



THE OPEN UNIVERSITY OF SRI LANKA

B.Sc Degree Program Final Examination 2012/2013

CHU 3139 – LEVEL 5 – BIOCHEMISTRY I

Duration : Two Hours

Date : 20th June 2013

Time: 1.00-3.00 pm

Instructions to candidates:

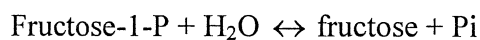
This paper consists of six (06) questions. **The first question is compulsory.** You may need to select three questions from the rest (Q2-Q6) and answer **four (04)** questions in total.

Q1. (a) An unknown sample was treated with dilute CuSO_4 in alkaline solution. Purple colour was observed.

- i. What do you infer from above observation?
- ii. What type of bond is present in above unknown sample?
- iii. Suppose a sample containing free amino acids is subjected to treat with dilute CuSO_4 in alkaline solution, would you expect to observe purple colour? Explain your answer.

(10 marks)

(b) An enzymatic hydrolysis of fructose-1-Phosphate was allowed to proceed to equilibrium at 25°C .



Suppose that the initial concentration of fructose-1-P was 0.2 M and the equilibrium concentration of fructose was 6.52×10^{-5} M, calculate the equilibrium constant for the above reaction and the standard Gibbs free energy change (ΔG^0). Predict whether above enzymatic hydrolysis of fructose-1-Phosphate is thermodynamically feasible or not?

($R = 8.314 \text{ Jmol}^{-1} \text{ K}^{-1}$)

(15 marks)

Q2. (a) i. What are the four (04) principle classes of bio molecules?
 ii. What are the constituents of the following complexes?
 1. Phospholipids 2. Peptidoglycan 3. Glycolipids (05 marks)

(b) i. What are glycoproteins? Give one example of a glycoprotein.
 ii. What are the common sugars that can be bound to glycoproteins?
 iii. Describe different types of glycosidic linkages formed between sugars and amino acids. (08 marks)

(c) What are the differences between lipoglycans and lipopolysaccharides. (04 marks)

(d) X and Y are two different pure proteins having same iso-electric point. Protein X is nearly spherical and composed of a single polypeptide chain of 15,000 KD. Protein Y is also nearly spherical protein of 55,000 KD and composed of two sub units of molecular weight of 45,000 KD and 8,000 KD each. What do you expect if both proteins are subjected to gel electrophoresis and SDS gel electrophoresis? Explain your answer. (08 marks)

Q3. (a) i. What is meant by codons?
 ii. What are initiation and termination codons? Explain.
 iii. What are the important steps involved in isolation of DNA?
 iv. Describe functions of RNA in eukaryotic cells. (09 marks)

(b) i. Describe the structure of the cell membrane using a suitable diagram.
 ii. What is the role of embedded proteins in the cell membrane?
 iii. How does active transport differ from simple diffusion? (08 marks)

(c) i. How do you extract lipids from wet tissues? Explain the experimental procedure.
 ii. How do you separate lipids? Explain. (08 marks)

Q4. (a) i. "Vitamin B₂ and Niacin act as coenzymes in oxido reductase reactions" By giving examples of the coenzymes, explain this statement.
 ii. How does biotin function as a carboxyl carrier? Describe using a labeled diagram.
 iii. What are the effects of deficiency and excess of vitamin B₁? (15 marks)

(b) i. What is a prosthetic group?
 ii. Describe the mechanism of decarboxylation of pyruvate by thiamine pyrophosphate. (10 marks)

- Q5. (a) i. What do you mean by oxidative phosphorylation?
ii. What are the similarities between oxidative and photophosphorylations?
iii. Name the complexes I, II, III and IV involved in the production of ATP by oxidative phosphorylation.
iv. What are the reactions catalyzed by each complex? (12 marks)
- (b) i. What is the importance of the citric acid cycle?
ii. How many irreversible steps are there in above cycle?
iii. Among these irreversible steps, which steps involve oxidative decarboxylation?
iv. Write down reactants, products and enzymes involve in these steps. (09 marks)
- (c) "Other than oxidative and photo phosphorylations, there is another way of synthesizing ATP". Justify this statement. (04 marks)
- Q6.(a) i. What is meant by β oxidation of fatty acids?
ii. When stearic acid ($C_{17}H_{35}COOH$) undergoes β – oxidation, how many moles of ATP are produced? Show your calculations clearly. Compare this value with the number of ATP moles produce when 3 moles of glucose which is equivalent to the number of carbon atoms in stearic acid is oxidized via the citric acid cycle. (08 marks)
- (b) i. What do you mean by pentose phosphate pathway?
ii. What are the special products of this pathway?
iii. Some tissues prefer pentose phosphate path way to glycolysis. Why this is so? (09 marks)
- (c) Oxidation of amino acids is important in three situations in animals. Explain these situations. (08 marks)

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