

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry, Part-I

PAPER-I (Honours)

(Physical Chemistry and Inorganic Chemistry)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any **Five** questions. All questions carry equal marks.

- (a) What is Bohr-Summerfield model of Atom ? What are its limitation ?
(b) Explain the meaning of ψ and ψ^2 ?
- (a) Write down the electronic configuration of the following :—
 Cr^+ , Cu^{++} , O^{-2} , Fe^{+3}
(b) What are the values of n, l, m, s quantum numbers values for the last electron of following :— Cl , Fe^{+2}
- Write notes on any **Two** of the following :—
(a) Ionisation Energy
(b) Electron Affinity
(c) Electronagativity
- What is Hybridization ? Determine the hybridization, structure and shape of following molecules :—
 NH_3 , H_2O , Bcl_3 , CH_4
- Write the electronic dot structure of following compounds :—
 NaCl , C_2H_2 , H_2O , Chcl_3 , So_4^{-2} , H_3O^+ , CO_2 , C_2H_4
- (a) What is sigma (δ) and Pai (π) bond ? Distinguish between them ?
(b) Draw the shape of all five d-orbitals ?
- What are noble gases ? Why they are called inert gases ? Explain the position of noble gases in periodic table ? How they are isolated from atmospheric air ?
- Write down the important ores of Boron ? How Boron is extracted from its ores ? Describe the diagonal relationship between B and Si ?
- Explain any **Two** of the following :—
(a) pH of solution
(b) Bronsted and Lewis concept of Acid and Base ?
(c) Buffer soln.
- How H_2O_2 is prepared in modern ways ? Explain its oxidising and reducing properties ? Explain the meaning of 10 volume, 20 volume and 30 volume of H_2O_2 soln.

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EXAMINATION PROGRAMME, 2021
B.Sc. Chemistry (Hons.), Part-I

Date	Papers	Time	Examination Centre
07.03.2022	Honours Paper-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
09.03.2022	Honours Paper-II	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
11.03.2022	Hindi Composition-100 or Hindi-50 + Urdu-50 or Eng-50	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
12.03.2022	Chemistry (Sub)-I	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
14.03.2022	Physics (Sub)-I	2.30 PM to 5.30 PM	A. N. College, Boring Road, Patna-800013
24.03.2022	Mathematics (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
25.03.2022	Botany (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
26.03.2022	Zoology (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
29.03.2022	Home Science (Sub) P-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna
30.03.2022	Geography (Sub) P-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 nd Floor, Biscomaun Bhawan, Patna

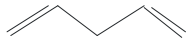

NALANDA OPEN UNIVERSITY
B.Sc. Chemistry, Part-I, PAPER-II (Honours)
Annual Examination, 2021

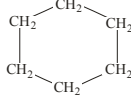
Time : 3 Hours.

Full Marks : 80

*Answer any **Five** questions. All questions carry equal marks.*

- State and explain First law of thermodynamics.
 - Derive a relationship between heat capacity at constant pressure (C_p) and constant volume (C_v) ($C_p - C_v = R$).
- Write notes on any **Two** of the following :—
 - Work done in isothermal process.
 - Abnormal Colligative properties.
 - Entropy.
- Give IUPAC name of following organic compounds :—

$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H} \end{array}$	$\begin{array}{c} \text{COOH} \\ \\ \text{COOH} \end{array}$	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H} \end{array}$	$\begin{array}{c} \text{O} \\ \\ \text{H}-\text{C}-\text{O}-\text{H} \end{array}$
$\begin{array}{c} \text{H} & & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{O} & \text{O} & \text{H} \end{array}$	$\begin{array}{c} \text{H} \\ \\ \text{C}=\text{O} \\ \\ \text{H}-\text{C}=\text{O} \end{array}$		
- Label the hybridization of C-atom in following compounds :—

(a) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$	(b) $\text{H}-\text{C}\equiv\text{C}-\text{H}$	(c) $\text{C}_6\text{H}_6-\text{CHO}$	(d) 
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 - Write the structure of following compounds :—

