

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2012

CHEMISTRY**PAPER V: GENERAL CHEMISTRY**

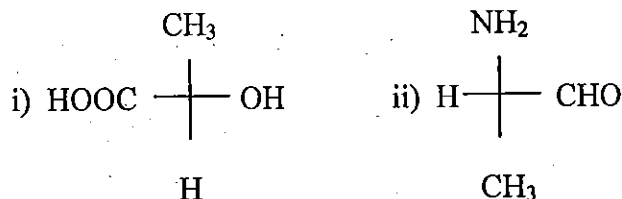
Duration: 3 hours

Max marks: 80

PART A1. Answer any **TEN** of the following:

2x10=20

- Write the Schrodinger wave equation and explain the terms.
- What is meant by Eigen Values?
- Give the molecular orbital configuration and bond order of O_2^+ ion.
- Diatomic helium molecule does not exist. Why?
- Define molar conductance and give its SI unit.
- State Kohlrausch's law.
- Give any two applications of Nernst distribution law.
- What is an azeotropic mixture? Give one example.
- What are diastereomers? Give example.
- What is resolution of racemic mixture?
- What are epimers? Give example.
- Assign R or S configuration for the following:

**PART-B**
UNIT-IAnswer any **TWO** of the following.

10x2=20

- Explain de-Broglie hypothesis and derive de-Broglie equation. 03
 - Draw the molecular orbital energy level diagram for fluorine molecule and show the filling up of electrons. Write molecular orbital configuration and calculate bond order. Explain magnetic property. 04
 - Explain the structure and geometry of SF_6 molecule. 03
- What are the conditions for the formation of molecular orbitals by LCAO Method? 03
 - What are the postulates of quantum mechanics? 04
 - Explain the hybridization involved and shape of water molecule on the basis of VSEPR theory. 03

4. a) Give the differences between valence bond theory and molecular orbital theory. 03
 b) Explain the significance of quantum numbers. 04
 c) Explain the bonding and structure of PF₅ molecule. 03

UNIT-II

Answer any **TWO** of the following.

10x2=20

5. a) Draw and explain the boiling point-composition curves for binary liquid mixture showing negative deviation from Raoult's law. 03
 b) Apply Nernst distribution law for the solutes undergoing association in one of the solvents. 03
 c) Describe Hittorf's method of determination of transport number using platinum electrode. 04
6. a) Explain the variation of equivalent conductance and specific conductance of a weak electrolyte with dilution. 03
 b) What is steam distillation? How do you calculate molecular mass of organic substance by this method? 04
 c) What is CST? Explain effect of impurity on miscibility temperature of phenol-water system. 03
7. a) Explain the miscibility temperature composition curve for nicotine-water system. 03
 b) A dilute solution of ammonium chloride was placed between two electrodes 0.2m apart with a potential difference of 12V. What is the mobility of ammonium ion if it covers a distance of 0.016m in one hour? 03
 c) How is solubility of a sparingly soluble salt determined by conductance method. 04

UNIT-III

Answer any **TWO** of the following.

10x2=20

8. a) How do you convert glucose to fructose? 03
 b) How do you determine configuration of geometrical isomers by physical and chemical methods? 04
 c) Write the mechanism of mutarotation. 03
9. a) Assign E or Z configuration for $\begin{array}{c} \text{Cl} \quad \quad \text{Br} \\ \quad \diagdown \quad \diagup \\ \quad \text{C} = \text{C} \\ \quad \diagup \quad \diagdown \\ \text{I} \quad \quad \text{F} \end{array}$. Justify your answer. 03
 b) How is the ring size of glucose determined by Haworth method? 04
 c) Explain the biochemical method of resolution of racemic mixture. 03
10. a) Explain the reaction of fructose with phenyl hydrazine. 03
 b) Explain optical isomerism in tartaric acid. 03
 c) Explain the conformational analysis of 1, 2 dichloroethane molecule. 04

03

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CHEMISTRY

PAPER VI: GENERAL CHEMISTRY

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PART A

1. Answer any **TEN** of the following:

2x10=20

- Explain, with an example, dipole-induced dipole interaction.
- Classify the following as hard and soft acids and bases.
 $Mg^{2+}, Hg^{2+}, I^{\ominus}, OH^{\ominus}$
- Give the name of the following organometallic compounds.
 $K[PtCl_3(C_2H_4)]; K[B(C_6H_5)_4]$
- Magnesium is a good conductor of electricity although its 3S band is completely filled. Why?
- What is phosphorescence? Give an example.
- What are upfield and down field shifts in PMR spectrum?
- Homonuclear diatomic molecules such as H_2, N_2, Cl_2 etc do not show IR spectra. Give reason.
- Calculate the energy of the second excited rotational level of CO molecule.
 $I = 1.46 \times 10^{-46} \text{ Kg m}^2, h = 6.626 \times 10^{-34} \text{ JS}$
- Give the synthesis of congo red.
- What is vulcanisation of rubber? Mention its advantage.
- Why ethylacetoacetate is an active methylene compound?
- What are the monomers of Buna-N rubber?

