



EASTERN UNIVERSITY, SRI LANKA

FIRST SEMESTER SECONDEXAMINATION IN SCIENCE

2009/2010 (JUNE – JULY 2011)

CH 202: ANALYTICAL CHEMISTRY

(Proper & Repeat)

Answer all questions

Time Allowed: One hour

1. (a) What is meant by the phrase "solvent Extraction"? List the advantages of using solvent extraction in the analytical chemistry **20 marks**
- (b) Outline the theory behind in the solvent extraction process **15 marks**
- (c) Consider a separation of weak acid HA by solvent extraction. Suppose  $K_a$  is the ionization constant of weak acid and  $K_D$  and  $D$  are the partition coefficient (organic/aqueous phase) and distribution ratio respectively. Derive expression to relate the distribution ratio  $D$  in terms with  $K_a$ ,  $K_D$  and  $[H^+]$  as indicated below.

$$D = \frac{K_D}{1 + \frac{K_a}{[H^+]}}$$

**25 marks**

- (d) Chelate complex formation is a method to extract certain metals in the solvent extraction process.
- (i) Give two chelating agents with structures as examples to indicate how chelating agents help selectively to extract analyte metal suppose the sample contains many metals as interference **20 marks**
- (ii) Outline briefly the factors affect the chelate formation **20 marks**

2. (a) Draw a fully labeled diagram to show the important components of gas chromatography. 20 m

(b) Briefly explain the functions of the components. 20 m

(c) Explain the following terms. 15 m

(i) Temperature programmed elution 15 m

(ii) Give the advantages of derivatives preparation of sample prior to the chromatographic analysis. 15 m

(iii) Retention time 15 m

(d) Suppose an analytical sample that contains three components A, B and C in the ratio of 1:1:1 and the retention time  $t_A$ ,  $t_B$ , and  $t_C$  respectively draw a rough sketch of the gas chromatogram for these samples. 15 m

(Assume the retention time  $t_A < t_C < t_B$ )

$$D = \frac{K_D}{1 + \frac{K_D}{[H^+]}}$$