NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE IN APPLIED BIOLOGY AND BIOCHEMISTRY

METABOLIC PROCESSES I SBB2102

EXAMINATION PAPER

DECEMBER 2017

This examination paper consists of 2 pages

Time Allowed: **3 hours**

Total Marks: **100**

Special Requirements: **Calculator**

INSTRUCTIONS TO CANDIDATES

1. **Answer Four (4) Questions. Each question carries 25 marks.**
2. **Where a question contains subdivisions, the mark value for each subdivision is given in brackets.**
3. **Illustrate your answer where appropriate with large, clearly labelled diagrams.**

1.(a) In rat liver cells, the concentrations of ATP, ADP and P_i are 3.4 mM, 1.3 mM and 4.8 mM respectively. Calculate the free energy change for hydrolysis of ATP given that the standard free energy of hydrolysis for ATP is -25KJ mol^{-1}, pH is 7.0 and temperature is 25°C. (5 marks)

(b) Explain how mammals use alanine in controlling blood sugar levels. (20 marks)

2.(a) Calculate the ATP molecules generated in the complete oxidation of dihydroxyacetone phosphate. (8 marks)

(b) Describe the activation, transportation and complete degradation of tridecanoic acid. (C13:0). (17 marks)

3.(a) Explain the biological advantage of uncoupling of oxidative phosphorylation. (5 marks)

(b) Discuss the regulation of the hexose monophosphate shunt. (20 marks)

4.(a) The tricarboxylic acid cycle, unlike glycolysis shuts down under anaerobic conditions. Explain. (5 marks)

(b) Describe all the dehydrogenation reactions in the tricarboxylic acid cycle and discuss the control of the cycle. (20 marks)

5.(a) Describe the composition of the α- ketoglutarate dehydrogenase complex. (5 marks)
(b) Compare and contrast glycogenesis and glycogenolysis. (20 marks)

6. (a) Describe the structure and mechanism of action of ATP synthase. (12 marks)

(b) Identify the main physiological function of the Cori cycle and describe the cycle. (13 marks)

END OF EXAMINATION