

# NALANDA OPEN UNIVERSITY

## B.Sc. Chemistry, Part-I

### PAPER-I (Honours)

(Physical Chemistry and Inorganic Chemistry)

Annual Examination, 2022

Time : 3 Hours.

Full Marks : 80

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

1. What are the postulates of the kinetic molecular theory of Gases ? Derive kinetic equation for gases?
2. Explain the following terms:-  
(a) Collision frequency      (b) Collision diameter      (c) Mean free path
3. What is Vender Waal's equation ? Describe the relation between Vender Waal's constant and critical constants?
4. Explain the following terms:-  
(i) Hydrolysis of Salt      (ii) Common Ion effect      (ii) P<sup>H</sup> of solution
5. Write notes on any two of the following :—  
(i) Solubility product and its application in salt analysis.      (ii) Buffer Solution  
(ii) Ionic hydrolysis
6. Write down the electronic configuration of the following.  
Ni<sup>2+</sup>, Cu<sup>+</sup>, Cr<sup>+</sup>, Mo, Xe, Kr, Cl<sup>-</sup>, Br<sup>-</sup>
7. Explain the following:-  
(i) Inert pair effect      (ii) Fajan's Rule
8. Write the electronic dot structure of following compound :-  
(i) N<sub>2</sub>O      (ii) CO<sub>2</sub>      (iii) SO<sub>4</sub><sup>-2</sup>      (iv) SOCl<sub>2</sub>  
(v) C Cl<sub>4</sub>      (vi) HCHO      (vii) O<sub>3</sub>      (viii) SO<sub>3</sub><sup>-2</sup>
9. Explain the position of Boron in Periodic table. What is borax bead test? Explain the structure of B<sub>2</sub>H<sub>6</sub>?
10. How H<sub>2</sub>O<sub>2</sub> is manufactured ? What is meaning of 10 volume, 20 volume and 100 volume of H<sub>2</sub>O<sub>2</sub>. Explain the oxidising and reducing character of H<sub>2</sub>O<sub>2</sub>.

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**EXAMINATION PROGRAMME, 2022**  
**B.Sc. Chemistry (Hons.), Part-I**

<b>Date</b>	<b>Papers</b>	<b>Time</b>	<b>Examination Centre</b>
19.12.2022	Honours Paper-I	<b>10.30 AM to 1.30 PM</b>	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
21.12.2022	Honours Paper-II	<b>10.30 AM to 1.30 PM</b>	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
22.12.2022	Hindi Composition-100 or Hindi-50 + Urdu-50 or Eng-50	<b>10.30 AM to 1.30 PM</b>	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
29.12.2022	Physics (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
30.12.2022	Botany (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
03.01.2023	Mathematics (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
04.01.2023	Zoology (Sub)-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
06.01.2023	Geography (Sub) P-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna
10.01.2023	Home Science (Sub) P-I	2.30 PM to 5.30 PM	Nalanda Open University, 2 <sup>nd</sup> Floor, Biscomaun Bhawan, Patna

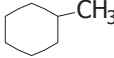
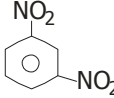
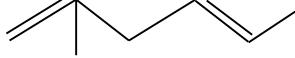
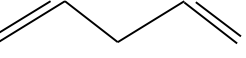
**NALANDA OPEN UNIVERSITY**  
**B.Sc. Chemistry, Part-I,**  
**PAPER-II (Honours)**  
*Annual Examination, 2022*

**Time : 3 Hours.**

**Full Marks : 80**

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

- Explain relation between pressure-volume and Temperature of ideal gas in adiabatic process.
  - What is energy function and enthalpy function.
- What is Osmotic Pressure and elevation in boiling point? Describe the expression to calculate the molecular mass of non-ionic solute by elevation in boiling point?
- Write notes on any two :-
  - Extensive and intensive properties
  - Work done in isothermal process
  - $C_p - C_v = R$
- Explain the determination of molecular mass of organic acid by silver salt method ?
- Write the IUPAC name of following organic compound :-
 