PART-B

UNIT-I

Answer any **TWO** of the following.

10x2=20

- What is Born-Haber Cycle? How can it be used for the determination of lattice energy of NaCl? 04
 - Discuss any two applications of HSAB principle. 03
 - Give one method of preparation, one property and one application of organomercury compounds. 03
- Differentiate between conductors, semiconductors and insulators on basis of band theory of metallic bond. 04
 - Illustrate HSAB principle. Give reason: AgI_2^- is stable while AgF_2^- does not exist. 03
 - How are organolithium compounds prepared? Give one property and one application of them. 03

4. a) State, with reasons, which cation will have greater polarizing power in the each of the following pairs. (i) Pb^{2+} or Pb^{4+} (ii) Na^+ or Cu^+ 04
- b) What is lattice energy? How does the solubility of an ionic solid depend upon its lattice energy and solvation energy? 03
- c) What are monocular carbonyls? Explain the nature of bonding in metal carbonyls. 03

UNIT-II

Answer any **TWO** of the following. 10x2=20

5. a) Explain Rayleigh line, Stokes lines and anti-Stokes lines in the Raman spectrum. 03
- b) Derive an expression to calculate the rotational energy levels of a rigid diatomic rotator. 03
- c) What is fundamental vibrational frequency? Calculate the vibrational frequency of CO molecule when the force constant is 1840Nm^{-1} .
Masses of atoms: C = 19.9×10^{-27} kg; O = 26.6×10^{-27} kg. 04
6. a) Write a note on absorption of energy for various types of molecular spectra. 03
- b) What information can be obtained from the following in an PMR spectrum?
(i) area under the curve (ii) chemical shift (iii) spin-spin splitting 03
- c) Explain low quantum yield and high quantum yield photochemical reactions with suitable examples. 04
7. a) State Einstein's law of photochemical equivalence. Calculate the value of the Einstein of radiation of wavelength 3750\AA . 03
- b) Discuss the application of microwave spectroscopy in the determination atomic mass of an unknown isotope. 03
- c) Give the expression for vibrational energy of a diatomic molecule. Explain the selection rule for vibrational transition. Mention the conditions for vibrational spectroscopy. 04

UNIT-III

Answer any **TWO** of the following. 10x2=20

8. a) How is nylon-6,6 manufactured? 03
- b) Give the synthesis of indigo dye. 03
- c) How is ethylacetoacetate useful in the synthesis of ketones and heterocyclic compounds? Explain with suitable examples. 04
9. a) Explain the mechanism of anionic addition polymerization. 03
- b) How is diethylmalonate useful in the synthesis of dicarboxylic acids? Explain with an example. 03
- c) How are dyes classified on the basis of method of application? Give an example for each class. 04
10. a) How is alizarin synthesized? 03
- b) Explain the mechanism of Claisen condensation. 03
- c) Explain the manufacture of polyurethane. 04

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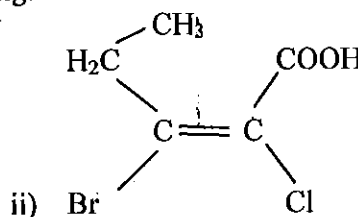
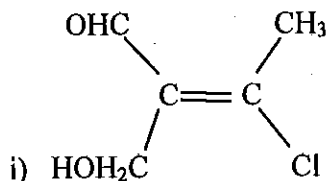
Max marks: 80

PART A

1. Answer any TEN of the following:

10x2=20

- Give reason: Bond angle in water molecule is more than that of ammonia.
- What is Photoelectric effect?
- Give reason: BF_3 is trigonal planar whereas NH_3 is pyramidal in shape.
- On the basis of molecular orbital theory account for the higher bond order of O_2^+ compared to O_2
- Define Nernst distribution law.
- What is conductance ratio?
- Write Debye Huckel Onsagar equation and explain the terms.
- Equivalent conductances at infinite dilution of NaCl , HCl , CH_3COONa are 126.4, 426.1 and $91 \text{ Scm}^2 \text{ eq}^{-1}$ respectively. Calculate the equivalent conductance at infinite dilution of acetic acid.
- Assign E or Z configuration for the following:



- What is mutarotation?
- Write the Newman projection formula for the most stable conformer of 1, 2-dichloroethane.
- What are mesocompounds? Give one example.

PART-B
UNIT-IAnswer any TWO of the following.

