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 2

SERIES:APRIL 2016

TIME:2 HOURS

DATE: Pick DateSelect MonthPick 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) Define the term Metalloproteins and give any FOUR factors that help to determine if a metal ion will form a complex with a particular biomolecule. (6 marks)

(b) i) Define Superoxide Dismutase (SOD). (2 marks)

ii) Use chemical structure to show the active site in SOD. (3 marks)

iii) Explain the action of SOD in elimination of harmful species like O_2^- and H_2O_2. (4 marks)

(c) Explain THREE possible functions of globin protein in Heme oxygenation. (6 marks)

(d) Explain the mechanism by which *Calmodulin* can activate a wide range of different target proteins. (5 marks)

(e) i) Give any TWO clinical signs associated with copper poisoning. (2 marks)

ii) State any TWO functions of Zn in metalloproteins. (2 marks)

Question TWO

(a) Use chemical structures to show the difference between Deoxyhemoglobin and Hemoglobin and state the medical application of their spectroscopic absorption frequencies. (8 marks)

(b) i) Outline THREE criteria for defining essentiality of an element. (3 marks)

ii) Use *Dose-Response curve* to describe the physiological effects of essential element. (6 marks)

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(c) Provide any THREE examples of copper proteins and enzymes. (3 marks)

Question THREE

(a) Explain briefly the role of Ion Pumps in transmembrane transport of metal ions. (4 marks)

(b) Describe the basic structure of Chlorophyll. Illustrate your anwer. (5 marks)

(c) With the aid of a diagram, show the rapid mobilization of Lewsite (**$AsCl_3$**) by British Anti Lewisite (**BAL**). (5 marks)

(d) i) Describe THREE different features of siderophores that enables them to bind iron extremely high affinity and selectivity. (3 marks)

ii) Iron has specific and "biologically suitable" properties otherwise not (or less) available with other transition metals. Specify any THREE of these properties. (3 marks)

Question FOUR

(a) Draw the structure of Ca Na_2EDTA, as a chelating agent. (3 marks)

(b) i) Explain what is meant by the term *Cooperative effect* in hemoglobin. (4 marks)

ii) Discuss briefly the classification of Copper proteins. (9 marks)

(c) Identify the missing products in the following Ion Pump reaction and complete equation for the process.

$$3Na^+_{ic} + 2K^+_{ec} + ATP^{4-} + H_2O \xrightarrow{Mg^{2+}} ? + ? + ADP^{3-} + ? + H^+$$

(4 marks)

Question FIVE

Discuss Lead (**Pb**) poisoning under the following subheadings:

i) Sources of poisoning
ii) Toxicokinetics
iii) Clinical signs
iv) Treatment (5 marks each)

END