<ol style="list-style-type: none"> <li> <math display="block">\begin{array}{c} \text{COOH} \\   \\ \text{COOH} \end{array}</math> </li> <li>  </li> <li>HCHO</li> <li>  </li> </ol>	<ol style="list-style-type: none"> <li><math>CH_3 - CH = CH - C \equiv C - COOH</math></li> <li>  </li> <li>  </li> <li><math>CH_3 - CH = CH - CHO</math></li> </ol>
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- Write notes on any **Two** of the following :-
  - Electrometric effect
  - Inductive effect
  - Carbanion end
- Explain the stereo chemistry of lactic acid and Tartaric acid?
  - How urea is prepared?
- Write IUPAC name of Lactic acid. How Lactic acid is prepared industrially? How it reacts with
  - $PCl_5$
  - conc.  $H_2SO_4$
  - $I_2$
- What is primary, secondary and tertiary amines ? How the mixture of amines are separated? How primary amines are prepared ?
- What are alcohols and how they are classified? How you will distinguish between primary secondary and tertiary alcohols? Give equation wherever possible?



**Programme of B.Sc. Part-I Chemistry (Hons.)**

**Practical Examination 2022**

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

*Practical Counselling Class Programme*

Date	Time	Roll No.
09.01.2023	11:00 AM to 02:00 PM	190470001 to 190470200, 200470001 to 200470600, 210470001 to 210470160
	02:00 PM to 05:00 PM	210470161 to 210470200

*Practical Exam Programme*

Date	Paper	Time	Roll No.
12.01.2023	I	11:00 AM to 02:00 PM	190470001 to 190470200, 200470001 to 200470600, 210470001 to 210470160
	II	02:30 PM to 05:30 PM	
13.01.2023	I	11:00 AM to 02:00 PM	210470161 to 210470200
	II	02:30 PM to 05:30 PM	

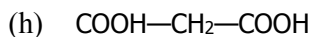
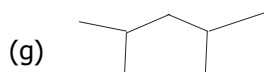
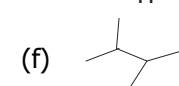
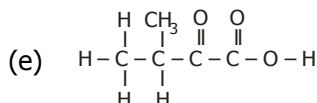
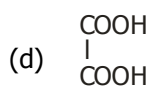
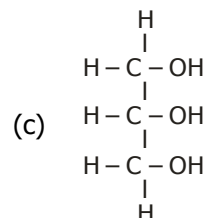
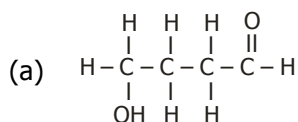
**NALANDA OPEN UNIVERSITY**  
**B.Sc. Chemistry, Part-I, PAPER-I (Subsidiary)**  
*Annual Examination, 2022*

**Time : 3 Hours.**

**Full Marks : 80**

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

- What is entropy of a systems ? What are the physical significance of entropy ? Explain entropy change is reversible and irreversible process?
- Explain the following :-  
 (a) Degree of freedom (b) Component (c) Gibbs phase rule
- Explain the application of phase rule in water system ?
- (a) What is order of reaction and molecularity? Distinguish between them ?  
 (b) Derive the expression for rate constant of 1<sup>st</sup> order reaction ?
- Give IUPAC name of following compounds :—



- Explain the optical isomerism of lactic acid and tartaric acid. How lactic acid reacts with  
 (a) CH<sub>3</sub>OH (b) PCl<sub>5</sub> (c) HI (d) I<sub>2</sub>
- Explain the open chain and ring chain structure of D-glucose.
- Explain any two reaction mechanism :-  
 (a) Friedel craft Reaction (b) Perkin Reaction (c) Cannizaro Reaction
- Explain with mechanism of electrophilic substitutor reaction with electrophiles of  
 (a) Cl<sub>2</sub> (b) HNO<sub>3</sub>
- How nitrobenzene is prepared in Laboratory ? How nitrobenzene reacts with  
 (a) H<sub>2</sub> (b) Sn | HCl (c) Zn | H<sub>2</sub>O



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

**Practical Counselling Classes and Practical Examination Programme, 2022 of  
B.Sc., Part-I (Chemistry Subsidiary, Paper-I)**

