

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

**Semester 1 Examinations 2010/2011**

**Module Title:     Applied Separation Technology**

**Module Code:        BIOM8001**

**School:                Science**

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

**Programme Code:**    CR\_SHERB\_8\_Y3  
                              CR\_SNHSC\_8\_Y4

**External Examiner(s):     Professor Elizabeth Williamson & Dr. J Green**  
**Internal Examiner(s):     Germain Levieille**

**Instructions:**         **Answer any 4 of the 6 questions asked.**  
                              **Each question carries a equal mark weighing.**

**Duration:**        2 hours

**Sitting:**            Winter 2010

**Requirements for this examination:**

**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.** What are the methods available to achieve separation of cells and biomass debris from a liquid maceration? Give an outline of the main principles guiding the separation for each of the available methods and comment on the advantages and limitations of each of these methods.
- Q2.** a) Detail the process of reverse osmosis. How does it work and what are its applications and limitations?  
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.
- Q3.** a) Explain the principle of gas chromatography? Give a description of main stationary phase used in gas chromatography.  
b) Discuss its applications as analytical method of natural products?
- Q4.** Supercritical fluid extraction can be use to extract volatile compounds such as essential oils. How does it work? Why would you choose to apply it instead of distillation?
- Q5.** 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.) column resolution; (b.) the average number of plates in the column; (c.) the average plate height; (d.) the resolution of these peaks; (e) calculate the minimum length of column sufficient to achieve a resolution of 1.*
- Q6.** You have 1L of an aqueous solution containing 100.0 mM of compound C. This solution is extracted with 250.0 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 20.0 mM.  
a) What is the equilibrium constant for this extraction system?  
b) How much compound C will remain in aqueous solution after three extractions?