

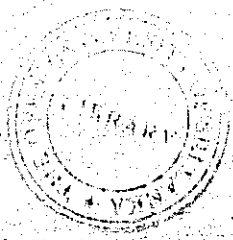
THE OPEN UNIVERSITY OF SRI LANKA

B.Sc DEGREE PROGRAMME 2009/2010

CHU 3139 -LEVEL 5- BIOCHEMISTRY 1

FINAL EXAMINATION

DURATION : THREE HOURS



Date: 23rd December 2009

Time: 1.00-3.30 pm.

INSTRUCTIONS TO CANDIDATES:

This paper consists of 6 questions.

The first question is compulsory. You may select 3 questions from the rest of the questions (No.2 to 6) and answer **4 questions in total.**

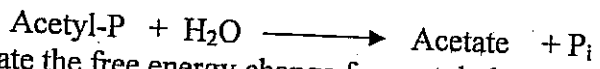
- Q1. a) A DNA sample was isolated using the phenol-chloroform procedure and purified by ethanol precipitation.
- i) Why is RNAse (ribonuclease) used in the isolation procedure?
 - ii) What contaminants may be present in the isolated DNA sample?
 - iii) Absorbance measurements at 260 and 280nm are performed to verify the purity of the sample. What molecular species absorbs at 280nm?
 - iv) Why is agarose generally the choice of matrix for DNA gel electrophoresis?
 - v) What is meant by kb?
 - vi) Draw the gel chromatogram you would expect if a DNA sample containing a mixture of DNA molecules of 20kb and 120kb size was electrophoresed against a standard containing DNA molecules of 10, 25, 60 and 100kb size.
 - vii) What is used to visualize the DNA bands on the gel?

(15 marks)

- b) Briefly describe a method for extracting lipids from wet tissues.
- i) Describe three factors that can complicate the extraction of lipids.
 - ii) T.L.C can be used to separate lipids. What type of solvents are best for lipid separation? What reagents may be used to detect the lipids on the TLC plate?

(10 marks)

- Q2 (i) Write a brief account on the enzyme phosphofructokinase including the reaction catalyzed and its regulatory function. (8 marks)
- (ii) Using the example found in the citric acid cycle, explain substrate level phosphorylation. (8 marks)
- (iii) The standard free energy of hydrolysis for acetylphosphate is $\Delta G^{\circ} = - 42.3 \text{ kJ/mol}$.



Calculate the free energy change for acetyl phosphate hydrolysis in a solution of 2mM acetate, 2mM phosphate and 3mM acetyl phosphate at 25°C.

(9 marks)



- Q3 (i) When is the pentose phosphate pathway for glucose metabolism preferred in tissues? (6 marks)
- (ii) The conversion of pyruvate to ethanol is common under anaerobic conditions.
- (a) Write the steps involved in this conversion.
- (b) What is/are the enzyme/s responsible? Is a cofactor necessary? If so what is/are the cofactor/s?
- (c) What organisms use this as a common route for pyruvate metabolism? (12 marks)
- (iii) Briefly describe how glucose-1-phosphate enters the glycolytic pathway. (7 marks)
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- Q4 (a) What is thiolysis? The 4th step of one cycle of β -oxidation of fatty acids involves thiolase. Describe this reaction and name the attacking nucleophile. (7 marks)
- (b) Explain why fatty acids are transported from the cytosol into the matrix. (5 marks)
- (c) What is the important component in the shuttle mechanism responsible for transport of fatty acids? How is this achieved? (8 marks)
- (d) What is an isoprenoid? Give one example of an isoprenoid vitamin and describe its biological importance. (5 marks)
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- Q5 (a) How many irreversible steps are there in the citric acid cycle? One of these steps involves a dehydrogenase. Describe the enzyme, reactants and products involved in this step. (10 marks)
- (b) Explain the importance of the intermediates of the citric acid cycle. (5 marks)
- (c) What are the structural differences between starch and glycogen? What are the functions of the enzymes glycogen phosphorylase, debranching enzyme and α (1,6) glucosidase in glycogenolysis? (10 marks)
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- Q6 (i) Tetrahydrofolate is the coenzyme form of folic acid. What role does this coenzyme play? What is its function in the metabolism of glycine? (9 marks)
- (ii) What is a lipoprotein? Describe the biological role played by lipoproteins. (8 marks)
- (iii) Briefly state the factors that can inactivate enzymes during their isolation and purification. (8 marks)