GDF-2621-23-24-25 Seat No._____

M. Sc. (Sem. III) Examination

January - 2016

Chemistry

1. CHN-603(O) : Organic Chemistry

2. CHN-603(I) : Inorganic Chemistry (Corrosion)

3. CHN-603(I) : Inorganic Chemistry (Coordination)

4. CHN-603(P) : Physical Chemistry (Polymer Chemistry)

Time : 3 Hours] [Total Marks : 70

1. CHN-603(O) : Organic Chemistry

Instructions :

(1) Figures shown at right side indicate marks.

(2) Language of answers is English.

1 Answer any two : 14

(a) Give an account on radiopharmaceuticals for Scintigraphy.

(b) Considering : amines, alcohols, phenols, carboxylic acids and heterocyclic moieties, explain their physiological impact.

(c) Write a note on receptor site theory.

(d) Explain the use of solvents and flavours in pharmaceutical preparations.

2 Answer any two : 14

(a) Give an account on amphotericin-B.

(b) Synthesis and uses of cephalosporin-C.

(c) How can you synthesize chloramphenicol ?

(d) Define an antibiotic drug. Give the classification of antibiotics based upon their mode of action.

3 Answer any two : 14

(a) What is dapsone ? Give general structure activity relationships of sulfonamide drugs.

(b) Explain synthesis and uses of sulphalene and sulphamerazine.

(c) Discuss the synthesis and uses of sulphathiazole and sulphafurazole.

4 Answer any two : 14

(a) What is resting potential ? How do local anesthetics affect resting potential ? Explain the related distribution and movement of sodium and potassium.

(b) Give an account on cholinergic drugs with ester group.

(c) Discuss the physiological effects of histamine.

(d) Write a note on amino alkyl ethers as antihistaminic agents.

5 Answer any seven questions in brief : 14

(a) What is the mechanism of action of trimethoprim ?

(b) How can you convert streptomycin to maltol ?

(c) Explain the meaning of H_1 antagonist.

(d) What is C.T. ? Explain.

(e) Discuss the role of acetylcholine in humans.

(f) Describe bioisosterism.

(g) Explain the difference of structure between aureomycin and terramycin.

(h) Explain efficacy and potency.

(i) Give the principles of GC and HPLC.

(j) Explain folic acid metabolism.

(k) Discuss the significance of pK_a of sulfonamide drugs.

(l) Explain, how many are basic types of odours (smell) and which are these ?

2. CHN-603(I) : Inorganic Chemistry (Corrosion)

Instruction : All questions carry equal marks.

1 Answer any two of the following :

(i) What are the different types of corrosion damages? Explain pitting type corrosion.

(ii) Write a note on uniform attack.

(iii) Explain the part of oxygen electrode in the construction of differential aeration cells with illustration.

(iv) Represent Pourbaix diagrams with their utility and limitation.

2 Answer any two of the following :

(i) What is Polarization ? Discuss with suitable example the influence of polarization on the corrosion rate in the acidic solution.

(ii) Explain Hydrogen Over Voltage. Give reasons for decreasing the overvoltage.

(iii) Write a short note on an atmospheric corrosion.

(iv) Explain : Corrosion Product Films.

3 Answer any two of the following :

(i) Discuss Wagner theory of Oxidation.

(ii) Explain the corrosion on underground pipe and discuss the methods for prevention of this corrosion.

(iii) Discuss two types of microorganisms participated in the soil corrosion. How the corrosion of Iron pipe occurred by them can be prevented ?

(iv) Write a short note on Oxidation Resistant Alloys.

4 Answer any two of the following :

(i) Explain methods for making soft water used in boiler.

(ii) Explain the mechanism of corrosion fatigue. How can be prevented ?

(iii) What is stress corrosion cracking ? Explain the mechanism of stress corrosion cracking that occurs on steel and other metals.

(iv) Write a short note on Hydrogen Cracking.

5 Answer any two of the following :

(i) Explain the nature of corrosion in boiler. Describe the effective stop to prevent it.

(ii) Write a short note on Dezincification and its prevention.

(iii) Discuss the factors that encourage intergranular cracking. Describe the steps to decrease it.

(iv) Write a short note on emf series.

3. CHN-603(I) : Inorganic Chemistry (Coordination)

1 Answer any two questions from the following. 14

(a) Discuss the Crystal field splitting diagram for any square planar complex.