(a) Methanal	(b) Glycol	(c) Aniline	(d) Glycerol
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- How urea is prepared ? Explain why urea is basic ? How would you identify urea in laboratory ? How urea reacts with (a) hydrazine (b) HNO_2 .
- Write IUPAC name of Lactic acid ? How lactic acid is prepared industrially ? How it reacts with (i) PCl_5 (ii) $\text{Cone H}_2\text{SO}_4$ (iii) I_2
- Explain the molecular weight determination of an organic acid compound by silver salt method ?
- Write notes on any **Two** of the following :—
 - Inductive effect
 - Electrometric effect
 - Carbanion and Carbonium
- How primary amine is prepared ? Explain the basicity of amine ? Explain that secondary amine is more basic than primary amine and tertiary amine ?
- Explain the stereo chemistry of lactic acid and tartaric acid.
 - Explain Geometrical Isomerism ?

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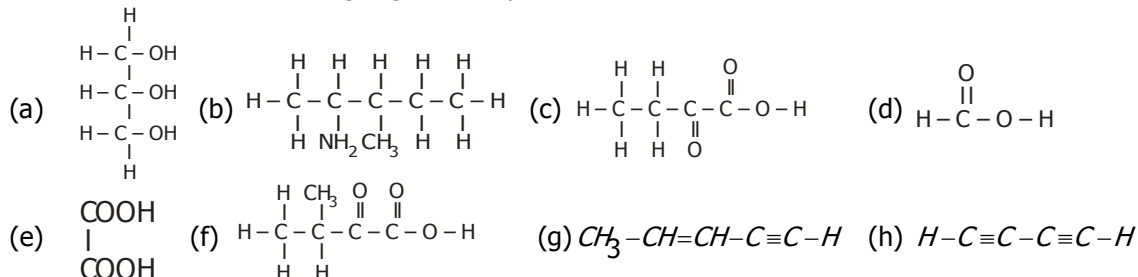
NALANDA OPEN UNIVERSITY
B.Sc. Chemistry, Part-I, PAPER-I (Subsidiary)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

*Answer any **Five** questions. All questions carry equal marks.*

- Distinguish between order of reaction and molecularity ? Derive the expression of 2nd order of reaction.
- (a) State and explain Second Law of thermodynamics.
(b) What is Gibb's free energy ?
- Explain the application of phase rule in water system with neat phase diagram ?
- Give IUPAC name of following organic compounds :—



- Explain the open chain and ring chain structure of fructose.
- Explain the reaction mechanism of nitration and halogenation is Benzene.
- Write notes on any **Two** reactions with mechanism :—
(a) Perkin Reaction (b) Sand Meyer Reaction (c) Friedal Craft Reaction
- Explain the optical isomerism of lactic acid and Tartaric acid ? How lactic acid react with (a) $\text{C}_2\text{H}_5\text{OH}$, (b) PCl_5 , (c) HI , (d) I_2 .
- Explain the following terms :— (a) Element of Symmetry. (b) Energy of Activation.
- How nitrobenzene is prepared in Laboratory ? How nitrobenzene reacts with (a) H_2 , (b) $\text{Sn} | \text{HC} |$, (c) $\text{Zn} | \text{H}_2\text{O}$.

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Practical Counselling Classes and Practical Examination Programme, 2021 of
B.Sc., Part-I (Chemistry Subsidiary, Paper-I)
Venue : Chemistry Lab, 4th Floor, Biscomaun Bhawan, Patna