**Venue : Chemistry Lab, 4<sup>th</sup> 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
18.01.2023	All New & Old Student Botany (Hons), Geography (Hons.), Home Sc. (Hons) & Yoga (Hons).	Enrollment No. of Physics (Hons.) Students 190500001 to 190500200 200500001 to 200500600 210500001 to 210500050	Enrollment No. of Physics (Hons.) Students 210500051 to 210500200	Enrollment No. of Physics (Hons.) Students 210500201 to 210500400
20.01.2023	Enrollment No. of Mathematics (Hons.) Students 190490001 to 190490400 200490001 to 200490600 210490001 to 210490050	Enrollment No. of Mathematics (Hons.) Students 210490051 to 210490200	Enrollment No. of Mathematics (Hons.) Students 210490201 to 210490400	-
23.01.2023	Enrollment No. of Zoology (Hons.) Students 190510001 to 190510200 200510001 to 200510700 210510001 to 210510080	Enrollment No. of Zoology (Hons.) Students 210510081 to 210510200	Enrollment No. of Zoology (Hons.) Students 210510201 to 210510380	Enrollment No. of Zoology (Hons.) Students 210510381 to 210510495
25.01.2023	Enrollment No. of Zoology (Hons.) Students 210510496 to 210510700	-	-	-

**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
19.01.2023	All New & Old Student Botany (Hons), Geography (Hons.), Home Sc. (Hons) & Yoga (Hons).	Enrollment No. of Physics (Hons.) Students 190500001 to 190500200 200500001 to 200500600 210500001 to 210500050	Enrollment No. of Physics (Hons.) Students 210500051 to 210500200	Enrollment No. of Physics (Hons.) Students 210500201 to 210500400
21.01.2023	Enrollment No. of Mathematics (Hons.) Students 190490001 to 190490400 200490001 to 200490600 210490001 to 210490050	Enrollment No. of Mathematics (Hons.) Students 210490051 to 210490200	Enrollment No. of Mathematics (Hons.) Students 210490201 to 210490400	-
24.01.2023	Enrollment No. of Zoology (Hons.) Students 190510001 to 190510200 200510001 to 200510700 210510001 to 210510080	Enrollment No. of Zoology (Hons.) Students 210510081 to 210510200	Enrollment No. of Zoology (Hons.) Students 210510201 to 210510380	Enrollment No. of Zoology (Hons.) Students 210510381 to 210510495
27.01.2023	Enrollment No. of Zoology (Hons.) Students 210510496 to 210510700	-	-	-

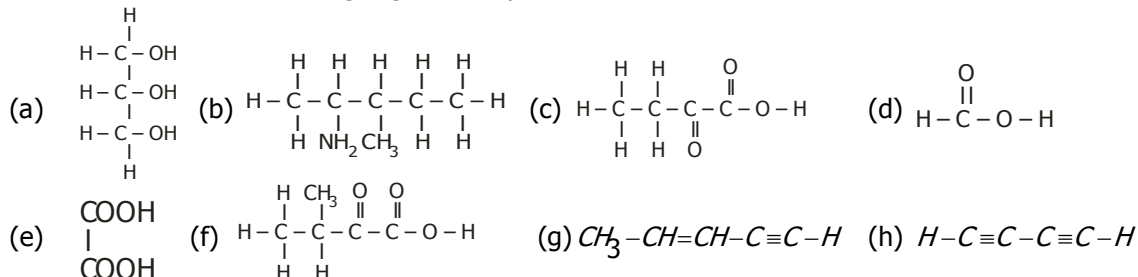
**NALANDA OPEN UNIVERSITY**  
**B.Sc. Chemistry, Part-I, PAPER-I (Subsidiary)**  
*Annual Examination, 2021*

**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)  $\text{PCl}_5$ , (c)  $\text{HI}$ , (d)  $\text{I}_2$ .
- Explain the following terms :— (a) Element of Symmetry. (b) Energy of Activation.
- How nitrobenzene is prepared in Laboratory ? How nitrobenzene reacts with (a)  $\text{H}_2$ , (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, 4<sup>th</sup> 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, 2022

Time : 3 Hours.

