



II Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
Paper – II : CHEMISTRY
(2014 – 15 Onwards)

Time : 3 Hours

Max. Marks : 60

- Instructions :** 1) Use SI units.
2) Write equations and neat diagrams wherever necessary.

PART – A

Answer all the questions.

(6×1=6)

1. a) Write the shape of ClF_3 .
b) Define the term coordination number of an ionic solid.
c) What is Hinsberg reagent ?
d) Give the IUPAC name of glycerol.
e) State Raoult's law of ideal solutions.
f) What is cryoscopic constant ?

PART – B

Answer any three questions.

(3×6=18)

2. a) Construct and explain Born-Haber cycle for the formation of an ionic solid. 4
b) Give the significance of bond energy. 2
3. a) Describe the factors favouring the formation of a covalent bond. 3
b) Explain the shape of SF_4 and ICl_2^- on the basis of VSEPR theory. 3
4. a) Write molecular orbital diagram for O_2 molecule and calculate its bond order. 3
b) Write the general properties of ionic compounds. 3
5. a) Define radius ratio rule. 2
b) What are σ and π bonds ? 2
c) What are polar and nonpolar molecules ? Give examples. 2

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PART - C

Answer **any three** questions.

(3×6=18)

6. a) Discuss the effect of substituents on acidity of phenol. 4
b) Explain the importance of Hoffman's exhaustive methylation. 2
7. a) How does primary, secondary and tertiary alcohols distinguished by Lucas test ? 3
b) Explain the preparation of amines by alkylation of NH_3 . 3
8. a) Discuss the reaction of glycerol with oxalic acid and HI. 4
b) Write a note on classification of alcohols. 2
9. a) Explain Fries rearrangement with mechanism. 4
b) Compare the basicity of methyl amine and aniline. 2

PART - D

Answer **any three** questions.

(3×6=18)

10. a) Describe the fractional distillation of type - I liquid mixture. 4
b) Write vapour pressure composition diagram for the liquid mixtures. 2
11. a) Explain the CST of phenol-water system. 3
b) Derive the relation between lowering of vapour pressure and molar mass. 3
12. a) How does molar mass of a nonvolatile solute determined by osmotic pressure method ? 4
b) The boiling point of a solution when 1.3 g of solute dissolved in water is found to be 97.8°C . The final volume of solution is found to be 15 cm^3 . Calculate the molar mass of solute. (Boiling point of solvent 97°C and its density 0.997 g/cc). 2
13. a) What are ideal and non ideal solutions ? 2
b) Define abnormal molar mass. 2
c) What is plasmolysis ? 2
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IV Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
CHEMISTRY
Chemistry (Paper – IV) (2014-15 Onwards)

Time : 3 Hours

Max. Marks : 60

Instructions : 1) Use SI Units.

2) Draw neat labelled diagrams wherever necessary.

PART – A

Answer **all** the questions :

(6×1=6)

1. a) What are isotones ?
- b) Define indicator constant.
- c) State Hackel's rule of aromaticity.
- d) How does methyl lithium reacts with ethylene oxide ?
- e) State third law of thermodynamics.
- f) Define molar extinction coefficient.

PART – B

Answer **any three** questions :

(3×6=18)

2. a) Explain nuclear forces. 3
- b) Mention the advantages of nuclear fusion over nuclear fission. 3
3. a) Explain Ostwald theory of indicators. 4
- b) What are universal indicators ? Give examples. 2
4. a) What is standard deviation and write its expression. 2
- b) How are errors classified ? Explain their minimisation. 4
5. a) Explain complex formation tendency of d-block elements. 2
- b) How does atomic radii of d-block elements vary along a period ? 2
- c) Explain binding energy. 2



PART - C

Answer **any three** questions :

(3×6=18)

6. a) Write the postulates of Bayer's strain theory. 4
b) How does cyclobutane prepared by Freund's method ? 2
7. a) Describe the Fridel-Crafts alkylation with mechanism. 4
b) Narrate the orienting influence of COOH group of benzoic acid on electrophilic substitution. 2
8. a) Compare the aromaticity of pyrrole and pyridine. 3
b) Discuss the synthesis of quinoline. 3
9. a) Give the classification of heterocyclic compounds with examples. 3
b) How does TEL (Tetra Ethyl-Lead) prepared ? Mention its uses. 3

PART - D

Answer **any three** questions :

(3×6=18)

