Nalanda Open University

Annual Examination – 2020

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 are the postulates of the kinetic molecular theory of Gases? Derive kinetic equation for gases?

2. Explain the following terms:-
   (a) Mean freepath
   (b) Collision frequency
   (c) Collision diameter

3. What is Vender Waal's equation? Describe the relation between Vender Waal's constant and critical constants?

4. Explain the following terms:-
   (i) Common Ion effect
   (ii) Solubility product and its application in salt analysis.

5. Write notes on any two:-
   (a) Buffer solution (b) P^H of solution (c) Ionic hydrolysis

6. Write down the electronic configuration of the following.
   Fe^{+2}, Cu, Ag, Kr, Xe, Cl^-, Ti^{+2}, Cr^+

7. Explain the following:-
   (i) Fajan's Rule (ii) Inert pair effect

8. Write the electronic dot structure of following compound :-
   (i) $Mg\ Br_2$ (ii) $C\ Cl_4$ (iii) CO_2 (iv) SO_4^{-2}
   (v) CO (vi) CO_2 (vii) $CHCl_3$ (viii) $SOCl_2$

9. How hydrogen Peroxide is manufactured? What is the meaning of 10 volume, 20 volume and 100 volume of H_2O_2? Explain the oxidising and reducing character of H_2O_2?

10. Explain the position of Boron in Periodic table. What is borax bead test? Explain the structure of B_2H_6?

Nalanda Open University

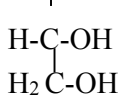
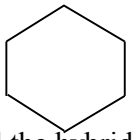
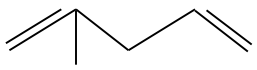
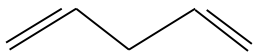
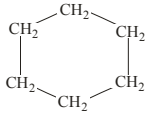
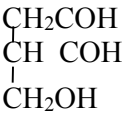
Annual Examination – 2020

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

Paper-II

Time: 3.00 Hrs. **Full Marks: 80**

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

1. What is Osmatic Pressure and elevation in boiling point? Describe the expression to calculate the molecular mass of non-ionic solute by elevation in boiling point?
2. (i) Explain relation between pressure-volume and Temperature of ideal gas in adiabatic process.
   (ii) What do you understand by extensive and intensive properties?
3. Write notes on any two :-
   (a) Depression in freezing point
   (b) Work done in isothermal process
   (c) Cp - Cv = R
4. Explain the determination of molecular mass of organic acid by silver salt method?
5. Write notes on any two :-
   (i) Electrometric effect
   (ii) Inductive effect
   (iii) Carboniumion and Carbocation
6. Write the IUPAC name of following organic compound:-
   (i) $CH_3—CH = CH—COOH$
   (ii) 
   (iii) 
   (iv) $CH_3—CH = CH—CHO$
   (v) $NH_2—CH_2—CH_2—CH_2—NH_2$
   (vi) 
   (vii) 
   (viii) 
7. Label the hybridization of c-atom in following compound:-
   (a) $CH_3—CH = CH—CH_3$ (b) $CH_2 = CH—CH = CH_2—CH_3$
   (c) $H—C \equiv C—C \equiv C—CH = CHCl_2$ (d) $C_6H_6—CHO$
   (e) 
   (f) 
   (g) 
8. Write IUPAC name of Lactic acid? How lactic acid in prepared industrially? How it reacts with (i) Pcl_5 (ii) Cone H_2SO_4 (iii) I_2
9. What is primary, secondary and tertiary amines? How the mixture of amines are separated? How primary amines are prepared?
10. (a) Explain the stereo chemistry of lactic acid and Tartaric acid?
    (b) How urea is prepared?

