b) Coupling Constant
   (c) Pascal Triangle
3. Explain any ***Two*** of the following :—
   (a) d-d transition (b) $n \rightarrow 6^*$ transition (c) Franck-condon principle
4. (a) Which of the following diatonic molecules do not absorb in the infra-red region :—
   Hcl, Co_2, H_2, O_2
   (b) NMR spectra are not observed in ^{12}C nuclei, because it nuclear spin quantum number :—
   (i) $I = \frac{1}{2}$ (ii) $I = 0$ (iii) $I = 1$ (iv) $I = -1$.
   (c) The no. of modes of bonding vibration in non-linear molecule containing n atoms is :—
   (i) 2n – 5 (ii) 3n – 5 (iii) 2n – 6 (iv) 3n – 6
   (d) The lines in a pure rotational spectrum, are not exactly equally-spaced because of the :—
   (a) Decrease in bond-length (b) Large increase in bond-length
   (c) Centrifugal distortion (d) None of them
5. Notes on any two of the following :—
   (a) McLaffery rearrangement (b) Beer-Lamberts law (c) Red and blue shift
6. Determine the ground state term and no. of microstates of
   (a) Fe^{+2} (b) Cu^{+2} (c) Mn^{+3} (d) Co^{+2}
7. Explain the following :—
   (a) Stark effect. (b) Isotopic effect.
8. What are the application of ESR in the study of organic and simple inorganic radicals ?
9. Derive spectroscopic terms for p^2 configuration and write down Hund's rule to find out ground state term and no. of microstates terms.
10. Explain the Zero-field splitting in ESR Spectroscopy.

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EXAMINATION PROGRAMME-2020

M.Sc. Chemistry, Part-II

Date	Papers	Time	Examination Centre
28.01.2021	Paper–IX	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
30.01.2021	Paper–X	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
02.02.2021	Paper–XI	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
04.02.2021	Paper–XII	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
06.02.2021	Paper–XIII	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
09.02.2021	Paper–XIV	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
11.02.2021	Paper–XV	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
13.02.2021	Paper–XVI	2.30 PM to 5.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER–X

(Advance Chemical Dynamics)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions.
All questions carry equal marks.

1. Describe the postulates of the Transition state theory. Compare between the collision and the transition state theories.
2. Write notes on any ***Two*** of the following :—
   (a) Kinetics of Corrosion.
   (b) Faradaic and non-Faradaic Current.
   (c) Dynamic Calculation Vs Transition State Theory.
3. Describe the followings :–
   (a) Photo dissociation and recombination.
   (b) Hammett equation.
4. Describe the Kinetics of Corrosion. Describe the various factors which influence the Corrosion.
5. Explain any ***Two*** of the following terms :—
   (a) Activation Controlled Reactions.
   (b) Oscillatory Reactions.
   (c) Stoichiometric Number.
6. Write notes on any ***Two*** of the following :—
   (a) Theory of acid-base catalyst.
   (b) Primary and Secondary salt effect.
   (c) Van't Hoff intermediates.
7. Explain the Kinetic of reaction in liquid and gas phase. What is diffusion controlled reaction ?
8. What is Kinetic primary and secondary salt effect ? Describe the Bronsted Bjerrum equation ?
9. Discuss the NMR method for study of fast reaction ?
10. Write notes on any ***Two*** of the following :—
    (a) General Mechanism of Catalytic Reaction.
    (b) Bronsted Catalysis Reaction.
    (c) Ground state terms and no. of microstates of d^7 configuration.

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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER–XI

(Molecular Thermodynamics)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. Derive the expression for the internal energy and entropy in terms of the partition function.
2. State and derive the Bose-Einstein statistics.
3. Entropy production due to heat flow inside the system is irreversible processes. Explain.
4. Write notes on any ***Two*** of the following :—
   (a) Microscopic Reversibility.
   (b) Specific heat of solids.
   (c) Thermodynamic Reversibility.
5. (a) What are stationary state of a systems. Explain with examples.
   (b) Show that the entropy production is minimum for stationary state systems.
6. Derive expression for any ***Two*** of the following :—
   (a) Rotational partition function.
   (b) Translational partition function.
   (c) Vibrational partition function.
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. Compare between the Maxwell-Boltzmann's, Bose-Einstein's and the Fermi-Dirac statistics.
9. Write short notes on the following :—
   (a) Dulong and Petit's law.
   (b) Micro-Canonical ensembles.
10. (a) Define Canonical ensembles in statistical thermodynamics.
    (b) Mention various types of ensembles.

