UNIVERSITY OF FORT HARE

BCH313

JUNE 2023

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Time:	3 Hours
Subject:	BCH313
Marks:	100

This paper consists of 5pages including the cover page

Internal Examiners: Mr N.Mazomba

External Examiners: Prof Pasha

Question 1. (20 marks)

a) List any 2 precursors of gluconeogenesis from each of the following sources: amino acids, glycolysis and tricarboxylic acid cycle. (6)

b) Explain in detail why the carbon which was used in the carboxylation step of pyruvate at the start of gluconeogenesis does not end up as one of glucose carbons. Include a diagram in your answer. (7)

c) Amylopectin is a complex carbohydrate that consists of of glucose residues. Describe in detail its synthesis. Do you think amylopectin would not be preferred as a storage carbohydrate by animals, and why? (7)

Question 2. (30 marks)

a) Draw a sketch of the synthesis pathway of sphingolipids to show how they are related to one another. (3)

b) Give the names of 3 phospholipids. Explain why they are amphipathic compounds? Using a diagram, show the synthesis of a phosphatidylserine from ethanolamine. (6)

c) Why would a certain vitamin deficiency severely affect synthesis of fatty acids? (4)

d) Describe what is common in the reactions that lead to the synthesis of cholesterol and ketone bodies. What circumstances favour the synthesis of cholesterol over that of ketone bodies? (6)

e) Describe in detail why citrate is implicated in the regulation of fatty acids synthesis. (5)

f) What is the source of glycerol and fatty acids in the synthesis of 'new' triacylglycerol in adipocytes? Describe in detail the synthesis of triacylglycerol in these cells. Include a diagram in your answer. (6)

Question 3. (20 marks)

a) Draw a diagram that shows the origin of the precursors involved in the synthesis of various families of amino acids. (7)

b) Explain in detail and include illustrations of the unusual phenomenon that is exhibited by one of the enzymes involved in tryptophan synthesis. (8)

c) A newly born baby was noted to have light colored hair that kept on becoming lighter during the 12 months observation period, and there were some notable biochemical changes in the baby's blood. If you were the doctor attending to the baby what would be your possible diagnosis and why, and how would you remedy the situation, and why? (5)

Question 4. (20 marks)

a) Using the synthesis of one of DNA's nucleotides as an example, explain in detail how one of the drugs used in cancer chemotherapy work. (7)

b) Explain the involvement of 5-phosphoribosyl-α-pyrophosphate (PRPP) in the synthesis of different purine and pyrimidine nucleotides. How is PRPP produced? (6)

c) Explain in full what occurs in synthesis steps starting from IMP to ensure balanced synthesis of purine nucleotides. (7)

Question 5. (10 marks)

a) The brain has no capacity to store fuels.
   1. What is the primary energy fuel preference for brain cells? (1)
   2. How much of this fuel do these cells need per day? (1)
   3. Why do the brain cells need this fuel? (2)
   4. Explain in detail how are the brain cells adapted to use this fuel effectively? (3)

b) Discuss in detail how the liver cells ensures that the brain functions normally. (3)