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

BTMBT 11M

ABT 4306 : DOWNSTREAM PROCESSING

SEMESTER EXAMINATION

DECEMBER 2013 SERIES 2 HOURS

Instructions to candidates:

This paper consist of FIVE questions
Answer question ONE (compulsory) and any other TWO questions

QUESTION ONE

a) Describe the principles behind separation by filtration **(6 marks)**

b) Highlight eight characteristics of a good gradient to be used in density gradient centrifugation **(8 marks)**

c) Describe the application of distillation as a downstream process **(5 marks)**

d) Explain the Debye-Huckel theory of salting out proteins at law salt concentration **(6 marks)**

e) Outline the methods used in dissociation of proteins and ligands from affinity columns **(5 marks)**

QUESTION TWO

Discuss the ways of achieving protein precipitation **(20 marks)**

QUESTION THREE

Discuss how cavitations and sonication achieve cell disruption, highlight their limitation **(20 marks)**

QUESTION FOUR

a) State the expression of net force and frictional force a spherical particle experiences when centrifuged in a medium and derive the equation which describes the sedimentation rate of the particle **(12 marks)**

b) Differentiate between differential and density gradient centrifugation **(8 marks)**

QUESTION FIVE

a) Outline the factors affecting the stability of proteins during precipitation **(6 marks)**

b) The solubility at different temperatures of certain proteins during crystallization in water were measured and the data recorded in the table below:

Temperature (˚C)	**Solubility (in 10ml water)**
0	0.15g
20	0.30g
40	0.65g
60	1.10g
80	1.70g

(i) Plot a graph of solubility against temperature **(4 marks)**

(ii) 0.1g of the protein was mixed with 1.0ml of water and heated to 80˚C. State and explain weather the protein will dissolve or not **(3 marks)**

(iii) The solution in (II) above was cooled. Find the temperature in which crystals of the protein appeared **(3 marks)**

(iv) The cooling described in (iii) above was continued to O˚C. Calculate the amount in grammes of the protein that came out of the solution **(4 marks)**