2x10=20

- Mention the significance of ψ and ψ^2 in quantum chemistry. 02
 - Discuss the shape of SF_6 molecule. 04
 - Draw the molecular orbital energy level diagram for N_2^{+2} ion, calculate its bond order. 04
- Draw the radial distribution curve for 1s orbital. 02
 - Based on the valence bond theory, discuss the shape of carbonate ion. 04
 - Name the different types of quantum numbers and give their significance. 04

4. a) Differentiate between Valence Bond theory and Molecular orbital theory. 02
 b) Justify the dual nature of matter and derive the de Broglie equation. 04
 c) Draw the molecular orbital energy level diagram for fluorine molecule and calculate its bond order. 04

UNIT-II

Answer any **TWO** of the following. 2x10=20

5. a) Define specific conductance. Write its SI unit. 02
 b) How does specific and equivalent conductance of a strong and weak electrolyte vary with dilution? Explain the observed trend. 04
 c) Draw and explain the boiling point composition curve for solutions showing negative deviation from Rault's law. 04
6. a) What are minimum boiling azeotropes? Give one example. 02
 b) What is critical solution temperature? Briefly explain critical solution temperature of phenol water system. 04
 c) Explain the determination of dissociation constant for a weak electrolyte by conductance measurement. 04
7. a) Draw the conductivity graph for the conductometric titration of NaOH vs HCl. 02
 b) Distribution coefficient of benzoic acid between water and benzene is 0.304 at 20°C. Calculate the mass of benzoic acid which may be extracted from 100mL of 0.2M aqueous solution using 10mL benzene. (Molecular weight of benzoic acid 122). 04
 c) Explain the determination of transport number of ions in the electrolyte by Hittorf's method. 04

UNIT-III

Answer any **TWO** of the following. 2x10=20

8. a) What are diastereomers? Give one example. 02
 b) Give an account of the chemical and biochemical methods of resolution of racemic mixture. 04
 c) Explain the conversion of fructose to glucose. 04
9. a) Write a note on D and L system of nomenclature of organic compounds. 02
 b) Discuss use of pKa values and cyclisation as methods of determination of configuration of geometric isomerism. 04
 c) Explain Killiani Fischer synthesis. 04
10. a) Give the conditions for a molecule to show geometrical isomerism. 02
 b) Explain the method of the determination of ring size of glucose. 04
 c) Explain the mechanism of osazone formation. 04

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Duration: 3 hours

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PART A

1. Answer any **TEN** of the following: 10x2=20

- a) Why H^+ is a hard acid and F^- is a hard base?
- b) Lanthanides have poor tendency to form complexes. Why?
- c) What is metallic bond?
- d) Can lanthanum ion (atomic number = 57) exist in +4 oxidation state? Justify your answer.
- e) State Grothus-Draper law of photochemistry.
- f) What are the values of rotational quantum numbers and the selection rules for rotational spectra?
- g) Which of the following nuclei do not show nuclear magnetic resonance?
 $^{12}C, ^{13}C, ^{15}N, ^{14}N$
- h) What is molar extinction coefficient?
- i) Give the keto-enol structures of ethylacetoacetate.
- j) What is a mordant dye? Give one example.
- k) What are the monomers of terylene?
- l) Give the synthesis of diethyl malonate.

PART-B

UNIT-I

Answer any **TWO** of the following.2x10=20

2.
 - a) Compare the properties of lanthanides with actinides with respect to oxidation states and complex formation. 04
 - b) Discuss ion exchange method of separation of lanthanides 03
 - c) What are hard acids and bases? Give examples. 03
3.
 - a) Explain how lattice energy is calculated using Born-Haber cycle for sodium chloride crystal. 04
 - b) Write a note on lanthanide contraction. 03
 - c) What are actinides? Give their general electronic configuration. Justify their common oxidation state. 03
4.
 - a) On the basis of band theory explain what are conductors and insulators? 04
 - b) Explain the similarities between later actinides and later lanthanides. 03
 - c) Write the electronic configuration of cerium (atomic number = 58), erbium (atomic number = 68) and actinium (atomic number = 89) 03

UNIT-II

Answer any **TWO** of the following.

2x10=20

5. a) Describe the principle of proton magnetic resonance spectroscopy. 03
b) What is meant by shielding and deshielding of protons? 04
c) What are the advantages of Raman spectroscopy over Infrared spectroscopy. 03
6. a) How is bond length of a molecule determined from its rotational spectra? 03
b) The internuclear distance of carbonmonoxide molecule is $1.13 \times 10^{-10}m$. Calculate the energy in joules of this molecule in the first excited rotational level. The masses of carbon and oxygen atoms are $1.99 \times 10^{-26}kg$ and $2.66 \times 10^{-26}kg$ respectively. 04
c) Write an expression for vibrational energy of a diatomic molecule taking it as a simple harmonic oscillator. Sketch the vibrational energy levels diagram. 03
7. a) Bring out the points of difference between thermochemical reactions and photochemical reactions. 03
b) Discuss the photosynthesis of HCl from hydrogen and chlorine. 04
c) Write a note on photosensitization. 03

UNIT-III

Answer any **TWO** of the following.

2x10=20

8. a) Enumerate the various kinds of electronic transitions taking place in dyes. 03
b) Give one method of preparation of each of the following dyes:
i) congo red ii) indigo 04
c) How is Buna – S manufactured? 03
9. a) Give mechanism of cationic addition polymerization. 04
b) What are epoxy resins? Give the preparation of one epoxy resin. 03
c) Give the synthesis of unsaturated acid using diethylmalonate. 03
10. a) Explain the classification of dyes based on method of application. 03
b) Starting from ethyl acetoacetate how are the following synthesized?
i) Antipyrine
ii) 2-Methyl propanoic acid 04
c) Explain the formation of phenol-formaldehyde resin. 03

CHE 501.1

Reg. No.

