THE OPEN UNIVERSITY OF SRI LANKA

B.Sc Degree Program 2013/14

CHU 3139 – LEVEL 5 – BIOCHEMISTRY 1

Duration : Two Hours

Date : 28th June 2014 Time: 1.00-3.00 pm

Instructions to candidates:

This paper consists of six (06) questions. **The first question is compulsory**. You may need to select three questions from the rest (Q2-Q6) and answer **four (04)** questions in total.

Q1 (a) Following test series were carried out for a sample isolated from a microorganism.

a. When a Molisch test was performed, a purple ring was observed.
b. Purple colour was observed with the Morgan-Elson reagent.
c. No colour change was observed when Biuret test was performed.
d. Sample was subjected to paper chromatography and showed three spots with R_{glc} values of 1.0, 0.92 and 0.7. (R_{glc} values for Galactose = 0.95, Glucosamine = 0.7, Galactosamine = 0.65, Manose = 1.1, Glucose = 1.0 and Ribose = 1.6)

i. What inferences can be obtained from each observation? Explain.
ii. Deduce the type of compound/s present in the sample.

(10 marks)

(b) i. Explain the terms, coenzyme, cofactor and the prosthetic group.
ii. What is meant by a codon?
iii. Name three biologically important peptides and explain their functions.

(10 marks)

(c) i. What are lipoproteins?
ii. What are the types of lipoproteins found in blood?
iii. What is the function of lipoproteins? Explain.

(05 marks)

Q2 (a) Consider the following half reactions.

Pyruate + $2H^+ + 2e \leftrightarrow$ Lactate $\quad E^0 = -0.185V$
$NAD^+ + H^+ + 2e \leftrightarrow NADH \quad E^0 = -0.315V$

i. Using standard reduction potentials of above half reactions, calculate the Gibbs free energy change for the conversion of pyruate to lactate in the presence of NADH.
Faraday constant, F = 96.5kJ/Vmol.
ii. From the above calculation, state whether the above conversion is thermodynamically feasible or not.

(15 marks)

(b) What is the fate of pyruate under aerobic and anaerobic conditions? Explain.

(10 marks)

Q3. i. Describe the structure of the cell membrane by drawing and labeling important components.

(10 marks)

ii. What is the function of embedded proteins?

(05 marks)

iii. What are the methods of membrane transport? Explain.

(05 marks)

iv. Discuss different functions of the cell membrane.

(05 marks)

Q4 (a) How do glycoproteins differ from peptidoglycans. Explain.

(05 marks)

(b) What techniques can be used to separate following mixtures? Explain.
i. Two proteins X and Y having the same molecular weight of 40,000 kD but iso-electric points are 5.5 and 6.5 respectively.
ii. Two proteins A and B having same iso-electric point of 6.5 and molecular weights are 20,000 kD and 50,000 kD respectively.

(10 marks)

(c) i. What are the functions of nucleic acids? Discuss.
ii. How does the genetic information in DNA convert into functional proteins? Explain.

(10 marks)

Q5 (a) i. What are the complexes I, II, III and IV formed in mitochondria?
ii What are the functions of each complex?

(10 marks)

(b) i) What is meant by oxidative deamination?
ii) During oxidative deamination, how are ammonium ions produced? Explain.

(05 marks)

(c) i. "Cyclic and non-cyclic electron flows are two different processes in photosynthetic organisms". Justify the statement.
ii. Compare different products formed by these two processes.

(05 marks)

(d) i. What is pyridoxal phosphate (PLP)?
ii. Explain how it helps to convert amino acids to α – keto acids.

(05 marks)

Q6 (a) When carbohydrates are deficient, what is the fate of acetyl CoA? Discuss.

(05 marks)

(b) What happens to the acetyl CoA, when the citric acid cycle cannot oxidize all the acetyl CoA? Explain.

(05 marks)

(c) Describe how sucrose provides energy on catabolism.

(10 marks)

(d) i. It is necessary to convert free fatty acids to fatty acyl CoA before undergoing β oxidation. Why is this so?
ii) What is the net ATP equivalent if palmitic acid undergoes β oxidation (palmitic acid is a C_{16} saturated fatty acid)

(05 marks)