Nalanda Open University

Annual Examination – 2020

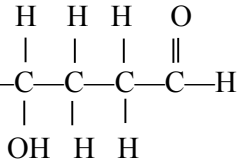
B.Sc. Chemistry (Subsidiary), Part-I

Paper-I

Time: 3.00 Hrs. **Full Marks: 80**

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

1. What is order of reaction and molecularity? Distinguish between them? Derive the expression for rate constant of 1st order reaction?
2. What is entropy of a systems? What are the physical significance of entropy? Explain entropy charge is reversible and irreversible process?
3. Explain the following:-
   (a) Gibbs phase role (b) Component (c) Degree of freedoms
4. Give IUPAC name of the following:-

   (i)
   

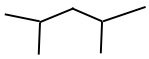
   (ii)
   

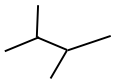
   (iii) $CH_3 — CH_2—C(=O)—CH_3$

   (iv) $COOH—CH_2—COOH$

   (v) $H_2N—CH_2—CH_2—CH_2—OH$

   (vi)
   

   (vii)
   

   (viii)
   

5. Explain the optical isomerism of lactic acid and tartaric acid. How lactic acid reacts with (a) CH_3OH (b) Pcl_5 (c) HI (d) I_2
6. What are the classification of carbohydrate? Explain the concept of open chain and ring chain structure of D-glucose?
7. (a) Explain following reaction with its mechanism:
      (i) Friedel craft Reaction (b) Perkin Reaction
   (b) Is water more acidic then ethyl alcohol? Explain.
8. Explain with mechanism of electrophilic substitution reaction with electrophiles of (i) cl_2 (ii) HNO_3
9. How nitrobenzene is prepared in laboratory? How nitrobenzene reacts with
   (a) H_2 (b) Sn/Hcl (c) Zn/H_2O
10. Write notes on any **two** of following:-
    (a) Cannizaro Reaction
    (b) Tetravalency of carbon
    (c) Inductive effect

Nalanda Open University

Annual Examination – 2020

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. (a) State and explain second law of thermodynamics?
   (b) Explain carnot cycle and carnot's theorem.
2. Explain the following :-
   (b) Reversible and Irreversible cell
   (c) Primary and Secondary cell
   (d) Entropy change in ideal gas
3. Write short notes on any two :-
   (a) Gibb's Helmholtz equation
   (b) Electrode and electrode potential
   (c) Clausius – claperyon equation
4. Determine the ground state term of d^2 system ? What are the total no. of microstates of d^2 system ?
5. Why d- block elements are called transition elements? Explain the edareeteristic of 3d-block elements on the basis of
   (a) Oxidation states (b) Magnetic properties (c) Complex formation.
6. How KM_nO_4 is prepared on large scale ? How does $KM_n O_4$ reacts with
   (a) H_2S in acid medium (b) Oxallic acid in presence of H_2SO_4 (c) KI in acidic medium
7. Write the IUPAC name of following :-
   (a) $[Fe F_6]^{-3}$ (b) $K_4[Fe (CN)_6]$ (c) $[Co(NH_3)_4Cl_2]^+$
   (d) $[Cr(H_2O)_6 Cl_2]^+$ (e) $[Ni CO)_4]$
8. What are the salient features of VBT? Explain the hybridisotion, nature and structure of following complexes :-
   (a) $[Fe (CN)_6]^{-4}$ (b) $[Co(NH_3)_4Cl_2]^+$
9. Explain the following :-
   (a) Nuclear fission and fusion
   (b) Radio-carbon dating
10. Write notes on any Two :-
    (a) Nuclear Binding energy (b) Heisenberg uncertainty theory
    (c) de Broglic theory of dual nature of electron.

Nalanda Open University

Annual Examination - 2020

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. 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 the support of chemical equation.
2. Explain the reaction mechanism of electrophillic substitution reaction in benzene with the electrophiles of nitration and sulphonation?
3. Explain conformation? Explain conformation of Ethane and Cyclohexane?
4. Establish the structure of D-glucose?
5. Do you agree C_{12} H_{22} O_{11} is injurious in diet? State and explain the necessary condition for a compound to exhibit optical isomerism? Discuss the optical isomerism exhibited by lactic acid and Tartaric acid.
6. How would you introduce the following in benzene?

