

**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-I**  
**Paper-I**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. (a) What is Bohr-Somerfield model of Atom? What are its limitation?  
 (b) Write down all the quantum numbers for  $4S^1$  and  $5f^3$  orbitals
2. (a) Write down the electronic configures of the following:-  
 $Fe^{+2}$ ,  $Ca^{+2}$ ,  $Cu^+$ ,  $Cr^{+3}$ ,  $Hg^{+1}$   
 (b) What are the values of n, l, m and s quantum number values for the last electrons enters in the orbital of following atom :  
 $V_{23}$ ,  $Cu_{29}$ ,  $Br_{35}$
3. What is common ion effect ? How does common ion effect for the solubility of salt? Describe the application of common ion effect and solubility product in the salt analysis?
4. Write down the important ores of Boron? How is Boron extracted from its ores? Describe the diagonal relationship between Boron and silicon? How does Boron react with  
 (a)  $H_2SO_4$  (b)  $NaOH$
5. What are noble gases? Why they are called inert gases? How noble gases are isolated from atmospheric air? How they are separated from each other?
6. Write notes on any two:-  
 (a) Ionization potential (b) Electron Affinity (c) Electronegativity
7. What is Hybridization? Determine the hybridisation structure and shape of following molecules:-  
 $H_2O$ ,  $NH_3$ ,  $CH_4$ ,  $BCl_3$
8. (a) What is sigma ( $\delta$ ) and Pai ( $\pi$ ) Bonds Distinguish between them ?  
 Draw the shape of all five d-orbitals?
9. Explain the following terms:-  
 (a) Most probable velocity of a gas  
 (b) Average velocity  
 (c) Root mean square velocity
10. Explain the following of any two:-  
 (a)  $P^H$  of solution  
 (b) Lewis concept of acid and bases  
 (c) Buffer solution



**B.Sc. Part-I Chemistry (Hons.), Practical Counselling and Examination 2019**

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

*(A) Practical Counselling Class*

Date	Paper	Time	Roll No.
26.06.2019	I & II	11:00 AM to 5:00 PM	170470001 to 170470100 180470001 to 180470031
27.06.2019	I & II	11:00 AM to 5:00 PM	180470032 to 180470070

*(B) Practical Examination*

Date	Time		Roll No.
	Paper - I	Paper - II	
28.06.2019	11:30 AM to 2:30 PM	02:45 PM to 05:45 PM	170470001 to 170470100 180470001 to 180470031
29.06.2019	11:30 AM to 2:30 PM	2:45 PM to 05:45 PM	180470032 to 180470070

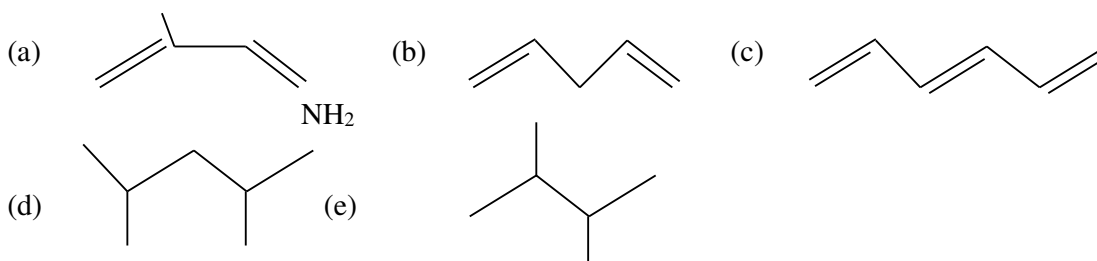
**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-I**  
**Paper-II**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

- (a) State and explain First Law of Thermodynamics?  
 (b) Derive a relation between heat capacity at constant pressure and constant number?
- Why does a solution exhibit abnormal osmotic pressure? What is Van't Hoff factor and how it is related to degree of dissociation of an electrolyte.
- Write notes on any two :-  
 (a) Extensive and intensive properties  
 (b) Abnormal Colligative properties  
 (c) Work done in isothermal process
- Give IUPAC name of following compounds.



