



## TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

**UNIVERSITY EXAMINATION FOR:**

**BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY:**

**BTAC 2014/S-FT AND BTAC 2015/S-PT**

**ACH 4304: BIOINORGANIC CHEMISTRY**

**SPECIAL/SUPPLEMENTARY EXAMINATION**

**SERIES: SEPT. 2017**

**TIME: 2 HOURS**

**DATE:** Pick DateSep2017

### **Instructions to Candidates**

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions. Answer question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

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### **Question ONE**

(a) i. Define the following terms.

I. *Ionophores*

(2 marks)

II. *Cytochromes*

(2 marks)

III. *Metalloenzymes*

(2 marks)

ii. Distinguish between *acute* and *chronic* metal toxicity.

(4 marks)

(b) i. State FOUR functions of *Non-heme iron-sulfur proteins*.

(4 marks)

ii. High affinity *Iron chelators* fail in human chelation therapy trials. Explain

(3 marks)

- (c) i. Draw the chemical structure of *Protoporphyrin IX (heme b)* as found in hemoglobin and cytochrome P450. (6 marks)
- ii. Write down biochemical equations for the reactions catalyzed by the following enzymes.
- I. *Liver Alcohol Dehydrogenase*. (2 marks)
- II. *Carboxy anhydrase*. (2 marks)
- (d) Give any THREE functions of *Vitamin B<sub>12</sub>* in biological systems. (3 marks)

### Question TWO

- (a) i. State THREE biological consequences resulting from the binding of *cis-DDP (Cisplatin)* to DNA. (6 marks)
- ii. Give any FOUR biological functions of  $\text{Na}^+$ . (4 marks)
- (b) i. Highlight the difference between hemoglobin and myoglobin based on structure and function. (6 marks)
- ii. Outline any FOUR factors that govern the stability of metalloenzymes. (4 marks)

### Question THREE

- (a) i. Define *Metallothioneins* and list any FOUR metals bound by metallothioneins. (6 marks)
- ii. Draw the chemical structure of the *active site* of iron loaded *transferrin*. (4 marks)
- (b) i. Name TWO biological substances that *control calcium* levels in the body. (2 marks)
- ii. State *clinical signs* arising from failure to *regulate  $\text{Ca}^{2+}$*  in the body. (2 marks)
- (c) i. Give the chemical structure of the *active site* in *Rieske protein* and identify its role in biological processes. (6 marks)

### Question FOUR

- (a) i. Write down THREE characteristics of coordination compounds of  $\text{Zn}^{2+}$  ions that make them to be more suitable for biological catalysis. (6 marks)
- ii. Provide any THREE sources of Cd poisoning. (3 marks)
- (b) i. List any THREE *Radionuclides* commonly used in diagnostic nuclear medicine. (3 marks)

ii. Describe briefly the biological role of  $Na^+ - K^+ - ATPase$  [ion pump]. (5 marks)

iii. Outline how *Metallochaperons* responds to different Cu levels in cells. (3 marks)

### Question FIVE

(a) i. Outline the chemical structure of the *active site* in *Rubredoxins* and point out its biological role. (6 marks)

ii. Name FOUR *zinc* metalloproteins. (4 marks)

(b) i. State FOUR biological functions of *Fe-porphyrin* complexes. (4 marks)

ii. Describe clinical signs and treatment of *Pb poisoning*. (6 marks)