

**Nalanda Open University**  
**Annual Examination - 2016**  
**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. What do you understand by ionic product of water? Establish relation between the ionic product of water and degree of hydrolysis of a salt of strong acid and weak base?
2. (a) What is the origin of line spectra in atoms?  
 (b) Even though hydrogen atom has only one electron, its spectra have many lines.
3. Classify the elements given below as s, p, d and f block  
 (a) 6 (b) 42 (c) 89 (d) 92 (e) 11 (f) 87 (g) 58 (h) 90
4. Mention the postulates of kinetic theory of gases. Deduce kinetic gas equation and establish Charles's and Avogadro's law from it.
5. How does Vander Waal's equation explain the behaviour of real gas? Deduce expression for reduced equation of state for gas.
6. Why is radium grouped with alkaline earth metals? Write a note on the extraction of radium from pitchblende. Write uses of Radium.
7. Answer the following:  
 (a)  $\text{SiCl}_4$  is hydrolysed but  $\text{CCl}_4$  is not, why?  
 (b) Use the V.S.P.E.R theory, identify the type of hybridization of  $\text{OF}_2$ . What are the oxidation states of O and F in  $\text{OF}_2$ .  
 (c) Bond angles or shape of  $\text{H}_2\text{O}$ ,  $\text{NH}_3$  and  $\text{CH}_4$  are different although central atoms have some types of hybridization ( $\text{sp}^3$ ), why?
8. What are the chief ores of silver? How is silver extracted from its ore? Describe the diagonal relationship between boron and silicon. How does boron react with:  
 (a)  $\text{H}_2\text{SO}_4$  and (b)  $\text{NaOH}$ .
9. (a) Describe the characteristics of s-block and p-block elements.  
 (b) Explain the diagonal relationship.
10. Write notes on the following:  
 (a) Pauli exclusion principle.  
 (b) Buffer solution and Buffer capacity.  
 (c) Quantum number.



**Examination Programme, 2016 (Revised)**  
**B.Sc (Part – I) All Honours Subjects**  
**Except Home Science, Geography & Statistics Honours**  
**(गृह विज्ञान, भूगोल और सांख्यिकी ऑनर्स को छोड़कर)**

Date	Papers.	Time	Examination Centre
26/3/2016	(Hons) P-I	3.30 to 6.30 pm	Nalanda Open University, Patna
28/3/2016	(Hons) P-II	3.30 to 6.30 pm	Nalanda Open University, Patna
30/3/2016	Rastrabhsha-100 or Hindi +Urdu 100	3.30 to 6.30 pm	Nalanda Open University, Patna
01/4/2016	Mathematics (Sub) P-I	8 to 11 am	Nalanda Open University, Patna
02/4/2016	Geography (Sub) P-I	8 to 11 am	Nalanda Open University, Patna
04/4/2016	Chemistry (Sub) P-I	8 to 11 am	Nalanda Open University, Patna
05/4/2016	Home Science (Sub)-P I	8 to 11 am	Nalanda Open University, Patna
06/4/2016	Zoology (Sub) P-I	8 to 11 am	Nalanda Open University, Patna
08/4/2016	Physics (Sub) P-I	8 to 11 am	Nalanda Open University, Patna
09/4/2016	Botany (Sub) P-I	8 to 11 am	Nalanda Open University, Patna
11/4/2016	Statistics (Sub)-P I	8 to 11 am	Nalanda Open University, Patna



**Nalanda Open University**  
**Annual Examination - 2016**  
**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. What do you understand by hydroxy acid? How Lactic acid manufactured by formation of sugar? How does it react with :-  
(a)  $H_2SO_4$  (b) HI (c) Fenton reagent.
2. How is oxalic acid obtained? How does it react with following :-  
(a)  $Pcl_5$  (b)  $KMnO_4$  in acid medium (c) Glycerol.
3. Distinguish between order of reaction and molecularity of reaction? Derive an expression of rate constant of first order reaction? What is its unit?
4. Describe the methods with equation to prepare phenol. How does it react with:-  
(a)  $CO_2$  and NaOH (b)  $CCL_4$  in NaOH  
(c) Fuming nitric acid in presence of  $H_2SO_4$ .
5. Explain the terms:-  
(a) Components (b) Phases (c) Degree of freedom.
6. What is the chief source of citric acid? How is it obtained in pure state? Establish the structure of citric acid.
7. Explain the following:-  
(a) Concentration on cell  
(b) Reversible and irreversible process
8. Define isomerism. What are the types of structural isomerism? Give suitable examples to explain them.
9. State first Law of thermodynamics. Derive a relation between heat Capacity at constant pressure and at constant volume.
10. Write notes any **two** of following:-  
(a) Inductive effect (b) Addition reaction  
(c) Elimination reaction (d) Substitution reaction.



