M. Sc. Chemistry Examination, 2023

(3rd Semester, CBCS)

Paper: XII-I

[Inorganic chemistry special]

Time : Two Hours Full Marks : 40

(20 marks for each unit)

Use a separate answer script for each unit.

UNIT - I - 3121

1. Discuss the mechanism of action of a naturally occurring carboxypeptidase. What is its role in the biological system? What is an apoenzyme? How can the role of a metal ion in an enzyme be determined by treating the metal ion with an apoenzyme? $2+{}^{1}/_{2}+{}^{1}/_{2}+1$

2. Answer any ***two*** questions : 3x2=6
   (a) Discuss mechanism of action of *cis* platin with DNA. Compare its activity with that of the dimeric rhodium (ii) carboxylates. $1{}^{1}/_{2}+1{}^{1}/_{2}$
   (b) For all complexes of Pt(II) and Pt(IV) prepared with anticancer activity in mind, which essential aspect based on the knowledge acquired from *cis* platin, was maintained. Draw the structures of two such compounds, one each of Pt(II) and Pt(IV). $2+{}^{1}/_{2}+{}^{1}/_{2}$

(c) Highlight a chemical transformation where Vitamin B_{12} acts as a co-enzyme. 3

3. Answer all questions :
   (a) What are the main differences between a corrin ring and a porphyrin ring? Give examples of each.
   (b) Draw the Z-scheme diagram of the process for photosynthesis and show how different e-carrier proteins arrange within it.
   (c) Draw the structure of antenna chlorophyll. What is its function? 2+2+1

4. Answer all questions :
   (a) Discuss different parts of ferritin.
   (b) What is the function of $Na^+ – K^+$ pump?
   (c) How can vanadate (VO_4^{3-}) even at extremely low concentration inhibit the function of phosphate (PO_4^{3-}) in a $Na^+ – K^+$ pump? 2+2+1

UNIT - I - 3122

5. (a) Define photochromism with an example that undergoes ring closing and ring opening reaction.
   b) Explain the mechanism of photochromic sunglass containing glass silicate and AgCl.
   (c) Discuss the polymorphic transformation in shape memory alloy.

(d) Depict and explain superhydrophilic, hydrophilic, hydrophobic and superhydrophobic materials in the context of contact angle.
(e) Write short note on (any one)
(i) Self-healing materials (ii) Piezoelectric material
(iii) Polymorphism in pharmaceuticals. 2+2+2+2+2

6. (a) Explain with suitable example why heterogeneous catalysis is surface catalysis.
   (b) Write a short note on “Sabatier Principle”.
   (c) Write down the seven steps of heterogeneous catalysis.
   (d) What is a photocatalyst? Describe the main processes with diagram in photocatalytic water splitting.
   (e) What do you mean by zeolites? Write their general formula. Discuss the synthesis method of any zeolite. 2+2+2+2+2