

INTERNAL ASSESSMENT EXAMINATION, 2020

CC-13 (CHEMISTRY HONOURS)

INORGANIC CHEMISTRY

Answer **any ten (10)** from among the following questions, each carrying **2** marks:-

Full Marks: 20

1. Explain why π -acid ligands show strong trans effect.
2. Iron forms both mono and dinuclear carbonyls but manganese forms only dinuclear carbonyl.
3. Arrange the following complexes in the increasing order ν_{M-C} values:
[Cr(CO)₆], [Cr(NH₃)₃(CO)₃] and [Cr(PPh₃)₃(CO)₃]
Justify the order you choose.
4. The second order rate constant for the reaction of I⁻ with *trans*-[PtCl(CH₃)(PEt₃)₂] in methanol at 30⁰C is 40 Lmol⁻¹s⁻¹. The corresponding reaction with N₃⁻ has $k_2 = 7.0$ Lmol⁻¹s⁻¹. Estimate S and C for the reaction given the npt values of 5.42 and 3.58 respectively. S: nucleophilic discriminating factor and C = $\log k_2^0$ where k_2^0 is the rate constant for the same reaction with a reference nucleophile, methanol.
5. Assuming dissociative pathway, predict the nature (consider the effect of solvent electrostriction) of ΔV^\ddagger and ΔS^\ddagger for substitution of the following octahedral complexes:
[Co(NH₃)₅(SO₄)]⁺ and [Co(NH₃)₅(H₂O)]³⁺
6. Carry out the following conversion using a suitable transition metal catalyst. Show the corresponding catalytic cycle.



7. Explain oxidative addition and reductive elimination using suitable example(s).
8. What is chelation therapy? How it can be applied for the removal of Pb²⁺ from a Pb²⁺ contaminated human body?
9. Mention biological functions of magnesium.
10. Write the reactions occurring in light and dark reactions of photosynthesis (only the main chemical reactions).
11. Name the disease due to the toxicity of mercury and copper.
12. What are the demerits of using cisplatin as the drug in chelation therapy?

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CC-14 (CHEMISTRY HONOURS)

PHYSICAL CHEMISTRY

Answer *any ten (10)* from among the following questions, each carrying **2** marks:-

Full Marks: 20

1. What is fluorescence? State its applications.
2. Prove that the vibrational energy levels of a harmonic oscillator are equally spaced.
3. Find out the highest J value for more intense rotational spectra.
4. What is quantum yield? State the reason for high quantum yield.
5. Define and explain photochemical equilibrium.
6. What is photosensitizer? Mention its application.
7. Compare and contrast between peptization and coagulation.
8. Clarify the statement: "Gold number of starch is 10-15". What is the significance of "Gold number".
9. State the significance of zeta potential.
10. Define CMC. What is Kraft temperature?
11. Derive an expression of Langmuir adsorption isotherm.
12. Write down the assumptions based on which the Brunauer-Emmett_Teller (B.E.T.) equation is framed.

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DSE-3 (CHEMISTRY HONOURS)

POLYMER CHEMISTRY

Answer *any ten (10)* from among the following questions, each carrying 2 marks:-

Full Marks: 20

1. Write the rate expressions of the following addition (chain growth) polymerization reactions:
(a) unimolecular (uncatalysed), (b) bimolecular (catalysed) (c) unimolecular (catalysed) and (d) bimolecular (uncatalysed).
2. In a polymer sample 20 molecules have molar mass 5000, 30 have 10,000 and 40 have 20,000. Calculate the number average, weight average molar mass and polydispersity.
3. Define degree of polymerization. Calculate the average degree of polymerization when 49.99% of the monomers take part in a step growth polymerization.
4. Derive an expression of the rate constant in case of acid catalyzed synthesis of polyethylene terephthalate.
5. What happens during glass transition? How can T_g of a polymer be changed?
6. State the criteria of solubility of a polymer sample.
7. Write down the structures of the monomeric forms of PVC & Teflon. Suggest reasonable synthetic pathways for both the monomers.
8. What is conducting polymer? Give an example with proper application.
9. Define natural polymer, synthetic polymer and semi-synthetic polymer with one example for each type.
10. Can hexane be converted into any kind of polymer? If yes, then show the plausible synthetic pathways.
11. Natural rubber is exposed to ozone atmosphere. What will happen?
12. Differentiate between Bakelite and Novalac.