(2½ Hours)   (Total Marks : 60)

N. B. :   **1.** **All** questions are **compulsory**.
2. **Figures** to the **right** indicate **full marks**.
3. **All** questions carry **equal marks**.
4. **Use** of **log-table** / **non-programmable calculator** is **allowed**.

1. a) Attempt **any two** of the following :   **(08)**
   i) What is the role of cobalt in biological system?
   ii) Write a brief account on the importance of siderphores to the microbial cell.
   iii) Explain the role of metal ions in structural context for biological function.
   iv) Discuss the role of Carboxypeptidase -A (CPA) as metalloenzyme.

   b) Attempt **any one** of the following :   **(04)**
   i) How are copper containing proteins classified? Explain their structure and importance with suitable examples.
   ii) Justify the statement 'all metalloenzymes are metalloproteins, but all metalloproteins are not metalloenzymes'. Give a brief account on non-blue copper oxidase protein 'galactose oxidase'.

2. a) Attempt **any two** of the following :   **(08)**
   i) Explain photo redox reaction with suitable example.
   ii) Discuss the potentiometric method to determine the stability of a complex.
   iii) Give the relationship between free energy and stability constant. Derive the relationship between overall stability constant and stepwise stability constant.
   iv) What is meant by Stoke's shift? Explain its importance.

   b) Attempt **any one** of the following :   **(04)**
   i) Justify the statement 'Photochemistry has emerged as a powerful tool in research.
   ii) What is meant by Quantum Yield? How it is calculated? In Job's method to determine the stability the peak point of the curve is not always sharp and often rounded. Explain

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3. a) Attempt **any two** of the following : **(08)**

    i) Discuss the classification of oxoanion basicity on the basis on their pK_b values.

    ii) Explain the Drago-Wayland equation to estimate quantitatively the strength of Lewis acid-base interactions.

    iii) Write down any four balanced equations to illustrate redox reaction in liquid ammonia.

    iv) Explain the Latimer diagram for manganese at pH = 0.

  b) Attempt **any one** of the following : **(04)**

    i) What is Pourbaix diagram? Explain with reference to iron.

    ii) How are Lewis bases classified on the basis of frontier molecular orbital topology?

4. a) Attempt **any two** of the following : **(08)**

    i) What is meant by fluxionality? Explain fluxional behavior in trigonal bipyramid molecules.

    ii) Draw molecular orbital diagram for square planar complexes considering sigma bonding only.

    iii) With the help of angular orbital overlap show that $\Delta_0 = \dfrac{9}{4}\Delta_t$.

    iv) Explain the geometries of hepta co-ordinated complexes.

  b) Attempt **any one** of the following : **(04)**

    i) Using trans effect series. Explain giving reasons synthesis of cis and trans of $\left[Pt(NH_3)_2\,NO_2\,Cl\right]$ complexes.

    ii) Discuss the redox reactions for the synthesis of co-ordination compounds.

5. Attempt **any four** of the following : **(12)**

  a) Brief account on 4Fe – 4S Protein.

  b) Distinguish between prompt and delayed transitions.

  c) Explain with suitable examples, species which behave as Lewis acids.

  d) What are enantiomers? Explain the optical activity of cis $\left[Cr(NH_3)_2\,Cl_2\right]$ complex and trans $\left[Cr(en)_2\,Cl_2\right]$ complex.

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e) Explain 'Redox catalysis' with reference to biological system.

f) Distinguish between photochemical and thermal reactions.

g) Explain whether the disproportion reaction is spontaneous with reference to Cu^{2+} $\underline{0.15}$ Cu^{+} $\underline{0.5}$ Cu.

h) Draw the geometrical isomers of $[MA_3B_3]$ complex. Explain with suitable structure and reasons whether fac - $[RhCl_3(py)_3]$ complex is polar and possess optical activity.

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