

UNIVERSITY OF FORT HARE

**ENZYMOLGY AND METABOLISM
BCH223**

**SUPPLEMENTARY EXAMINATIONS
JANUARY 2025**

.....

Time: 3 Hours

Subject: Metabolism and Enzymology

Marks: 100

This paper consists of 3 pages including cover page

Internal Examiner

Mr NT Mazomba

Professor N Mkwetshana

External Examiner

Instructions

Answer all the questions.

Question 1 (20 marks)

- Fully describe how an enzyme is regulated by controlling its substrate concentration and by using compartments of the cell. (6)
- You are given results of enzyme activity, V , in relation to substrate concentration, $[S]$. In addition, you are given results of the same enzyme activity under inhibition. How would you use these results to determine whether the enzyme was competitively or non-competitively inhibited? (Hint: Inhibition curves) (6)
- Enzymes are specific in their activity. Describe in full 4 main types of enzyme specificity. (8)

Question 2 (20 marks)

- List all the glycolysis pathway enzymes (except aldolase and 3-phosphoglycerate mutase) into classes of enzymes. Use three examples from the different enzyme classes you have listed to explain why you classified these enzymes in this way (Hint: Write down the enzyme reaction and explain the mechanism occurring in the reaction). (10)
- Glycolysis.
 - Write down a net reaction of glycolysis under aerobic conditions. (2)
 - Molecular oxygen is not involved in glycolysis, but one of the products in glycolysis' net reaction is shown as being reduced. What is the name of this product? (1)
 - To balance the net reaction of glycolysis some other reactants must have been oxidized. Describe in detail what has been oxidized. (2)
- Give the name(s) of and describe the process(es) by which glycolysis produce energy. (4)

Question 3 (30 marks)

- Terms or phrases such as; the coordinated catalysis, the proximity of one enzyme to another, it minimizes side reactions, are usually mentioned in relation to the enzyme that produces acetyl-CoA from pyruvate. Describe each one in detail. Mention examples where appropriate. (8)
- Certain citric acid cycle reaction products or intermediates use coenzyme A as a carrier. What are the names of these products or intermediates? Describe their involvement in their respective reactions, and why they are very important in those reaction or subsequent reactions? (8)
- To the human eye, the $-\text{CH}_2\text{-COO}^-$ groups on either end of citrate are similar. Explain why these same groups would appear different to cis-aconitase. (Hint: How does an enzyme work?) (4)
- Explain in detail why sometimes the number of ATP generated in the complete oxidation of glucose yield 36 instead of 38 ATPs? (10)

Question 4 (20 marks)

- Why do many slimming pills that contain carnitine work? (4)
- What role do fatty acids play? What role would they play when there is low oxaloacetate in cells, or an individual is subjected to prolonged starvation? (6)
- It has been found that migrating/hibernating animals do not eat or drink whilst in hibernation. It has been proposed that this has to do with the fats that these animals store. Using the knowledge you acquired, map out how a hibernating animal uses stored fats to provide for its energy and water needs. (6)

2024 BCH223 Supplementary examinations

- d) Explain why would an intermediate of fatty acid synthesis be involved in the regulation of fatty acid oxidation? (4)

Question 5 (10 marks)

Explain in detail why do sugar cane plant grows very well in the Kwazulu-Natal to Mpumalanga areas, whereas aloe plants grow very well in the Karoo region. (10)