PRACTICAL COUNSELLING CLASS PROGRAMME

Date	Time			
	9:00 AM to 11:00 AM	11:00 AM to 1:00 PM	1:00 PM to 3:00 PM	3:00 PM to 5:00 PM
05.04.2022	Enrollment No. of Physics (Hons.) Students 190500001 to 190500300 200500001 to 200500050	Enrollment No. of Physics (Hons.) Students 200500051 to 200500130	Enrollment No. of Physics (Hons.) Students 200500131 to 200500210	Enrollment No. of Physics (Hons.) Students 200500211 to 200500300
07.04.2022	Enrollment No. of Physics (Hons.) Students 200500301 to 200500380	Enrollment No. of Physics (Hons.) Students 200500381 to 200500600	Enrollment No. of Mathematics (Hons.) Students 190490001 to 190490400 200490001 to 200490100	Enrollment No. of Mathematics (Hons.) Students 200490101 to 200490206
11.04.2022	Enrollment No. of Mathematics (Hons.) Students 200490207 to 200490350	Enrollment No. of Mathematics (Hons.) Students 200490351 to 200490600	All New & Old Students of Botany (Hons.), Yoga (Hons.), Geography (Hons.) & Home Science (Hons.)	Enrollment No. of Zoology (Hons.) Students 190510001 to 190510200 200510001 to 200510130
13.04.2022	Enrollment No. of Zoology (Hons.) Students 200510131 to 200510260	Enrollment No. of Zoology (Hons.) Students 200510261 to 200510400	Enrollment No. of Zoology (Hons.) Students 200510401 to 200510700	—

PRACTICAL EXAMINATION PROGRAMME

Date	Time			
	9:00 AM to 11:00 AM	11:00 AM to 1:00 PM	1:00 PM to 3:00 PM	3:00 PM to 5:00 PM
06.04.2022	Enrollment No. of Physics (Hons.) Students 190500001 to 190500300 200500001 to 200500050	Enrollment No. of Physics (Hons.) Students 200500051 to 200500130	Enrollment No. of Physics (Hons.) Students 200500131 to 200500210	Enrollment No. of Physics (Hons.) Students 200500211 to 200500300
08.04.2022	Enrollment No. of Physics (Hons.) Students 200500301 to 200500380	Enrollment No. of Physics (Hons.) Students 200500381 to 200500600	Enrollment No. of Mathematics (Hons.) Students 190490001 to 190490400 200490001 to 200490100	Enrollment No. of Mathematics (Hons.) Students 200490101 to 200490206
12.04.2022	Enrollment No. of Mathematics (Hons.) Students 200490207 to 200490350	Enrollment No. of Mathematics (Hons.) Students 200490351 to 200490600	All New & Old Students of Botany (Hons.), Yoga (Hons.), Geography (Hons.) & Home Science (Hons.)	Enrollment No. of Zoology (Hons.) Students 190510001 to 190510200 200510001 to 200510130
16.04.2022	Enrollment No. of Zoology (Hons.) Students 200510131 to 200510260	Enrollment No. of Zoology (Hons.) Students 200510261 to 200510400	Enrollment No. of Zoology (Hons.) Students 200510401 to 200510700	—

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry, Part-II

PAPER—III (Honours)

(Physical Chemistry and Inorganic Chemistry)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any **Five** questions. All questions carry equal marks.

- (a) What is entropy ? Explain entropy change in ideal gas ?
(b) What is work function ? Explain it with examples and give its units ?
- (a) What is reversible cell and irreversible cell ?
(b) What is difference between primary cell and secondary cell ?
- Write notes on any **Two** of the following :—
(a) Carnot cycle and carnot theorem.
(b) Liquid junction potential.
(c) Electrode and Electrode potential.
- Determine the ground state term of d^2 system ? What are the total no. of microstates of d^2 system ?
- Write the IUPAC name of following complexes :—
(a) $K_4[Fe(CN)_6]$ (b) $[Co(NH_3)_4Br_2]^+$ (c) $[Cr(H_2O)_6Cl_2]^+$
(d) $[Ti(H_2O)_6]^{+2}$ (e) $[Cu(H_2O)_4]^{+2}$ (e) $[Fe(H_2O)_6]SO_4$
- Write down the formula of the following complex compounds :—
(a) Hexa Amine Platinum (IV) Chloride (b) Tetra Carbonyl Nickel (O)
(c) Potassium tetra cyano nickelate (III) (d) Di chloro tetraamine cobalt (III) ion
(e) Potassium hexa cyanoferrate (III)
- (a) What is Werner's theory of coordination compound ?
(b) $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral why ?
- Write notes of any **Two** of the following :—
(a) Nuclear Binding Energy. (b) Mass Defect.
(c) Group Displacement Law.
- Explain any **Two** of the following :—
(a) Nuclear fission and Nuclear fusion. (b) Radio carbon-dating.
(c) Atom Bomb.
- Write the electronic configuration of 3d block elements ? Explain the chemistry of d-block elements on the basis of
(i) Complex formation. (ii) Magnetic property.
(iii) Colour of complexes.