- What are alcohols and how they are classified? How you will distinguish between primary secondary and tertiary alcohols? Give equation wherever possible?
- How Urea is prepared? Explain why urea is basic? How would you identify urea in Laboratory? How urea does reacts with.  
 (a) hydrazine and (b) nitrous acid.
- What is the chief source of citric acid? How it is obtained in pure state? Establish the structure of citric acid?
- Explain the molecular weight determination of organic acids by silver salt method?
- How will you synthesise following compounds from malonic ester-  
 (a) Succinic acid (b) Cinnamic acid (c) Acetoacetic acid
- Write notes on any tow of following :-  
 (a) Hyperconjugation (b) Inductive effect (c) Tetravalency of carbon



**B.Sc. Part-I Chemistry (Hons.), Practical Counselling and Examination 2019**

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

*(A) Practical Counselling Class*

Date	Paper	Time	Roll No.
26.06.2019	I & II	11:00 AM to 5:00 PM	160470001 to 160470150
			170470001 to 170470100
			180470001 to 180470031
27.06.2019	I & II	11:00 AM to 5:00 PM	180470032 to 180470070

*(B) Practical Examination*

Date	Time		Roll No.
28.06.2019	<i>Paper - I</i>	<i>Paper - II</i>	170470001 to 170470100
	11:30 AM to 2:30 PM	02:45 PM to 05:45 PM	180470001 to 180470031
29.06.2019	11:30 AM to 2:30 PM	2:45 PM to 05:45 PM	180470032 to 180470070

**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Subsidiary), Part-I**  
**Paper-I**

**Time: 3.00 Hrs.**

**Full Marks: 80**

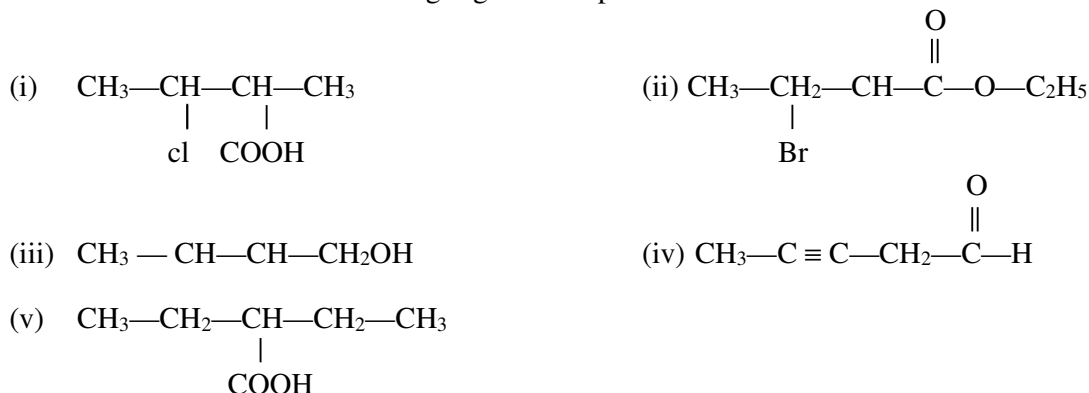
*Answer any Five questions. All questions carry equal marks.*

1. State and explain following terms:

- (a) Conductance
- (b) Specific Conductance
- (c) Equivalent Conductance

Explain the effect of concentration on all the above terms?

2. (a) Define First Law of thermodynamics. Explain the mathematical statement of the Law?  
(b) What are extensive and intensive properties?
3. Derive an expression for the work done in isothermal reversible expansion of an ideal gas? Distinguish between heat and work?
4. What is order of reaction? What are the methods to determine order of reaction? Explain at least one.
5. Give IUPAC name of the following organic compounds:-



6. How Aniline is prepared in laboratory? Give its reaction with  
(a) HCl (b) CH<sub>3</sub>I (c) HNO<sub>2</sub>
7. How Tartaric acid can be manufactured from Argol? Give its reaction with  
(a) HBr (b) HI (c) ammonical AgNO<sub>3</sub>
8. Give the concept of open chain structure and ring chain structure of fructose?
9. 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
10. Write notes on any **two** of following:-  
(a) Perkin Reaction  
(b) Friedel Craft Reaction  
(c) Cannizaro Reaction



**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-II**  
**Paper-III**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

