MEB-4691 Seat No._____

M. Sc. (Sem. II) Examination

November / December - 2018

Inorganic Chemistry

(New Course)

Time : 3 Hours] [Total Marks : 70

Instruction : All questions carry equal marks.

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

(1) Explain valence shell electron pair repulsion (VSEPR) theory by taking suitable examples.

(2) Explain : Energy of hybridization.

(3) Explain : Walsh diagram for an AB_2 triatomic molecule.

(b) Answer any **one** of the following : 4

(1) Explain "Bent rule" by giving suitable example.

(2) Derive the wave function and bond angles in CH_4.

2 (a) Answer any **two** of the following : 10

(1) Discuss briefly how the following factors affecting the stability of metal complexes.

(a) Electronic configuration of central metal ion.

(b) Basicity of ligand

(2) Explain chelate effect and thermodynamic origin for complexes.

(3) Explain : Stepwise formation constant.

(b) Answer any **one** of the following : 4

(1) Describe Job's method to determine Binary formation constant.

(2) Explain : Overail formation constant.

3 (a) Answer any **two** of the following : 10

(1) Explain trans effect with suitable examples.

(2) Propose efficient routes to obtain cis and trans $\left[Ptcl_2(NH_3)(PPh_3)\right]$

(3) Explain with suitable examples inner sphere and outer sphere reaction.

(b) Answer any **one** of the following : 4

(1) Give definition of trans effect. Discuss the polarization theory of trans effect.

(2) Explain : stable, instable, labile and inert metal complexes.

4 (a) Answer any **two** of the following : 10

(1) Explain Tanebe – Sugano diagram for d^2 – configuration.

(2) Explain M.O. diagram for oh-complexes.

(3) Explain the limitation of crystal field theory.

(b) Answer any **one** of the following : **4**

(1) Write a note on π – bonding.

(2) Explain the factor affecting the value of Δ_0.

5 Answer any **seven** of the following : **14**

(1) Predict the shape of H_2O molecule on the basis of Walsh diagram.

(2) Give the definition of trans influence.

(3) Using VSEPR theory predict the shape of NH_3 and SF_4.

(4) What is hybridization ? State hybridization in oh and in $Fe(CO)_5$.

(5) What is CFSE ? Calculate the CFSE for $\left[Co(H_2O)_6\right]^{+2}$ complex.

(6) What is bond order ? Calculate bond order in co-molecule.

(7) Which orbitals are involved in t_{29} and e_9.

(8) What is ligand ? Give an example of hexadentate ligand.

(9) Limitation of Walsh diagram.

(10) Calculate the μ_s for d^4 in weak oh field.

AAF-7301

Seat No._____

M. Sc. (Sem. II) Examination

April/May – 2018

CHN-501 : Chemistry : Paper - VII

(Inorganic Chemistry)

Time : 3 Hours] [Total Marks : 70

Instructions : (1) All questions carry equal 14 marks.
(2) All questions are compulsory.

1 (a) Answer any two : 10

(i) Derive the term symbols for all the possible states (Ground and excited) show by V^{+3} aquo complex.

(iii) Identify the ground state term for each set of the following terms with reason :

(a) ^5D ^3H ^3P ^3I ^1G

(b) ^3P ^1D ^1S

(c) ^3F ^1D ^3P ^1S ^1G

(iii) Derive the calculation of 10 Dq, B and β parameters by appropriate example.

(b) Answer any one : 4

(i) Explain the "charge transfer spectra" of MnO_4^-.

(iii) What is Orgel - diagram ? Explain the Orgel-diagram for $d^4 - d^6$

2 (a) Answer any two : 10

(i) "Metal-Carbonyl cluster" - Give brief report.

(ii) Define metal carbonyls. Give their classification. Explain the structure of $CO_2(CO)_8$.

(iii) Explain the nature of Carbonyl (CO) ligand as a π-acid ligand with reference to Metal-carbon (M-C) bond in Metal-Carbonyls.