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2014

CHEMISTRY

PAPER V: GENERAL CHEMISTRY

Duration: 3 hours

Max marks: 80

PART A

1. Answer any **TEN** of the following: 10x2=20

- a) What is Hamiltonian operator?
- b) Write the values of quantum numbers n , l , m and s for the last electron of sodium atom.
- c) Mention any two limitations of Valence Bond Theory.
- d) Even though nitrogen atom is sp^3 hybridized, the bond angle in NH_3 molecule is less than $109^\circ 28'$. Give reason.
- e) State Raoult's law.
- f) Mention any two conditions for the validity of Nernst distribution law.
- g) How do specific and equivalent conductances vary with dilution?
- h) Write Debye-Hckel-Onsager equation and explain the terms.
- i) Maleic acid readily forms a cyclic anhydride while fumaric acid does not. Why?
- j) Write the cyclic structures of α - and β - D glucose.
- k) Mesotartaric acid is optically inactive. Why?
- l) Explain the term mutarotatin.

**PART-B
UNIT-I**

Answer any **TWO** of the following. 2x10=20

- 2. a) Explain Compton effect. 03
- b) Explain the Planck's quantum law of radiation. 03
- c) Draw the MO energy level diagram for fluorine molecule and show the filling up electrons. Write the molecular orbital configuration, calculate the bond order and explain the magnetic property. 04

- 3. a) Give an elementary account of Valence Bond Theory. 04
- b) Explain photoelectric effect 03
- c) State and explain Heisenberg's uncertainty principle. 03

- 4. a) Explain the hybridization and shape of BF_3 molecule. 03
- b) Describe the physical significance of wave function Ψ and Ψ^2 . 03
- c) Give the conditions for the formation of molecular orbitals by LCAO method. 04

UNIT-II

Answer any **TWO** of the following.

2x10=20

5. a) Describe the boiling point-composition curves of a liquid mixture showing positive deviation from Raoult's law. 03
b) Explain the conductometric titration of a weak acid against a strong base. 03
c) How is the degree of dissociation of a weak electrolyte determined by conductance method? 04
6. a) State Nernst distribution law and explain any one of its applications. 03
b) Explain phenol-water system and discuss the effect of impurities on its C.S.T. 03
c) Describe Hittorf's method of determining the transport number of an ion using non-attackable electrodes. 04
7. a) State Kohlrausch's law and explain any one of its applications. 03
b) Write a note on steam distillation. 03
c) What is equivalent conductance of an electrolyte? How is it experimentally determined? 04

UNIT-III

Answer any **TWO** of the following.

2x10=20

8. a) What are enantiomers and diastereomers? 03
b) Describe the geometrical isomerism in oximes. 03
b) How is the ring size of D-Glucose determined by Haworth's method? 04
9. a) How do you convert D-Glucose into D-Mannose? 03
b) What are erythro and threo compounds? 03
c) Give the mechanism of osazone formation. 04
10. a) How does fructose react with phenyl hydrazine and HCN? 03
b) Explain the conformational isomerism in 1, 2- dichloroethane. 03
c) What is a racemic mixture? Explain the chemical method of resolution of a racemic mixture. 04

CHE 502.1

Reg. No.

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2014

CHEMISTRY

PAPER VI: GENERAL CHEMISTRY

Duration: 3 hours

Max marks: 80

PART A

1. Answer any TEN of the following: 10x2=20

- a) State Pearson's HSAB concept.
- b) Why is europium (II) more stable than cerium (III)?
- c) Define lattice energy.
- d) Give the general electronic configuration of *f* block elements.
- e) State Stark-Einstein's law of photochemical equivalence.
- f) What are the selection rules for Raman spectra?
- g) What is meant by chemical shift?
- h) What is chemiluminescence?
- i) Write the structures of keto enol forms of ethylacetoacetate.
- j) How is methyl orange synthesized?
- k) Name any one synthetic rubber and give its preparation.
- l) What are vat dyes? Give one example.

PART-B

UNIT-I

Answer any TWO of the following. 2x10=20

2.
 - a) Discuss ion exchange method of separation of lanthanides. 03
 - b) What is lanthanide contraction? What are the consequences of lanthanide contraction? 04
 - c) Explain acid-base strength based on Pearson's HSAB concept. 03
3.
 - a) Explain the conducting properties of materials using band theory. 03
 - b) Explain how lattice energy of sodium chloride crystal is calculated using Born-Haber cycle. 04
 - c) Explain the complexation tendencies of *f*-block elements. 03
4.
 - a) State Fajan's rules and explain its applications. 04
 - b) Explain the solubility of ionic solids on the basis of lattice energy and solvation energy. 03
 - c) Classify the following into hard and soft acids and bases 03
 $F^{-}, O^{2-}, S^{2-}, Li^{+}, Mg^{2+}, Hg^{+}$

UNIT-II

Answer any **TWO** of the following.

