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: DECEMBER 2024

TIME:2HOURS

DATE: Pick DateSelect MonthPick Year

Paper 1

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 (30 Marks)

a) Define the following terms as used in Bioinorganic Chemistry

(i) Allosteric effectors **(2 marks)**

(ii) Chelates **(2 marks)**

(iii) Metalloenzyme **(2 marks)**

(iv) Cofactor **(2 marks)**

b) State any THREE toxicity effects of Arsenic (As) **(3 marks)**

c) Giving any TWO examples in each case, describe the classification of elements with respect to physiological processes **(12 marks)**

d) Outline the main properties of inorganic elements that highlights their importance in biochemical process **(5 marks)**

e) State HSAB principle **(2 marks)**

QUESTION TWO (20 Marks)

a) Classify the following metallobiomolecules as proteins or nonproteins and state their broad functions: Cytochromes, Transferrin, nitrogenase and chlorophyll **(8 marks)**

b) Highlight the structural difference between cytochromes and hemoglobin **(4 marks)**

c) Describe how blood oxygen saturation changes with the changes in the following allosteric effectors

i. Temperature **(2 marks)**
ii. pH **(2 marks)**
iii. P_{CO2} **(2 marks)**
iv. 2,3-diphosphoglycerate concentration **(2 marks)**

QUESTION THREE (20 Marks)

a) Giving one example in each case, distinguish between prostheticgroup and coenzyme **(3 marks)**

b) Identify and explain the five parts of physiological effect dose response curve **(15 marks)**

c) State the functional difference between hemoglobin and myoglobin **(2 marks)**

QUESTION FOUR (20 Marks)

a) Describe cooperativity effect in oxygen transport by hemoglobin **(5 marks)**

b) List any three electron transport systems in living organisms **(3 marks)**

c) Describe how conversion of molecular, O_2 to water H_2O is carried out by cytochromes **(8 marks)**

d) Explain the name cytochrome P450 and how it is different from other types of cytochromes **(4 marks)**

QUESTION FIVE (20 Marks)

a) Outline three main deficiency symptoms of Vitamin B_{12} **(4 marks)**

b) Compare and contrast the two main methods of nitrogen fixation **(8 marks)**

c) Describe any four metal complexes used in Medicine for treatment or diagnosis **(8 marks)**