(b) Answer any one : 4

(i) What is mono nuclear metal carbonyls ? Discuss the structure of Iron penta carbonyl $[Fe(CO)_5]$.

(ii) Calculate Effective Atomin Number (EAN) for the
$Ni(CO)_4$, $Fe_3(CO)_{12}$

3 (a) Answer any two : 10

(i) Explain the Wed's rule for "Boron-Cages"

(ii) Write report on "Metallo-carborane"

(iii) Give the method of Preparation for higher-boranes like
B_4H_{10}, B_5H_9, B_6H_{10}, B_8H_{12}, $B_{10}H_{14}$

(b) Answer any one : 4

(i) Give the classification of 'Carboranes'

(ii) Describe the Keggin's Theory.

4 (a) Answer any **two** : 10

(i) Give brief Report on "Isopoly Tungstates"

(ii) Classified the organo-metallic compounds.

(iii) Explain : "Heteropoly Blues"

(iv) Discuss the structure of Irons Organo-metallic Compound - "Ferrocine".

(b) Answer any one : 4

(i) Explain the structure of Tetramethyle lithim.

(ii) Explain the structure of $(Me_3Al)_2$

5 Answer any seven : 14

(i) What is term-symbol ? Give the formula of term- symbol given by "Russel-Saunders"

(ii) What are Microstates ? Calculate the No. of possible microstable for d^2 electronic configuration.

(iii) Give the limitations of Orgel-diagram.

(iv) Find the value of L, S, J and No. off unpained electrons for 5_I term symbol.

(v) Draw the structure of $Fe_3(CO)_{12}$ and show the oxidation states of Fe.

(vi) Classified the carbonyls (CO) show by Metal-carbonyls.

(v) Draw the Bridge-bonded structure of B_2H_6 and give Hybridisation show by Boron in this compound.

(vi) Draw the combined-orgel diagram for d^1–d^9 case.

(vii) Give two classes of metal clusters bassi on the oxidation states of metal.

(viii) Draw the structures of B_5H_9 and $B_{12}H_{12}^-$

(ix) Find the EAN value for $Cr(CO)_6$ and $Fe_2(CO)_9$.

(x) Give the characteristics of "Organo-metallic compounds.

AAJ-7323 Seat No._____

M. Sc. (Sem. II) Examination

April/May – 2018

CHN-503 : Physical Chemistry : Paper - IX

Time : 3 Hours] [Total Marks : 70

Instructions :

(1) Each question carries 14 marks.

(2) Figures to the right indicate marks of the question.

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

(1) Write a short note : Primary salt effect.

(2) Write a short note : Flash photolysis.

(3) Explain the Hinshelwood theory of unimolecular reactions.

(b) Answer the following : (any one) 4

(1) The rate constant is found to be 6.3×10^{-5} at 30°C and 9.2×10^{-4} at 50°C. Calculate the Arrhenius frequency factor.

(2) The rate constant for the first order decomposition at alkylene oxide into CH_4 and CO_2 following equation : log

$$K = 14.34 - \left(\frac{1.25 \times 10^4}{T}\right)$$

Calculate :

(i) Activation energy

(ii) The frequency factor

2 (a) Answer the following : (any two) 10

(1) Write a short note : Micellization

(2) Explain the Gibbs Absorption isotherm.

(3) Discuss the determination of molecular mass of polymer by light scattering method.

(b) Answer the following : (any one) 4

(1) A polymer sample contains 40% : 60% weight ratio of particle with molecular weight 30000 and 50000 respectively. Calculate the PDI of polymer.

(2) The concentration of Myosin is 0.25 M in water at 27°C. Calculate the relative viscosity of this sample.

[Huggins constant $K^1 = 0.33$, constant $K = 1.3 \times 10^{-4}$ and $a = 0.8$ molecular weight = 10^5 gm/mole]

3 (a) Answer the following : (any two) 10

(1) Derive the Butler-Volmer equation.