2x10=20

5. a) What is force constant? Explain the vibrational energy level diagram of a diatomic molecule. 03
- b) The rotational spectrum of HI consists of series of equally spaced lines with $\bar{\nu} = 12.8\text{cm}^{-1}$. What is the moment of inertia and internuclear distance atomic mass of iodine = 126.9? 04
- c) Why is tetramethylsilane used as a reference in NMR spectroscopy? 03
6. a) Explain the formation of Rayleigh line, Stokes lines and antiStokes lines in Raman spectra. 04
- b) What is meant by shielding and deshielding effect? 03
- c) Calculate the force constant for the bond in HCl from the fact that the fundamental vibrational frequency is $8.667 \times 10^{13} \text{s}^{-1}$ 03
7. a) Discuss the kinetics of photosynthesis of HCl from hydrogen and chlorine. 04
- b) Give any three differences between thermochemical reactions and photochemical reactions. 03
- c) A certain system absorbs 3×10^{18} quanta of light per second. On irradiation for 20 minutes 0.003 mole of the reactant was found to have reacted. Calculate the quantum yield for the process. 03

UNIT-III

Answer any **TWO** of the following.

2x10=20

8. a) Give one method of preparation for each of the following dyes.
i) malachite green ii) alizarin 03
- b) Explain the electronic concept of color of dyes. 04
- c) Give the preparation of polyurethanes. 03
9. a) Give the mechanism of free radical addition polymerization. 04
- b) Explain the preparation and uses of nylon 6,6 03
- c) What is meant by Zeigler-Natta polymerization? 03
10. a) Explain the mechanism of Claisen condensation. 03
- b) Using malonic ester how are the following synthesized
i) succinic acid
ii) barbituric acid 04
- c) Explain the method of manufacture of decron. 03

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CHE 501

Reg. No.

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2015

CHEMISTRY

PAPER V: GENERAL CHEMISTRY

Duration: 3 hours

Max marks: 80

PART A

1. Answer any **TEN** of the following:

10x2=20

- What are the limitations of valence bond theory?
- Even though nitrogen atom is sp^3 hybridized, the bond angle in ammonia is less than $109^\circ 28'$. Why
- Calculate the wavelength of a stone of mass 1g moving with a velocity 1ms^{-1} ($h = 6.62 \times 10^{-34} \text{JS}$).
- Write the values of l and m quantum numbers for the last electron in an atom with atomic number 19.
- What are ideal liquid mixtures? Give an example.
- State the Nernst distribution law.
- Define equivalent conductance. Give its S.I. Unit.
- State Kohlrausch's law.
- What are oligosaccharides? Give an example.
- Write any two differences between configuration and conformation?
- What is mutarotation?
- What are geometrical isomers?

PART-B

UNIT-I

Answer any **TWO** of the following.

2x10=20

- Write the Schrodinger wave equation and explain the terms involved in it. 03
 - Explain Hamiltonian operator. 03
 - Give an elementary account of VSEPR Theory. 04
- Explain the structure and geometry of SF_6 molecule. 03
 - What is Compton Effect? Explain it on the basis of Planck's quantum theory. 03
 - Draw the molecular orbital energy level diagram for fluorine molecule, show the filling up of electrons. Write the molecular orbital configuration and calculate bond order and explain the magnetic property. 04
- Give an account of Heisenberg Uncertainty principle. 03
 - Explain the shape of NH_4^+ ion using the concept of hybridization. 03
 - Explain the significance of quantum numbers. 04

UNIT-II

Answer any **TWO** of the following.

2x10=20

5. a) Discuss the effect of association and dissociation on the distribution of a solute between two immiscible liquids. 03
- b) Write Debye Huckel Onsager equation for strong electrolytes and account for the variation of equivalent conductance of strong electrolytes with dilution. 03
- c) (i) Explain the principle involved in conductometric titrations.
(ii) A solid X is added to mixture of benzene and water. After shaking well and allowing it to stand, 10cm^3 of X and 100cm^3 of water layer contains 0.22g of X. Calculate distribution coefficient. 2+2
6. a) State and explain Raoult's law of liquid mixtures. 03
- b) Discuss boiling point composition curves of a liquid mixture which forms an ideal solution. 03
- c) Briefly outline Hittorf's method for determination of transport number of an ion using unattackable electrodes. 04
7. a) Explain the miscibility temperature composition curve of triethylamine water system. 03
- b) Outline the principle and method of determination of solubility of a sparingly soluble salt by conductance method. 04
- c) Explain relaxation effect on the basis of Debye Huckel theory. 03

UNIT-III

Answer any **TWO** of the following.

