



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
TECHNOLOGY IN INDUSTRIAL MICROBIOLOGY AND BIOTECHNOLOGY
BIMBT 10M

SBH 2330: DOWNSTREAM PROCESSING

SPECIAL/SUPPLEMENTARY EXAMINATION

FEBRUARY 2013 SERIES

2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

Question ONE

- Highlight the disadvantages of sonication as a cell disruption methods. **(6marks)**
- Differentiate between downstream processing and chemical processing **(6marks)**
- At 20°C human serum albumin has a diffusion coefficient of $6.1 \times 10^{-7} \text{cm}^2 \text{C}^{-1}$, a specific volume of $7.4 \times 10^{-1} \text{cm}^3 \text{g}^{-1}$ and sedimentation of 4.6s. calculate the relative molecular mass of human serum albumin if the density of water at 20°C is 998Kg m^{-3} and
 $R = 8.314 \text{J K}^{-1} \text{mol}^{-1}$ **(6marks)**
- State the advantages of bioseparation processes **(6marks)**
- Outline the major steps involved in downstream processing **(6marks)**

Question TWO

- Isoelectric precipitation precipitates the unwanted protein rather than the protein of interest explain **(2marks)**

- b) Explain separation of a mixture of proteins by ISO-electric precipitation. **(8marks)**
- c) Explain the principle employed in protein separation by addition of organic solvents **(6marks)**
- d) Give the equation that describes the relationship between solubility of protein molecules and dielectric constant during organic solvent precipitation **(4marks)**

Question THREE

- a) The boiling point of a pure protein is known to be 110-111°C. Describe the boiling behavior expected to the protein is contaminated. **(3marks)**
- b) Explain the melting behavior expected with contamination **(3marks)**
- c) Outline the schematics of the various particles in reverse phase HPLC **(4marks)**
- d) With examples differentiate between solid sieve and bed of granular materials as filter medium **(10marks)**

Question FOUR

- a) Outline the advantages and disadvantages of lyophilization **(7marks)**
- b) In a certain crystallization, the solubility and temperature data for soluble protein in water was obtained as shown below

Temperature	Solubility in 10ml of water
0	0.15g
20	0.30g
40	0.65g
60	1.10g
80	1.70g

- (i) Plot a graph of solubility against temperature. **(5marks)**
- (ii) 0.1g of the protein was mixed with 1.0ml of water and heated upto 80°C. State whether the protein dissolved and by how many grams **(2marks)**
- (iii) The solution in (b) above was cooled. At what temperature will crystals of the protein form? **(2marks)**
- (iv) The cooling described in (c) above was continued to 0°C. How many grammes of the proteins were precipitated out of the solution **(4marks)**

Question FIVE

- a) Differentiate between density gradient and differential centrifugations. **(8marks)**
- b) Outline FOUR density gradients that are commonly used in biochemical separation **(4marks)**
- c) Outline any eight factors that affect the stability of proteins during isolation and purification **(8marks)**