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63/2 (SEM-4) CHM 409

2023

CHEMISTRY

(Theory Paper)

Paper Code : CHM 409

(Bioinorganic Chemistry)

Full Marks – 80

Pass Marks – 32

Time – Three hours

The figures in the margin indicate full marks
for the questions.

1. Choose the correct answers : 1×6=6

(a) In bacterial rubredoxin, the number of iron atoms, sulfur bridges and cystine ligands respectively are

(i) 4, 4, 4

(ii) 2, 2, 4

(iii) 2, 2, 2

(iv) 1, 0, 4

[Turn over

(b) Storage of Iron in human body is carried out by

- (i) Myoglobin (ii) Ferritin
(iii) Hemoglobin (iv) Cytochrome P50

(c) Which metal forms part of the haem group to which oxygen binds in hemoglobin ?

- (i) Zn (ii) Fe
(iii) Mn (iv) Cu

(d) Which amongst the following is not a therapeutic use of drug cisplatin ?

- (i) Down's diseases
(ii) Hodgkin's lymphomas
(iii) Non-Hodgkin's lymphomas
(iv) Small-cell lung cancer

(e) Which element plays a key role in the nitrogen fixation ?

- (i) Mn (ii) Mo
(iii) Zn (iv) Cu

(f) How many number of rings are found in the chemical structure of the drug cisplatin ?

- (i) 0 (ii) 1
(iii) 2 (iv) 3

2. Answer any *six* of the following questions :

5×6=30

(a) Why a Sodium-Potassium pump is called a p-type ion pump ? Describe the selectivity $\text{Na}^+ - \text{K}^+$ pump with crown ether. 2+3=5

(b) How does oxygen bind to Hemoglobin ? Briefly describe the hemoglobin protein structure. 5

(c) State the challenges and advances in the field of self-assembled membranes leading to vital importance in biological, systems. 5

(d) Gold compounds have been used to combat rheumatoid arthritis. Comment. 5

(e) What is a soluble electron carrier protein of photosynthetic bacteria with an Fe_4S_4 cluster called ? Draw and differentiate the cluster of ferredoxins. 5

(f) What is the role of Xanthine oxidase in the treatment of gout ? Draw and explain its significance. 5

(g) Discuss the role of bio-minerals containing Ca and Fe in bio-inorganic chemistry. 5

3. Answer any *four* of the following questions :

6×4=24

(a) What are the genetic factors for metal toxicity ? How do toxicity due to Hg, As, Cd, Pd affects the ecosystem ? 6

(b) Write the mechanism and functions of Nitrogenase in account of its nitrogen fixation activity. 6

(c) Discuss the adverse effects of oxygen toxicity with the help of its mechanism. 6

(d) Describe the beneficial effects of co-enzyme B₁₂ in regard to biological existences. 6

(e) Write short notes on the following :

1½×4=6

(i) Molecular recognition

(ii) Cryptands

(iii) Cytochrome P-450

(iv) Thalassemia.

4. Answer any *two* of the following questions :

10×2=20

(a) What is the role of transferrin in the absorption of iron ? Describe the functions and variety of siderophores.

(b) How do metal complexes interact with negatively charged DNA ? Explain with the help of a structure.

(c) On the basis for the use of Square-planar platinum(II) containing anti-cancer drugs.

(i) Explain the biochemical mechanism of action of cisplatin.

(ii) Explain the interaction of right-handed DNA with chiral complexes.