2x10=20

8. a) What is Inversion? Give an example. 03
- b) What are glucosides? How are they prepared? 2+2
- c) Explain (i) Racemisation (ii) Diastereo isomers 03
9. a) Explain Ruff's degradation with an example. 03
- b) What are conformers? Write the Newmann projection formulae for eclipsed and staggered forms of 1, 2 dichloroethane. 04
- c) Give the mechanism of osazone formation. 03
10. a) Explain the chemical methods of determination of configuration of geometrical isomers. 03
- b) Explain the conversion of glucose into fructose. 03
- c) How is the ring structure of D(+) glucose established. 04

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2015

CHEMISTRY

PAPER VI: GENERAL CHEMISTRY

Duration: 3 hours

Max marks: 80

PART A

1. Answer any **TEN** of the following:

10x2=20

- a) Give reason: Lithium fluoride is least soluble among lithium halides.
- b) Write the increasing order of covalent character among the following:
 $BeCO_3$, $MgCO_3$ and $CaCO_3$.
- c) Which of the following complex is most stable $[AgI_2]^-$ or $[HgI_4]^{2-}$.
- d) Write the IUPAC name of $Fe(C_5H_5)_2$.
- e) Why is tetra methyl silane used as a reference in NMR spectroscopy?
- f) What are Stoke's and anti Stokes lines?
- g) Which of the following molecule give rotational spectra H_2 , HCl , CO_2 , NO .
- h) Explain the different modes of bending vibrations in carbondioxide molecule.
- i) Define the term chromophore.
- j) Give an example for natural dye.
- k) What is vulcanization?
- l) Write the keto-enol forms of ethylacetoacetate.

PART-B
UNIT-IAnswer any **TWO** of the following.

2x10=20

2. a) Give reasons: $HgCl_2$ is more covalent than $CaCl_2$ even though size of Hg^{2+} and Ca^{2+} are almost same. 02
- b) How are organometallic compounds classified? Give one example for each. 04
- c) What is HSAB theory? How does it explain the stability of compounds? 04
3. a) Calculate the lattice energy of sodium chloride. If heat of formation is equal to $-381.8kJmol^{-1}$, Ionization energy of sodium is equal to $495.8kJmol^{-1}$. Heat of sublimation of sodium is equal to $108.5kJmol^{-1}$. Dissociation energy of chloride molecule is $243.0kJmol^{-1}$ and Electron affinity of chlorine is equal to $-348.3kJmol^{-1}$ 03
- b) How is methyl lithium prepared? Starting from methyl lithium how is acetic acid obtained? 04
- c) Explain the bonding in metal carbonyls. 03

4. a) (i) Explain Fajan's rules.
(ii) Sodium sulphate is soluble in water but barium sulphate is insoluble why? 05
b) How is strength of acids and bases explained using HSAB theory? 03
c) Explain insulating properties of metals using band theory. 02

UNIT-II

Answer any **TWO** of the following. 2x10=20

5. a) Calculate the force constant of the bond in hydrogen chloride if fundamental vibration frequency is $8.667 \times 10^{13} s^{-1}$ and reduced mass is $1.6260 \times 10^{-27} kg$. 02
b) Explain the basic principles of NMR spectroscopy. 04
c) Explain microwave spectroscopy with energy level diagram and selection rule. 04
6. a) Derive an expression for rotational energy of a rigid diatomic rotator and show that successive line separates at $2B$. 03
b) Explain the Raman Spectra of a compound using phenomenon of Raman scattering. 04
c) The molar extinction coefficient of a complex of iron (II) is $1200 dm^3 mol^{-1} cm^{-1}$. If the concentration of iron (II) solution is $10^{-5} mol / dm^3$ and diameter of the cell in one centimeter, what will be the absorbance of monochromatic light? 03
7. a) Derive an expression for the rate of photochemical formation of HBr and comment on the quantum yield of the above reaction. 05
b) Calculate the Raman shift in cm^{-1} for a Raman line at 4447 \AA when sample was irradiated by mercury light of wave length 4358 \AA . 02
c) Explain phosphorescence using Jablonski diagram. 03

UNIT-III

Answer any **TWO** of the following. 2x10=20

8. a) How is phenol formaldehyde resins prepared? 02
b) Explain the mechanism of free radical polymerization. 04
c) (i) How is diethylmalonate prepared?
(ii) How is dicarboxylic acid synthesized from diethyl malonate? 04
9. a) How is Buna N is prepared? 03
b) Give the synthesis of the following dyes (i) Malachite green (ii) Indigo 04
c) Give the mechanism of synthesis of ethylacetoacetate. 03
10. a) Explain with examples, electronic concept of colour and constitution of dyes. 05
b) How is Nylon 66, manufactured? 03
c) How is a ketone obtained from ethylacetoacetate. 02

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2015

CHEMISTRY**PAPER V: GENERAL CHEMISTRY**

Duration: 3 hours

Max marks: 80

PART A1. Answer any **TEN** of the following: 10x2=20

- a) What is photoelectric effect?
- b) Write the values of four quantum numbers for the last electron in an atom with atomic number 19.
- c) Diatomic helium molecule does not exist. Why?
- d) Give two differences between bonding and antibonding molecular orbitals.
- e) Mention any two limitations of Nernst distribution law.
- f) What is ideal liquid mixture? Give an example.
- g) State Kohlrausch's law.
- h) Define equivalent conductance and give its SI unit.
- i) Give the difference between configuration and conformation.
- j) What are diastereomers? Give example.
- k) What is meant by glycosidic bond?
- l) What are reducing and non-reducing sugars? Give an example for each.

