



THE OPEN UNIVERSITY OF SRI LANKA

B.Sc Degree Program 2015/16

CHU 3139 – LEVEL 5 – BIOCHEMISTRY 1

Duration : Two Hours

Date : 21st July 2016

Time: 1.00-3.00 pm

Instructions to candidates:

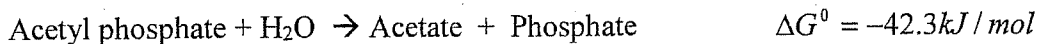
This paper consists of six (06) questions. **The first question is compulsory.** You may need to select three questions from the rest (Q2-Q6) and answer **four (04)** questions in total.

Q1 (a) Plant fraction was isolated and divided into four portions, P, Q, R and S.

1. Molisch test was performed for P, a purple ring was observed.
2. Tollen's reagent was added for Q, a silver mirror was observed.
3. Dilute H_2SO_4 was added for R and this acid hydrolyzate and S were subjected to paper chromatography, R_{glc} values observed were 1.0 and 0.5, respectively.

- i. What information can you gather from above observations? Explain clearly.
 - ii. Can you suggest an experiment to confirm proposed compounds? Give experimental details.
(30 marks)
 - (b) i. How many irreversible steps are there in the citric acid cycle? What are they? Explain.
 - ii. Explain the importance of the intermediates of the citric acid cycle?
(20 marks)
 - (c) i. What is meant by the tertiary structure of proteins?
 - ii. What are the major forces that help to maintain this tertiary structure?
(20 marks)
 - (d) i. What do you mean by transamination?
 - ii. What are the common methods of nitrogen removal observed in different species?
(30 marks)
- Explain.

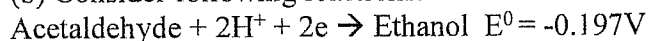
Q2 (a) Consider the following reactions involving the hydrolysis of acetyl phosphate.



- Calculate the Gibbs free energy change for acetyl phosphate hydrolysis in a solution of 3 mM acetyl phosphate, 2 mM acetate, and 2 mM phosphate at 25°C.
- State whether above hydrolysis process is thermodynamically feasible under above experimental conditions. Give reasons.

(50 marks)

(b) Consider following reactions.



Suppose that all reactants and the products are at 1M concentrations, calculate the Gibbs free energy change for the conversion of acetaldehyde to ethanol by NADH.

(50 marks)

- Q3 (a) i. Describe a method for extracting lipids from wet tissues.
- What are the factors that can complicate above extraction process?
 - In TLC, what type of solvents can be used to separate lipids?
 - What reagents can be used to detect lipids on a TLC plate?

(40 marks)

(b) What is the structural difference between O-glycosyl linkages and N-glycosyl linkages? Explain.

(20 marks)

(c) i. "The nature of the side chain is important in biological functions of proteins and peptides" Justify the statement.

- Describe the procedure followed to separate a mixture of proteins by electrophoresis.
- P, Q and R proteins have following properties. P and R have same isoelectric points but R has higher solubility than P. Q has higher isoelectric point than P but same solubility as P. Explain how isoelectric precipitation technique can be used to separate these three proteins.

(40 marks)

Q4 (a) i. What is meant by β oxidation?

- Calculate the number of moles of ATP produced from β oxidation of palmitic acid (Palmitic acid is a C_{16} saturated fatty acid).
- Compare this with the moles of ATP produced by complete oxidation of 3 moles of glucose.

(40 marks)

(b) What are the similarities and differences between oxidative phosphorylation and photophosphorylation?

(20 marks)

- (c) i. What is meant by pentose phosphate pathway?
ii. What are the special products formed in this pathway?
iii. Explain the fate of pyruvate under aerobic and anaerobic conditions?
(40 marks)

- Q5 (a) i. What are the special properties of the biological membrane?
ii. By drawing a labeled diagram, describe the structure of the membrane.
iii. What are the major functions of the biological membrane?
(35 marks)

- (b) i. What is the difference between cofactor and the coenzyme?
ii. Write down the mechanism for decarboxylation of pyruvate by thiamine pyrophosphate.
(30 marks)

- (c) i. List down water soluble and fat soluble vitamins.
ii. What vitamins have the ability to function as antioxidants?
iii. Describe using a labeled diagram how biotin functions as a carboxyl carrier.
(35 marks)

- Q6 (a) i. What is the fate of acetyl CoA when carbohydrates are deficient. Discuss.
ii. What are the ways in which glucose provides energy for cells? Explain.
(30 marks)

- (b) i. What are the functions of nucleic acids? Explain.
ii. How does the genetic information in DNA convert into functional proteins? Describe.
(20 marks)

- (c) Compare cyclic and non-cyclic electron flows in photosynthetic organisms.
(30 marks)

- (d) i. What is meant by denaturation of proteins? Explain.
ii. What are the factors that bring about denaturation?
(20 marks)

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