Nalanda Open University, Patna

Programme of B.Sc. Part-II Chemistry (Hons.),

Practical Class and Practical Examination, 2021

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

(A) Practical Counselling Class

Date	Paper	Time	Roll No
17.05.2022	III & IV	11:00 AM to 5:00 PM	All Old & New Students

(B) Practical Examination

Date	Paper	Time	Roll No
18.05.2022	III	11:00 AM to 02:00 PM	All Old & New Students
	IV	02:35 PM to 5:30 PM	

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry, Part-II

PAPER-IV (Honours)

(Physical Chemistry and Organic 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) Electrophoresis
 - (b) Origin of charge on colloids
 - (c) Zeta Potential
2. Define and explain the following :—
 - (a) Molar Conductance
 - (b) Equivalent Conductance
 - (c) Specific Conductance
3. What is Transport Number and explain its experimental determinations ?
4. What are carbohydrates ? Establish the structure of D-Fructose
5. Explain the mechanism of electrophilic substitution in Toluene and Benzene with electrophile of nitration and chlorination ?
6. (a) How is Benzaldehyde prepared from ?
 - (i) Benzene
 - (ii) Benzoyl Chloride(b) Write notes on the following :—
 - (i) Polymerisation and Condensation Reaction
 - (ii) Fries Rearrangements.
7. State and explain the necessary condition for a compound to exhibit optical isomerism ? Discuss the optical isomerism exhibited by Lactic Acid and Tartaric Acid ?
8. Write note on any **Two** of the following :—
 - (a) Elementary idea of RNA and DNA
 - (b) Sandmeyer Reaction
 - (c) Pinacol-Pinacolone Rearrangement
9. Give the following conversation :—
 - (a) Aldose to Ketose
 - (b) Ketose into Aldose
 - (c) D-glucose into D-arabinose
 - (d) D-fructose into D-glucose
10. How Benzene diazonium chloride is prepared ? How it exhibits replacement reaction with
 - (a) H₂O,
 - (b) C₂H₅OH,
 - (c) KI.



Nalanda Open University, Patna

Programme of B.Sc. Part-II Chemistry (Hons.),

Practical Class and Practical Examination, 2021

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

(A) Practical Counselling Class

Date	Paper	Time	Roll No
17.05.2022	III & IV	11:00 AM to 5:00 PM	All Old & New Students

(B) Practical Examination

Date	Paper	Time	Roll No
18.05.2022	III	11:00 AM to 02:00 PM	All Old & New Students
	IV	02:35 PM to 5:30 PM	

NALANDA OPEN UNIVERSITY
B.Sc. Chemistry, Part-II, PAPER-II (Subsidiary)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any Five questions. All questions carry equal marks. Question No. 1 is Compulsory.

