UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER: MAY 2018

TITLE OF PAPER:	BIOCHEMISTRY & CELL BIOLOGY
COURSE CODE:	BIO 352
TIME ALLOWED:	THREE HOURS
INSTRUCTIONS:	1. ANSWER QUESTION 1 (COMPULSORY) IN SECTION A AND ANY TWO OTHER QUESTIONS IN SECTION B. 2. ANSWER A TOTAL OF 3 (THREE) QUESTIONS 3. QUESTION 1 CARRIES FIFTY (50) MARKS AND EACH QUESTION IN SECTION B CARRIES TWENTY FIVE (25) MARKS 4. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELLED DIAGRAMS WHERE APPROPRIATE
SPECIAL REQUIREMENTS:	CANDIDATES MAY USE CALCULATORS

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATORS

Section A: Compulsory (Answer all questions in this section)

Question 1.

a) Briefly explain the following: stem cells, totipotent cell, pluripotent cell and unipotent cell. (8 marks)

b) Calculate the pH of a solution containing 0.2 M acetic acid (pK_a = 4.7) and 0.1 M sodium acetate? (4marks)

c) Briefly explain why amino acids, when dissolved in water, become zwitterions? (3 marks)

d) Explain the difference between fibrous and globular proteins. Give and example of each. (4 marks)

e) Briefly explain the difference between uncompetitive and non-competitive inhibitor. (6 marks)

f) List the factors that would make it difficult to interpret the results after gel electrophoresis of proteins in the absence of sodium dodecyl sulfate (SDS). (4 marks)

g) What is the main metabolic function of the pentose phosphate pathway? (3 marks)

h) During glycolysis, glucose 1-phosphate is converted to fructose 6-phosphate in two successive reactions:

Glucose 1-phosphate → glucose 6-phosphate $\Delta G'^{\circ} = -7.4$ *kJ/mol*
Glucose 6-phosphate → fructose 6-phosphate $\Delta G'^{\circ} = +2.0$ *kJ/mol*

Calculate the ΔG° for the overall reaction. (3 marks)

i) Explain in biochemical terms, why individuals with a thiamine deficient diet have relatively high levels of pyruvate in their blood. (5 marks)

j) Explain why, as humans, we require proteins in our diet. (2 marks)

k) Explain how amino acids are de-aminated. (3 marks)

l) Explain what gluconeogenesis is and give the purposes it serves in humans. (5 marks)

[Total Marks = 50]

Section B (Choose any two questions in this section)

Question 2

Discuss using diagrams how energy is metabolically extracted from carbohydrates, triglycerides and proteins, indicating the cellular compartmentalization of such processes. (25 marks)

Question 3

Using any example of a signalling pathway of your choice, discuss the molecular circuit that results in signal transduction. (25 marks)

Question 3

Explain the production of ATP and NADPH in green plants, illustrating how these molecules are central to carbohydrate anabolism. (25 marks)

END OF QUESTION PAPER