EPCH704T

I-M.Sc CHEMISTRY

BIOINORGANIC and SUPRAMOLECULAR CHEMISTRY

Unit -1

Part – A

1. The oxidation state of iron in ferritin----------
2. Ferritin stores----------
3. Ferritin releases iron by the reduction of Fe^{3+} to ----------
4. Transferrin involves transport of ----------
5. The number of subunits in apotransferrin is----------
6. The oxidation state of iron in transferrin----------
7. The colour of siderochromes is red-brown because of the presence of ----------
8. Ferrichromes and ferrioxamines mainly contains ----------moieties
9. Enterobactins contain----------moieties
10. The main function of siderophores is----------
11. $[Ca_{10}(PO_4)_6(OH)_2]$ is called ----------
12. $3[Ca_3(PO_4)_2]CaF_2]$ is called ----------
13. Calmodulin is ---------- carrier
14. Osteoporosis means----------
15. Rickets arises due to low level of vitamin D and low intake of ----------
16. Hypoglycaemia leads to a ----------in serum calcium level

Part – B (2 marks)

1. What is called biomineralisation?
2. What are siderophores?
3. Give the representation of calcium-carboxylate interaction
4. Write a short note on storage of calcium.
5. Write a short note on ferritin
6. Write a short note on transferrin
7. Write a short note on siderophore

Part – C (5 marks)

1. Explain the structure of Ferritin.
2. Explain the action of Ferritin.
3. Explain the mechanism of transferrin.
4. Give the structure of Fe^{3+} - hydroxamate siderophore, ferrichorme and Fe^{3+}-catecholate enterobactin complex.
5. Exaplin the mechanism of calcium level in plasma.
6. Give the structure of two amino acids **hya** and **gla** and explain how they are used as calcium binding sites in calcium binding proteins.

7. Write a note on calmodulin.

Unit – 2

Part – A (1 mark)

1. The geometry of Cu and Zn in superoxide dismutase respectively----------& ----------
2. In the presence of superoxide dismutase, $O_2^- + O_2^- + 2H^+ \rightarrow$ --------- + --------
3. In catalase and peroxidase, iron exists as----------
4. Catalase and peroxidase, both catalyses the decomposition of ----------
5. In the presence of catalase, $H_2O_2 + H_2O_2 \rightarrow$ ----------&----------
6. In the presence of peroxidase, $H_2O_2 + AH_2 \rightarrow$ ----------&----------
7. The metal ion present in carboxy peptidase-A is ----------
8. The metal ion present in carbonic anhydrase is ----------
9. What is apoenzyme?
10. The prosthetic group of carboxy peptidase contains----------
11. Xanthine oxidase is an example for ----------containing redox enzyme

Part – B (2 marks)

1. Draw the structure of carboxy peptidase.
2. What is called prosthetic group?
3. What is called coenzyme? Give example.
4. Write about the function of carboxy peptidase
5. What is the function of catalase?
6. What is the function of peroxidase?
7. Why cytochrome P-450 is called so?
8. Draw the structure of superoxide dismutase.

Part – C (5 marks)

1. Explain the action of carboxy peptidase
2. Explain the mechanism of carbonic anhydrase
3. Write the structural features of catalase and peroxidase
4. Explain the importance of structure of superoxide dismutase
5. Give the complete structure of vitamin B_{12}
6. Write a note on xanthine oxidase.

Unit – 3

Part – A (1 mark)

1. Give an example for trace elements.
2. Give an example for essential elements.
3. Which among the following is toxic to central nervous system? (a) lead (b) copper (c) copper
4. What is cis-platin or cis-DDP?

5. ---------- is used as an heart imaging agent
6. ^{24}Na is used to locate the site of ----------in blood
7. Give the molecular formula of gadolinium complex used to locate brain tumour.
8.

