

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1625 C Roll No.....
Unique Paper Code : 217601
Name of the Course : B.Sc. (Hons.) Chemistry
Name of the Paper : Inorganic Chemistry – V (CHHT–615)
Semester : VI
Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. Answer any five questions.
 3. All questions carry equal marks.
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1. (a) Give the chemistry for identification of the following ions in the presence of each other :
 - (i) Cu^{2+} and Cd^{2+}
 - (ii) NO_2^- and NO_3^- (5)
 - (b) What are interfering anions ? Why do they interfere only after group II of the cation analysis scheme and not before ? (4)
 - (c) In qualitative analysis, why are group II sulphides precipitated in acidic medium and group IV sulphides in alkaline medium ? (4)
 - (d) How SO_4^{2-} and Pb^{2+} ions are tested in PbSO_4 compound ? (2)
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2. (a) Where and in what form is iron stored in the human body ? How is it taken from the storage sites to the sites for incorporation into haemoglobin ? (6)

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- (b) What do you understand by essential and non-essential metal ions in the biosystem? (2)
- (c) What are the differences between haemoglobin and myoglobin? Haemoglobin acts as an oxygen carrier from lungs to muscle but as a carbon dioxide carrier from the tissues to the lungs. Explain this cycle. (6)
- (d) $\text{Ni}(\text{CO})_4$ is monomer but the analogous cobalt compound is a dimer, why? (1)
3. (a) What is meant by synergic effect? How does it account for the formation of carbonyl complexes of transition metals in low oxidation states? (4)
- (b) Give the valence electron counts of the following :
- (i) $[\text{Mn}(\pi\text{-C}_5\text{H}_5)(\text{CO})_4]$
- (ii) $[\text{H}(\text{Co}(\text{CO})_4)]$
- (iii) $[\text{Fe}(\pi\text{-C}_5\text{H}_5)_2]$
- (iv) $[\text{Mn}(\text{CO})_5\text{Cl}]$ (6)
- (c) Cyclopentadienyl rings in the ferrocene have aromatic character but cyclopentadiene itself has no such character. Explain. (3)
- (d) $\text{Ni}(\text{CO})_4$ is tetrahedral. Explain. (2)
4. (a) Give the use of the following reagents in the identification of ions along with the chemistry involved.
- (i) Ammonium molybdate
- (ii) Dimethylglyoxime (5)
- (b) What do you mean by common-ion effect? Explain with two examples. (5)

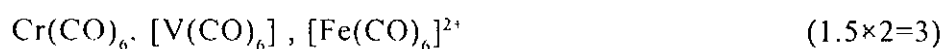
- (c) Why is NH_4OH added to the centrifugate obtained after group III analysis before passing H_2S for the analysis of group IV ? (3)
- (d) A slight excess of ammonium salts are needed during the precipitation of group V ions but a large excess is avoided. Explain. (2)
5. (a) Explain with the help of a diagram the mechanism of sodium-potassium pump in human body and what is the source of energy for the function of this pump ? (6)
- (b) Explain why haem group cannot function as biological oxygen carrier in the absence of the globin chain ? What serves as the trigger in the Perutz mechanism for oxygenation and deoxygenation of haemoglobin ? (6)
- (c) Why is cis-platin used by oncologists in preference to the trans-isomer ? (3)
6. (a) Give two reactions of ferrocene which show it is more reactive than benzene. (3)
- (b) Explain why direct nitration of ferrocene is not possible ? How can you get nitroderivative of ferrocene ? (3)
- (c) Define organometallic compounds. Which of the following are organometallic compounds ?
- (i) CH_3MgBr
 - (ii) $(\text{C}_2\text{H}_5)_2\text{Zn}$
 - (iii) $\text{Ti}(\text{OEt})_4$
 - (iv) Zeise's salt
 - (v) $(\eta^6\text{-C}_6\text{H}_6)_2\text{Cr}$ (6)
- (d) The V-C bond lengths in $[\text{V}(\text{CO})_6]$ and $[\text{V}(\text{CO})_6]^-$ are 200 pm and 193 pm respectively. Explain. (3)

7. (a) Giving reasons arrange the following in order of

(i) Shortest C-O bond length



(ii) Lowest C-O stretching frequency



(b) Write the toxic effects of Hg(II) poisoning. Give the reasons for its toxicity. How it can be treated? (3)

(c) What special features of Zn^{2+} ion make it an excellent biocatalyst? Substitution of Co^{2+} for Zn^{2+} ion gives a spectral probe. What special features of Co^{2+} ion are exploited and why does Zn^{2+} lacks them? (4)

(d) What are the impacts of excess and deficiency of Cu^{2+} and Co^{2+} ions in human body? (5)