(2) Write a short note : Gouy-Chappman Model

(3) Write a short note : D.H.O. theory

(b) Answer the following : (any one) 4

(1) The value of overvoltage is 0.35 V. Calculate the overvoltage under the condition, when the magnitude of electric current is increased by ten times and the value of b is 0.12.

(2) In an alkali chloride cell, a saturated solution of 6 N NaCl is electrolyte at 25°C. Using a steel cathode. Which of the two ions H^+ or Na^+ will be discharged first ?

[pH = 7.0 $E^{\circ}_{H/H^+} = 0.0\,V$, $E^{\circ}_{Na/Na^+} = 2.71\,V$

Hydrogen over voltage η = 0.2V]

4 (a) Answer the following : (any two) **10**

(1) Derive the Half-wave potential equation.

(2) Explain : Donnan membrane equilibrium when

(a) The electrolytes on both the sides have no common ions.

(b) One of the solution is water alone.

(3) Describe the quantum aspects of charge transfer at electrode-solution interface.

(b) Answer the following : (any one) **4**

(1) Write an explanatory note on bioelectro catalysis.

(2) Write a short note on : Electrocardiography.

5 Answer in one to four lines : (any seven) **14**

(1) Give the relation of the Half Life time and initial concentration of n^{th} order reaction.

(2) Derive the unit of surface excess.

(3) Give the effect of pH on overvoltage.

(4) Write a lindmann equation on high and low pressure.

(5) Give the difference between Homo and co-polymers.

(6) A polymer sample is prepared by two components are equal weight. The ratio of molecular weight is 2.0. Prove the $\overline{Mn}$ is greater in molecular weight of the small component by 4/3.

(7) Slop and intershap of log $K \rightarrow \frac{1}{T}$ is respectively 3260 and 14.2596 respectively. Calculate energy of activation and Arrhenius constant. [R = 1.987 cal/mole K]

(8) Give the difference between LDP and HDP.

(9) Give the elcovic equation and explain its terms.

(10) What is n-P junction ?

AAL-7339-7340 Seat No. _____

M. Sc. (Physics) (Sem. II) Examination

April / May - 2018

(1) EPH-501 : Energy Technology & Storage System

(Elective Course - Disciplinary)

(2) EPH - 502 : Synthesis of Materials

(Elective Course - Disciplinary)

Time : 2 Hours] [Total Marks : 50

(1) EPH-501 : Energy Technology & Storage System

(Elective Course - Disciplinary)

Instructions : (1) Symbols used have usual meaning.
(2) Nos. on RHS indicates marks of the sub question.

1 (a) Answer the following (any **two**) 10

(i) Give merits and demerits of Petro-Geothermal Energy power plants.

(ii) Giving example, explain how wind power density is estimated.

(iii) State merits and limitations of wind energy conservation.

(b) Answer the following (any **one**) 6

(i) State the various principle routes of biomass energy conversion to useful energy.

(ii) Obtain formula for power in wind stream and give its conclusion.

(c) Answer the following : (any **one**) 4

(i) List the variables with units associated with wind energy conversion system.

(ii) Write types of wind turbine.

2 (a) Answer the following : (any **one**) 10

(i) Explain lead acid battery cell.

(ii) Explain superconducting magnet energy storages.

(iii) Explain energy storage in high pressure hydraulic accumulator.

(b) Answer the following : (any **one**) 6

(i) Describe the functioning of advance battery.

(ii) Which are distinct categories of chemical energy storage?

(c) Answer the following : (any **one**) 4

(i) List non-electrical energy storage systems.

(ii) Which are challenges in energy storage systems?

3 Attempt any **seven** : 10

(i) Define geothermal energy.

(ii) What is the suitable range of wind for wind turbines?

(iii) Under which condition the wind energy is not reliable.

(iv) State the name of row biomass for waste.

(v) Define planetary winds and local winds.

(vi) Mention the criteria for the choice of type of battery.

(vii) Define compressed air storage.

