



HCG-1301

Seat No. _____

M. Sc. (Sem. II) Examination

April / May - 2015

Inorganic Chemistry : Paper-VII

Time : 3 Hours]

[Total Marks : 70

- I
- (a) Answer any two. (8)
- (1) Derive the terms for all the states originated from P^2 case by 'Pegeon hole diagram'.
 - (2) Explain the correlation diagram for d^2 electronic configuration.
 - (3) Which of the following term represents the ground state of the V^{3+} ion? Give reasons for your choice. $3F, 3P, 1G, 1D$ and $1S$.
- (b) Answer any one. (6)
- (1) Drive the calculation $10Dq, B$ and β Parameters.
 - (2) Write note on: Charge transfer spectra.
- 2
- (a) Answer any two. (8)
- (1) Explain the behaviour of CO as π -acid Ligand in relation to M-C bond.
 - (2) What is mononuclear metal Carbonyls? Explain the structure of $Cr(CO)_6$.
 - (3) Explain the use of vibrational spectra to determine the molecular symmetry of polynuclear carbonyls.
- (b) Answer any one. (6)
- (1) Write notes on: Importance of nitrosyl complexes.
 - (2) Give report on: Metal - Carbonyl cluster.

HCG-1301]

I

[Contd...

- 3 (a) Answer any two. (8)
- (1) Give the preparation of higher boranes like B_5H_9 , B_6H_{10} , $B_{10}H_{14}$, B_8H_{12} .
 - (2) Give preparation and properties of Nido-Carborane.
 - (3) Write notes on: Metallo - carboranes.
- (b) Answer any one. (6)
- (1) Explain the molecular description of metal-metal bonding.
 - (2) Explain the weds rule for boron cages.
- 4 (a) Answer any two. (8)
- (1) Write note on: "Isopoly tungstate".
 - (2) Give short account on: "Heteropoly blues".
 - (3) Explain the Molybdenum's poly acids and salts.
- (b) Answer any one. (6)
- (1) Give the method of preparation for Aluminium's O.M.C and their physical and chemical properties.
 - (2) Explain the structure of $(Me_3Al)_2$.
- 5 Answer any Seven. (14)
- (1) What are microstates? Give the formula of microstates.
 - (2) Explain the term $\Delta s=0$ and $\Delta l = \pm 1$ in short.
 - (3) Draw the structure of bridge bonded B_2H_6 and give hybridization of Boron atom in it?
 - (4) Find out the values of L, S and J for $4f^6$ term.
 - (5) Derive the ground state term for Cr^{2+} ion.
 - (6) Give the two classes of metal clusters basis on the oxidation states of metal.
 - (7) What is Orgal diagram?
 - (8) Draw the structure of $Fe_2(CO)_9$.
 - (9) Give the classification of CO group.
 - (10) Which is the ground state term from $1s, 2p, 3d$?



HCG-1301

Seat No. _____

M. Sc. (Sem. II) Examination

April / May - 2015

Inorganic Chemistry : Paper-VII

Time : 3 Hours]

[Total Marks : 70

1 (a) Answer any two

- (1) Derive the terms for all the states originated from P^2 case by Pigeon hole diagram.
- (2) Explain the correlation diagram for d^2 electronic configuration.
- (3) Which of the following term represents the ground state of the V^{3+} ion? Give reasons for your choice.
 $3F, 3P, 1G, 1D$ and $1S$

(b) Answer any one

- (1) Drive the calculation $10Dq, B$ and β Parameters.
- (2) Write note on: Charge transfer spectra.

2 (a) Answer any two

- (1) Explain the behaviour of CO as π -acid Ligand in relation to M-C bond.
- (2) What is mononuclear metal Carbonyls? Explain the structure of $Cr(CO)_6$
- (3) Explain the use of vibrational spectra to determine the molecular symmetry of polynuclear carbonyls.

(b) Answer any one

- (1) Write notes on: Importance of nitrosyl complexes.
- (2) Give report on: Metal - Carbonyl cluster.

6

HCG-1301]

1

[Contd...



HCG-1310

Seat No. _____

M. Sc. (Sem. II) Examination

April/May - 2015

Chemistry : Paper - 502

(Organic Chemistry)

Time : 3 Hours]

[Total Marks : 70

Instructions : (1) All questions are compulsory and of equal marks.

(2) The medium of answers is English only.

1 Answer any four :

(i) Discuss the free radical mechanism of an aromatic substrate.