- What is second law of thermodynamics? Explain carnot cycle and carnot's theorem.
- How is potential developed in a cell ?
  - What is reversible and irreversible cell ?
  - What is difference between primary and secondary cell ?
- Write notes on any two :-
  - Liquid Junction Potential
  - Emf of a cell
  - Entropy change in ideal gas.
- Describe Thomson's method to determine specific charge  $\left(\frac{e}{m}\right)$  of an electron ?
- 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 :-
  - $[\text{Fe}(\text{CN})_6]^{-3}$
  - $[\text{Cr}(\text{H}_2\text{O})_4\text{Br}_2]^+$
  - $[\text{Cu}(\text{H}_2\text{O})_4]^{+2}$
  - $[\text{Co}(\text{en})\text{I}_4]^-$
  - $[\text{Ti}(\text{H}_2\text{O})_6]^{+2}$
- What is Werner's theory of coordination compound ?
  - How EAN rule is determined ?
- Write down the preparation and properties of following :-
  - Hydrazine
  - Hydroxylamine
- Write notes on following of any two:-
  - Nuclear Binding energy
  - Mass defect
  - Group Displacement Law
- Explain the following them :-
  - Nuclear fission and fusion
  - Radio-carbon dating



*Programme of B.Sc. Part-II Chemistry (Hons.),  
 Practical Class and Practical Examination, 2019  
 Venue:- 4th Floor, Chemistry Lab, Biscomaun Bhawan, Patna*

**(A) Practical Counselling Class**

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Roll No</i>
11.06.2019	III & IV	11:30 AM to 5:30 PM	150470001 to 150470100 160470001 to 160470130
12.06.2019	III & IV	11:30 AM to 5:30 PM	160470131 to 160470170 170470001 to 170470036
13.06.2019	III & IV	11:30 AM to 5:30 PM	170470037 to 170470150

**(B) Practical Examination**

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Roll No</i>
14.06.2019	III	11:30 AM to 2:30 PM	150470001 to 150470100
	IV	02:45 PM to 5:45 PM	160470001 to 160470130
15.06.2019	III	11:30 AM to 2:30 PM	160470131 to 160470170

	IV	<i>02:45 PM to 5:45 PM</i>	<i>170470001 to 170470036</i>
18.06.2019	III	<i>11:30 AM to 2:30 PM</i>	<i>170470037 to 170470150</i>
	IV	<i>02:45 PM to 5:45 PM</i>	

**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-II**  
**Paper-IV**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

- Explain the following terms :-  
 (a) Electrophoresis                      (b) Emulsim and Gels                      (c) Zeta Potential
- Define and explain the following:-  
 (i) Molar conductance                      (ii) Specific conductance                      (iii) Equivalent conductance
- (a) State and explain the necessary condition for a compound to exhibits optical isomerism.  
 (b) Discuss the optical isomerism exhibited by tartaric acid.
- (a) Home is benzaldehyde prepared from  
 (i) Benzene                      (ii) Benzoyl chloride                      (iii) Toluene  
 (b) Write notes on  
 (i) Claisen-Schmidt condensation  
 (ii) Benzoin condensation
- What are carbohydrates? How are they classified Establish the open chain structure of Fructose
- Discuss the carbonium ion rearrangement by taking examples of pinacolone
- Explain the mechanism of electrophilic substitution in Tolwene and Benzene with electrophiles of nitration and chlorination?
- What are amino acids? Give formula and name of any two amino acids? Give general method for the preparation of amino acids write a short notes on strecker's synthesis of amino acids?
- write notes on any two:-  
 (a) Elementary idea of RNA and DNA.  
 (b) Sandmeyer reaction  
 (c) Reimer-Tiemann reaction
- How Benzene diazonium chloride is prepared? How it exhibite replacement reaction with :-  
 (a) CuCl                      (b) KI                      (c) CuCN



*Programme of B.Sc. Part-II Chemistry (Hons.),  
 Practical Class and Practical Examination, 2019*  
 Venue:- 4th Floor, Chemistry Lab, Biscomaun Bhawan, Patna  
**(A) Practical Counselling Class**

