



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
END OF SECOND SEMESTER EXAMINATIONS – MAY 2013
CHROMATOGRAPHIC SEPARATIONS – SCH 4292
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer **ANY FOUR** questions. Each question carries 25 marks.

Total Marks - 100

1. (a) Define the following terms (i) phase ratio (ii) sparging (iii) resolution (iv) retention factor (v) selectivity factor. [10 marks]
- (b) Describe in detail **three** methods of improving resolution in liquid chromatography. [15 marks]
2. (a) With the aid of diagrams explain (i) what is peak tailing and peak fronting (ii) how the two arise and (iii) the difference between them. [10 marks]
- (c) Substances A and B were found to have retention times of 16.40 and 17.63 min respectively, on a 30 cm column. An unretained species passed through the column in 1.30 min. The peak widths (at base) for A and B were 1.11 and 1.21 min respectively. Calculate (i) the column resolution, (ii) the average number of plates of the column, (iii) the plate height, (iv) the average length of the column required to achieve a resolution of 1.5, (v) the time required to elute substance B on the longer column, and (vi) the plate height required for a resolution of 1.5 on the original 30 cm column and in the original time. [15 marks]
3. (a) What is the difference between a bulk property detector and a solute property detector? Give examples in your explanation. [4 marks]
- (b) Choose **three** detectors used in HPLC and describe the principle behind their mode of operation. Also highlight their advantages and disadvantages. [18 marks]
- (c) What is temperature programming as used in gas chromatography? [3 marks]
4. (a) What is the difference between gas solid and gas liquid chromatography? [4 marks]
- (b) Why is GSC not used nearly as extensively as GLC? [4 marks]
- (c) What properties should the stationary phase for gas chromatography possess? Give an example of a stationary phase used in GLC. [5 marks]

- (d) What would be the effect of the following on the plate height of a column?
Explain.
- (i) reducing the particle size of the packing [4 marks]
 - (ii) increasing the flow rate [4 marks]
 - (ii) decreasing the column temperature [4 marks]
5. (a) What properties of a supercritical fluid are important in chromatography? [3 marks]
- (b) Compare supercritical fluid chromatography to other chromatographic methods. [10 marks]
- (c) Briefly describe the applications of SFC. [4 marks]
- (d) Explain why HPTLC is superior in its performance than conventional TLC. [6 marks]

End of question Paper!!!