THE OPEN UNIVERSITY OF SRI LANKA

B.Sc DEGREE PROGRAMME/ STAND ALONE COURSES 2007/2008

LEVEL 5 – CONTINUOUS ASSESSMENT TEST 1 (NBT)

CHU 3139 – BIO CHEMISTRY 1

DURATION : $1_{1/2}$ HOURS

Date: 22nd February 2008 Time : 3.30 p.m – 5.00 p.m

Reg. No: ----------

Question	Marks
1	
2	
Total	

Instructions to candidates:

This Question paper has 4 pages and 2 questions. Answer all questions only in the space provided. Attached sheets will not be graded.

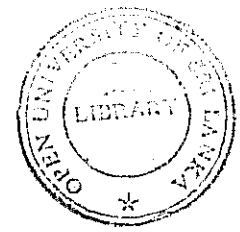
01. (a) i. What is a lipoprotein? (05 marks)

ii. What is the function of lipoproteins? (05 marks)

iii. What are the types of lipoproteins found in blood? (15 marks)

(b) How do you separate a mixture of carbohydrate using paper chromatography. Assume that the mixture consists of glucose, ribose, galactose and maltose. Explain in details. (35 marks)

(c) What are the types of linkages formed between sugars and amino acids? Discuss. (20 marks)



(d) Explain why the nature of the side chain is important in biological functions of proteins and peptides? (20 marks)

2. (a) What is the importance of biuret test? (10 marks)

(b) What techniques would you use to separate following mixtures?

1. Two proteins, each of isoelectric point 6.0; one has molecular weight of about 10,000 Daltons, the other about 40,000 Daltons.

2. Two proteins, each of molecular weight 50,000 Daltons, one has an isoelectric point of 5.0 and the other 6.0. (40 marks)

(c) What is the importance of SDS-gel electrophoresis? How does it different from gel electrophoresis? (25 marks

(d) i. What do you mean by denaturation of proteins? (10 marks

ii. Describe the factors that bring about denaturation of proteins. (15 marks

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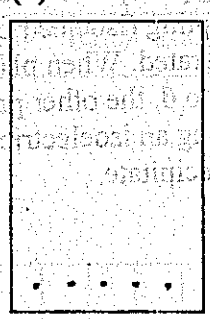
CHU 3139 – Bio Chemistry 1 – Answer Guide

1. (a) (i) A lipoprotein is a multicomponent complex of protein and lipids. It is a molecular aggregate having specific components. Each type of lipoprotein will have a characteristic molecular weight, size, density etc.

(ii) Transport lipids from tissue to tissue and participating in lipid metabolism.

(iii) HDL - High density lipoprotein
LDL - Low density lipoprotein
IDL - Intermediate density lipoprotein
VLDL - Very low density lipoprotein
Chylomicrons

(b)



M G R Ga Ma

Standard solutions of glucose, ribose, galactose, maltose and the mixture (M) are spotted in the paper chromatogram as shown in the figure. It is allowed to run in a suitable solvent. By comparing spots in the mixture (M) with standard glucose, ribose, galactose and maltose, we can find out corresponding carbohydrates present in M.

(c) 1) Carbon 1 (anomeric carbon) forms a glucoside linkage with the OH group of the amino acid. (Glycosidic linkage) or O-glycosyl likage.

2) Linkage through a nitrogen atom. N- glycosidic linkage between sugar and amino acid. Eg. Aspargine and glutamine have an amide in the side chain. Usually this and N acetyl glucosamine is found to form N- glycosyl linkages.

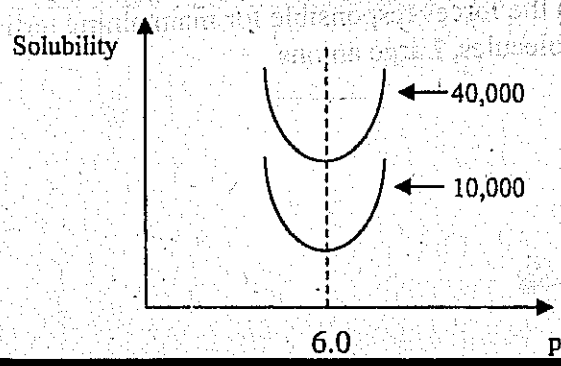
(d) 1) In determining pK of a protein. This is important in buffer capacity.

2) In ion exchange chromatography. Ion exchange chromatography depends on the charge of the amino acid which depends on pH of the medium.

3) Folding of proteins. 3 D shape of the protein is determined by the nature of the side chain.

2. (a)To find out whether the compound has peptide bonds or not. Free amino acids do not have peptide bonds. So it does not answer for biuret test.

(b) 1. - Isoelectric precipitation



By increasing pH up to 6 first the protein having MW 40,000 D precipitates.
Later on at the same pH the other protein having MW 10,000 D precipitates.

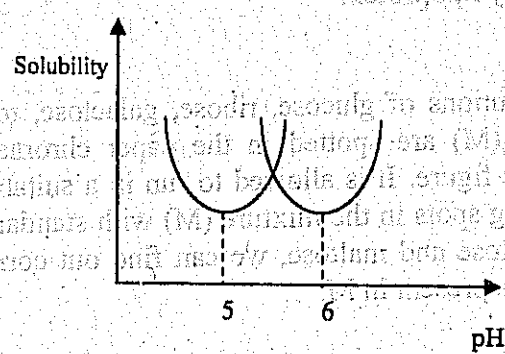
- Gel filtration

The small solute molecules that pass through are trapped in the pores, and only large molecules will be excluded and filter through. Large molecules will come out the column faster. The smaller molecules are distributed between the solvent inside and outside the gel particles. These move slowly. MW 40,000 D protein comes out first. Then comes out the MW 10,000 D protein.

- Gel electrophoresis

The separation/ rate of movement depends on the ratio of charge to mass (size). The pH of the solution will determine the net charge of the protein. Hence, if the charge is equal, the size will determine the movement. Therefore MW 40,000 D protein moves slowly than the MW 10,000 D protein in the gel.

2. - Isoelectric precipitation



By increasing pH up to 5 one protein Start precipitating (isoelectric point 5). It can be separated. When pH is increased up to 6, the other protein which is having an isoelectric point of 6 will also precipitate.

- Gel electrophoresis

The separation/ rate of movement depends on the ratio of charge to mass (size). The pH of the solution will determine the net charge of the protein. Hence, if the mass is equal the charge will determine the movement. Therefore highly charged protein moves faster than the protein with lower charge in the gel.

(c) SDS-gel electrophoresis is important in separating proteins. Since it has thiol, it reduces disulphide bonds in proteins. Therefore, several subunits can be seen in SDS-gel electrophoresis. In gel electrophoresis, gel electrophoretogram shows different proteins, not divided into subunits.

(d) i. Partial or complete unfolding of the specific native confirmation of polypeptide chain or protein.

ii. 1. Change in pH – Changes the ionic charges in the ionizable side chains.
2. Heat – Denatures proteins by high temperature.
3. Agents that interfere with the forces responsible for maintaining tertiary Structure. Eg. Organic molecules, Large anions
4. Mechanical stress