   (a) Br_2 (b) $-CH_3$ (c) $-COOH$ (d) $-NO_2$

   You support your answer with reaction mechanism?
7. Write notes on any two:
   (a) Friedel Craft Reaction
   (b) Perkin reaction
   (d) Sandmeyer reaction.
8. Explain the following:
   (a) Tyndall effect (b) gold number (c) Origin of charge on colloids
9. What do you understand by Kohlrausch's Law? Explain the application of Kohlrausch's Law?
10. Write notes on following of any two:-
    (a) Elementary idea of RNA and DNA.
    (b) Polypeptide linkage
    (c) Emulsion and Gels

Nalanda Open University

Annual Examination – 2020

B.Sc. (Honours), Part-II

Paper - Chemistry (Subsidiary)

Time: 3.00 Hrs. **Full Marks: 80**

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

1. Choose correct answer from the following statements:-

   (i) Inner transition elements are:
   (a) d-block (b) s-block (c) p-block (d) f-block

   (ii) Cr has electronic configuration:
   (a) Kr $4d^5\ 5s^1$ (b) Ar $3d^5\ 4s^1$ (c) Kr $4d^4\ 5s^2$ (d) Kr $4d^5\ 6s^1$

   (iii) Which of the Halogen acids does not give prcipitates with $AgNO_3$ solution:
   (a) Hcl (b) HBr (c) HF (d) HI

   (iv) All metals are solid but only:
   (a) Hg is liquid (b) Na is liquid (c) Ca is liquid (d) Rb is gas

   (v) Which acid is present is minimum in acid rain:
   (a) CH_3COOH (b) H_2SO_4 (c) HCl (d) H_3PO_4

   (vi) Which of the following has the greatest affinity for hemoglobin:
   (a) NO (b) CO (c) SO_2 (d) NH_3 (e) None

   (vii) 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

   (viii) Which is most electropositive element:
   (a) K (b) Cs (c) Fe (d) L; (e) Ca

2. Write the IuPAC name of following complexes:
   (a) $[Fe(CN)6]^{-3}$ (b) $[Cr(en)I_4]^-$ (c) $[K_3[Fe(C_2O_4)_3]$ (d) $K[PtCl_3(NH_3)]$

3. What are transition elements? Why they are called 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

4. What are salient features of Werner's theory of coordination compounds formation? What are its merits and weakness?

5. What is salient feature of valence bond theory? Explain the hybridisation, structure and nature of complex and magnetic character of following complex compound.
   (a) $[Ni(CO)_4]$ (b) $[V(H_2O)_6]^{+3}$ (c) $[Mn(CN)_6]^{-3}$

6. Describe the principle involved in the estimation of silver in the solution volumetrically?

7. Explain the comparative chemistry of Fe, Co and N:?

8. Explain the following :-

   (a) Allotropic from of carbon (b) Fullerenes (c) Graphites

9. What do you know about :-
   (a) Pesticide and Herbicide Pollution
   (b) Water pollution due to Arsenic presence in drinking water

10. Write notes on any two:
    (a) Metallic bond (b) Hydrogen bond (c) Variable valency

Nalanda Open University

Annual Examination – 2020

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. (a) State and explain the following terms:
   (i) Phase (ii) Component (iii) Degree of freedom
   (b) Find the number of phases, number of components and degree of freedom in the following system :
   $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$
2. State and explain Gibbs phase rule and use it to discuss the phase diagram of water system.
3. Explain the following term :-
   (a) Molar volume (b) Surface tension and parachor (c) Viscosity
4. (a) Explain the difference between tetrahedral void and Octahedral void ?
   (b) What is Schottkey and Frankl's defect in crystal lattice ?
5. Define the kinetic equation of third order of reaction ? What are the characteristics of third order of reaction ?
6. (a) Derive Bragg's equation (b) Explain the structure of Zns ?
7. Derive the expression for the rate constant of second order reaction ? What are the characteristic of second order reaction ?
8. Write notes on any two of the following :
   (a) Radius ration rule
   (b) Clausius-Mossotti relationship
   (c) Enzyme catalysis
9. Distinguish between thermal and photochemical reaction ? Explain Einstein law's of photo chemical Equivalence and derive the equation ?
10. What is adsorption isotherm ? Derive the equation of Langmuir Adsorption Isotherm ?