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Roll No</i>
11.06.2019	III & IV	11:30 AM to 5:30 PM	150470001 to 150470100 160470001 to 160470130
12.06.2019	III & IV	11:30 AM to 5:30 PM	160470131 to 160470170 170470001 to 170470036
13.06.2019	III & IV	11:30 AM to 5:30 PM	170470037 to 170470150

**(B) Practical Examination**

<i>Date</i>	<i>Paper</i>	<i>Time</i>	<i>Roll No</i>
14.06.2019	III	11:30 AM to 2:30 PM	150470001 to 150470100
	IV	02:45 PM to 5:45 PM	160470001 to 160470130
15.06.2019	III	11:30 AM to 2:30 PM	160470131 to 160470170
	IV	02:45 PM to 5:45 PM	170470001 to 170470036
18.06.2019	III	11:30 AM to 2:30 PM	170470037 to 170470150
	IV	02:45 PM to 5:45 PM	

# Nalanda Open University

Annual Examination - 2019

B.Sc. (Honours), Part-II

Paper - Chemistry (Subsidiary)

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:  
(a) d-block (b) s-block (c) p-block (d) f-block
  - Chromium has electronic configuration:  
(a)  $[\text{Ar}] 3d^5 4s^1$  (b)  $[\text{Ar}] 3d^4 4s^2$  (c)  $[\text{Ar}] 3d^3 4s^2 4p^1$  (d)  $[\text{Ar}] 3d^6 4s^0$
  - Which of the Halogen acids does not give precipitates with  $\text{AgNO}_3$  solution:  
(a)  $\text{HCl}$  (b)  $\text{HBr}$  (c)  $\text{HF}$  (d)  $\text{HI}$
  - Which of the following is present in minimum is acid rain:  
(a)  $\text{CH}_3\text{COOH}$  (b)  $\text{H}_2\text{SO}_4$  (c)  $\text{HCl}$  (d)  $\begin{array}{c} \text{CH}_2 - \text{COOH} \\ | \\ \text{CH}_2 - \text{COOH} \end{array}$
  - Which of the following has the greatest affinity for haemoglobin:  
(a)  $\text{NO}$  (b)  $\text{CO}$  (c)  $\text{SO}_2$  (d)  $\text{NH}_3$
  - The EAN of Nickel in the complex  $[\text{Ni}(\text{CO})_4]$  is:  
(a) 28 (b) 30 (c) 32 (d) 36
  - Electron affinity increasing order is as:  
(a)  $\text{F} < \text{Cl} < \text{Br} < \text{I}$  (b)  $\text{F} > \text{Cl} > \text{Br} > \text{I}$  (c)  $\text{I} < \text{Br} < \text{F} < \text{Cl}$  (d)  $\text{I} < \text{Cl} < \text{Br} < \text{F}$
  - All noble gas elements belong to:  
(a) zero group of PT (b) 1st group of PT (c) IVth group of PT (d) VIth group of PT
- What are 3d block elements? Write their electronic configuration. Explain the properties of transition elements on the basis of :  
(a) Complex formation (b) Magnetic Properties
- What are the 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)  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$  (b)  $[\text{CrCl}_2(\text{N}_2\text{O})_4]\text{NO}_3$  (c)  $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$  (d)  $\text{K}[\text{PtCl}_3(\text{NH}_3)]$
- Explain why:  
(a)  $\text{Hg}$  is liquid but all metals are solid (b)  $\text{F}$  is the most electronegative element  
(c)  $\text{KMnO}_4$  is a good oxidising agent (d) f-block elements are called inner transition elements.
- (a) How Arsenic present as a pollutant in drinking water can be removed primarily?  
(b) 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.
- What are the salient features of Valence Bond theory of coordination compound?  
Determine the hybridisation and structure of following :-  
(a)  $[\text{Cr}(\text{NH}_3)_6]^{+3}$  (b)  $[\text{Co}(\text{CN})_6]^{-3}$
- Write notes on any two:  
(a) Double salts and coordination compound (b) Sodium Thiosulphate  
(c) Sidgwick theory of EAN rule