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2020
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 150250001 to 150250350, 160250001 to 160250450 & 170250001 to 170250470

Counselling Class Programme		*Practical Examination Programme*		
Date	***Time***	***Paper***	***Date***	***Time***
15.02.2021 & 17.02.2021	11.00 AM to 5.00 PM	XII	18.02.2021	11:30 AM to 2:30 PM
		XIII	18.02.2021	2:45 PM to 5:45 PM
		XV	19.02.2021	11:30 AM to 2:30 PM
		XVI	19.02.2021	2:45 PM to 5:45 PM

For Enrollment No. 180250001 to 180250150

Counselling Class Programme		*Practical Examination Programme*		
Date	***Time***	***Paper***	***Date***	***Time***
20.02.2021 & 22.02.2021	11.00 AM to 5.00 PM	XII	23.02.2021	11:30 AM to 2:30 PM
		XIII	23.02.2021	2:45 PM to 5:45 PM
		XV	24.02.2021	11:30 AM to 2:30 PM
		XVI	24.02.2021	2:45 PM to 5:45 PM

For Enrollment No. 180250151 to 180250350

Counselling Class Programme		*Practical Examination Programme*		
Date	***Time***	***Paper***	***Date***	***Time***
25.02.2021 & 26.02.2021	11.00 AM to 5.00 PM	XII	02.03.2021	11:30 AM to 2:30 PM
		XIII	02.03.2021	2:45 PM to 5:45 PM
		XV	03.03.2021	11:30 AM to 2:30 PM
		XVI	03.03.2021	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XII
(Ligand Field Theory)
Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. How can the following be distinguished by IR spectroscopy ?
   (a) NO^+ (b) NO^-
2. Explain the following :—
   (a) Racah Parameters.
   (b) Non-crossing Rule.
3. (a) Explain Hund's rule of maximum spin multiplicity.
   (b) Find out ground state terms and total no. of microstates term of d^2 system.
   (c) Calculate spin orbit coupling constant (λ) in a d^2 system.
4. (a) Assign the ground state term for Fe^{+2} and Ni^{+2} ions ?
   (b) How does the term ^4F split by spin orbit coupling.
5. Write short notes on any ***Two*** of the following :—
   (a) Nephelauxetic Ratio.
   (b) Spin Cross Over Phenomenon.
   (c) Condon Shortley Parameters.
6. Explain the following :–
   (a) Cross Over Points.
   (b) Correlation diagrams for d^1 and d^8 systems.
7. Derive the free Ion term, ground state term and no. of microstates of following configuration : Fe^{+3}, Fe^{+2}, Cu^+, V^{+2}
8. Explain charge transfer Bands and their assignment in both octahedral and tetrahedral field.
9. Explain the following :–
   (a) Vibronic Coupling.
   (b) Nephelauxetic Ratio.
10. (a) Write selection rules observed in IR spectra of diatomic molecules.
    (b) How IR spectra can be used to distinguish Fe(II) and Fe(III) Ion ?

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2020
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 150250001 to 150250350, 160250001 to 160250450 & 170250001 to 170250470

Counselling Class Programme		*Practical Examination Programme*		
Date	***Time***	***Paper***	***Date***	***Time***
15.02.2021 & 17.02.2021	11.00 AM to 5.00 PM	XII	18.02.2021	11:30 AM to 2:30 PM
		XIII	18.02.2021	2:45 PM to 5:45 PM
		XV	19.02.2021	11:30 AM to 2:30 PM
		XVI	19.02.2021	2:45 PM to 5:45 PM

For Enrollment No. 180250001 to 180250150

Counselling Class Programme		*Practical Examination Programme*		
Date	***Time***	***Paper***	***Date***	***Time***
20.02.2021 & 22.02.2021	11.00 AM to 5.00 PM	XII	23.02.2021	11:30 AM to 2:30 PM
		XIII	23.02.2021	2:45 PM to 5:45 PM
		XV	24.02.2021	11:30 AM to 2:30 PM
		XVI	24.02.2021	2:45 PM to 5:45 PM

For Enrollment No. 180250151 to 180250350

Counselling Class Programme		*Practical Examination Programme*		
Date	***Time***	***Paper***	***Date***	***Time***
25.02.2021 & 26.02.2021	11.00 AM to 5.00 PM	XII	02.03.2021	11:30 AM to 2:30 PM
		XIII	02.03.2021	2:45 PM to 5:45 PM
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NALANDA OPEN UNIVERSITY
M.Sc. Chemistry, Part-II
PAPER–XIII
(Organotransition Metal Chemistry and Metal Clusters)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. What is Zeigler-Natta catalyst ? How ethylene is polymerized to produce useful material like plastic, fibres and PVC ? Discuss mechanism involved in it ?
2. Give the concept of organometallic compounds ? Write the methods of preparation and structure of Zeise's salt ?
3. Give the concept of the formation of multiple metal-metal bonds ? What are the evidences in support of metal-metal bond and quadruple bonds ?
4. What is metal nitrosyl ? Explain the structure of nitrosyl ? Write the MO diagram for NO and NO^+ ?
5. Write short notes on any ***Two*** of the following :—
   (a) Synthesis of metal clusters.
   (b) MO diagram for CO of with the explanation of stability and configuration.
   (c) Zintal Ions.
6. What is ZSM-5 ? How methanol can be transformed into gasoline using ZSM-5 ?
7. Discuss the nature of bonding in following compounds,
   (a) $Fe\left(\eta^5 - C_6H_5\right)_2$
   (b) $Cr\left(\eta^6 - C_6H_5\right)_2$
8. How you will synthesize the δ bonded organo-transition metal compound.
9. What are the factors determining the stability of transition metal alkyls ? Why organometallic compounds are more stable than alkyl organometallic compounds.
10. Write notes on any ***Two*** of the following :—
    (a) Fischer-Tropsch reaction.
    (b) Oxo Process.
    (c) MO treatment for 3 centres-2 electron Bond formation in B_2H_6 molecule.

