

Sl. No. of Ques. Paper : 1330 F-7
Unique Paper Code : 2171504
Name of Paper : XIV (Section A : Inorganic Chemistry and
Section B: Organic Chemistry)
Name of Course : B.Sc. (Hons.) Chemistry (FYUP)
Semester : V
Duration : 3 hours
Maximum Marks : 75

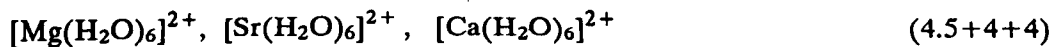
(Write your Roll No. on the top immediately on receipt of this question paper.)

This paper has two sections.
Attempt any three questions from each Section.

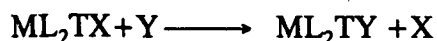
SECTION A

Attempt any three questions. All questions carry equal marks.

1. (a) What is Trans effect? Discuss the electrostatic polarization theory to explain the Trans effect.
- (b) Predict the geometry of the complex which results from the following reaction (1 mol of each reactant)
 - (i) $[\text{Pt}(\text{NH}_3)_3\text{Cl}]^+ + \text{Cl}^- \longrightarrow$
 - (ii) $[\text{Pt}(\text{NH}_3)\text{Br}_3]^- + \text{NH}_3 \longrightarrow$
- (c) (i) Ni^{2+} complex with 8-hydroxyquinoline is more stable ($\log_{10} \beta = 21.8$) than Ni^{2+} complex of 2-methyl-8-hydroxyquinoline ($\log_{10} \beta = 17.8$). Comment.
- (ii) Arrange the following in order of increasing rate of water exchange and explain briefly:



2. (a) Derive an expression for the rate law for the substitution reaction:



What happens when the solvent molecules compete with ligand?

- (b) What is a dissociative mechanism in substitution reactions? Give the energy diagram for the transition species where an intermediate is isolated.
- (c) Show the process of nucleophilic substitution reaction (mechanism) in a square planar complex PtA_2LX to yield PtA_2LY when reacted with ligand Y. (4.5+4+4)

3. (a) Is there a correlation between thermodynamically stable and kinetically inert complexes? Justify with examples.
- (b) Ni(II) complexes are observed to undergo substitution much faster than Pt(II) complexes. Give an explanation based on CFT. Also comment in general four coordinated complexes react more rapidly than six coordinated complexes.
- (c) Give the expression for the correlation of ΔG with $\log_{10} \beta$. Discuss the comparative stability of chelated and non-chelated complexes. 4.5+4+4
4. (a) Compare and contrast three points of homogeneous and heterogeneous catalysts. Give one example of each.
- (b) What is hydroformylation or oxo process? Give the mechanism of hydroformylation using cobalt complex as a catalyst. Show how cobalt containing intermediate in the cycle alternate between 18 electron and 16 electron species.
- (c) What is the catalyst used in a Fischer-Tropsch process? Is it a homogeneous or heterogeneous catalyst? Give one reaction (no mechanism) using this catalyst. 4+5.5+3

SECTION B

Attempt any three questions. All questions carry equal marks.

5. (a) Sketch a suitable mechanistic scheme for the following transformation:
Citral when reacted with KHSO_4 gives *p*-cymene.
- (b) Give biosynthesis of geranyl pyrophosphate and a monoterpene geraniol from isopentenyl pyrophosphate.
- (c) Draw the short segment of gutta-percha and natural rubber depicting the difference between them.
- (d) Write two medicinal uses of neem and curcumin.
- (e) Define alkaloids. How are they generally isolated from natural sources? 2.5×5
6. (a) What is a plasticizer? Explain your answer by giving the example of two plasticizers commonly used. Give their structures.
- (b) Write the anionic mechanism for polymerization of acrylonitrile in the presence of butyl lithium. Give the use of resulting polymer.
- (c) How are the following polymers prepared? Give their uses and synthesis of monomer units.

- (i) Nylon 66
- (ii) Polyester. 3,3.5,6
7. (a) Give the synthesis and uses of paracetamol. What type of drug is it?
- (b) Give the Green synthesis of ibuprofen. What typical adverse effects are associated with the therapeutic administration of it?
- (c) How is the structure of chloramphenicol established? What type of drug is it? Give its uses and side effects. 3,3.5,6
8. (a) How is *o*-methyl group in an alkaloid detected? Name the method and give the reaction involved.
- (b) Outline the steps involved in Emde's modification by taking isoquinoline as an example.
- (c) An aliphatic compound (A) C_5H_8O on being treated with $Zn-Cu/H_2O$ gives (B) $C_5H_{10}O$. Treatment of (B) with PBr_3 gives (C) C_5H_9Br . Reaction of (C) with sodioethyl acetoacetate followed by ketonic hydrolysis yields methyl heptenone (D). How can (D) be converted into citral-a? 3,3.5,6