TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
TECHNOLOGY IN INDUSTRIAL MICROBIOLOGY AND BIOTECHNOLOGY
BIMBT 11 M

SBH 2203 : BASIC METABOLISM I

SPECIAL/SUPPLEMENTARY EXAMINATION

FEBRUARY 2013 SERIES   2 HOURS
Instructions to candidates:

This paper consist of **FIVE** questions
Answer question **ONE** (compulsory) and any other **TWO** questions

Constants $R = 8.315 Jmol^{-1}K^{-1}$

$F = 96.5 Kjmol^{-1}V^{-1}$

Standard temperature   =   **25°C**

Question ONE

a) Describe with an illustration transfer of elements from ubiquinot, a two electron donor to cytochrome c   **(6marks)**

b) Explain the use of ATP in driving endergonic reactions in biological systems **(6marks)**

c) Consider the reduction of acetaldehyde to ethanol Acetalaldehyde + NADH + H^+ → Ethanol + NAD^+ on the acetaldehyde, ethanol, NAD^+ and NADH are present in 1mm, 0.1mM and 1mM receptively the standard electrode potential OF01 for PAD+/NADH = -0.32V and acetaldehyde/ethanol = -0.197V.

i)   Write a balanced equation for the calubolism of glucose to ethanol **(2marks)**

ii)   Write balanced hart cell reactions and calculate the standard and actual/ biological free energy changes for the reactions.   **(9marks)**

d) Outline utilization of product of C3-photosynthetic pathways by a plant. **(3marks)**

e) ATP inhibits phosphate fructokinase -1 by feedback inhibition yet it is a substrate for the enzyme. This situation does not render the enzyme useless. Explain **(4marks)**

Question TWO

a) You are provided with two sample of ginocose radioactively labeled with carbon-14 (14_C) at position 4 and 5 respectively. The samples are inarborted with cell free extracts under anaerobic conditions containing phosphoginconatic pathway enzyme some glycolylic enzymes and the necessary co-factors. Through justification of your answer identify the sample that felled the radioactive labeled ethanol. **(10marks)**

b) Draw the glycolytic cycle showing all the enzymes co-factors, intermediates and products **(10marks)**

Question THREE

a) Describe the chemiosmotic theory **(3marks)**

b) The steady state concentration of ATC ADP and Pi in isolated spinach chloroplast under full illumination at pH 7.0 are 120μm, 6μm and 700μm respectively

   i) Calculate the free energy requirements for the synthesis of 1M of ATP and under these conditions **(4marks)**

   ii) The energy of synthesis is furnished by light induled electron transfer in the chloroplast. Calculate the minimum coltage drop necessary during the transfer of a pair of electrons to synthesize ATP under these conditions. (3marks)

c) Consider the isomerisation of druclise-6-phosphate to glucose-6-phasphate

   Fructose – 6-phosphate $\rightleftharpoons$ Glucose-6-phosphate Keq = 1.97

   i) Name the enzymes involved in the reaction **(1mark)**

   ii) Calculate the ΔH^{01} in Kjmol^{-1} **(3marks)**

   iii) If the fructose-6-phosphate and glucose-6-phosphate are adjusted to 1.5M and 0.5m respectively, Calculate the actual free energy change (AG) inKjmol^{-1} **(4marks)**

   iv) Explain the difference inAG^{01} and AG from (ii) and (iii) above **(2marks)**

Question FOUR

a) Discuss the regulation and control of glycolysis **(14marks)**

b) Outline the importance of cycle **(6marks)**

Question FIVE

a) Discuss the regulation of pyrunate delydrogenase complex. **(12marks)**

b) Describe the anaerobic metabolism of pyrunale **(8marks)**