PART-B**UNIT-I**Answer any **TWO** of the following. 2x10=20

2.
 - a) Write de Broglie equation for matter wave. Show that it is significant only for small particles. 03
 - b) Explain the hybridization and shape of SF_6 molecule. 04
 - c) What is Compton Effect? Explain on the basis of Planck's quantum theory. 03

3.
 - a) What are the conditions for the formation of molecular orbitals by LCAO method? 03
 - b) Give any three similarities between Valence Bond Theory and Molecular Orbital Theory. 03
 - c) Explain the importance of four quantum numbers. 04

4.
 - a) Write the postulates of Planck's quantum theory of radiation. 03
 - b) Calculate the wavelength of a particle of mass 1g moving with a velocity of 10ms^{-1} . Given: $h = 6.626 \times 10^{-34} \text{Js}$. 03
 - c) Draw the molecular orbital energy level diagram for fluorine molecule. Show the filling up of electrons, write molecular orbital electronic configuration, calculate bond order and explain the magnetic property. 04

130

19/10

UNIT-II

Answer any TWO of the following.

2x10=20

5. a) Write a note on trimethylamine-water system. 03
b) A mixture of nitrobenzene and water distils at 99°C at which the respective vapour pressures are 3.6 kPa and 97.7kPa. The ratio by weight in which the liquids distill is water: nitrobenzene = 3.97:1. What is the molecular mass of nitrobenzene. 03
c) Explain the application of conductance measurement for determining the solubility of sparingly soluble salt. 04
6. a) Explain the variation of specific and equivalent conductances with dilution. 03
b) Discuss the effect of impurities on the C.S.T. of phenol-water system. 03
c) Explain Hittorf's method of determining transport number of an ion using non-attackable electrodes. 04
7. a) State Nernst distribution law and explain any one of its applications. 03
b) Explain any one application of Kohlrausch's law. 03
c) Explain the boiling point-composition curve of a liquid mixture showing large negative deviation from Raoult's law. 04

UNIT-III

Answer any TWO of the following.

2x10=20

8. a) Explain the optical isomerism in tartaric acid. 03
b) How do you convert an aldopentose into aldohexose? 03
c) What is meant by absolute configuration? Explain the D and L system of assigning configuration. 04
9. a) Explain the different conformations of 1, 2 - dichloroethane. 03
b) Write a note on muta rotation. 03
c) Explain the elucidation of cyclic structure of D(+) glucose. 04
10. a) Write a note on Walden inversion. 03
b) How does glucose react with
(i) Bromine water (ii) Hydrogen Cyanide. 03
c) How is the ring size of D(+) glucose established? 04

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2015
CHEMISTRY

PAPER VI: GENERAL CHEMISTRY

Duration: 3 hours

Max marks: 80

PART A

1. Answer any **TEN** of the following: 10x2=20

- a) Cerium and Terbium show +4 oxidation states. Give reason.
- b) Define solvation energy.
- c) What is a soft base? Give an example.
- d) Barium sulphate is insoluble in water while sodium sulphate is soluble in water. Give reason.
- e) State Grothus – Draper law of photo chemistry.
- f) What type of molecules give vibrational spectra? Give an example.
- g) HCl molecule shows pure rotational spectrum, while H_2 molecule does not. Give reason.
- h) Which of the following is NMR active?
 1_1H , ${}^{13}_6C$, ${}^{12}_6C$ and ${}^{16}_8O$
- i) What are the monomers of Nylon 6, 6 ?
- j) Give the keto-enol structures of ethyl aceto-acetate.
- k) What are mordant dyes? Give one example.
- l) How is malonic ester prepared?

PART-B

UNIT-I

Answer any **TWO** of the following. 2x10=20

2.
 - a) What is lanthanide contraction? Explain its cause and consequences. 04
 - b) How does HSAB principle govern the occurrence of minerals? 03
 - c) State Fajan's rules. Explain its applications. 03

3.
 - a) Explain the complexation tendencies of f-block elements. 04
 - b) Describe the conducting properties of a material using band theory. 03
 - c) Discuss the effect of substituents on the hardness and softness of an acid. 03

4.
 - a) Explain how lattice energy of sodium chloride crystal is calculated using Born-Haber cycle. 04
 - b) What are actinides? Give their general electronic configuration. Justify their common oxidation state. 03
 - c) Discuss the ion exchange method of separation of Lanthanides. 03

UNIT-II

Answer any **TWO** of the following.