- Choose correct answer from the following statements :-
 - Copper is a :-
 (a) Transition metal (b) Alkali metal (c) Alkaline earth metal (d) Halogen elements
 - Which of the Halogen acids does not give precipitation with AgNO_3 solution :-
 (a) HCl (b) HBr (c) HI (d) HF
 - Which of the following has the greatest affinity for haemoglobin :-
 (a) NO (b) CO (c) SO_2 (d) NH_3
 - Which is the radioactive elements :-
 (a) C (b) M (c) U (d) F
 - Mechanism of Atomic Bomb explosion based on :-
 (a) Nuclear fusion (b) Nuclear fission (c) Radio carbon dating (d) None of these
 - Lanthanides are elements of :-
 (a) d-block (b) s-block (c) p-block (d) f-block
 - Coordination compounds are coloured due to :-
 (a) s-s transition (b) p-p transition (c) d-d transition (d) charge transfer
 - Temperature of universe is rising due to :-
 (a) CO_2 emission (b) NO_2 emission (c) Acid rain (d) SO_2 emission
- What are 3d-block elements ? Why they are called transition elements ? Write their electronic configuration ? Explain their properties on the basis of (a) Complex formation, (b) Magnetic Properties.
- What are salient features of Werner's theory of coordination compound formation ? What are its merits and Weakness ?
- Write the IUPAC name of the following complex compounds :-
 (a) $[\text{Co}(\text{NH}_3)_3]\text{Cl}_3$ (b) $\text{K}_4[\text{Fe}(\text{CN})_6]$ (c) $[\text{Co}(\text{NH}_3)_4\text{Br}_2]^+$ (d) $[\text{Ti}(\text{H}_2\text{O})_6]^{+2}$ (e) $[\text{Cu}(\text{H}_2\text{O})_4]^{+2}$
- Explain why :-
 (a) Hg is liquid but all metals are solid. (b) F is the most electronegative element.
 (c) H_2O_2 is a good oxidising agent. (d) f-block elements are called inner transition elements.
- What are the ores of Cobalt ? How cobalt in pure state is obtained from its ores ? Describe its oxidation state and its industrial application.
- Describe the principle involved in the determination of nickel ion in the solution gravimetrically.
- (a) What are the salient features of Valence Bond theory of coordination compound ?
 (b) Determine the hybridization and structure of following :- (i) $[\text{Cr}(\text{NH}_3)_6]^{+3}$ (ii) $[\text{NiCl}_4]^{-2}$
- Write notes on any **Two** of the following :-
 (a) Double salt and coordination compound. (b) Sidgwick theory of EAN rule.
 (c) Arsenic as a pollutant in drinking water.
- Explain the comparative chemistry of Fe , Co , Ni .



B.Sc. Part-II Chemistry (Subsidiary)

Practical Counselling Class and Examination Programme, 2021

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

(A) Practical Counselling Class Programme

Date	10.30 AM to 12.30 PM	01.00 PM to 03.00 PM	03.30 PM to 05.30 PM
19.05.2022	Math (H) Students All Old and 190490001 to 180490050	Math (Hons) 190490051 to 190490115	Math (Hons) 190490116 to 190490218
21.05.2022	Math (Hons) 190490219 to 190490400	Physics (H) All Old Students & 190500001 to 190500150	Physics (H) 190500151 to 190500350 (Botany, Geography & Home Science (Hons) All Old & New Students)
24.05.2022	Zoology (H) Students All Old and 190510001 to 190510050	Zoology (H) 190510051 to 190510120	Zoology (H) 190510121 to 190510230
28.05.2022	Zoology (H) 190510231 to 190510290	Zoology (H) 190510291 to 190510380	Zoology (H) 190510381 to 190510550

(B) Practical Examination Programme

Date	10.30 AM to 12.30 PM	01.00 PM to 03.00 PM	03.30 PM to 05.30 PM
20.05.2022	Math (H) Students All Old and 190490001 to 180490050	Math (Hons) 190490051 to 190490115	Math (Hons) 190490116 to 190490218
23.05.2022	Math (Hons) 190490219 to 190490400	Physics (H) All Old Students & 190500001 to 190500150	Physics (H) 190500151 to 190500350 (Botany, Geography & Home Science (Hons) All Old & New Students)
25.05.2022	Zoology (H) Students All Old and 190510001 to 190510050	Zoology (H) 190510051 to 190510120	Zoology (H) 190510121 to 190510230
30.05.2022	Zoology (H) 190510231 to 190510290	Zoology (H) 190510291 to 190510380	Zoology (H) 190510381 to 190510550

Nalanda Open University
Annual Examination - 2021
B.Sc. (Honours), Part-II
Paper - Chemistry (Subsidiary)
(Only for Yoga Hons.)