Part – B (2 marks)

7. Write a note metal-nucleic acid interaction
8. Explain the importance of the interaction of cis-platin complex with cancer DNA
9. Mention the possible modes of metal complex-DNA binding
10. Explain how cis-platinum complex interacts with cancer DNA and ruptures the growth of cancer cell?
11. Give the toxicity of the following metals (a) Arsenic (b) iron
12. What are the conditions to be satisfied by the metals which are used as diagnostic agents.
13. Why Gd^{III} is used in MRI?
14. Give the schematic representation of cis-$[Pt(NH_3)_2\{d(pGpG)\}]$ adduct.
15. Write a short note toxic effects of anticancer Pt-complexes.
16. What are SSR proteins? Mention their importance.,
17. What is minamata disease? Mention the antidots used in this disease.

Part – C (5 marks)

1. Explain the binding modes of metal ion with DNA.
2. Explain how metal complexes suchas $[Ru(phen)_3]^{2+}$ are used as probes of nucleic acids.
3. Write a note on metals which are used for diagnosis.
4. Explain the biological functions of manganese, calcium, aluminium, sodium, potassium
5. Discuss the anti-inflammatory effects of Zn and Cu compounds.
6. Discuss the radioactivity in medicine.

Unit-IV

Objective type Questions

1. Which of the following type of interaction is not important in supramolecular chemistry
   a) Hydrogen Bonding b) Ion-dipole c) dipole-dipole d) Ionic bonding
2. Supramolecular chemistry can be defined as ……..
3. Supramolecular chemistry is concerned with the …….
4. Molecular recognition thus implies the …… and…….
5. Information may be stored in the architecture of the ……
6. Host posses …… binding site.
7. Guest posses…… binding site.
8. Schiff ‘s base macrocycle of Busch lab in 1964 contains …….. as central metal ion
9. Supramolecular Chemistry is classified according to type of …….
10. Clathrates - host molecule is stable only in ……. State.

Short Answer

1. Rank all the interactions according to their relative strength.
2. A receptor–substrate supermolecule is characterized by which three factors?
3. Which is the least useful interaction to be applied to the assembly of supramolecular nanomaterials?

4. List four reasons why there is an interest in self-assembly.
5. What is a receptor and a carrier?
6. What is preorganization and complementarity?

Detailed Answer

1. Give a brief account on Molecular recognition.
2. What are the main supramolecular interactions? What are their properties?
3. Discuss briefly the type of interactions used in supramolecular chemistry and include a (molecular) example for each interaction.
4. Write a short notes on self-replication.
5. Write a note on molecular receptors.
6. Draw some macrocycle compounds like cryptands and crownethers.
7. Discuss the interactions occurring in supramolecules.
8. Explain about Spherical and tetrahedral recognition.
9. Describe about recognition of ammonium ions.
10. Write a note on recognition of neutral molecules.
11. Account on multiple recognition in Metalloreceptors.

Unit-V

Objective type Questions

1. Componenets and devices define areas of molecular and supramolecular photonics, electronics and ionics belonging to an intriguing and rather futuristic field of chemistry that may be termed as……..
2. Crown ethers and cryptands are……..
3. Enzyme has the binding site to which its……fits
4. The concept of biological receptor is explained by……
5. The force between host and guest is……
6. Lock and key principle is explained by…….
7. ……..is the central metal atom in crown ether prepared in penderson lab in 1967.

Short Answer

1. Define molecular machine?
2. Define Molecular switch.
3. Explain about Molecular wires.
4. Describe about the Light Conversion device.
5. Write a short note on Energy Transfer device.
6. Brief account on ladders.
7. Brief account on Grids.
8. Brief account on racks.

9. Write a note on Podants.

Detailed Answer

1. Explain the properties of dendrimers.
2. Briefly discuss the incipient proton transfer reaction as it applies to the H-bond.
3. Briefly name two current hydrogen storage technologies.
4. Explain example for molecular machines
5. Explain electro switching devices.
6. Explain mechanical switching processes.
7. Explain racks, ladders, grids.
8. Write a short notes on self-replication.
9. Write a note on supramolecular materials in nanochemistry.
10. Write note on Supramolecular Chemistry in Biology.