2x10=20

5. a) Pure rotational spectrum of HCl consist of a series of equally spaced lines separated by 1050m^{-1} . Calculate the HCl bond length. (Atomic mass of H and Cl are respectively 1.008 gram per mole and 34.95 gram per mole.) 04
- b) Explain the principles of NMR spectroscopy with an example. 03
- c) Explain photo sensitization with an example. 03
6. a) Explain the general rules about spin-spin interaction and predict the NMR spectrum of ethyl alcohol. 04
- b) Derive an expression for rotational energy of a rigid rotator. 03
- c) What are the reasons for very high and very low quantum yield in photo chemical reaction? 03
7. a) Write short note on phosphorescence and fluorescence. 04
- b) Give an elementary account of Raman spectroscopy. 03
- c) Write an expression for vibrational energy of diatomic molecules taking it as simple harmonic oscillator and mention the selection rules for vibrational transition. Sketch the vibrational energy levels of such molecules. 03

UNIT-III

Answer any **TWO** of the following.

2x10=20

8. a) Explain the classification of dyes based on applications. 04
- b) Give the synthesis of unsaturated acid using diethylmalonate. 03
- c) How is Buna-S manufactured and give two applications of it. 03
9. a) Explain the mechanism of Claisen condensation. 04
- b) Give one method of preparation of malachite green. 03
- c) Explain the formation of phenol-formaldehyde resin. 03
10. a) Explain the mechanism of anionic vinyl polymerisation 04
- b) Starting from ethyl aceto acetate, how are the following synthesized?
(i) Adipic acid (ii) 2-methyl propanoic acid. 03
- c) Enumerate the various kinds of electronic transition taking place in dye. 03

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2016

CHEMISTRY**PAPER VI: GENERAL CHEMISTRY**

Duration: 3 hours

Max marks: 80

PART A1. Answer any **TEN** of the following: 10x2=20

- a) Write the general electronic configuration of lanthanides and account for its oxidation states.
- b) Give reasons: $CaCl_2$ is ionic but $HgCl_2$ is covalent even though size of Ca^{2+} and Hg^{2+} is same.
- c) Define solvation energy.
- d) Give an example each for hard acid, hard base, soft acid and soft base.
- e) Explain phosphorescence with example.
- f) Why CO is IR active and O_2 is IR inactive?
- g) Calculate the stretching frequency of vibration between C and H. Force constant $K = 4.443 \times 10^2 \text{ kg / s}^2$. Mass of $C = 20 \times 10^{-27} \text{ kg}$ and mass of $H = 1.6 \times 10^{-27} \text{ kg}$.
- h) Explain photosensitized reaction.
- i) What is meant by active methylene group? Give an example.
- j) What is vulcanization of rubber?
- k) Give an example each for azo dye and indigoid dye.
- l) How urea formaldehyde resin is prepared?

PART-B**UNIT-I**Answer any **TWO** of the following. 2x10=20

2.
 - a) Explain the determination of lattice energy of sodium chloride crystal using Born-Haber cycle. 04
 - b) Explain Pearson's HSAB concept. 03
 - c) Explain the cause and consequences of Lanthanide contraction. 03

3.
 - a) Account for thermal stability of $BeCO_3$, $MgCO_3$, $CaCO_3$, $SrCO_3$, $BaCO_3$ and solubility of AgF , $AgCl$, $AgBr$, AgI . 04
 - b) Explain the ion exchange method of separation of lanthanides. 03
 - c) Classify the following as hard and soft acid and bases -
 Mg^{2+} , Hg^{2+} , Cu^+ , I^- , OH^- , F^- 03

4.
 - a) On the basis of band theory explain the classification of substances as conductors, semiconductors and insulator. 04
 - b) Give three similarities between the later actinides and the later lanthanides. 03

- c) Explain the tendency of complex formation among the Lanthanides. 03

UNIT-II

Answer any **TWO** of the following. 2x10=20

5. a) Explain Raman spectroscopy on the basis of quantum theory. 03
b) Explain the kinetics of photochemical reaction between hydrogen and chloride and account for quantum yield. 03
c) Derive an expression for the rotational constant of a rigid diatomic rotator on the basis of quantum theory. 04
6. a) Give any three differences between thermal and photochemical processes. 03
b) Deduce an expression for force constant of a diatomic molecule acting as a simple harmonic oscillation. What is its selection rule? 04
c) What is shielding and deshielding effect? How does it explain the chemical shift in PMR spectra? 03
7. a) Draw the energy level diagram for the interaction of matter with radiation and explain the quantization. 04
b) Explain spin-spin splitting, coupling constant and area of signals for C_2H_5OH molecule. 03
c) Explain Einstein's law of photochemical equivalence. 03

UNIT-III

Answer any **TWO** of the following. 2x10=20

8. a) Explain the mechanism of anionic addition polymerization. 04
b) How are alizarin and congo red synthesized? 03
c) How is diethylmalonate synthesized? 03
9. a) Explain the mechanism of polymerisation of ethene using Ziegler-Natta catalyst. 03
b) Give the synthesis of epoxy resins. 03
c) Explain any two synthetic applications of ethylacetoacetate. 04
10. a) Give an example each for natural and synthetic rubber. Explain the superiority of synthetic rubber over natural rubber. 03
b) How are heterocyclic compounds prepared from diethyl malonate? 03
c) Explain the electronic concept of colour and constitution. 04