Time: 3.00 Hrs.

Full Marks: 80

Answer any Five questions. All questions carry equal marks.

- Choose correct answer from the following statements:-
 - Inner transition elements are:
 - d-block
 - s-block
 - p-block
 - f-block
 - All noble gas elements belong to:
 - zero group of PT
 - 1st group of PT
 - IVth group of PT
 - VIth group of PT
 - Electron affinity increasing order is as:
 - $F < Cl < Br < I$
 - $F > Cl > Br > I$
 - $I < Br < F < Cl$
 - $I < Cl < Br < F$
 - The EAN of Nickel in the complex $[Ni(CO)_4]$ is:
 - 28
 - 30
 - 32
 - 36
 - Which of the following has the greatest affinity for haemoglobin:
 - NO
 - CO
 - SO₂
 - NH₃
 - Which of the following is present in minimum is acid rain:
 - CH₃COOH
 - H₂SO₄
 - HCl
 - $$\begin{array}{c} CH_2 - COOH \\ | \\ CH_2 - COOH \end{array}$$
 - Which of the Halogen acids does not give precipitates with AgNO₃ solution:
 - HCl
 - HBr
 - HF
 - HI
 - Chromium has electronic configuration:
 - $[Ar] 3d^5 4s^1$
 - $[Ar] 3d^4 4s^2$
 - $[Ar] 3d^3 4s^2 4p^1$
 - $[Ar] 3d^6 4s^0$
- Write the IUPAC name of the following complex compounds:
 - $[Co(NH_3)_6]Cl_3$
 - $[CrCl_2(N_2O)_4]NO_3$
 - $K_3[Fe(C_2O_4)_3]$
 - $K[PtCl_3(NH_3)]$
- Explain why:
 - Hg is liquid but all metals are solid
 - F is the most electronegative element
 - KMnO₄ is a good oxidising agent
 - f-block elements are called inner transition elements.
- What are the salient features of Werner's theory of coordination compound formation? What are its merits and Weakness?
- What are 3d block elements? Write their electronic configuration. Explain the properties of transition elements on the basis of :
 - Complex formation
 - Magnetic Properties
- What are the salient features of Valence Bond theory of coordination compound? Determine the hybridisation and structure of following :-
 - $[Cr(NH_3)_6]^{+3}$
 - $[Co(CN)_6]^{-3}$
- How Arsenic present as a pollutant in drinking water can be removed primarily?
 - What are the injurious effect of Arsenic present in drinking water on human body?
- What are the ores of Cobalt? How cobalt in pure state is obtained from its ores? Describe its oxidation state and presence in periodic table?
- Describe the principle involved in the determination of nickel ion in the solution gravimetrically.
- Write notes on any two:
 - Double salts and coordination compound
 - Sodium Thiosulphate
 - Sidgwick theory of EAN rule



B.Sc. Zoology, Chemistry & Physics (Subsidiary), Part II, Practical Exam 2021
[For B.Sc Yoga (Hons. Part-II Students)]

Venue: For Zoology - 1st Floor, Zoology Lab, Biscomaun Tower, Patna-1

For Physics- 1st Floor, Physics Lab, Biscomaun Tower, Patna-1

For Chemistry- 1st Floor, Chemistry Lab, Biscomaun Tower, Patna-1

Annual Practical Examination 2021

Date	Time	
	11.00 AM to 2.00 PM	2.30 PM to 05.30 PM
29.09.2022	-----	Zoology (Subsidiary)
30.09.2022	Chemistry (Subsidiary)	Physics (Subsidiary)

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry, Part-III

PAPER-V (Honours)

(Physical Chemistry)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any **Five** questions. All questions carry equal marks.