Full Marks : 80

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

- (a) State and explain second law of thermodynamics.  
(b) What is the importance of second law of thermodynamics ?  
(c) How does the 2nd law of thermodynamics apply to our daily life.
- Explain the following:-  
(a) Reversible and irreversible cell (b) Primary and secondary cell  
(c) Entropy change in ideal gas.
- Write short notes on any **Two** of the following :—  
(a) Electrode and electrode potential  
(b) Clausius – Clapeyron equation  
(c) Gibb's Helmholtz equation
- Determine the ground state term of  $d^2$  system. What are the total no. of microstates of  $d^2$  system ?
- Explain the characteristic of 3d-block elements on the basis of  
(a) Magnetic properties (b) Complex formation.  
(c) Oxidation states (d) Coloured compound formation
- How  $KMnO_4$  is prepared on large scale ? How does  $KMnO_4$  reacts with  
(a)  $H_2S$  in acidic medium (b)  $KI$  in acidic medium  
(c) Oxalic acid in presence of  $H_2SO_4$
- Write the IUPAC name of following compound :-  
(a)  $K_4 [Fe(CN)_6]$  (b)  $[Co(NH_3)_4 Cl_2]^+$  (c)  $[Cr(H_2O)_6 Cl_2]^+$  (d)  $[Ni CO_4]$   
(e)  $[Fe F_6]^{-3}$  (f)  $K_3[Fe (C_2O_4)_3]$  (g)  $[Cr(en)I_4]^-$  (h)  $[Fe(CN)_6]^{-3}$
- What are the salient features of VBT ? Explain the hybridisation, nature and structure of following complexes :-  
(a)  $[Fe (CN)_6]^{-4}$  (b)  $[Co(NH_3)_4Cl_2]^+$
- Explain the following :—  
(a) Nuclear fission and Nuclear fusion. (b) Radio carbon-dating.
- Write notes on any Two :-  
(a) Heisenberg uncertainty theory (b) de Broglie theory of dual nature of electron  
(c) Nuclear Binding energy



*Programme of B.Sc. Part-II Chemistry (Hons.),  
Practical Class and Practical Examination, 2022*

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

#### (A) Practical Counselling Class

Date	Paper	Time	Roll No
02.02.2023	III & IV	11:00 AM to 5:00 PM	All Old & New Students

#### (B) Practical Examination

Date	Paper	Time	Roll No
03.02.2023	III	11:30 AM to 02:30 PM	All Old & New Students
	IV	02:45 PM to 5:45 PM	

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry, Part-II

PAPER-IV (Honours)

(Physical Chemistry and Organic Chemistry)

Annual Examination, 2022

Time : 3 Hours.

Full Marks : 80

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

1. Explain the following :—  
(a) Specific Conductance (b) Equivalent Conductance  
(c) Molar Conductance
2. What do you understand by Kohlrausch's Law ? Explain the application of Kohlrausch's Law ?
3. Write notes on any two of the following :-  
(a) Tyndall effect  
(b) Emulsion and Gels  
(c) Gold number
4. How nitrobenzene is prepared in the laboratory ? How nitrobenzene is prepared also from benzene diozonium chloride ? How nitrobenzene is reduced in acidic, alkaline and neutral medium ? Explain it with support of chemical equation.
5. Explain conformation of Ethane and Cyclohexane ?
6. Establish the structure of D-glucose ?
7. How D-Glucose reacts with :  
(a) HCN (b) Acetic anhydride  
(c) Phenyl hydrazine (d) Formation of glucoside
8. Write note on any **Two** of the following :—  
(a) Friedel Craft Reaction (b) Perkin Reaction (c) Aldol condensation
9. How would you introduce the following in benzene ?  
(a) Br<sub>2</sub> (b) -CH<sub>3</sub> (c) -COOH (d) -NO<sub>2</sub>  
You support your answer with reaction mechanism.
10. Explain the reaction mechanism of electrophilic substitution reaction in benzene with the electrophiles of nitration and sulphonation?



*Programme of B.Sc. Part-II Chemistry (Hons.),  
Practical Class and Practical Examination, 2022*

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

**(A) Practical Counselling Class**

Date	Paper	Time	Roll No
02.02.2023	III & IV	11:00 AM to 5:00 PM	All Old & New Students

**(B) Practical Examination**

Date	Paper	Time	Roll No
03.02.2023	III	11:30 AM to 02:30 PM	All Old & New Students
	IV	02:45 PM to 5:45 PM	

# NALANDA OPEN UNIVERSITY

## B.Sc. Chemistry, Part-II

### PAPER-II (Subsidiary)

Annual Examination, 2022

Time : 3 Hours.

