TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

Department of Pure & Applied Sciences

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY

ACH 4304: BIOINORGANIC CHEMISTRY

END OF SEMESTER EXAMINATION

SERIES: JULY 2025

TIME:2HOURS

DATE: Pick DateSelect MonthPick Year

Paper 2

Instructions to Candidates

You should have the following for this examination

Answer Booklet, examination pass and student ID

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

Do not write on the question paper.

QUESTION ONE

a) Define the following terms

(i) Essential elements **(2 marks)**

(ii) Metalloproteins **(2 marks)**

(iii) Metal ion poisoning **(2 marks)**

b) State the **THREE** factors that determine essentiality of elements **(3 marks)**

c) Briefly highlight the roles of the following metal ions in bioprocesses **(4marks)**

(i) Iron

(ii) Calcium

d) State the **FOUR** properties of a porphryin ring **(4 marks)**

e) Describe **THREE** ways in which metal ion poisoning may occur **(6 marks)**

f) Name any **TWO** none-biogenic methods of nitrogen fixation (**2 marks**)

g) Highlight the functions of the following components of nitrogenase enzyme **(2 marks)**

I. Mo-Fe factor

II. Fe-S factor

h) State any TWO biomedical applications of bioinorganic compounds (**2 marks**)

QUESTION TWO

a) Describe the functional difference between hemoglobin and myoglobin (**4 marks**)

b) Describe Oxygen (O_2) transport by hemoglobin and myoglobin in the body **(10 marks)**

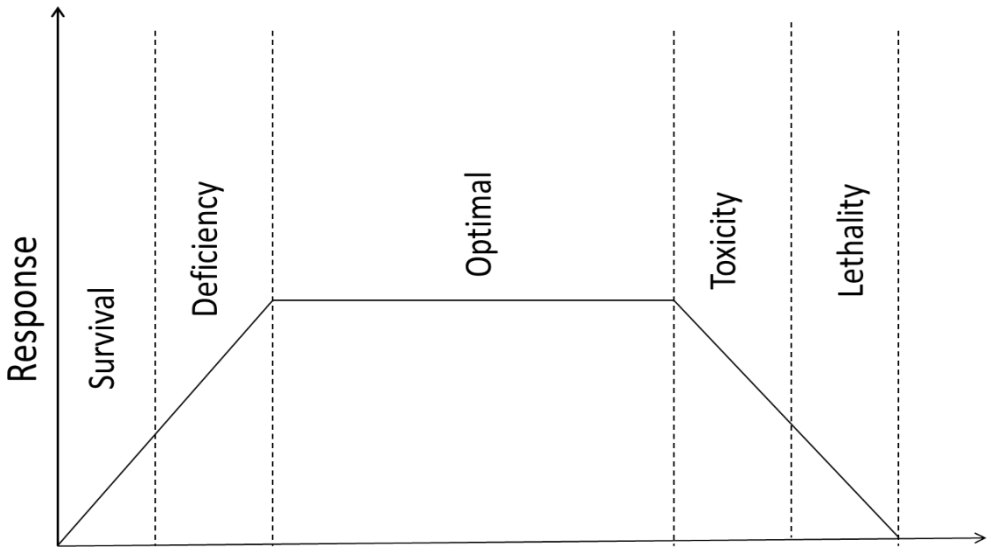
c) (i) What are "Allosteric effectors" **(1mark)**

(ii) Name any THREE allosteric effector **(3 marks)**

d) Explain the functional difference between cytochrome and hemoglobin (**2 marks**)

QUESTION THREE

Study the graph below and answer the questions that follow



a) What does the graph above represent **(1mark)**

b) Interpret each stage in the above graph **(5 marks)**

c) State and explain the FOUR classes of chemical elements essential to life forms **(8 marks)**

d) With the help of features illustrate the difference between Deoxyhaemoglobin and oxyhaemoglobin **(6 marks)**

QUESTION FOUR

a) Explain the extent of cyanide toxicity in relation to its distribution in nature (**3 marks**)

b) List any **FOUR** plant species that contain cyanide (**4 marks**)

c) Give any **FOUR** food substances for humans and animals that are rich in cyanide. (**4 marks**)

d) Describe lethality of cyanide (**3 marks**)

e) Compare toxicity of cyanide in ruminants and non-ruminants animals (**6 marks**)

QUESTION FIVE

a) Describe the structure components of chlorophyll **(4 marks)**

b) With the help of diagrams explain the possible schemes of coordination between metal center, enzyme and substrate for metal–activated enzymes **(8 marks)**

c) State and explain the **FOUR** evidences of enzymes – substrate complex **(8 marks)**