

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

SSC2103

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF SPORTS SCIENCE AND COACHING

THEORY: SSC2103: PRINCIPLES OF BIOCHEMISTRY

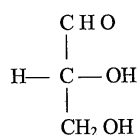
DECEMBER 2004

3 HOURS (100 MARKS)

INSTRUCTIONS

Answer any four questions only. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets. Illustrate your answer where appropriate with large clearly labeled diagrams.

1. a) Name the molecules shown below. (1 mark)



- b) What is the characteristic of the central carbon? (1 mark)
- c) Glucose readily enters into all tissues from blood but only specialized tissues (liver and kidney) are capable of releasing glucose into blood. Give two reasons why most tissues cannot supply glucose to the blood. (4 marks)
- d) Discuss the assay of glucose by chemical and enzymatic methods. Outline the principles involved. (10 marks)
- e) Distinguish between reducing sugar and non-reducing sugar. (2 marks)
- f) For the polysaccharide mentioned below, indicate all the descriptions that are appropriate
- (i) Glycogen (4 marks)
- (ii) Starch (3 marks)

Description

- ❖ Contains α 1,6 glucosidic bonds.
- ❖ Contains β 1,4 glucosidic bonds
- ❖ Is a storage polysaccharide in humans.
- ❖ Is a component of starch
- ❖ Is a branched polysaccharide.
- ❖ Can be effectively digested by humans
- ❖ Is a storage polysaccharide in yeasts and bacteria.

2. a) During strenuous activity, muscle tissue demands vast quantities of ATP compared to resting tissue. In white skeletal muscle this ATP is produced almost exclusively by anaerobic glycolysis. If the muscle was devoid of lactate dehydrogenase, could the muscle carry out strenuous exercises (ie) produce ATP? Explain showing the relevant pathway. (Chemical structures are not required) (15 marks)
- b) The V_{\max} value for the enzyme glycogen phosphorylase from skeletal muscle is much larger than V_{roax} value of the same enzyme from liver tissue.
- What is the physiological function of glycogen phosphorylase in skeletal tissue?
 - What is the physiological function of glycogen phosphorylase in liver tissue? (5 marks)
- c) Write short notes on the Cori cycle and explain its biological role. (5 marks)
3. a) Fluorocitrate (FCH_2COOH) inhibits the operation of the citric acid cycle because:
- It inactivates SH groups in enzymes.
 - It prevents the formation of citrate by the condensing enzyme.
 - Its structure is sufficiently like succinate to inhabit succinate dehydrogenase.
 - Fluoride is a general enzyme poison.
 - Fluorocitrate is a competitive inhibitor of aconitase. (6 marks)
- b) Distinguish between the following terms:
- Catabolism and anabolism (2 marks)
 - Ketogenesis and gluconeogenesis (2 marks)
- c) Describe the structure and biological function of testosterone. (15 marks)
4. a) Sketch the following curves
- $[P]$ vs time for $[S] \gg K_m$ (1 mark)
 - V vs pH for pepsin (1 mark)
 - V vs time for $[S] \ll K_m$ (1 mark)
 - V vs temperature (1 mark)
 - V vs pH for trypsin (1 mark)
- b) For a reaction $E + S = ES \rightarrow P$ write rate equation for ES formation and P formation. (5 marks)
- c) Write an essay on allosteric enzymes. (15 marks)