Full Marks : 80

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

- What are transition elements ? Write the electronic configuration of all 3d-block transition elements ? Explain the properties of transition elements on the basis of  
(a) Magnetic properties (b) Complex formation (c) Colour formation of compound
- What are the salient features of Werner's theory of coordination compound formation ? What are its merits and weakness ?
- What is salient feature of valence bond theory ? Explain the hybridisation, structure and nature of complex and magnetic character of following complex compound.  
(a)  $[\text{Ni}(\text{CO})_4]$  (b)  $[\text{V}(\text{H}_2\text{O})_6]^{+3}$  (c)  $[\text{Mn}(\text{CN})_6]^{-3}$  (d)  $[\text{Fe}(\text{CN})_6]^{-3}$
- Describe the principle involved in the estimation of silver in the solution volumetrically ?
- Explain the comparative chemistry of Fe, Co and Ni ?
- Explain the following :-  
(a) Fullerenes (b) Graphites (c) Variable Valency
- What do you know about :-  
(a) Pesticide and Herbicide Pollution  
(b) Water pollution due to Arsenic presence in drinking water
- Write the IUPAC name of following complexes :-  
(a)  $[\text{Fe}(\text{CN})_6]^{-3}$  (b)  $[\text{V}(\text{H}_2\text{O})_6]^{+3}$  (c)  $[\text{Mn}(\text{CN})_6]^{-3}$  (d)  $[\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$
- Write notes on any **Two** of the following :-  
(a) Metallic Bond (b) Hydrogen Bond (c) EAN Rule
- (a) What is Double salt and coordination compound.  
(b) What is Zeolites.

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### B.Sc. Part-II Chemistry (Subsidiary)

#### Practical Counselling Class and Examination Programme, 2022

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

#### (A) Practical Counselling Class Programme

Date	10.00 AM to 12.00 Noon	01.00 Noon to 02.00 PM	02.00 PM to 04.00 PM
04.02.2023	All Botany (H) Home Sci Geography (H) Yoga (H) All old & New Student	Math (Hons) Students 180490001 to 180490100 190490001 to 190490400 200490001 to 200490200	Math (Hons) Students 200490201 to 200490600
07.02.2023	Physics (Hons) Students 180500001 to 180500100 190500001 to 190500300 200500001 to 200500100	Physics (H) 200500101 to 200500600	Zoology (H) Students 190510001 to 190510500 200510001 to 200510200
09.02.2023	Zoology (H) Students 200510201 to 200510700	—	—

#### (B) Practical Examination Programme

Date	10.00 AM to 12.00 Noon	12.00 Noon to 02.00 PM	02.00 PM to 04.00 PM
06.02.2023	All Botany (H) Home Sci Geography (H) Yoga (H) All old & New Student	Math (Hons) Students 180490001 to 180490100 190490001 to 190490400 200490001 to 200490200	Math (Hons) Students 200490201 to 200490600
08.02.2023	Physics (Hons) Students 180500001 to 180500100 190500001 to 190500300 200500001 to 200500100	Physics (H) 200500101 to 200500600	Zoology (H) Students 190510001 to 190510500 200510001 to 200510200
10.02.2023	Zoology (H) Students 200510201 to 200510700	—	—



**B.Sc. Part-II Chemistry (Subsidiary)**  
**Practical Counselling Class and Examination Programme, 2022**

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

**(A) Practical Counselling Class Programme**

<b>Date</b>	<b>10.00 AM to 12.00 Noon</b>	<b>012.00 Noon to 02.00 PM</b>	<b>02.00 PM to 04.00 PM</b>
04.02.2023	All Botany (H) Home Sci Geography (H) Yoga (H) All old & New Student	Math (Hons) Students 180490001 to 180490100 190490001 to 190490400 200490001 to 200490200	Math (Hons) Students 200490201 to 200490600
07.02.2023	Physiscs (Hons) Students 180500001 to 180500100 190500001 to 190500300 200500001 to 200500100	Physics (H) 200500101 to 200500600	Zoology (H) Students 190510001 to 190510500 200510001 to 200510200
09.02.2023	Zoology (H) Students 200510210 to 200510700	—	—

**(B) Practical Examination Programme**

<b>Date</b>	<b>10.00 AM to 12.00 Noon</b>	<b>12.00 Noon to 02.00 PM</b>	<b>02.00 PM to 04.00 PM</b>
06.02.2023	All Botany (H) Home Sci Geography (H) Yoga (H) All old & New Student	Math (Hons) Students 180490001 to 180490100 190490001 to 190490400 200490001 to 200490200	Math (Hons) Students 200490201 to 200490600
08.02.2023	Physiscs (Hons) Students 180500001 to 180500100 190500001 to 190500300 200500001 to 200500100	Physics (H) 200500101 to 200500600	Zoology (H) Students 190510001 to 190510500 200510001 to 200510200
10.02.2023	Zoology (H) Students 200510210 to 200510700	—	—