**Nalanda Open University**  
**Annual Examination - 2016**  
**B.Sc. Chemistry (Honours), Part-II**  
**Paper-III**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. What do you understand by reversible and irreversible cell? Deduce an expression for the concentration of cell with transference.
2. Explain work function and Gibbs free energy. Derive Gibbs Helmholtz equation.
3. Describe Millikan's oil drop method for determination of charge of an electron.
4. What are molecular formula of Caro's and Marshall's acid? Discuss the two methods of preparation and properties. Write down their proof.
5. What do you mean by term transition elements? Give reasons to explain the following:
  - (a) All most all transition metals form complex compound why?
  - (b) Generally transition metals are para magnetic.
  - (c) Generally compounds of transition metals are colored Why?
6. How potassium permanganate is prepared on large scale? How does  $\text{KMnO}_4$  reacts with:-
  - (a)  $\text{H}_2\text{S}$  in acid medium
  - (b) Oxalic acid in presence of  $\text{H}_2\text{SO}_4$
  - (c)  $\text{KI}$  in acid medium calculate equivalent weight of  $\text{KMnO}_4$  in different medium.
7. What are important ores of Nickel? Isolate large amount of Nickel in pure state from its Sudbury ore. Explain that nickel shows properties of transition element.
8. What are silent feature of valence theory for complex formation Write down its limitation Explain, why  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic and square planer.
9. What do you understand by terms given below used in nuclear Chemistry .
  - (a) Nuclear stability
  - (b) Packing fraction
  - (c) Mass defect
  - (c) Nuclear Binding energy.
10. Write notes any two:
  - (a) Silica Gel
  - (b) Silicones
  - (c) Sodium Thio sulphate.



**Nalanda Open University**  
**Annual Examination - 2016**  
**B.Sc. Chemistry (Honours), Part-II**  
**Paper-IV**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. What is Grignard Reagent? How Grignard reagents can be prepared. How can you obtain the following with the help of Grignard reagents:-
  - (a) Primary alcohol
  - (b) Secondary alcohol
  - (c) Tertiary alcohol
  - (d) Carboxylic acid
2. Why amino acids are weaker acids than the corresponding unsubstituted acids? Explain the following with reference.
  - (i) Peptide Linkage
  - (ii) Zwitter ion
3. State and explain conformation. Explain conformations of Ethane and Cyclohexane.
4. (a) Is ethyl zinc iodide a Grignard reagent? Why is zinc dialkyl less reactive than lithium alkyl.  
(b) How would you synthesize the following:-
  - (i)  $C_6H_5 - COOH$  from  $C_6H_5Br$
  - (ii)  $CH_3CH_2 - \overset{\overset{OH}{|}}{CH} - CH_3$  from  $CH_3MgBr$
  - (iii)  $C_6H_5 - \overset{\overset{CH_3}{|}}{C} - CH_3$  from  $(CH_3)_2Zn$
5. How is the structure of D-glucose established?
6. (i) Explain what is observed when,
  - (a) A beam of light is passed through the colloidal solution.
  - (b) An electric current is passed through the colloidal solution.(ii) Write at least four applications through the colloidal solution.
7. What do you understand by Kohlrausch Law? What are their applications of Kohlrausch Law.
8. How would you introduce the following in an aromatic ring?
  - (i)  $-COOH$
  - (ii)  $-COCH_3$
  - (iii)  $-Cl$
9. How is nitrobenzene prepared in the laboratory? And also prepare it from benzene diazonium chloride. Give its reduction products in acid/alkaline/neutral medium. Also give equations in support of your answer.
10. Write notes on following:-
  - (a) Sand Meyer reaction
  - (b) Friedel-Crafts reaction
  - (c) Benzoin Condensation
  - (d) Cannizzaro reaction