(2) EPH - 502 : Synthesis of Materials
(Elective Course - Disciplinary)

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

(1) Discuss general principle of ceramic method. Also describe and experimental procedure to prepare samples using a solid state reaction method.

(2) Explain electroless deposition.

(b) Answer the following : (any **one** unit of two) **6**

(1) Describe "Pulse Laser Deposition (PLD) technique" for synthesis of thin film.

(2) Explain briefly vacuum evaporation techniques for thin film production.

(c) Answer the following : (any **one** out of two) **4**

(1) Explain heat treatment and analysis of solid state reactions.

(2) Write down difficulties (limitations) of solid state reactions, while growing single crystals of MgO and Al_2O_3.

2 (a) Answer the following : (any **one** out of two) **10**

(1) Discuss Silica for optical fibres and write reactions for silica fibres.

(2) Explain exitaxial growth of thin layers.

(b) Answer the following : (any **one** out of two) 6

(1) Describe Czochralski method for the growth of single crystals.

(2) Explain "MET FLUX Method".

(c) Answer the following : (any **one** out of two) 4

(1) Explain Bridgman and Stockbarger methods.

(2) Explain vapour Phase Transport method.

3 Answer the following : (any **five** out of seven) 10

(1) Define Topotuctic and Epituctic reactions.

(2) What is Sputtering" ?

(3) What are the uses of XRD and EDAX ?

(4) Write the principle of sol-gel method.

(5) Write down two important factors of solid state reactions.

(6) What do you understand by Epitaxial Growth ?

(7) What is reagent ?

AAJ-7326 Seat No._____

M. Sc. (Physics) (Sem. II) Examination

April / May - 2018

CPH - 503 : Nano Technology

Time : 3 Hours] [Total Marks : 70

Instruction : (1) All questions carry equal marks.
(2) Nos. on RHS indicates marks of the sub question.

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

(i) Describe application of Nano technology in Information and communication.

(ii) Describe the properties of fullerenes.

(iii) Describe the methods for production of Nano particles.

(b) Answer the following : (any **one**) 4

(i) Describe the size concerns of Nano materials.

(ii) Write short note on application of Nano technology in Nano medicine.

2 (a) Answer the following : (any **two**) 10

(i) Describe the carbon nanotube in detail.

(ii) What is quantumdot ? Describe its optical properties.

(iii) Describe Nano crystal with its applications.

(b) Answer the following : (any **one**) 4

(i) Write short note on "Quantum confinement in semiconductors".

(ii) Write short note on Quantum well.

3 (a) Answer the following : (any **two**) 10

(i) Explain the concept of Nano medicine in drug delivery.

(ii) Describe types of Nanosensors in detail.

(iii) What is biosensor? Describe principles of detection of biosensor in detail.

(b) Answer the following : (any **one**) 4

(i) Write short note on "in vivo therapy".

(ii) Write short note on "'Optical biosensors".

4 (a) Answer the following : (any **two**) 10

(i) Describe in detail about pollution prevention with Nano technologies.

(ii) Write short note on "scanning probe microscope".

(iii) Describe scanning tunneling microscope in detail.

(b) Answer the following : (any **one**) 4

(i) Describe advantages and disadvantages of AFM over SEM.

(ii) Write short note on Environmentally Beneficial Nanotechnologies.

5 Attempt any **seven** : 14

(i) What is Nanoshell ?

(ii) What are DNA sensors ?

(iii) What is Bucky ball ?

(iv) Name the different forces measured by AFM.

(v) What is Nano materials ?

(vi) What is quantum wire ?

(vii) What are quantum computers ?

(viii) What is dendrimers ?

(ix) What are electro chemical biosensors ?

(x) What are the negative aspects of Nano ?

AAF-7302 Seat No. _____

M. Sc. (Part - I) (Sem. II) Examination

April / May - 2018

Angiosperm Taxonomy & Plant Reproduction : CBO - 404

(Old Course)

Time : 3 Hours] [Total Marks : 70

Instructions :

(1) The question paper consists of two sections. Write answer of each section in separate answer sheet.