**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
    - SO<sub>2</sub>
    - NH<sub>3</sub>
  - Which of the following is present in minimum is acid rain:
    - CH<sub>3</sub>COOH
    - H<sub>2</sub>SO<sub>4</sub>
    - HCl
    - $$\begin{array}{c} CH_2 - COOH \\ | \\ CH_2 - COOH \end{array}$$
  - Which of the Halogen acids does not give precipitates with AgNO<sub>3</sub> 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
  - KMnO<sub>4</sub> 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, 2022

Time : 3 Hours.

Full Marks : 80

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

1. State and explain Gibb's phase rule and use it to discuss the phase diagram of water system ?
2. Explain the following term :-  
(a) Molar volume            (b) Surface tension and parachor    (c) Viscosity
3. (a) Explain the difference between tetrahedral void and Octahedral void ?  
(b) What is Schottky and Frankl's defect in crystal lattice ?
4. (a) Derive Bragg's equation  
(b) Explain the structure of ZnS ?
5. Derive the expression for the rate constant of second order reaction ? What are the characteristic of second order reaction ?
6. Write notes on any two of the following :  
(a) Enzyme catalysis  
(b) Radius ratio rule  
(c) Degree of freedom in phase rule
7. What is adsorption isotherm ? Derive the equation of Langmuir Adsorption isotherm ?
8. Distinguish between thermal and photochemical reaction ? Explain Einstein law's of photo chemical Equivalence and derive the equation ?
9. Explain the following term :-  
(a) Collision frequency  
(b) Component  
(c) Molecular Refractivity
10. (a) What is Lambert and Beer's Law  
(b) Establish clausius-Mossotti Relationship



### Programme of B.Sc. Part-III Chemistry (Hons.) Annual Practical Counselling & Practical Examination - 2022

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

#### Practical Counselling

Date	Paper	Time	Roll No
14.01.2023	V to VIII	11.00 AM to 05.30 PM	For All Old & New Students

#### Practical Examination

Date	Paper	Time	Roll No
16.01.2023	V	11.30 AM to 02.30 PM	For All Old & New Students
16.01.2023	VI	02.45 PM to 05.45 PM	For All Old & New Students
17.01.2023	VII	11.30 AM to 02.30 PM	For All Old & New Students
17.01.2023	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, 2022

Time : 3 Hours.

Full Marks : 80

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

- Determine the CFSE of  $d^6$ ,  $d^9$  and  $d^4$  configuration ? Why  $\Delta_0$  for  $[\text{Co}(\text{CN})_6]^{3-}$  is greater than  $[\text{Co}(\text{NH}_3)_6]^{3+}$  ?
- Write the electronic configuration of all lanthanide elements. Explain the position of lanthanide elements in periodic table ? Explain the magnetic properties of lanthanide ?
- What are the advantages and disadvantages of liquid ammonia as a solvent ? Explain the chemical reaction of liquid ammonia as
  - Precipitation reaction
  - A proton acceptor
  - Acid-base reaction
- Explain the hybridization, structure, nature of complexes and magnetic moment of following compound by VBT method-  $[\text{Fe}(\text{CN})_6]^{3-}$  and  $[\text{FeF}_6]^{3-}$ ,  $[\text{Tl}(\text{H}_2\text{O})_6]^{3+}$  ?
- Write notes on any **two** of the following :—
  - Chelates
  - Aufbaue principle
  - Hund's Rule
- Derive Schrodinger wave equation for a particle in three dimensions.
- Draw the radial probability distribution curve of electron of 1s, 2s and 2p electrons ? Label the curve with the determination of number of nodes?
- Explain the following terms:-
  - Group symmetry
  - Symmetry elements
  - Lanthanide Contraction
- Draw the molecular orbital diagram for molecule  $\text{O}_2$ ,  $\text{O}_2^+$ ,  $\text{N}_2$ ,  $\text{F}_2$  ? Write their configuration, Bond order, magnetic nature and stability ?
- What are the important ores of platinum ? Give details of extraction of pure platinum from ores ? What are five uses of Platinum ?