1. State and explain phase rule and use it to discuss the phase diagram of Sulphur system?
2. (a) State and explain the following terms :—
(i) Phase (ii) Component (iii) Degree of freedom
(b) Find the number of phase, number of components and degree of freedom in the following system :— $Na_2CO_{3(s)} \rightleftharpoons Na_2O_{(s)} + CO_{2(g)}$
3. Using X-ray beam of known frequency or known wavelength deduce Bragg's Equation for the measurement of the inter-planer distance in a crystal.
4. Explain the following terms :—
(i) Collision Frequency.
(ii) Surface Tension and Parachor.
5. What do you mean by the void in the crystal lattice ? Explain the difference between tetrahedral void and octahedral void.
6. Define the Kinetic equation of third order of reaction ? What are the characteristic of third order of reaction ?
7. What is heterogeneous catalysis? State the theory of heterogeneous catalysis and explain with examples the activity and selecting of heterogeneous catalysis.
8. What is adsorption isotherm ? Derive the equation of Langmuir Adsorption isotherm ?
9. What is doping in crystal lattice? How does it work as semiconductor ? Explain p-type semiconductor.
10. Write notes on any **two** of the following :—
(a) Molecular Refractivity
(b) Radius Ratio Rule
(c) Enzyme Catalysts



Programme of B.Sc. Part-III Chemistry (Hons.)

Annual Practical Counselling & Practical Examination - 2021

Venue : 4th Floor Bismaun Bhawan, Patna - 800 001

Practical Counselling

Date	Paper	Time	Roll No
22.06.2022	V to VIII	11.00 AM to 05.30 PM	For All Old & New Students

Practical Examination

Date	Paper	Time	Roll No
23.06.2022	V	11.30 AM to 02.30 PM	For All Old & New Students
23.06.2022	VI	02.45 PM to 05.45 PM	For All Old & New Students
24.06.2022	VII	11.30 AM to 02.30 PM	For All Old & New Students
24.06.2022	VIII	02.45 PM to 05.45 PM	For All Old & New Students

NALANDA OPEN UNIVERSITY
B.Sc. Chemistry, Part-III
PAPER–VI (Honours)
(Inorganic Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

*Answer any **Five** questions. All questions carry equal marks.*

- What do you mean by Lanthanide contraction ? What are the consequences of Lanthanide contraction ?
- (a) How does d-orbital split in octahedral and tetrahedral field ?
(b) Determine the CFSE of d^3 , d^7 and d^8 configuration.
- Derive Schrödinger wave equation for a particle in three dimension ?
- Draw the MO energy level diagram of O_2^+ , NO^+ , F_2 ? Write the magnetic properties and determine the magnetic moment ?
- What are the important ores of Vanadium ? Give the details of extraction of pure vanadium from the ores. Explain the important oxidation state of Vanadium ? What are its uses in industry ?
- Write notes on the following :—
(a) Point Group
(b) Element of symmetry
(c) Symmetry Operation
- Why liquid SO_2 is a good non-aqueous solvent ? Explain the following type of reaction in liquid SO_2 with example :—
(a) Solvolysis
(b) Acid-base reaction
(c) Precipitation reaction
- Write notes on any **two** of the following :—
(a) Chelates.
(b) Δ_o for $[Co(CN)_4]^{-3}$ is greater than $[Co(NH_3)_6]^{+3}$. Why ?
(c) Significance of Wave Function.
- Draw the radial probability distribution curve of electron of 1s, 2s and 3s electron. Label the curve with the determination of number of nodes ?
- Explain the hybridization, structure, nature of complexes and magnetic moment of following compounds by VBT method :—
 $[Fe(CN)_6]^{-3}$, $[FeF_6]^{-3}$, $[Cu(CN)_4]^{-3}$

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Programme of B.Sc. Part-III Chemistry (Hons.)
Annual Practical Counselling & Practical Examination - 2021

