

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2014/2015

Module Title: Applied Separation Technology (CA)

Module Code: BIOM8001

School: Science & Informatics

Programme Title: BSc (Honours) in Herbal Science – Year 4
 BSc (Honours) in Nutrition and Health Science – Year 3
 BSc Food Science and Technology – Year 3

Programme Code: SHERB_8_Y4
 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 a equal mark weighing of 25%. Please state clearly the questions addressed in your paper.

Duration: 2 hours

Sitting: Autumn 2015

Requirements for this examination: Calculator

Note to Candidates: 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.

- Q1. a) Indicate three of the methods available to achieve separation of cells and biomass debris from a liquid suspension? (6 marks)
- b) Give a brief description, advantages and limitations for these 3 methods. (9 marks)
- c) Give a definition and description for these terms used in separation technology:
- i) Flocculation (2 marks)
 - ii) Dead-End Flow filtration (2 marks)
 - iii) Cross Flow filtration (2 marks)
 - iv) Sedimentation (2 marks)
 - v) Centrifugation (2 marks)
- Q2. a) Detail the process of reverse osmosis. How does it work and what are its applications and limitations? (8 marks)
- b) Separations by reverse osmosis and by nanofiltration can be considered to achieve similar level of separation. Discuss the differences, similarities and relative advantages of these two methods. (10 marks)
- c) Amongst the methods available, elaborate on the ones you would recommend to remove salt from seawater to obtain drinking water? (7 marks)
- Q3. a) Explain the principle of gas chromatography? (8 Marks)
- b) Give a description of stationary phases used in gas chromatography. (7 Marks)
- c) Discuss the applications of GC combined with Mass Spectrometry as analytical method to identify the chemical nature of natural products? (10 Marks)
- Q4. a) Discuss the plate theory of chromatographic separation. How does it help to understand and improve the quality of chromatographic separation of compounds in liquid column chromatography? (10 marks)
- b) How would you choose a HPLC method of quantification of a known natural compound in an extract? (7 marks)
- c) Indicate the factors to consider when optimising the method and detail the steps you would take to proceed your optimisation. (8 marks)

Q5. You have 1L of an aqueous solution containing 100 mM of compound C. This solution is extracted with 500 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 20 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?

(8 marks)

c) What will the percentage of recovery of the compound C after these three extractions?

(7 marks)