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

#### Annual Practical Counselling & Practical Examination - 2022

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

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14.01.2023	V to VIII	11.00 AM to 05.30 PM	For All Old & New Students

#### Practical Examination

Date	Paper	Time	Roll No
16.01.2023	V	11.30 AM to 02.30 PM	For All Old & New Students
16.01.2023	VI	02.45 PM to 05.45 PM	For All Old & New Students
17.01.2023	VII	11.30 AM to 02.30 PM	For All Old & New Students
17.01.2023	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, 2022**

**Time : 3 Hours.**

**Full Marks : 80**

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

1. Explain the concept aromaticity and explain Huckel ( $4n+2$ ) rule with suitable examples ?
2. How furan is prepared ? Give the structure of Furan. How furan reacts with  $\text{HNO}_3$  and  $\text{Cl}_2$  ? Is Furan aromatic or not?
3. How thiophene is prepared ? Give the structure of thiophene. How it reacts with  $\text{SO}_2\text{Cl}_2$  and  $\text{HNO}_3$ ?
4. Explain the preparation and constitution of Indigo ? What is Indigo dyeing ?
5. Explain the application of following reagents in at least three reactions.  
(i)  $\text{H}_2\text{O}_2$                       (ii) Pb                      (iii) Periodic acid
6. What is Azodyes ? How it is prepared ? How Methyl orange and congo red is prepared ?
7. (a) What do you understand by Heterocyclic compounds ? Explain with examples.  
(b) How quinoline is prepared by Skrap synthesis ? How it reacts with  $\text{H}_2\text{SO}_4$ ,  $\text{NaNH}_2$ , and  $\text{KOH}$  ?
8. (a) What do you understand by polynuclear hydrocarbons. Explain with examples.  
(b) Give the structure and synthesis of Naphthalene. Explain the electrophilic substitution reaction of Naphthalene with  $\text{NO}_2^+$  electrophiles ?
9. (a) What are differences between  $\text{SN}_1$  and  $\text{SN}_2$  reaction ?  
(b) Explain the mechanism of aromatic substitution reaction of phenol with an electrophiles.  
(c) Explain the formation of alkene by elimination reaction.
10. Write short notes on any two of the following :-  
(a) Steric hindrance  
(b) Methyl group in Toluene is an activator. Explain?  
(c) Uric Acid



**Programme of B.Sc. Part-III Chemistry (Hons.)**  
**Annual Practical Counselling & Practical Examination - 2022**

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

**Practical Counselling**

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Roll No</i>
14.01.2023	V to VIII	11.00 AM to 05.30 PM	For All Old & New Students

**Practical Examination**

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Roll No</i>
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17.01.2023	VIII	02.45 PM to 05.45 PM	For All Old & New Students

# NALANDA OPEN UNIVERSITY

## B.Sc. Chemistry, Part-III

### PAPER–VIII (Honours)

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

Annual Examination, 2022

Time : 3 Hours.

Full Marks : 80

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

1. What is acid rain ? What are the sources of acid rain ? Give the theory and mechanism of the acid rain formation? How acid rain can be prevented ?
2. Discuss the following :—
  - (a) Coal Gas
  - (b) Water Gas
  - (c) Cause of pollution by industrial waste
3. What are the types of water pollution ? Give the classification of water pollution ? What are the injurious effect of Arsenic as a pollutant in ground water ?
4. What is soil pollution and soil pollutant ? What are the effect of soil pollutant ? How soil pollution is prevented ?
5. Explain following:
  - (a) Fertilizers and pesticides
  - (b) Radioactive pollutants
  - (c) Pesticide pollutants
6. Write notes on any two of following:
  - (a) Ozone layer
  - (b) Fluoride as a pollutant in ground water.
  - (c) Prevention and control of air pollution
7. Explain the following :-
  - (a) Forms of thermal energy
  - (b) Relation between frequency, wave length and wave number
  - (c) Radio Carbon Dating
8. Explain the following :—
  - (a) Nuclear magnetic moment and nuclear spin
  - (b) Chemical Shift
  - (c) Spin-Spin Coupling
9. What is Vibrational modes and Vibrational frequency ? What are the factors influencing vibrational frequency ?
10. Discuss the chemistry of UV spectroscopy. Explain the following electronic transition in UV spectroscopy.
  - (a)  $\sigma \rightarrow \sigma^*$  transition
  - (b)  $n \rightarrow \sigma^*$  transition
  - (c)  $\pi \rightarrow \pi^*$  transition



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

#### Annual Practical Counselling & Practical Examination - 2022

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

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