

B.Sc. 6th Semester (Honours) Examination, 2021 (CBCS)

Subject: Chemistry

Paper: CC-13

Time: 2 Hours

Full Marks: 40

Candidates are required to give their answers in their own words as far as practicable.

Answer any eight questions from the following:

8×5 = 40

- (a) State the function of Zn(II) ion for the hydration of CO₂ by human carbonic anhydrase.
(b) 'In chlorophyll, the chlorin ring without Mg(II) is fluorescent but after incorporation of Mg(II), it becomes phosphorescent'- explain.
- (a) What is Wilson's disease? 'D-penicillamine (DPA) is clinically recommended for treatment of Wilson's disease'-explain.
(b) Write the use of *cis*-platin. Give one example of second generation anticancer drug.
- (a) What are the functions of cytochromes?
(b) What is the fundamental requirement of a metal centre to participate in redox metallo enzymes? Give examples in support of your answer.
- (a) Write in brief the significance of Na⁺-K⁺ ion pump in biological system.
(b) Define Bohr effect in connection to oxygenation of hemoglobin and myoglobin with proper plot.
- (a) Point out the structures and bonding of CO in Mn₂(CO)₁₀ and Fe₃(CO)₁₂ complexes.
(b) 'Nitrosyl stretching frequency in its metal complexes appears at different positions for its different oxidation levels'-explain.
- (a) Why the complex M(PEt₃)₃(CO)₃ exhibits ν_{CO} at 2090 and 2055 cm⁻¹ where M(PF₃)₃(CO)₃ exhibits ν_{CO} at 1937 and 1847 cm⁻¹? Out of these two phosphines, which one is more π bonding ligand?
(b) What is 18 electron rule? Considering the rule find out the value of 'n' in the following complexes: Na₂Fe(CO)_n, W(η⁶-C₆H₆)(CO)_n and Fe(η⁶-Cp)(η¹-Cp)(CO)_n
- (a) Write the catalytic cycle for hydrogenation of ethylene catalyzed by (Ph₃P)₃RhCl. Indicate the rate determining step.
(b) Distinguish oxidative addition and reductive elimination with proper examples.
- (a) How is ferrocene obtained? Draw the structure of ferrocene and ruthenocene with proper confirmation.
(b) What is the catalytic species used in Wacker's process and how is it generated?
- (a) Distinguish between kinetic and thermodynamic stability of metal complexes.
(b) Write a short note on 'Linear Free Energy Relationship (LFER)'.
- (a) Compare the rate of base hydrolysis of [Co(NH₃)₅Cl]⁺ and [Co(py)₅Cl]⁺ with reason.
(b) 'Substitution reactions of [Cr(CO)₆] are very slow, consistent with a low spin d⁶ complex, but the isoelectronic complex [V(CO)₅NO] is very reactive'-comment.