THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME – 2006/2007 - LEVEL 3
FINAL EXAMINATION

CHU 1140/CHE 3140/NSU 1140 – INTRODUCTION TO BIOCHEMISTRY & BIOPHYSICS

DURATION : TWO (02) HOURS

Date : 17th November 2006 Time: 1.30 p.m. – 3.30 p.m.

Instructions to candidates

This question paper consists of two parts: Part A and Part B. Each part consists of three questions. You are required to answer four questions in all choosing two questions from each part.

PART A – BIOCHEMISTRY

01. a. (i) Briefly describe the function of a chloroplast. (4 marks)

(ii) In what ways are chloroplasts and mitochondria similar? (4 marks)

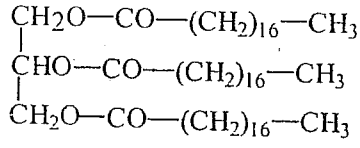
(iii) What is an important structural difference between chloroplasts and mitochondria? (4 marks)

b. Fats and Oils are tringlycerides.

(i) Draw the general formula for a triglyceride (8 marks)

(ii) What do you mean by the terms "saturated triglyceride" and unsaturated triglyceride. (10 marks)

(iii) How would you distinguish saturated and unsaturated triglycerides using their physical properties? (10 marks)



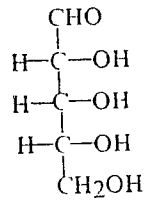
A

(iv) Give the balanced equation for the formation of A starting with glycerol. (30 marks)

(v) Give the balanced equation for the saponification of A with aq.NaOH. (30 marks)

02. a. The D and L forms of pairs of stereoisomers are identical in their chemical and physical properties. How do you distinguish these stereoisomers experimentally? (20 marks)

b. The Fischer projection of the <u>five</u> carbon sugar D-ribose is given below.



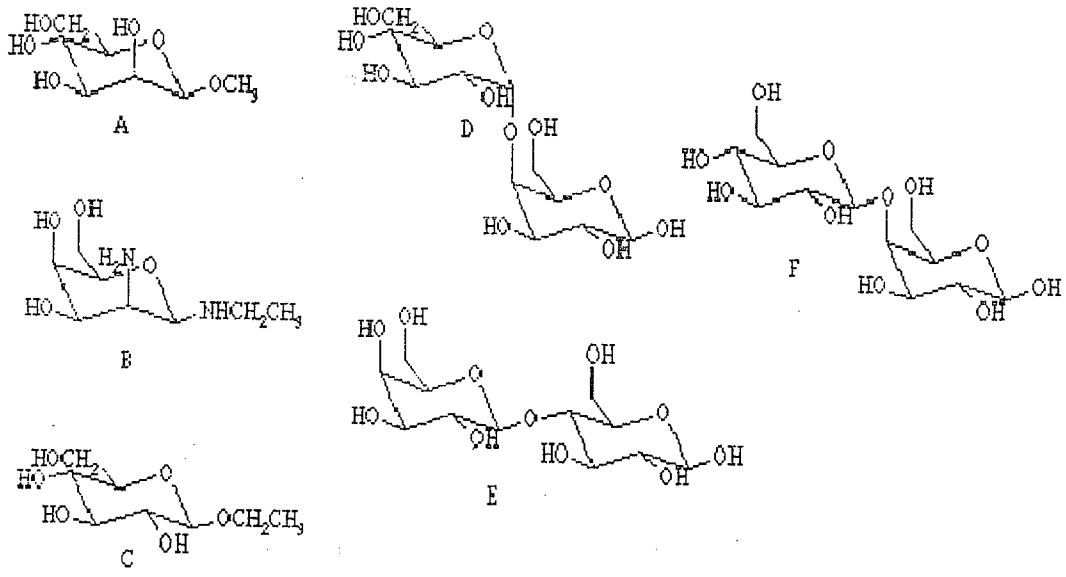
D-ribose

(i) Draw two possible Haworth projection formulas of the two cyclic structures of D-ribose. (20 marks)

(ii) Number all Carbon atoms in the above two structures. (5 marks)

(iii) Name the two structures. (10 marks)

c. (A) – (F) refer to the set of molecules in the following figure.



