

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

FEBRUARY 2010

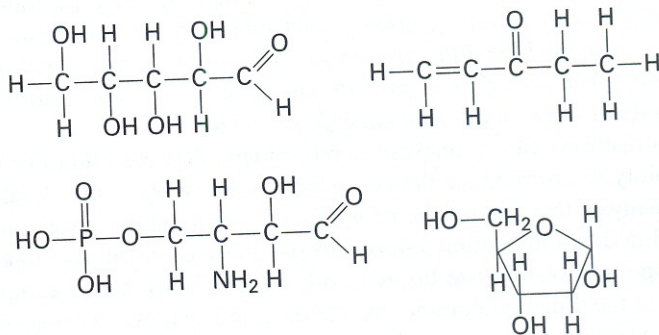
3 HOURS (100 MARKS)

INSTRUCTIONS

Answer **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) Outline the formation of ketone bodies and identify the acidic ketone bodies. (10 marks)
- b) Explain why the human body tends to burn more fat than carbohydrate during prolonged starvation. (3 marks)
- c) Discuss the reactions involved in the transformation of glucose into pyruvate and enumerate the ATP and NADH molecules produced in the process. (12 marks)

2. a) Circle each chiral center in each of the compounds in the diagram below. (8 marks)



- b) Lactate dehydrogenase is present in muscle cells at all times, yet little pyruvate is converted to lactate in the presence of O_2 . What triggers the production of lactate as O_2 concentrations drop? (7 marks)
- c) What is the pH of a buffer that contains 0.12 M acetic acid (CH_3COOH) and 0.37 M sodium acetate (CH_3COONa) if the pK_a for acetic acid is 4.76? (7 marks)
- d) What is the net production of ATP molecules derived from the oxidation of glucose 6 P in glycolysis (3 marks)

3. a) List the three major physiological functions of fatty acids (3 marks)
- b) Describe the complete oxidation of an odd-numbered fatty acid (15 marks)
- c) Which of the following statements about glycogen storage are correct?
- i) Glycogen is stored in muscles and liver
 - ii) Glycogen is stored in the brain and adipose tissue
 - iii) Glycogen reserves can exceed the equivalent of 10,000 kcal in an average human
 - iv) Glycogen essentially fills cells that specialize in glycogen storage
 - v) Glycogen storage occurs in the form of dense granules in the cytoplasm of cells. (2 marks)
- d) A patient with a defective muscle phosphofructokinase produces increased amounts of glycogen having a normal structure. He is normal except for having a limited ability to perform strenuous exercise. Briefly discuss. (5 marks)
4. a) Define the following terms:
- i) Ureotelic (2 marks)
 - ii) Uricotelic (2 marks)
 - iii) Ammonotelic (2 marks)
- b) Describe the fate of excess nitrogen in a human body (12 marks)
- c) Outline the formation of Vitamin D (7 marks)
5. Discuss steroid hormones. Your answer should include:
- i) The five classes of steroid hormones. (5 marks)
 - ii) Site of synthesis of the hormones. (5 marks)
 - iii) An example of a hormone in each class. (5 marks)
 - iv) The function of each hormone mentioned in (iii). (10 marks)
6. a) What is the nucleotide sequence of the polyribonucleotide that is totally complementary to:
AUCUAAUCGCAU (6 marks)
- b) Distinguish between the terms nucleoside and nucleotide (4 marks)
- c) List the three major classes of RNA that are involved in the assembly of polypeptides. (3 marks)
- d) Describe the Cori cycle and explain its significance in the body. (12 marks)

END OF EXAMINATION