# Nalanda Open University

Annual Examination - 2016

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:-
  - Which of the following has maximum number of unpaired electrons:  
(a) Zn (b) Cu (c) Mn (d) Ni
  - The most abundant hydrocarbon pollutant is:  
(a) CH<sub>4</sub> (b) C<sub>2</sub>H<sub>6</sub> (c) C<sub>3</sub>H<sub>8</sub> (d) C<sub>4</sub>H<sub>10</sub>
  - Which of the following is not involved in formation of photo chemical smog:  
(a) O<sub>3</sub> (b) C<sub>x</sub>H<sub>y</sub> (c) NO (d) SO<sub>2</sub>
  - Aromatic compounds present as particulates are:  
(a) Benzene (b) Toluene (c) Nitrobenzene (d) Polycyclic
  - Which of following compounds exhibits colour:  
(a) CaCl<sub>2</sub> (b) AlCl<sub>3</sub> (c) KCl (d) FeCl<sub>3</sub>
  - Oxidation number of central metal ion in the [Fe(CM)<sub>6</sub>]<sup>-4</sup> is  
(a) +4 (b) 2 (c) -4 (d) Zero
  - Pyrolusite is the ore of:  
(a) Mn (b) Cr (c) Co (d) Fe
  - Which of the following is not green house gas:  
(a) CO<sub>2</sub> (b) CCl<sub>2</sub>F<sub>2</sub> (c) CH<sub>4</sub> (d) O<sub>2</sub>
- State the salient points of Valence Bond theory. What are its defects?
- Explain:
  - SiC is as hard as diamond.
  - CCl<sub>4</sub> is not hydrolysed while SiCl<sub>4</sub> gets hydrolysed.
  - CO<sub>2</sub> is acidic while SiO<sub>2</sub> is amphoteric.
  - C-H bond is essentially non-polar.
- What do you know about Caro's and Marshall's acid? Give their preparation and properties.
- Discuss the position of halogen in the periodic table. What are reasons for late isolation of fluorine? Give the properties and uses of fluorine.
- Define the following terms:
  - Double salt
  - Ligand
  - Co-ordination numberDifferentiate between double salt and co-ordination compounds with examples.
- What are sources of soil pollution? How can soil pollution be controlled?
- What are the ores of cobalt? How is cobalt in pure state obtained from its ore? Describe its oxidation states.
- Describe the principle involved in the determination of Nickel ion in the solution gravimetrically.
- Write short notes on any two of the following:
  - Zeolites
  - Fullerenes
  - Alloptropy
  - Optical isomerism



**Nalanda Open University**  
**Annual Examination - 2016**  
**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. What is fluorescence and phosphorescence? Describe these on the basis of Jablonski diagram.
2. What do you understand by adsorption? Discuss the factors on which adsorption depends. Discuss Freundlich adsorption isotherm. To what extent it explains experimental data.
3. What are the postulates of the theory of absolute rate of reaction? Deduce expression for the rate Constant.
4. What is meant by enzyme catalysis? Why are they specific in their action? How will you explain that enzymes catalyzed reaction has an optimum pH at which the activity of enzymes is maximum.
5. (a) State and Explain Stark-Einstein's law of photo chemical equivalence.  
(b) Discuss the mechanism for the formation of HCl when the mixture of hydrogen and chlorine exposed to light of Wavelength less than  $4000\text{\AA}$ .
6. Deduce expression for 3rd order reaction given that the initial Concentration of all these reactants are same and stoichiometric coefficient is one for each of the three reactants.
7. (a) Explain the following:  
(i) Molar viscosity (ii) Molar-Refraction  
(iii) Dipole Moment  
(b) The dipole moment of  $\text{NH}_3$  is  $1.48\text{D}$ . If the angle H-N-H is  $108^\circ$  calculate the bond moment of N-H bond.
8. What are Miller indices of the planes of a crystal lattice? Show that all parallel planes of any crystal lattice have same Miller indices.  
Given that the initial concentration of both reactants are different.
9. What do you mean by polarizability of a molecule? Derive the classical-Mossotti equation for determination of Molar polarization in terms of relative permittivity of the medium and induced polarizability of molecule.
10. Write short notes on any **two** of following:-  
(a) Chemiluminescence  
(b) Radius Ratio rule and its relation with Co-ordination number  
(c) Lambert Beer Law.



