



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY:

BTAC/SEP2013/J-FT Y3S2; BTAC/SEP 2014/S-PT Y3S2

ACH4304: BIOINORGANIC CHEMISTRY

PAPER 1

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

- (a) When examining the interaction of different metal ions with various amino acids, suggest a brief explanation for:
- i) Why glycine binds Cu(II) with a higher affinity than other metal ions. (2 marks)
 - ii) Why cysteine has a higher affinity for Co(II) and Zn(II) than glycine does. (2 marks)
- (b) i) Use chemical equations to show the active sites in either Carboxy anhydrase or Liver Alcohol dehydrogenase (LADH) and write down in either case the specific biochemical reaction catalyzed. (5 marks)
- ii) Draw the chemical structure of corrin and name the associated biomolecule. (5 marks)
- (c) i) Zn(II) ion is naturally at the active site of many hydrolytic enzymes. Give FOUR reasons justifying this statement. (4 marks)

- ii) Name any TWO non-heme proteins involved in O₂ transport. (2 marks)
- (d) i) Account for cadmium (Cd) toxicity in biosystem. (2 marks)
- ii) Explain any TWO methods of treatment following Lead poisoning. (2 marks)
- iii) Provide any ONE storage forms of Ca²⁺ ions in biological systems. (2 marks)
- (e) Explain briefly the O₂ binding by hemocyanin. (4 marks)

Question TWO

- (a) Differentiate between Carriers and Channels ionophores. (4 marks)
- (b) i) Explain briefly Any TWO ways in which mobilization of iron occurs in biological systems. (4 marks)
- ii) Give reason(s) why *Cytochrome a* is responsible for severe toxicity of cyanide (CN⁻). (2 marks)
- (c) Describe briefly how the transport of Na⁺ and K⁺ across the lipid bilayer is effected by Na⁺-K⁺ATPase. (6 marks)
- (d) Define hemoglobin and specify the inorganic element that is fundamental in the composition of hemoglobin? (4 marks)

Question THREE

- (a) Tranferin and ferritin are metalloproteins involved in the transport and storage of iron. Explain how iron, when ingested with food ends up in sites of potential use or storage in the body. (6 marks)
- (b) Show the mechanism of phosphate hydrolysis of Mg-ATP. (6 marks)
- (c) i) State any THREE deficiency symptoms for each of the following elements in Humans.
 (i) Zinc (ii) Iron (6 marks)
- ii) Give TWO functions of vitamin B₁₂ in biosystems. (2 marks)

Question FOUR

- (a) i) Define *Cytochrome P450* and state its major role. (3 marks)
- ii) Complete the monooxygenase and superoxide dismutase reactions given below:



(b) i) Suggest with a reason whether *Cytochrome c* would NOT be a useful oxygen carrier. (3 marks)

ii) Name any THREE amino acids commonly used as ligands in metalloproteins. (3 marks)

(c) Give FIVE criteria for qualifying a potential chelating drug. (5 marks)

Question FIVE

Discuss Arsenic (As) poisoning under the following subheadings:

i) Sources of poisoning

ii) Toxicokinetics

iii) Clinical signs

iv) Treatment

(5 marks each)

END