10. a) Derive Gibbs-Helmoltz equation at constant pressure. 3
b) How does Gibbs free energy varies with pressure and temperature ? 3
11. a) Write a note on partial molar properties. 3
b) Explain high quantum yield with an example. 3
12. a) State Lambert-Beers law. Derive its mathematical equation. 3
b) Explain the following :
i) Fluorescence.
ii) Photosensitization. 3
13. a) Write a brief note on radiolysis of acetic acid. 2
b) Mention the applications of spectrophotometry. 2
c) The value of partial pressure equilibrium constant for a reaction is 1.06×10^5 at 25°C. Calculate the standard free energy change. 2



V Semester B.Sc. Examination, April/May 2016
(Semester Scheme) (2008 Onwards)

CHEMISTRY
Inorganic Chemistry (Paper – V)

Time : 3 Hours

Max. Marks : 60

Instruction : Write equations and neat diagrams wherever necessary.

PART – A

1. Answer the following : (10×1=10)
- Identify the coordination number of iron in $[\text{Fe}(\text{en})_3]^{3+}$ ion.
 - Give an example for ambidentate ligand.
 - What are transuranic elements ?
 - Write the general electronic configuration of 4d transition series.
 - Write the structure of magnesium-oxine complex.
 - What is an innermetallic complex ?
 - Define standard deviation.
 - Give an example for an octahedral complex having SP^3d^2 hybridization.
 - What are spectrochemical series ?
 - What are molecular compounds ?

PART – B

Answer **any five** questions : (4×5=20)

- What is stability constant ? Explain the factors affecting it. 4
- Explain the following with respect to transition elements : 4
 - Ionic radii
 - Ionization energy
- Describe the separation of lanthanide by ion exchange method. 4
- Write notes on : 4
 - Coprecipitation
 - Post precipitation.

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V Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
CHEMISTRY
Organic Chemistry (Paper – VI)
(2008 Onwards)

Time : 3 Hours

Max. Marks : 60

Instruction : Write equations and structures wherever necessary.

PART – A

Answer **all** the questions.

(10×1=10)

1. a) Name the internal standard used in NMR spectroscopy.
- b) Define saponification value of an oil.
- c) Mention the base value for heteroannular diene.
- d) Write the structure of phenolphthalein.
- e) Write the structure of paracetamol.
- f) What are thermoplastics ?
- g) Define photosensitisation reaction.
- h) Write the structure of Vitamin C.
- i) What are dyes ?
- j) Mention the appropriate IR absorption bands of acetone.

PART – B

Answer **any five** questions of the following.

(5×4=20)

2. Explain Jablonski diagram. 4
3. Discuss the classification of dyes based on applications with examples. 4
4. Explain the mechanism of cleansing action of soaps. 4
5. Write the synthesis and uses of sulphanilamide. 4
6. Outline the synthesis and applications of buna-s rubber. 4

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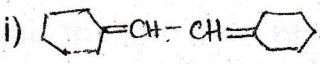
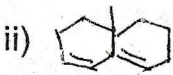


7. What are vitamins ? How are they classified ? Give examples. 4
8. What are the different types of electronic excitations ? Arrange them in the decreasing order of their energies. 4

PART - C

Answer any five questions.

(5×6=30)

9. a) Discuss Norrish type - II reaction. 4
b) Write a note on spin-spin coupling. 2
10. a) Explain cis-trans isomerism in stilbene. 4
b) Write the structure of vitamin - A and its occurrence. 2
11. a) Discuss the photo-reduction reaction of benzophenone. 3
b) Outline the synthesis of malachite green. 3
12. a) What are antibiotics ? Write the structure and mode of action of penicillin - G. 3
b) Write the synthesis of Nylon-6 and its application. 3
13. a) Discuss the synthesis of Indigo. 3
b) Making use of Woodward-Hoffmann's rule, calculate the λ_{\max} of the following compounds. 3
- i) 
- ii) 
14. a) Elucidate the structure of alizarin. 4
b) How many ^1H NMR signals would be expected for (i) acetone (ii) propane ? 2
15. a) Discuss the principle of IR spectroscopy. 2
b) What are detergents ? How are they classified ? 2
c) Outline the synthesis of sodium dodecylbenzene sulphonate. 2



V Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
(2008 Onwards)
CHEMISTRY
Paper – VII : Physical Chemistry

Time : 3 Hours

Max. Marks : 60

Instruction : Write chemical equations, **neat** diagram and **SI** units **wherever** necessary.