**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-III**  
**Paper-V**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. State and explain the following terms:
  - (i) Collision theory
  - (ii) Absolute rate theory for biomolecular reaction
2. Write notes on any *two* of following :-
  - (a) Refractive Index
  - (b) Fluorescence and phosphorescence
  - (c) Crystal defect
  - (d) Molecular Refractivity
3. State and explain phase rule and use it to discuss the phase diagram of Sulphur system?
4. (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:-  $\text{CaCO}_3 \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$
5. Explain following
  - (i) Quantum yield
  - (ii) Lambert and Beer's Law
6. Using X-ray beam of known frequency or known wavelength deduce Brag's Equation for the measurement of the inter-planer distance in a crystal.
7. What is doping in crystal lattice? How does it work as semiconductor? Explain p-type semiconductor.
8. Explain the following terms:-
  - (i) Coordination number and radius ration rule
  - (ii) Brevis Lattice
9. What do you mean by the void in the crystal lattice? Explain the difference between tetrahedral void and octahedral void.
10. What is heterogeneous catalysis? State the theory of heterogeneous catalysis and explain with examples the activity and selecting of heterogeneous catalysis.



**Examination Programme-2019**  
**B.Sc (Part-III) Chemistry Honours**

Date	Papers	Time	Examination Centre
09/4/2019	Honours Paper-V	8.00 to 11.00 pm	Nalanda Open University, Patna
12/4/2019	Honours Paper-VI	8.00 to 11.00 pm	Nalanda Open University, Patna
13/4/2019	Honours Paper-VII	8.00 to 11.00 pm	Nalanda Open University, Patna
15/4/2019	Honours Paper-VIII	8.00 to 11.00 pm	Nalanda Open University, Patna
17/4/2019	Paper -XV (General Studies )	8.00 to 11.00 pm	Nalanda Open University, Patna



# Nalanda Open University

Annual Examination - 2019

B.Sc. Chemistry (Honours), Part-III

Paper-VI (Inorganic Chemistry)

Time: 3.00 Hrs.

Full Marks: 80

Answer any five questions. All questions carry equal marks.

1. 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?
2. What are Lanthenide? Write their electronic configuration? Why they are called inner-transition elements?
3. Explain R-S coupling scheme? How would you derive the ground state Term symbol. Calculate the free ion Term symbol for  $\text{Fe}^{+3}$ ,  $\text{Cr}^{+1}$ ,  $\text{Cu}^{++}$  and  $d^2$  system?
4. What do you mean by Lanthenide contraction. What are the consequences of Lanthenide contraction?
5. What do you mean by splitting of a d-orbitals in crystal field? How does d-orbital split in octahedral and tetrahedral field? Explain it with a neat diagram.
6. What do you mean by the dual nature of a particle? Derive the expression for de Broglie relationship? How was it verified?
7. Why liquid Sulphur dioxide is a good non-aqueous solvent? Explain the following type of reaction in liquid sulphur dioxide with example:-  
(i) Solvolysis (ii) acid-base reaction (iii) precipitation reaction
8. (a) Derive the magnetic moment value of following ions:-  
 $\text{Fe}^{+2}$ ,  $\text{Cr}^{+1}$ ,  $\text{Cu}^{+}$ ,  $\text{Ni}^{+2}$   
(b) Give the significance of wave function.
9. Draw the MO energy level diagram of  $\text{O}_2^+$ ,  $\text{NO}^+$ ,  $\text{F}_2$ . Write its magnetic properties and determine the magnetic momentum?
10. Write down the notes on the following :-  
(a) Point Group  
(b) Element of symmetry  
(c) Symmetry Operation



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

### Annual Practical Counselling & Practical Examination - 2019

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

#### Practical Counselling

Date	Time	Paper	Roll No.
18.04.2019 and 20.04.2019	11:00 AM to 5:30 PM	V to VIII	130470001 to 130470020 150470001 to 150470040 160470001 to 160470042
22.04.2019 and 24.04.2019	11:00 AM to 5:30 PM	V to VIII	160470043 to 160470200

#### Practical Examination

Date	Paper	Time	Roll No.
25.04.2019	V	11.30 AM to 2.30 PM	130470001 to 130470020 150470001 to 150470140 160470001 to 160470042
25.04.2019	VI	02.45 PM to 5.45 PM	
26.04.2019	VII	11.30 AM to 2.30 PM	
26.04.2019	VIII	02.45 PM to 5.45 PM	160470043 to 160470200
27.04.2019	V	11.30 AM to 2.30 PM	
27.04.2019	VI	02.45 PM to 5.45 PM	
29.04.2019	VII	11.30 AM to 2.30 PM	
29.04.2019	VIII	02.45 PM to 5.45 PM	

