Total No. of Questions :4]

SEAT No. :

P1963

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[4923]-39
M.Sc. II
INORGANIC CHEMISTRY
CH-332: Bio -Inorganic Chemistry
Inorganic Elements in the Chemistry of Life
(2008 Pattern) (Semester - III)

Time : 3 Hours *[Max. Marks :80]*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***

Q1) Answer any four: **[20]**

a) Discuss the types, structures and functions of copper proteins with one example each.

b) Write the balanced reaction for oxidation of water at PS II. Explain with the help of S_4 cycle, the steps involved in water oxidation.

c) Explain with suitable examples different binding interactions of metal complexes with DNA.

d) What are radiopharmaceuticals? Which techniques are used to monitor the α – and β– particles emitted from radiopharmaceuticals?

e) Illustrate with a neat diagram the structure and function of enzyme carbonic anhydrase.

Q2) Attempt the following (any four): **[20]**

a) What is the principle of magnetic resonance imaging? How it is useful in clinical diagnosis? Write down the structures of at least two complexes that are used as MRI contrast agents.

b) With the help of a neat diagram, explain the active site structure of enzyme urease. Name the metal ion present at the active site and the substrate for the enzyme.

c) Give a detailed account of the oxidative cleavage of DNA by metal complexes with special emphasis on the types of radicals involved and selectivity towards nucleobases.

P.T.O.

d) Enlist the coenzymes of Vit. B_{12}. Write down the reactions for the conversion of -

i) Mercury to methyl mercury.

ii) Homocysteine to methionine.

e) Name the copper proteins involved in -

i) Oxygen transport.

ii) Oxygenation.

iii) Oxidase activity.

iv) Electron transfer and

v) Antioxidative function

Q3) Attempt <u>any four</u>: **[20]**

a) What are the desired properties of metal complexes to act as MRI contrast agents?

b) Match the following:

	Function	Metal ion involved
i)	Formation of methylmercury	Ni
ii)	Production of ammonia	Mn
iii)	Peptide bond cleavage	Cu
iv)	Electron transfer	Zn
v)	Water oxidation	Co

c) Draw the structures of-

i) DOTA

ii) $[Fe\text{-}EDTA]^{2-}$

iii) Oxyhemocyanin

iv) Cu^{+} $(phen)_2$

v) Active site in Manganese catalase

d) Fill in the blanks with the correct option:

i) In blue copper oxidases, the by product is _____.

1) H_2O

2) H_2O_2

3) H_2

4) OOH

ii) The polypyrrole ring present in Vit. B_{12} is _____.

1) Porphyrin
2) Chlorin
3) Protoporphyrin
4) Corrin

iii) _____enzyme isolated from erythrocytes was earlier known as 'erythrocuprein.'

1) Cu-zn SOD
2) Urease
3) Catalase
4) Tyrosinase

iv) Hydrogenases are enzymes that catalyze 2-$\bar{e}$ oxidation of _____.

1) CH_4
2) H_2
3) H_2S
4) H_2O

v) The number of Cu and Fe ions present at the active site of cytochrome c oxidase are ____ and ____ respectively.

1) 2 and 3
2) 2 and 2
3) 3 and 2
4) 3 and 3

e) In developing any therapeutic radiopharmaceuticals, the choice of the radionuclides will depend on which factors?

Q4) Write short notes on (any four): **[20]**

a) Important structural features of Vit. B_{12}.

b) Hydrogenases.

c) Zn-fingers and other gene regulatory zn-proteins.

d) Manganese peroxidases.

e) Enzyme tyrosinase.