PART – A

Answer **all** the questions :**(10×1=10)**

1. a) "Molar conductance increases with dilution". Justify the statement.
- b) In which region of electromagnetic radiation photochemical reactions takes place ?
- c) Define ionic yield.
- d) Lithium is more powerful reducing agent than magnesium give reason.
- e) Define liquid junction potential.
- f) Give an example for alkaline buffer system.
- g) Mention electrolyte used in drycell.
- h) Give an example for Amalgam electrode.
- i) Write any one of the electro chemical reaction takes place during corrosion.
- j) Why CdCl_2 is used as supporting electrolyte in determination of transport number H^+ in HCl by moving boundary method ?



PART - B

Answer **any five** of the following :

(5×4)

2. Define quantum yield. What is the value of quantum yield according to Stark Einstein law of photochemical equivalence and give any two reason for low quantum yield.
3. a) Explain the variation of specific conductance with dilution.
b) Give any two differences between metallic conductance and electrolytic conductance. 2
4. a) Define transport number and show that sum of the T.N. of cation and anion is equal to unity. 2
b) Write a note on cathodic protection. 2
5. What is meant by electrode potential ? Derive Nernst equation for single electrode potential. 4
6. a) Explain the role of buffer in pH maintenance in beverage industries. 2
b) Write a note on abnormal transport number. 2
7. What are fuel cells ? Explain the construction and working of $H_2 - O_2$ fuel cell ? 4
8. The specific conductance of 0.01 M aqueous solution of acetic acid is $1.63 \times 10^{-2} \text{ Sm}^{-1}$ and the molar conductance at infinite dilution is $390.7 \times 10^{-4} \text{ Sm}^2 \text{ mol}^{-1}$. Calculate the degree of dissociation and dissociation constant of the acetic acid. 4

PART - C

Answer **any five** of the following :

(5×6=30)

9. a) Define phosphorescence and explain the detailed mechanism of phosphorescence. 3
b) State Lambert-Beer's law, write the mathematical expression and give any two limitations of Beer's law. 3



- a) Explain the asymmetric effect and electrophoretic effect found in strong electrolyte and write Debye-Huckel Onsagar equation. 4
- b) EMF of the Weston standard cell is 1.018 V at 25°C. Calculate ΔG° of the cell reaction. 2
11. a) What are reference electrodes? Illustrate how can a calomel electrode to be used as a reference electrode to determine standard electrode potential of zinc electrode. 3
- b) In a moving boundary experiment with 0.10 M KCl using 0.065 M LiCl as indicator solution, a constant current of 0.005893 amp was passed for 35 minutes. The boundary was observed to move through 5.6 cm in a tube of 0.1142 sq cm cross-section. Calculate the transport number of K^+ and Cl^- ions. 3
12. a) What are dosimeters? How does Fricke's dosimeter is used to measure absorbed radiation energy? 3
- b) What is chemiluminescence? Discuss its mechanism in anion-cation reaction. 3
13. a) State Kohlrausch's law and explain the calculation of molar conductance of NH_4OH at infinite dilution using Kohlrausch law. 3
- b) What is the principle involved in the potentiometric titrations? Explain the location of end point in titration between $AgNO_3$ and KCl solutions. 3
14. a) Derive expression for EMF of concentration cell. 3
- b) Calculate the pH before and after the addition of 0.01 mole of NaOH to 1 dm³ of a buffer solution that is 0.1 M in acetic acid and 0.1 M in sodium acetate. (The dissociation constant of acetic acid is 1.75×10^{-5}). 3
15. Write a note on :
- i) Fluorescence. 2
- ii) Bio-luminescence. 2
- iii) Dry cell. 2



VI Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
CHEMISTRY

Paper – VIII : Inorganic Chemistry (2008 Onwards)

Max. Marks : 60

Time : 3 Hours

Instruction : Write equations and **neat** diagrams **wherever necessary.**

PART – A

(10×1=10)

- 1 Answer **all** the questions :
- What is glass transition temperature ?
 - Write the general formula of phosphazenes.
 - What are organometallic compounds ?
 - Write the constituents of lithopone.
 - What is RDX ?
 - Give an example for monopropellant.
 - What is the role of sand in ceramics ?
 - Give the composition of producer gas.
 - Write the formula of carborundum.
 - Name the chief ore of thorium.