(b) Complete the deviation of $V_{(x,y,z)}$ from the expansion of $\frac{1}{r_{ij}}$ showing that contributions from n = 4, m = ±1, ±2 are zero.

(c) Evaluate the $<\Theta_{2,0}|\, V_{oct}\,|\Theta_{2,0}>$ integral.

2 Answer any two questions from the following. 14

(a) Explain step up and step down operators of angular momentum.

(b) For the octahedral point group, by using the character χ_α, prove that $\Gamma = T_{2g} + E_g$

(c) Find out the commutator value of [L–, L+].

3 Answer any two questions from the following. 14

(a) For m = m', prove that integral value is $\frac{3}{4} r^4 \sin^4\theta$.

(b) Prove that $<0|\, V_0\,|\, 0> = -6$ Dq.

(c) Prove that $<2\left|\, \left(x^4 + y^4 + z^4\right) \right| 2> = \frac{13}{21} r^4$

4 Answer any two questions from the following. 14

(a) Explain Vibronic coupling spectra of Ti (III).

(b) Explain the Jahn - Teller theorem.

(c) Discuss the Electronic spectra of first transition metal complexes.

5 Answer any seven questions from the following. 14

(1) According to Jacobian, what is the value of $d\tau$ in polar coordinate?

(2) In d^1 case, what is the angle θ and φ ?

(3) What will be the value of l for d-orbitals?

(4) What are the values of ladder operators L_+ and L_- ?

(5) $<\pm 2 \mid V_{oct} \mid \mp 2> = ?$

(6) What are the values of the coefficients c_1 and c_2 for the Ψ_1 ?

(7) d^2 ion splits into which terms due to inter-electronic repulsion?

(8) What will be the value of the quantum number J ?

(9) What information can be provided by vibronic spectroscopy?

(10) What is the relation between distortion and overall energy of the species in a molecule?

4. CHN-603(P) : Physical Chemistry (Polymer Chemistry)

Instructions : (1) Attempt all questions.
(2) All questions carry equal marks.

1 (a) Write any two of the following : **2×5=10**

(i) What are differences between Elastomers, plastics and fibres, explain on the basis of glass transition temperatures.

(ii) Discuss different types of forces and chemical bonding observed in polymers.

(iii) Explain effect of average mol. wt. and mol. weight distribution on the properties of the polymers.

(iv) Discuss various types of polymers on the basis of microstructures based on geometrical structures.

(b) Do any one of the following : **1×4=4**

(i) What are polymers ? How are these different from lower molecular weight compounds ?

(ii) Prove that for polymers $M_w > M_n$.

2 (a) Answer any two of the following : **2×5=10**

(i) Write the mechanism of free radical chain polymerisation.

(ii) Explain polycondensation reactions and give general characteristics of polycondensation reactions.

(iii) Discuss kinetics of anionic chain polymerisation.

(iv) Define active centres. Explain coordination polymerisation mechanism considering Cosse's monometallic concept.

(b) Attempt any one of the following : **1×4=4**

(i) Discuss kinetics of coordination polymerisation on the basis of early kinetic model.

(ii) Derive an equation for degree of polymerisation for non-acid catalysed polycondensation reactions.

3 (a) Do any two of the following : 2×5=10

(i) Derive WLF equation.

(ii) Write down various methods used for determining the glass transition temperature.

(iii) Define glass transition temperature and explain various factors affecting glass transition temperature.

(iv) Explain glass transition temperature and glassy solids are explained on basis of state of phases.

(b) Attempt any one of the following : 1×4=4

(i) What are differences between primary and secondary glass temperature ?

(ii) Explain transition and associated property determination for true polymers are used to differentiate amorphous and crystalline polymers.

4 (a) Answer any two of the following : 2×5=10

(i) Degradation in Rubber.

(ii) Oxidative degradation in polymers.

(iii) Define crystallisability and discuss various factors affecting crystallisability.

(iv) Cylisation reaction in polymers.

(b) Do any one of the following : 1×4=4

(i) Explain Crosslinking type of reactions observed in polymers.

(ii) Define polymer degradation and its general types with examples.

5 Attempt any seven from the following : 2×7=14

(i) Polydispersity

(ii) Degree of polymerisation

(iii) Plastics

(iv) Optically active polymers

(v) Conditions necessary for coordination polymerisation.

(vi) Role or plasticisers.

(vii) Define Tf

(viii) Degradation in cotton clothes

(ix) Mechanical degradation

(x) Example of useful polymer-degradation.