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M.Sc. Chemistry, Part–II
Programme for Practical Counselling Classes and Practical Examination, 2020
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

For Enrollment No. 150250001 to 150250350, 160250001 to 160250450 & 170250001 to 170250470

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For Enrollment No. 180250001 to 180250150

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For Enrollment No. 180250151 to 180250350

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

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. Discuss the photochemistry of intermolecular dimerisation (2+2) cycloaddition.
2. Discuss Zimmerman mechanism for the rearrangement given by 2, 5-dienones.
3. Explain Barton reaction. Give its synthetic use and application.
4. Write a note on Conrotatory motion and disrotatory motion.
5. Write short notes on the following :–
   (a) Photochemistry of aromatic compounds.
   (b) Franck Condon Principle.
6. Give π molecular diagram of
   (a) 1, 3 – Pentadiene
   (b) 1, 3, 5 – Heptatriene
7. What is the endo-rule as applied to Diel-Alder reaction ?
8. Give mechanism of Norrish Type-I process. How many types of Carbonyl Compounds gives this reaction ?
9. What do you mean by Perricyclic reaction ? What are the types of Perricyclic reaction ? Write them with suitable examples.
10. Write short notes on any ***Two*** of the following :—
    (a) Controtatery Motion.
    (b) Quenching.
    (c) Singlet and Triplet State.
    (d) Common Class of Compound of β-cleavage and why.

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M.Sc. Chemistry, Part–II
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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER–XV

(Organic Synthesis)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. Discuss the mechanism of any ***Two*** of the following :—
   (a) Claisen Rearrangement.
   (b) Pinacol-Pinacolane Rearrangement.
   (c) Wegner-Meerwein Rearrangment.
2. Discuss the preparation and four properties of thioether.
3. How are organomagnesium compound prepared ? How does Grignard reagent react with :—
   (a) Acetaldehyde (b) Formaldehyde (c) Acetone (d) CO_2 (e) H_2O
4. Write notes on any ***Two*** of the following :—
   (a) Prevost Reaction (b) Aldol Reaction. (c) Perkin Reaction.
5. What are Silanes ? How are they named ? Name the following compounds :—
   (a) $CH_3\,HSi\,(NH_2)_2$ (b) $(CH_3)_2\,SiCl_2$ (c) $(C_2H_5)_2\,SiHOOC-CH_3$
   (d) $C_2H_5Si\,(OH)_3$ (e) $H_3Si\,(SiH_2)_3\,SiH_3$
6. Explain the synthetic use of $NaBH_4$. Compare reductions wing $NaBH_4$ and $LiAlH_4$.
7. Write notes on any ***Two*** of the following :—
   (a) Sulpha Drug (b) T.N.T. (c) Mustard Gas
8. Explain the synthetic use of H_2O_2 and O_SO_4 in the oxidation of alkene to glycol.
9. Write notes on any ***Two*** of the following :—
   (a) Etard Reaction (b) Barton Reaction (c) Oppenauer Oxidation
10. Explain the reduction reaction of the following compounds with examples :—
    (a) Reduction of Aldehyde.
    (b) Reduction of Ketones.
    (c) Reduction of Nitro Compounds.

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M.Sc. Chemistry, Part–II
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NALANDA OPEN UNIVERSITY

M.Sc. Chemistry, Part-II

PAPER–XVI

(Environmental Chemistry and Analytical Chemistry)

Annual Examination, 2020

Time : 3 Hours. **Full Marks : 80**

Answer any FIVE Questions. All questions carry equal marks.

1. Write notes on the following :—
   (a) Green House Effect
   (b) Arsenic in drinking water and its hazardous effect on health.
2. How SO_2, CO_2, NO_2 pollutants gas are measured ? How these gasses damage our health system in society ?
3. What is smog ? What are its mechanism ? How does it harm the human life and other living World ?
4. Explain the following :—
   (a) Rf Value (b) TLC (c) TGA
5. What are the basis of the following types of Chromatography :—
   (a) Paper Chromatography.
   (b) ION Exchange Chromatography.
   (c) Columan Chromatography.
6. Write notes on any ***Two*** of the following :–
   (a) Acid Rain
   (b) Measuring of BOD and COD
   (c) Photochemical Reaction in Atmosphere
7. Explain biogeochemical cycles in environments ? How do they sustain life in biosphere ?
8. Explain the composition of soil ? Discuss the organic and inorganic components of soil. Write a note on waste treatment of soil.
9. Explain defluorination and fluoridation ? How you will estimate the fluoride in the sample of water ?
10. Write notes on any ***Two*** of the following :—
    (a) Micro and Macronutrient of Soil.
    (b) Estimation of total solid in Water.
    (c) Estimation of Protein in given sample.

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M.Sc. Chemistry, Part–II
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