(i) Which molecule(s) is (are) a methyl glycopyranoside? (5 marks)

(ii) Which moledulce(s) is (are) a β-1,4-linked disaccharide? (5 marks)

(iii) Which molecule(s) is (are) an α-1,4-linked disaccharide? (5 marks)

(iv) Which molecule(s) is (are) an N-linked glycoside? (5 marks)

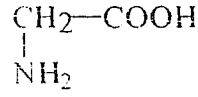
(v) Which molecule(s) is (are) the reducing sugars? (5 marks)

(vi) Draw the Haworth projections of the two monosaccharides obtained if you hydrolyze the sugar F. (20 marks)

03. a. (i) What are Proteins composed of? (10 marks)

(ii) Distinguish primary and secondary structures of proteins? (10 marks)

(iii) The structure of glycine is given below.



Clearly draw the structures of glycine that you expect to see in solutions of pH=2 and pH=10. (Indicate the pH value in front of the structure you draw) (20 marks)

b. A polypeptide has the sequence

Leu-Arg-Ala-Gly-Met-Lys-Gly-Val

(i) Indicate the C-terminal and the N-terminal (10 marks)

(ii) How many peptide bonds are there in the above poly-peptide? (10 marks)

c. What is a nucleoside, nucleotide and nucleic acid? (30 marks)

d. What is denaturation of proteins? (10 marks)

PART B – BIOPHYSICS.

Answer in a separate booklet.

01. a) Assuming the human body as a machine which converts all the chemical energy it receives from food (about 10.4 MJ per day) in to internal energy, calculate its power as a heater.

(20 marks)

b) The human body is about 25% efficient at converting chemical energy into mechanical energy (most of the rests is sued to heat it). If some one develops a power output of 500W when running up a flight of stairs, what is the power input to the body

(20 marks)

c) It is found that the average quantity of energy available by "burning" 1Kg of fat in the body is 37.7×10^6J. A man wishes to loose 3 Kg of his body fat by playing football. Assuming that all his extra activity is at the expense of his store of fat, how many games of foot-ball must he play to loose his 3Kg? You may assume that his average rate of energy expenditure during each 1 ½ hour game of foot-ball is 500W.

Do you consider that exercise is the best way to loose weight? Discuss briefly.

(60 marks)

02. a) Describe the optical functions of the iris and lens in the human eye. Compare them with the corresponding components in a camera.

(20 marks)

b) How would you expect the eye's refractive properties to change when swimming underwater?

Discuss the effect, if any, of wearing goggles.

(30 marks)

c) The focal length f of a convex lens refractive index μ_1 , placed in a medium of refractive index μ_2 is given by;

$\frac{1}{f} = K\left[\frac{\mu_1 - \mu_2}{\mu_2}\right]$ where K is a constant. If the refractive index of the eye lens is 1.4 and its power is 18D when in a medium of refractive index 1.33, find its approximate focal length in air.

(40 marks)

In what ways would an air – filled eye differ from a fluid-filled one?

(10 marks)

03. a). Explain what is meant by the decibel scale for comparing two quantities and give a definition of a reference level for such a scale for sound intensities.

(20 marks)

b) Without using a calculator, determine the increase in a sound level when the intensity of the sound source becomes 10 times what it was previously.

(30 marks)

c) In a test, a subsonic jet flies overhead at an altitude of 100m. The sound intensity of the ground as the jet passes overhead is 150dB. At what altitude should the plane fly so that the ground noise is no greater than 120 dB, the threshold of plain?

Ignore the finite time required for the sound to reach the ground.

(50 marks)