

**THE OPEN UNIVERSITY OF SRI LANKA**

B.Sc Degree Program 2014/2015

CHU 3139 – LEVEL 5 – BIOCHEMISTRY 1

Duration : Two Hours

Date : 21<sup>st</sup> May 2015

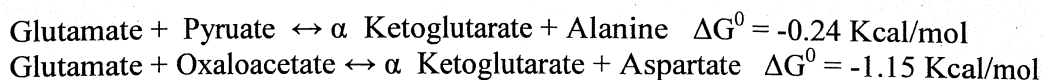
Time: 1.30-3.30 pm

**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) Isolated biological sample was divided into five fractions, A, B, C, D and E. Following tests were carried out for each fraction and observations were recorded.
- When a Biuret test was performed for fraction A, no colour change was observed.
  - For the Molisch test in fraction B, purple colour was observed.
  - An orange colour was observed when phenol/sulphuric acid test was performed to fraction C.
  - Tollen's reagent was added to fraction D, a faint silver mirror test was observed.
  - Fraction E was hydrolyzed with dilute  $H_2SO_4$  and the hydrolyzate and fraction E was subjected to TLC and two spots were observed. Reported  $R_{glc}$  values were 1.0 and 0.5.
- (i) Explain each observation and suggest possible class of compounds present in isolated biological sample?
- (ii) What further experiments can to be performed to confirm suggested compounds?
- (b) (i) What do you mean by tertiary structure of proteins? Explain.  
(ii) What are the forces that maintain the tertiary structure of proteins?
- (c) (i) What is meant by denaturation of proteins?  
(ii) Briefly explain factors that brings about denaturation?
- (d) i. What is meant by renaturation?  
ii. What are the methods of renaturing proteins?

Q2 (a) Consider the following reactions.



- (i) By giving reasons, predict whether the net formation of Oxaloacetate and Alanine is thermodynamically feasible under standard conditions?
- (ii) Show whether the spontaneous synthesis of Oxaloacetate and Alanine is possible with following concentration values of reactants and products.  
 $[\text{Alanine}] = 10^{-3} \text{ M}$ ,  $[\text{Aspartate}] = 10^{-4} \text{ M}$ ,  $[\text{Oxaloacetate}] = 10^{-5} \text{ M}$ ,  $[\text{Pyruvate}] = 10^{-2} \text{ M}$

Faraday constant,  $F = 96.5 \text{ kJ/Vmol}$ ,  $1 \text{ J} = 1 \text{ CV}$ ,  $R = 8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$ ,  $1 \text{ Calorie} = 4.184 \text{ J}$ .

(b) What are the types of linkages formed between sugars and amino acids? Explain.

- (c) (i) What are lipoproteins?
- (ii) What are the types of lipoproteins found in blood?
- (iii) What is the function of lipoproteins in human body?

Q3. (a) (i) What is meant by a codon?  
 (ii) DNA is very fragile, how do you isolate DNA from cells without damaging? Explain.  
 (iii) What method can be used to purify isolated DNA? Write down basic steps of this method?

- (b) (i) What are the special properties of the cell membrane?
- (ii) List some of the proteins present in the cell membrane and state their function.
- (iii) Draw a model of a cell membrane and label important structural components.
- (iv) How do substances move across the membrane? Explain.

(c) Using labeled diagram, describe how biotin functions as a carboxyl carrier.

- Q4. (a) (i) What is meant by a cofactor?  
 (ii) List five enzymes containing or requiring inorganic elements as cofactors.  
 (iii) Name all water soluble and fat soluble vitamins.  
 (iv) What vitamins have the ability to function as antioxidants?

- (b) (i). What are the major roles of lipids in human body? Explain.
- ii. What is the common isolation method for lipids? Write down major steps.
- iii. Explain the factors that can complicate above isolation method.

(c) How do you determine cholesterol concentration in blood serum? Explain the procedure.

Q5. (a) Compare cyclic and non-cyclic electron flow in the photosynthetic organisms.

(b) (i) What are the ways in which glucose provides energy for cells?

(ii) Explain different methods of removing amino groups from amino acids?

(iii) Describe how cane sugar provides energy on catabolism.

(c) i. What is the pentose phosphate pathway?

ii. List two special products of this pathway?

iii. Why do some tissues prefer pentose phosphate path way to glycolysis?

(d) Explain situations where oxidation of amino acids is important in animals.

Q6. (a) (i) What is the function of citric acid cycle?

(ii) Write down major steps of the citric acid cycle.

(b) (i) Calculate the number of moles of ATP produced from  $\beta$  oxidation of stearic acid? (Stearic acid is  $C_{17}H_{35}COOH$ ),

(ii) Compare the above value with the net ATP equivalent from oxidation of glucose.

(c) (i) What is meant by oxidative deamination?

(ii) What are the different forms of nitrogen removal? Explain.

(d) Describe three situations where oxidation of amino acid is required in animals.