PART – B

(5×4=20)

Answer **any five** of the following :

- How is gold extracted from its ore by cyanide process ? 4
- Give an example for a binuclear carbonyl and write its structure. 2
 - Write the composition and uses of optical glass. 2
- Explain the steps involved in the production of ceramic ware. 4
- How is alundum manufactured ? 2
 - Explain the role of Na in biological systems. 2
- How is teflon prepared ? List out its important properties and uses. 4
- Write notes on Kuroll's salts and Maddrell's salts. 4
- What are silicones ? How are they classified ? Write their partial structures. 4

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VI Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
CHEMISTRY
Paper – VIII : Inorganic Chemistry (2008 Onwards)

Time : 3 Hours

Max. Marks : 60

Instruction : Write equations and *neat* diagrams *wherever* necessary.

PART – A

- 1 Answer **all** the questions : **(10×1=10)**
- a) What is glass transition temperature ?
 - b) Write the general formula of phosphazenes.
 - c) What are organometallic compounds ?
 - d) Write the constituents of lithopone.
 - e) What is RDX ?
 - f) Give an example for monopropellant.
 - g) What is the role of sand in ceramics ?
 - h) Give the composition of producer gas.
 - i) Write the formula of carborundum.
 - j) Name the chief ore of thorium.

PART – B

- Answer **any five** of the following : **(5×4=20)**
2. How is gold extracted from its ore by cyanide process ? 4
 3. a) Give an example for a binuclear carbonyl and write its structure. 2
 b) Write the composition and uses of optical glass. 2
 4. Explain the steps involved in the production of ceramic ware. 4
 5. a) How is alundum manufactured ? 2
 b) Explain the role of Na in biological systems. 2
 6. How is teflon prepared ? List out its important properties and uses. 4
 7. Write notes on Kuroll's salts and Maddrell's salts. 4
 8. What are silicones ? How are they classified ? Write their partial structures. 4



PART - C

Answer **any five** of the following :

(5×6=30)

- | | |
|--|---|
| 9. a) Discuss the extraction of lithium. | 4 |
| b) Mention the applications of abrasives. | 2 |
| 10. a) Explain the preparation and properties of alkyls of lithium. | 3 |
| b) How is glass manufactured ? Explain. | 3 |
| 11. a) Explain EAN rule as applicable to metal carbonyls. | 4 |
| b) Mention the applications of powder metallurgy. | 2 |
| 12. a) Write a note on the production of CNG and give its applications. | 4 |
| b) Write a note on classification of explosives. | 2 |
| 13. a) What are refractories ? Explain their properties. | 3 |
| b) What are chalcogenide glasses ? Explain memory switching phenomenon. | 3 |
| 14. a) What are the constituents of varnishes ? Explain their functions. | 4 |
| b) Explain the role of iron in Haemoglobin. | 2 |
| 15. a) Mention the important characteristics of a gaseous fuel. | 3 |
| b) How is polymeric sulphur nitride prepared ? Write its structure. | 3 |

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VI Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
CHEMISTRY
Organic Chemistry (Paper – IX) (2008 Onwards)

Time : 3 Hours

Max. Marks : 60

Instruction : Write chemical equations and **neat** structure wherever necessary.

PART – A

Answer **all** the questions.

(10×1 = 10)

1. a) State isoprene rule.
- b) Write the structure of oestrone.
- c) Mention the alkaloid present in cinchona bark.
- d) Define centre of symmetry.
- e) Name the sugars present in nucleosides.
- f) Give an example for chiral molecule.
- g) Write the Haworth projection formula for α -D glucose.
- h) Name the product formed when fructose is treated with HCN.
- i) Write the structural formula of atropine.
- j) Mention the physiological importance of progesterone.

PART – B

Answer **any five** questions.

(5×4 = 20)

2. a) Write the structural formula of α -terpeneol. 2
- b) Discuss the physiological action of cholesterol. 2
3. What are terpenes ? How are they classified ? Give examples for each. 4

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4. Write the structure and physiological importance of quinine. 4
5. Outline the synthesis of a dipeptide by carbobenzoxy method. 4
6. a) What are polysaccharides? Give an example. 2
b) Write the partial structure of amylose and amylopectin. 2
7. Write a note on resolution by bio-chemical method. 4
8. How do you transform D-Arabinose to Glucose? (Kiliani Fischer synthesis). 4

PART - C

Answer **any five** questions.