Venue : 4th Floor Biscomaun Bhawan, Patna - 800 001

Practical Counselling

Date	Paper	Time	Roll No
22.06.2022	V to VIII	11.00 AM to 05.30 PM	For All Old & New Students

Practical Examination

Date	Paper	Time	Roll No
23.06.2022	V	11.30 AM to 02.30 PM	For All Old & New Students
23.06.2022	VI	02.45 PM to 05.45 PM	For All Old & New Students
24.06.2022	VII	11.30 AM to 02.30 PM	For All Old & New Students
24.06.2022	VIII	02.45 PM to 05.45 PM	For All Old & New Students

NALANDA OPEN UNIVERSITY
B.Sc. Chemistry, Part-III
PAPER-VII (Honours)
(Organic Chemistry)
Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

*Answer any **Five** questions. All questions carry equal marks.*

1. Determine the constitution of uric acid and also give its synthetic evidence in favour of the accepted structure of uric acid.
2. How actual indigo obtained from plant ? Give two methods of its synthesis ? What are its important uses ?
3. Explain the following :—
 - (a) Cyclobutadiene is not an aromatic compound.
 - (b) Cyclopropenyl anion is not aromatic but cyclopropenyl cation is aromatic.
 - (c) Methyl group in Toluene is an activator .
4. Discuss the degradative and synthetic means for accepting the structure of isoflavone ? How isoflavone is related to flavon ?
5. How is Xanthene prepared from uric acid ? How Xanthene is synthesized by Trambe's method?
6. Explain any **Two** of the following :—
 - (a) Stearic Hindrence
 - (b) Strength of acid and bases
 - (c) Mechanism of addition to carbon double bond
7. What is Azodyes ? How it is prepared ? How Methyl orange and Congo red is prepared ?
8. How furan is prepared ? Give the structure of Furan. How furan reacts with HNO₃ and Cl₂ ?
9.
 - (a) What do you understand by Heterocyclic compounds ? Explain with examples.
 - (b) How quinoline is prepared by Skraup synthesis? How it reacts with H₂SO₄, NaNH₂, and KOH ?
10.
 - (a) What are differences between SN₁ and SN₂ reaction ?
 - (b) Explain the mechanism of aromatic substitution reaction of phenol with an electrophiles.
 - (c) Explain the formation of alkene by elimination reaction.



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NALANDA OPEN UNIVERSITY

B.Sc. Chemistry, Part-III

PAPER-VIII (Honours)

(Introduction to Molecular Spectroscopy, Industrial Chemistry, Environmental Chemistry)

Annual Examination, 2021

Time : 3 Hours.

Full Marks : 80

Answer any **Five** questions. All questions carry equal marks.

1. Give two methods of synthesis of any **Two** of the following :—
(a) Nylon-66 (b) Teflon (c) Terylene
2. What is green House effect ? How it is caused ? What are the major gasses causing green House effect ? What are the adverse effect of Green House Effect ?
3. Discuss the following :—
(a) Coal Gas (b) Octane Number (c)Knocking and Unknowcking Compound
4. Explain the following :—
(a) Pesticides Pollutants (b) Ozone layer and its depletion (c) Acid Rain
5. How urea fertilizer is manufactured. Explain its action as fertilizers.
6. What is Soil Pollution and Soil Pollutants ? What are the effects of Soil Pollutants ? How soil pollution is prevented ?
7. Discuss the chemistry of UV spectroscopy. Explain the following electronic transition in UV spectroscopy.
(a) $\delta \rightarrow \delta^*$ transition (b) $\pi \rightarrow \delta^*$ transition (c) $\pi \rightarrow \pi^*$ transition
8. Explain the following :—
(a) Radioactive Pollutants (b) Cause of pollution by industrial waste (c) Biogas
9. Write notes on any **Two** of the following :—
(a) Arsenic as a pollutant on ground water.
(b) Floride as a pollutant in ground water.
(c) Vibrational modes and Vibrational frequency.
10. Explain the following :—
(a) Sewage and Sewage treatment.
(b) Natural rubber and Vulcanization of rubber.



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