

**CORK INSTITUTE OF TECHNOLOGY**  
**INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

**Autumn Examinations 2013/14**

<b>Module Title:</b>	<b>Applied Separation Technology (CA)</b>
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**Module Code:** BIOM8001

**School:** Science

**Programme Title:** B.Sc. (Honours) in Nutrition and Health Science  
B.Sc. Food Science and technology

**Programme Code:** SNHSC\_8\_Y3  
SFSTE\_7\_Y3

**External Examiner(s):** Prof. Torres Sweeney  
**Internal Examiner(s):** Germain Levieille

**Instructions:** Answer any 4 of the 5 questions asked. Each question carries equal marks.  
Please state clearly the questions addressed in your paper.

**Duration:** 2 Hours

**Sitting:** Autumn 2014

**Requirements for this examination:**

<p><b>Note to Candidates:</b> Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper. If in doubt please contact an Invigilator.</p>
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- Q1. a) Discuss the Plate Theory as a model of prediction of analytes behaviour in chromatography. (10 marks)  
b) Highlight the key factors affecting the efficiency of a chromatographic method based on the Plate theory rational. (5 marks)  
c) Discuss the Rate Theory, give its principles, mathematical components and equation. (10 marks)
- Q2. Two substances A and B are separated by column chromatography. Their retention times are A: 6.5 min and B: 11 min, on a 20 cm column. The widths of the peak bases were 0.35 and 0.68 min respectively.  
Calculate:  
(a.) the resolution of these peaks; (5 marks)  
(b.) the average number of plates in the column; (7 marks)  
(c.) the average plate height; (7 marks)  
(d.) calculate the minimum length of column to achieve a resolution of 1. (6 marks)
- Q3. a) Give 3 different methods (6 marks) available to achieve separation of cells and biomass debris from a liquid suspension and provide a brief description (7 marks) for these methods.  
b) Give definition and description for these terms used in separation technology:  
i) Flocculation (3 marks)  
ii) Dead-End Flow filtration (3 marks)  
iii) Cross Flow filtration (3 marks)  
iv) Expression (3 marks)
- Q4. You have a 2-Liters aqueous solution containing 200.0 mM of compound C. This solution is extracted with 500.0 mL of diethyl ether and the aqueous phase is assayed and it is found that the concentration of compound C that remains is now at 40.0 mM.  
a) What is the equilibrium constant for this extraction system? (10 marks)  
b) How much compound C will remain in aqueous solution after three extractions? (10 marks)  
c) What will be the percentage of recovery of the compound C after three extractions (5 marks)
- Q5. a) Detail the process of reverse osmosis. How does it work and what are its applications and limitations? (10 marks)  
b) Discuss the process of separation by nanofiltration. How does it work and what are its applications and limitations? (10 marks)  
c) Separations by reverse osmosis and by nanofiltration can achieve similar level of separation. Discuss the differences, similarities and relative advantages of these two methods. (5 marks)