(ii) Write short notes on following :

(a) Sandmeyer reaction

(b) Hunsdiecker reaction

(iii) Discuss the reactivity for aliphatic and aromatic substrates at a bridgehead.

(iv) Discuss the effect of solvents on reactivity.

(v) Discuss auto-oxidation in detail.

(vi) Discuss ionic and acid dichromate mechanism.

2 Answer any three :

(i) Discuss mechanism of metal hydride reduction of unsaturated acids.

(ii) Discuss the addition of organozinc reagent to carbonyl compounds.

1

HCG-1310]

[Contd...

14

14

- (v) Discuss the effect of substrate, attacking base and leaving group on E_2 mechanism.
- (iv) Discuss mechanism and orientation in pyrolytic elimination.
- (iii) Explain E_1 mechanism with suitable examples.
- (ii) Write a note on Ene reaction.
- (i) Write a note on aza-cope rearrangement.

14

4 Answer any three :

- (v) What are electrocyclic reactions ? Using FMO approach discuss electrocyclic reaction.
- (iv) Discuss Woodward-Hoffman correlation diagrams with suitable examples.
- (iii) Discuss difference between suprafacial and antarafacial cycloadditions.
- (ii) Discuss 1,3 dipolar cycloaddition reaction.
- examples.

- (i) What are pericyclic reactions ? Give the classification of pericyclic reactions with

14

3 Answer any three :

- (iii) Discuss the hydrolysis and ammonolysis of esters with suitable examples.
- (iv) Explain in detail : Perkin reaction.
- (v) Discuss the mechanism of Wittig reaction in detail.

- Answer any seven :
- (i) Define neighbouring group assistance with example.
 - (ii) What is Mannich reaction ?
 - (iii) What is con-rotatory and dis-rotatory ?
 - (iv) What is Hunsdiecker reaction ?
 - (v) What is aldol condensation ?
 - (vi) Importance of solvent in E_1 mechanism.
 - (vii) What is fluxional tautomerism ?
 - (viii) Which bases are used for accomplish E_2 elimination reaction ?
 - (ix) What is E1cb reaction ?
 - (x) What is cycloaddition reaction ?



HCG-1318

Seat No. _____

M. Sc. (Sem. II) Examination

April / May - 2015

CHN-503 : Physical Chemistry

Time : 3 Hours]

[Total Marks : 70

Instructions : (1) Each question carries 14 marks.

(2) Figures to the right indicate marks of

the question.

(3) Write answers of all the question in

the same answer book.

1 (a) Answer any two of the following : 10

(i) Describe the flow method to study fast reactions:

(ii) Explain : Lindemann theory of unimolecular reactions:

(iii) Discuss about the collision theory of reaction rate.

(b) Answer any one of the following : 4

(i) For reaction probability factor is 22138 and its collision number (Z_0) is 3.146×10^{10} ml/cm and energy of activation of a reaction is 22388 Cal. Find the rate constant of reaction. ($T=22^\circ\text{C}$)

HCG-1318]

1

[Contd...

(ii) If the adsorbed nitrogen required to form a mono layer on one gram of $\text{Fe-Al}_2\text{O}_3$ catalyst at -190°C , occupies 2.86 cm^3 at 0°C and 1 atm, what is the surface area of the catalyst. One molecule of N_2 covers 16.2 \AA^2 at -190°C . [$N = 6.02 \times 10^{23}$, $1 \text{ meter}^2 = 10^{20} \text{ \AA}^2$]

(i) A polymer sample contains equal mass of particle with molecular weight 2×10^4 and 4×10^4 respectively. Calculate \bar{M}_n and \bar{M}_w .

(b) Answer any one of the following :

- (iii) What is CMC ? What are the factors affecting the CMC of surfactants ?
- (ii) Explain : any one method for determining the molecular weight of polymer.
- (i) Derive Gibb's adsorption isotherm equation.

(a) Answer any two of the following :

(ii) The following values for the first order rate constant were obtained for a reaction

Temp $^\circ\text{C}$	K
25 $^\circ$	$3.46 \times 10^{-5} \text{ S}^{-1}$
35 $^\circ$	$13.50 \times 10^{-5} \text{ S}^{-1}$

Calculate the Arrhenius Frequency factors.