(5×6=30)

9. a) Explain asymmetric synthesis with an example. 3
b) Discuss the chain degradation reaction in carbohydrate. 3
10. a) Write a note on nucleic acids. 3
b) Discuss the Geometric isomerism in aldoximes and ketoximes. 3
11. a) Give a brief account on classification and denaturation of proteins. 3
b) Write the structural formulae and importance of oestrodiol and testosterone. 3
12. a) Explain E and Z isomers in Geometric isomerism by taking suitable examples. 3
b) Elucidate the open chain structure of D Glucose. 3
13. a) Explain plane of symmetry. 2
b) Write the structure of mesotartaric acid and discuss its optical activity. 4
14. a) How do you determine the ring size of Glucose by methylation method? 3
b) Write a notes on Zwitter ion and isoelectric point of amino acids. 3
15. a) What are threo and erythro diastereomers? Give examples. 4
b) Give the classification of enzymes with examples. 2

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VI Semester B.Sc. Examination, April/May 2016
(Semester Scheme)
CHEMISTRY
Physical Chemistry (Paper – X) (2008 Onwards)

Time : 3 Hours

Max. Marks : 60

Instruction : Write neatly and legibly.

1. Answer **all** the questions. (10×1=10)
- Define threshold frequency.
 - Arrange the following in increasing order of coagulation value for a negative sol– MgCl_2 , Na_3PO_4 , $\text{Al}_2(\text{SO}_4)_3$.
 - Gold number of albumin is 0.08 mg. What does it mean ?
 - Give an example for water in oil type of emulsion.
 - Why is partial molar free energy said to be an intensive property ?
 - Show that ΔG is a measure of net work.
 - The dipole moment of CCl_4 is zero ? Why ?
 - Define parachor.
 - What are the different types of molecular energy levels present in a molecule ?
 - On what principle is the Raman spectrum based ?

Answer **any five** questions : (5×4=20)

- What is Compton shift ? Write its mathematical equation. 2
 - Why does the electronic spectrum of a molecule occur as a band spectrum. 2
- Discuss the electrical properties of the colloidal systems. 4
- Derive the general equation relating ΔG , ΔG^0 and the equilibrium constant under any condition of T and P and also at equilibrium. 4
- Discuss the experimental method to determine the dipole moment of a polar molecule. 4

P.T.O.



6. The far infrared spectrum of a molecule AB has a series of equally spaced lines with $\Delta V = 12.8 \text{ cm}^{-1}$. Calculate ;
- The moment of inertia and
 - The internuclear distance of the molecule, given $h = 6.626 \times 10^{-27} \text{ ergs sec}$, $c = 3 \times 10^{10} \text{ cm/sec}$. $m_A = 1.008$, $m_B = 127$. Also express the answers in SI units.

7. Explain with mathematical equations the type of pure rotational Raman spectrum expected for a diatomic molecule.

- Mention the applications of Gibb's-Helmholtz equation.
- Which type of molecules give vibrational spectrum and in which region does the spectrum occur ?

Answer any 5 questions :

(5×6=30)

- Discuss black-body and black body radiations.
 - What are the gross and specific selection rules for a pure microwave spectrum and pure vibration Raman spectrum of a molecule to occur ?
- Why is sodium chloride called a crystalloid and a protein molecule colloidal ?
 - Express partial molar volume by the mathematical equation and state its significance.
 - State Frank-Condon principle.
- Derive the differential form of Clausius – Clapeyron equation and write its integrated form for liquid \rightleftharpoons vapour system.
 - What is orientation polarization ? Why is it shown only by polar molecules ?
- Show through mathematical equation that the thermodynamic criteria for spontaneity is $\Delta G < 0$.
 - Given two possible structures A and B for an organic compound, how is the correct structure predicted for it on the basis of parachor study ?
 - Why are lyophilic sols more stable than lyophobic sols ?



- a) What is Tyndal effect ? How is it useful in colloidal studies ? 2
- b) Define force-constant and discuss the vibration spectrum of a simple diatomic harmonic oscillator to determine force constant. 4
14. a) Give an example for gels, sols, aerosols and emulsifiers. 2
- b) Discuss the occurrence and intensities of the three types of lines in Raman spectrum. 4
15. a) Calculate the force constant of the HCl bond if the fundamental vibration frequency of the molecule is at $8.667 \times 10^{13} \text{ s}^{-1}$ given $m_{\text{H}} = 1.008$, $m_{\text{Cl}} = 35.5$. 2
- b) Which of these molecules show rotational spectrum and which do not. Give reasons H_2O , CO_2 , SO_2 , CS_2 , CH_4 , CH_3Cl . 2
- c) For a reaction at 28°C temperature and two atmosphere pressure, the standard free energy change is 300 kJ/mole and the equilibrium constant is 1.45×10^{-5} . Calculate the free energy change of the reaction. 2
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