Nalanda Open University

Annual Examination - 2020

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. Draw the molecular orbital diagram for molecule N_2, O_2^{-2}, F_2? Write their configuration, Bond order, magnetic property and stabitly?
2. What are the important ores of platinum? Give details of extraction of pure platinum from ores? Write the electronic configuration of platinum and explain its position in periodic table?
3. Why lanthanides are called inner transition elements? Write the electronic configuration of all lanthanide elements. Explain the position of lanthanide in periodic table? Explain the magmatic properties of lanthanide?
4. Determine the CFSE of d^3, d^7 and d^8 configuration? Why Δ_o for $[Co(CN)_6]^{-3}$ is greater than $[Co(NH)_6]^{+3}$?
5. What are the advantages and disadvantages of liquid ammonia as a solvent? Explain the chemical reaction of liquid ammonia as
   (i) Precipitation reaction
   (ii) A proton acceptor
   (iii) Acid-base reaction
6. Explain the hybridization structure, nature of complexes and magnetic moment of following compound by VBT method-$[Fe(CN)_6]^{-3}$, $[FeF_6]^{-3}$, $[Cu(CN)_4]^{-3}$?
7. Write notes on any two
   (i) Chelates (ii) Aufbaue principle (iii) Significance of wave function
8. Derive Schrodinger wave equation for a particle in three dimensions.
9. Draw the radial portability distribution curve of electron of 1s, 2s and 3s electrons? Label the curve with the determination of number of nodes?
10. Explain the following terms:-
    (a) Group symmetry
    (b) Symmetry elements
    (c) Symmetry Operation

Nalanda Open University

Annual Examination – 2020

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. What is azo dyes? How it is prepared? How methyl orange and congo red is prepared?
2. (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 electrophile NO_2^+?
3. (a) What do you understand by Heterocyclic compound? Explain with examples.
   (b) How quinoline is prepared by skrap synthesis? How it reach with H_2SO_4, $NaNH_2$ and KOH?
4. Explain the conept of aromaticity and explain Huckel $(4n+2)$ rule with suitable examples?
5. How Furan is prepared. Give the structure of Furan? How Furan reacts with HNO_3 and Cl_2?
6. How thiophenc is prepared? Give the structure of thiophinc? How it reach with HNO_3 acid and SO_2Cl_2?
7. (a) Explain aromatic substitution reaction of phenol with an electrophiles?
   (b) Explain the formation of alkene by elimination reaction?
8. Explain the application of following reagents in at least three reactions.

   (i) H_2O_2 (ii) Pb (iii) Periodic acid
9. Explain the preparation and constitution of Indigo?
10. Write short notes on following:-

    (a) Hydrogen Bonding (b) Strength of Acid and Base

    (c) Uric Acid.

Nalanda Open University

Annual Examination – 2020

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. Explain the following -
   (a) Forms of thermal energy
   (b) Relation between frequency, wave length and wave number
   (c) Electromagnetic spectrum
2. Explain the following term-
   (a) Nuclear magnetic moment and nuclear spin (b) Chemical shift
   (c) Spin-spin coupling
3. Discuss the Chemistry of UV spectroscopy. Explain the following electronic transition in UV spectroscopy.

   (a) $\sigma \rightarrow \sigma^{*}$ *transition* (b) $\pi \rightarrow \sigma^{*}$ *transition* (c) $\pi \rightarrow \pi^{*}$ *transition*
4. What is Vibrational modes and Vibrational frequency? What are the factors influencing vibrational frequency?
5. 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?
6. Discuss the following:
   (a) Coal gas (b) Water gas (c) Biogas
7. What are the types of water pollution? Give the classification of water pollution? What are the injurious effect of fluoride as a pollutant in ground water?
8. What is soil pollution and soil pollutant? What are the effects of soil pollutant? How soil pollution is prevented?
9. Explain following:
   (a) Fertilizers and pesticides
   (b) Radioactive pollutants
   (c) Cause of pollution by Industrial waste
10. Write notes on any two of following:
    (a) Ozone layer (b) Prevention and control of air pollution
    (c) Arsenic as a pollutant in ground water?