10

- 3 (a) Answer any two of the following : 10
- (i) Write a note on Gouy-Chapmann model for electrical double layer.
- (ii) Discuss Lippmann equation for surface excess process at electrified interface.
- (iii) Explain the nature and importance of Tafel plot.
- (b) Answer any one of the following : 4
- (i) In an alkali chloride cell, a saturated solution of 6N NaCl is electrolysed at 25°C, using a steel cathode [Hydrogen over voltage, $\eta = 0.2V$], which of the two ions, H^+ or Na^+ will be discharged first? pH of the solution is 7, $E_{H^+/H^+}^{\circ} = 0.00V$, $E_{Na^+/Na}^{\circ} = 2.71V$
activity = concentration
- (ii) Explain : Electrocapillary curves.
- 10 (a) Answer any two of the following :
- (i) Describe the quantum aspects of charge transfer at electrode-solution interface.
- (ii) Short note on electrocardiography.
- (iii) Explain the theory and apparatus used in polarographic analysis.

- (x) What is Zeta potential ?
 affecting over voltage.
 (ix) Definition over voltage and give factors
 (viii) What is oscillatory reaction ? Give an example.
 (vii) What is electro catalysis ?
 (vi) Define polymerisation in your words.
 (v) What is 'overpotential' ?
 (iv) What is the principle of polarography ?

(a) $K \rightarrow T$
 (b) $\log K \rightarrow 1/T$

- (iii) What is the shape of the graph drawn
 (ii) Define the terms - adsorption and adsorbent.
 (i) Why reactions of higher orders are rare ?

Answer any seven of the following :

- (ii) Explain "Donnan membrane equilibrium".
 Calculate the diffusion coefficient of M^{++} .
 prepared and its slope was $4.92 \mu\text{a}/\text{mm}$.
 A standard calibration curve for M^{++} was
 and t are 1.46 mg/s and 4.29 respectively.
 limiting current region, the values of m
 dropping mercury electrode. In the

(i) Metal ion M^{++} is being reduced at the
 Answer any one of the following :



HCG-1302

Seat No. _____

M. Sc. (Sem. II) Examination

April / May - 2015

Botany : CBO-404

(Angiosperm Taxonomy and Plant Reproduction)

Time : 3 Hours]

[Total Marks : 70

Instructions :

1. The question paper consists of two section, each has three question.

2. All questions are compulsory. In each section first two questions carry 14 marks and Last questions carry 7 marks.

3. There is no overall choice. However, an internal choice has been provided in each question.

4. Write answer of each section in separate answer sheet

5. Illustrate your answers with necessary diagrams, if required.

SECTION - I

1. Answer the following: (two out of three) each of 07 marks. 14

1. Describe: External morphology in relation to taxonomy.

2. Explain the salient features of ICBN.

3. Describe: Hutchinson's system of classification.

HCG-1302]

1

[Contd...

- 4 Answer the following: (two out of three) each of 07 marks. 14
1. Write note on: Tapetum
 2. Describe the types of ovules.
 3. Write note on: Scope of palynology.

SECTION - II

- 3 Answer the following: (four out of six) each 02, 02, 02 and 01 marks. 7
1. Describe in short: Role of herbarium in taxonomy. (2)
 2. Write in short: Computers as a tool of taxonomy. (2)
 3. What is phylogenetic classification system? (1)
 4. What is gynandrophore? Give an example. (2)
 5. Write the system position of Menispermaceae. (2)
 6. Write the floral formula of Cactaceae. (1)
- 2 Answer the following: (three out of five) each of 05, 05 and 04 marks. 14
1. Write the economic importance and floral variations of Anacardiaceae.
 2. Describe: Compare the floral variation between Cyperaceae and Poaceae.
 3. Write short note: Economic importance of Amaranthaceae and Meliaceae.
 4. Describe: Floral characteristics of Euphorbiaceae.
 5. Write short note: Systematic position and floral characters of Rutaceae.

- 14
- Answer the following: (three out of five) each of 05, 05 and 04 marks.
1. Write in short: fertilization.
 2. Explain the monosporic types of embryo sac development.
 3. Write short note: Polyembryony.
 4. Describe: Crucifer types of embryo development
 5. Write in short: Endosperm
- 6
- Answer the following: (four out of six) each 02, 02, 02 and 01 marks.
1. Define Microsprogenesis.
 2. Write the name of layer of mature pollen wall.
 3. The ovule of angiosperms can be called.
 4. Write the function of endosperm.
 5. Write the roll of boron in *in vitro* pollen germination.
 6. When a pollen tube enter the embryo sac at the micropylar end it is called
- 7



HCG-1330

Seat No. _____

M. Sc. (Sem. II) Examination

April / May - 2015

Botany : EBO-405

(Plant Tissue Culture)

[Total Marks : 50

Time : 2 Hours]

Instructions : (1) There are two sections, write answers of each section in separate answer book.