(2) All questions are compulsory. In each section first two questions carry 14 marks and last question carry 7 marks.

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

(4) Illustrate your answer with necessary diagrams, if required.

SECTION - I

1 Answer the following (two out of three) each of 7 marks. 14

(a) Write salient features of the International code of Botanical Nomenclature (ICBN).

(b) Write merits and demerits of classification system of Takhtajan.

(c) Write notes on : Taxonomic tools.

2 Answer the following : (three out of five) each of 05, 05 and 04 marks. 14

(a) Write the systematic position and economic importance of Rutaceae.

(b) Describe geographical distribution and floral formula of Lamiaceae.

(c) Write distinguish characters and floral diagram of Euphorbiaceae.

(d) Write economic importance of Poaceae.

(e) Give floral formula and floral diagram of Meliaceae.

3 Answer the following (four out of six) each 2, 2, 2 and 1 marks. 7

(a) Describe : Taxonomy 2

(b) Write the merits of Bassacy's classification system. 2

(c) Give floral formula of cypraceae. 1

(d) Give classification of Amaranthaceae. 2

(e) Explain : Polypetalae. 2

(f) Give floral formula of Anacartiaceae. 1

SECTION - II

4 Answer the following : (two out of three) each of 7 marks. 14

(a) Write scope of Palynology

(b) Describe types of ovules.

(c) Write structure and functions of microporogenesis.

5 Answer the following : (Three out of five) each of 5, 5 and 4 marks. 14

(a) Explain : Double fertilization.

(b) Write on nutrition of embryo sac.

(c) Write on Pollen viability test.

(d) Explain : Embryogenesis

(e) Explain : Endosperm development during early stage.

6 Answer the following (four out of six) each 2, 2, 2 and 1 marks. 7

(a) Define : Megasporogenesis. 2

(b) Define : Polyembryony. 2

(c) Write full form of TTC. 1

(d) Write name of chemical present in the pollen exine and its functions. 2

(e) Define : in-vitro pollen germination. 2

(f) Define : Plant reproduction. 1

AAJ-7324

Seat No._____

M. Sc. (Sem. II) Examination

April / May - 2018

Botany : CBO-406

(Biophysics, Instrumentation & Biochemistry)

Time : 3 Hours] [Total Marks : 70

Instruction :
(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) Discuss: First and second Laws of Thermodynamics and their importance in Plants.
(2) What are Isotopes? Mention their use in Plant sciences research.
(3) pH scale and its significance in plants.

2 Discuss any **three** in short : 14
(1) Principle and, applications of Electrophoresis. 5
(2) Principle and types of Paper Chromatography. 5
(3) Principle and applications of Centrifugation. 5
(4) Principle and working of TLC. 4
(5) Principle and uses of Light Microscopy. 4

3 Explain any **four** in brief : 7

(1) Free radicals with suitable example. 2

(2) Principle of Colorimetry. 2

(3) Applications of Ultracentrifugation. 2

(4) Uses of radiations in Plant Sciences. 2

(5) Define: Buffers. 1

(6) An instrument used to measure optical density of coloured solution. 1

SECTION – II

4 Describe any **two** in detail : 14

(1) Disaccharides: Properties, structural formula and sources.

(2) Explain: Hydrogen bond.

(3) Functions and symptoms of deficiency diseases of B-complex Vitamins.

5 Discuss any **three** in short : 14

(1) Importance of Proteins in living organisms. 5

(2) Explain: Transamination and Deamination. 5

(3) Classification of Enzymes. 5

(4) Types of RNA. 4

(5) Define: Enzymes and write their properties. 4

6 Explain any **four** in brief : 7

(1) Coenzymes. 2

(2) Polyunsaturated Fatty acids. 2

(3) Formation of peptide bond. 2

(4) Structural isomers of Pentane. 2

(5) Examples of Ionic bond and Covalent bond. 1

(6) Components of Nucleotides used in DNA. 1