THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME/STAND ALONE COURSES 2007/2008
LEVEL 5 - FINAL EXAMINATION

CHU 3139 - BIOCHEMISTRY

Date: 11.06.2008 **Time: 10.00 am-12.30pm**

Instruction to candidates

This paper has three pages and six questions.
Answer the first question and any three of the other questions. A total of four questions must be answered.
If more than four questions answered, only the first question and the first three of the other questions will be marked.

01. (a) A plant fraction was isolated and following tests were performed.

i. 15% solution of β- naphthol in ethanol was added to a portion of plant extract and mixed well. Concentrated H_2SO_4 was added very slowly down the side of the test tube. A purple ring was formed between the concentrated H_2SO_4 and the plant fraction layers. What can you infer about the plant fraction? What is this purple colour due to?
ii. Another portion was hydrolyzed with an acid and divided into two portions X and Y. Ammonical silver nitrate was added to a portion of X and mixed well. Silver mirror was formed. Explain this observation. What gives silver mirror?
iii. 80% phenol solution and concentrated H_2SO_4 was added to a portion of Y. Orange colour was observed. What inferences can you get from this?

(30 marks)

(b) What method could you use to confirm the identity of compounds in the plant fraction? Write down the experimental procedure in detail.

(20 marks)

(c) Two reactions involving L- amino acids and the values of their respective free-energy changes are as follows:

Glutamate + pyruate $\rightleftharpoons$ α- ketoglutarate + alanine $\Delta G^0 = -0.24$ kcalmol^{-1}

Glutamate + oxaloacetate $\rightleftharpoons$ α- ketoglutarate + aspartate $\Delta G^0 = -1.15$ kcalmol^{-1}

i. Under standard conditions, is the net formation of alanine and oxaloacetate from aspartate and pyruate thermodynamically favourable or unfavourable? Give reasons. (20 marks)

ii. Suppose that at 25°C the molar concentrations of reactants and products are as follows.
[pyruate] = [aspartate] = 10^{-2}M
[alanine] = 10^{-4}M
[oxaloacetate] = 10^{-5}M
Is the spontaneous synthesis of alanine and oxaloacetate possible under these conditions? Why? (30 marks)

02. (a) i. What do you mean by renaturation of proteins?
ii. What are the methods of renaturing proteins? (20 marks)

(b) Write short notes on
i. Globular proteins.
ii. Immunoglobulin.
iii. Lipoproteins. (30 marks)

(c) What are the factors that affect enzyme activity? (10 marks)

(d) Suppose you are provided with two pure proteins having following properties. Both of these proteins have isoelectric point of 6.0.
Protein A - A nearly spherical protein of 50,000 KD composed of three subunits 20,000, 10,000 and 5,000 KD.
Protein B - A nearly spherical protein composed of a single polypeptide chain of 15,000 KD.

If these two proteins are subjected to gel electrophoresis and SDS-gel electrophoresis, what would you expect? Explain in detail. (40 marks)

03. (a) i. What are the functions of messenger RNA (m-RNA) and transfer RNA (t-RNA)? (10 marks)

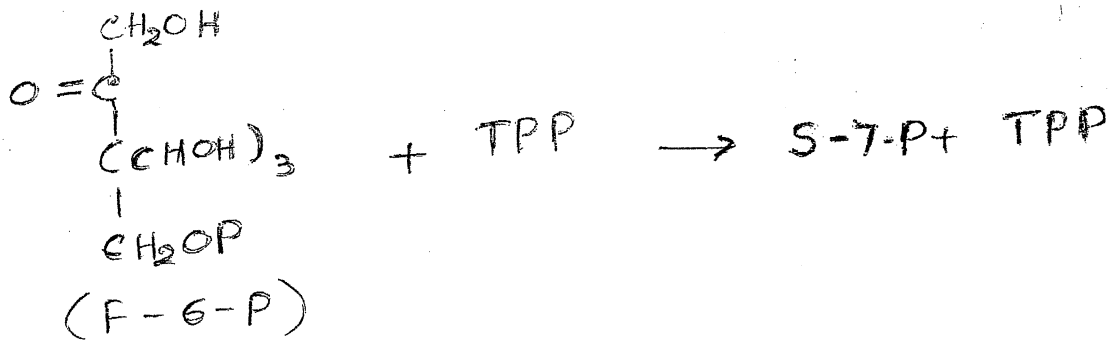
ii. What do you mean by a codon? (10 marks)

(b) i. Describe the structure of the cell membrane. (20 marks)
ii. Cell membranes act as barriers to many molecules. How do molecules move across these membranes? Explain in detail. (30 marks)
iii. What are the functions of a cell membrane? Discuss. (30 marks)

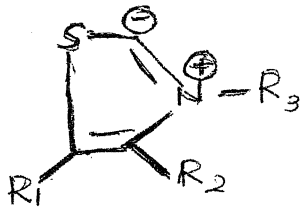
04. (a) Define (a) a coenzyme.
(b) a prosthetic group.
(c) a cofactor (30 marks)

(b) i. What vitamins have the ability to act as antioxidants? (10 marks)
ii. Describe tests for vitamin A and E. (20 marks)

(c) Give a detail mechanism for the following reaction.



The structure of TPP is



(40 marks)

05. (a) i. What do you mean by oxidative phosphorylation? (10 marks)
ii. How does NADH produced in the cytoplasm enter the mitochondria? Explain in detail. (30 marks)

(b) Explain the fate of pyruate in an aerobic and anaerobic conditions? What are the coenzymes needed for these processes? (40 marks)

(c) What is the net ATP equivalent from the oxidation of palmitic acid during β-0xidation? Palmitic acid is a C-16 saturated fatty acid. (20 marks)

06. (a) Explain the important steps of the citric acid cycle? Give chemical structures in each step. (40 marks)

(b) i. What do you mean by oxidative deamination? Explain. (10 marks)
ii. What are the ways of nitrogen removal? Discuss. (20 marks)

(c) Describe the fate of acetyl CoA during conditions of lack of carbohydrate. (30 marks)