- (2) Each section carries 25 marks and having two questions.
- (3) Figures to the right indicate marks of questions/sub-questions.
- (4) Whenever required, give your answers with labeled diagrams.

SECTION - I

(a) Describe in detail (any two) : 10

- (1) Major stages involved in micro-propagation.
- (2) Chemical sterilization of explant.
- (3) Role of various plant growth regulators in plant tissue culture.

- (1) Name the scientist who made first attempt of plant tissue culture.
- (2) Name the plant used by Steward for regeneration of embryos from callus.
- (3) Give full form of MS in MS nutrition medium.
- (4) Define the term: Plant tissue culture.

2 Answer the following (any five):

- (1) Carbon and energy source in nutrition medium for plant tissue culture.
- (2) Role of pH in nutrition medium.
- (3) Equipment items essential for general laboratory and media preparation.
- (4) Vitamins required in plant tissue culture nutrition medium.

(c) Answer in short (any two) :

- (1) Inorganic nutrients required in plant tissue culture nutrition medium.
- (2) Gelling agents of plant tissue culture nutrition medium.
- (3) Steam sterilization.
- (4) Spontaneous and Induced methods for protoplast fusion.

(b) Discuss (any two):

- (4) Production of edible vaccines.
- (3) Phytoalexins.
- (2) Salt stress resistant plants.
- (1) Biodegradable plastic.
- 4 (c) Answer in short (any two):
- (4) Compound having cryo-protective properties.
- (3) Oxidative stress resistant plants.
- (2) Problems associated with secondary metabolite production.
- (1) Pathogen (Disease) resistance.
- 6 (b) Discuss (any two):
- (3) Herbicide resistance.
- (2) Artificial seed production.
- (1) Write advantages of cell culture systems for production of secondary metabolites.
- 10 (a) Describe in detail (any TWO):

SECTION-II

- (5) Explain: Totipotency.
- (6) Write complete name: IBA.
- (7) Give the name of the plant hormone used to develop shoot in callus.

- 4 Answer the following (any Five)
- (1) Write full name of PHB.
 - (2) Name the transgenic tomato produced using antisense RNA gene.
 - (3) Write complete name of DMSO.
 - (4) Give the name of phyto-hormone which plays a major role in regulating fruit ripening.
 - (5) Explain/Define: Cryopreservation.
 - (6) Give the temperature of liquid nitrogen at which plant material is frozen and maintained.
 - (7) Write full form of TTC.



HCG-1319

Seat No. _____

M. Sc. (Sem. II) Examination

April/May - 2015

Botany : CBO - 406

(Biophysics, Instrumentation & Biochemistry)

Time : 3 Hours]

[Total Marks : 70

Instructions : (1) There are two sections in this question

paper.

(2) Each section contains three questions

and carries 35 marks.

(3) Write answers of each section in

separate answer book.

(4) Figures to the right indicate marks of

questions.

SECTION - I

1 Describe any two in detail : 14

1. First and second laws of Thermodynamics.

2. Role of various isotopes in Plant sciences.

3. pH scale and its applications.

2 Discuss any three in short: 14

1. Principle and applications of Electrophoresis.

2. Types of Paper Chromatography.

3. Thin layer Chromatography and its

applications.

4. HPLC.

5. Principle and uses of Electron microscopy.

HCG-1319]

1

[Contd...

- 3 Explain any four in brief:
1. Free radicals with suitable example.
 2. Write: Principle of Spectrophotometry.
 3. Applications of ultracentrifugation.
 4. Uses of radiations in Plant Sciences.
 5. Define: Buffers.
 6. An instrument used to measure pH of the solution.
- 4 Describe any two in detail :
1. Disaccharides: Properties, structural formula and sources.
 2. Covalent and Ionic chemical bonds.
 3. Symptoms of deficiency diseases of Vitamins.
- 5 Discuss any three in short :
1. Biosynthesis of amino acid.
 2. Biological significance of Carbohydrates and Lipids.
 3. Kinds of Enzyme inhibition.
 4. Distinguish: DNA and RNA.
 5. Mechanisms of Enzyme action.
- 6 Explain any four in brief :
1. Prosthetic groups.
 2. Saturated and Unsaturated Fatty acids.
 3. Formation of Peptide bond.
 4. Isomerism and its types.
 5. Define: Hydrogen bond.
 6. Types and %age of RNA.

SECTION - II