**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-III**  
**Paper-VII**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. (a) What are differences between  $SN_1$  and  $SN_2$  reaction ?  
 (b) Explain the mechanism of hydroboration of alken ?
2. Determine the constitution of uric acid and also give synthetic evidence in favour of the accepted structure of uric acid.
3. (a) How pyridine is prepared (b) Is it base or acid  
 (c) Explain that the basicity of pyridine is greater than pyrrole ?  
 (d) Why the electrophilic substitution in pyridine occurs chiefly at position- 3 ?
4. How is natural indigo obtained from plant ? Give two methods of its synthesis? What are its important uses ?
5. (a) What is meant by anti Markovnikov's i.e. Kharasch peroxide effect ?  
 (b) Explain in terms of inductive effect on acidity order as given below.  
 (c)  $ClCH_2COOH > HCOOH > CH_3COOH$
6. Explain the following of any two.  
 (a) Steric Hindrance (b) Strength of acid and bases  
 (c) mechanism of addition to carbon carbon double bond
7. Explain the following:-  
 (a) Cyclobutadiene is not an aromatic compound  
 (b) Methyl group in Toluene is an activator  
 (c) cyclopropenyl anion is not aromatic .
8. Discuss the degradative and synthetic means for ascertaining the structure of isoflavone? How is isoflavone related to flavone?
9. Explain the application of following reagents.  
 (a) Periodic acid (b) Nitrous acid (c) N-Bromosuccinamide
10. How is Xanthine prepared from uric acid ? How Xanthine is synthesized by Traube's method?



**Programme of B.Sc. Part-III Chemistry (Hons.)**  
**Annual Practical Counselling & Practical Examination - 2019**

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

**Practical Counselling**

Date	Time	Paper	Roll No.
18.04.2019 and 20.04.2019	11:00 AM to 5:30 PM	V to VIII	130470001 to 130470020 150470001 to 150470040 160470001 to 160470042
22.04.2019 and 24.04.2019	11:00 AM to 5:30 PM	V to VIII	160470043 to 160470200

**Practical Examination**

Date	Paper	Time	Roll No.
25.04.2019	V	11.30 AM to 2.30 PM	130470001 to 130470020 150470001 to 150470140 160470001 to 160470042
25.04.2019	VI	02.45 PM to 5.45 PM	
26.04.2019	VII	11.30 AM to 2.30 PM	
26.04.2019	VIII	02.45 PM to 5.45 PM	160470043 to 160470200
27.04.2019	V	11.30 AM to 2.30 PM	
27.04.2019	VI	02.45 PM to 5.45 PM	
29.04.2019	VII	11.30 AM to 2.30 PM	
29.04.2019	VIII	02.45 PM to 5.45 PM	

**Nalanda Open University**  
**Annual Examination - 2019**  
**B.Sc. Chemistry (Honours), Part-III**  
**Paper-VIII**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. 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?
2. Write the differences between fertilizer and manure? Write four characteristic of fertilizers? What is the process of production of urea from ammonia?
3. Give two methods of synthesis of any two of the following :-  
(a) Nylon-66                      (b) Teflon                      (c) Terylene
4. Write notes on any two :-  
(a) Spin-spin coupling      (b) Chemical shift  
(c) Nuclear magnetic moment and nuclear spin
5. Discuss the following:  
(a) Coal gas                      (b) octane number              (c) Knocking compound
6. Explain the following:  
(a) Pesticides pollutants      (b) Ozone layer and its depletion
7. Explain vibrational modes and vibration frequency? What are the factors influencing vibrational frequencies.
8. How urea fertilizer is manufactured. Explain its action as fertilizers?
9. Explain the following:  
(a) Sewage and sewage treatment  
(b) Purification of water and analysis of water pollution.
10. What do you mean by rubber?  
Write the structure of recurring units of natural rubber? What is vulcanization of rubber? Mention its uses?