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**B.Sc. Chemistry (Honours), Part-III**  
**Paper-VI**

**Time: 3.00 Hrs.**

**Full Marks: 80**

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

1. What is Crystal field Theory for the formation of a complex Compound? How does This Theory account for the fact that  $[\text{CoF}_6]^{-3}$  is paramagnetic but  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is diamagnetic Compound though both are octahedral Compound?
2. What is ferrocene? How it is prepared? Give the structure of ferrocene? Discuss its important reactions.
3. What do you mean by the dual nature of a particle? Derive an expression for the de-Broglie relation. How was it verified.
4. Write down the important ore of Platinum? How Platinum metal is called noble metal? Discuss its important types of platinum metal and their uses.
5. Elaborate role of sodium, Potassium and Magnesium in the plants and animals.
6. What are important ore of Molybdenum? Give the details of the extraction of Molybdenum from its important one. Why molybdenum exhibit different oxidation state.
7. Explain on the basis of Molecular orbital Theory as why:-
  - (a) oxygen molecule is paramagnetic and a nitrogen molecule is diamagnetic.
  - (b) Hydrogen forms diatomic molecules where as helium forms monatomic molecule only.
8. Write notes on:-
  - (a) R-S Coupling
  - (b) Magnetic susceptibility
  - (c) Hole formation
9. Discuss the main postulates of quantum Mechanics.
10. Write down the notes any two on the following:-
  - (a) Element of symmetry
  - (b) Symmetry operation
  - (c) Point group
  - (d) M.O diagram of Co.





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**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. Define the aromaticity, making a special mention of Hockle Rule. Discuss modern theory of aromaciticity. Explain why fulvene and Azulene are aromatic.
2. What are flavones? Discuss the degradative and synthetic method to establish the structure of flavones. How is a flavone related to a flavanil?
3. Discuss the preparation, mechanism and application of any **two** of the following reagents:-
  - (a) Hydrogen peroxide
  - (b) Periodic acid
  - (c) Lithium aluminum hydride.
4. Give the synthesis of following dye:-
  - (i) Malachite Green (ii) Congo red (iii) Methyl orange (iv) Phenolphthalein
5. Discuss the prepration, mechanism and application of any **two** of the following reagents:-
  - (a) N-Brom succinimide (b) Peractic acid (c) lead tetra acetate
6. Discuss the degrative and Synthetic method to establish the structure of Annthraceine. Why in Annthraceine, the attack of an electrophile, prefretially occurs at C<sub>9</sub> C<sub>10</sub>? How will you, synthesis Anthraquinone from Anthracine?
7. How will you prove the presence of two fused benzene nepthalene into (i) β naphol (ii) α naphthylamine.
8. Discuss with suitable examples :-
  - (a) Plane of symmetry
  - (b) Reflection of Symmetry
9. Explain Cl group is activating yet it is ortho and para directing in electrophilic aromatic substitution reactions. Discuss briefly the method of isolation of ortho, para and meta isomer from Obtained by disubstitution of benzene.
10. Decribe the sythesis of quinoline by Skraup and Fridlander method. How does quinoline react with:-
  - (a) Mixture of funring HNO<sub>3</sub>+H<sub>2</sub>SO<sub>4</sub>
  - (b) Sodamide



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**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. Discuss the chemistry of UV spectroscopy. Explain the following electronic transition in ultraviolet spectroscopy.  
(a)  $\sigma \rightarrow \sigma^*$  transition    (b)  $n \rightarrow \sigma^*$  transition    (c)  $\pi \rightarrow \pi^*$  transition    (d)  $n \rightarrow \pi^*$  transition
2. Define the term 'Chromophore'. How will you detect the presence of  $>C=O$  group in aldehyde and ketone.
3. What do you understand by term acid rain? What are the sources of acid rain? Give the theory & mechanism of the acid-rain formation. What are the effects of acid rain?
4. What is soil pollution and soil pollutant? What are the effects of soil pollutant? How is soil pollution prevented?
5. Write a short note on deshielding and shielding effect with suitable examples. Describe clearly what do you know about coupling constant?
6. Explain the effect of anharmonicity on vibrational spectra of diatomic molecule.
7. (a) What is meant by the term chemical shift in an nmr spectrum?  
(b) Describe the splitting of signals with suitable example.
8. Differentiate between addition polymerization and condensation polymerization with suitable example. Write the repeating units in Neoprene and Teflon polymers.
9. (a) What are chemical fuel? Describe how the Calorific value of a solid fuel is determined by using a bomb calorimeter.  
(b) What are advantages of gaseous fuel over liquid fuel?
10. Write notes on any two of the following :-
  - (a) Neoprene
  - (b) Aviation Gasoline
  - (c) Sewage treatment