EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF CHEMISTRY
SECOND EXAMINATION IN SCIENCE (2004/2005) FIRST SEMESTER
CH 202 ANALYTICAL CHEMISTRY (PROPER)

Answer all questions **Time: One hour**

1) a) Explain the basic principle involved in solvent extraction.

(20 marks)

b) Clearly differentiate the distribution ratio (D) from the partition coefficient (K) and show that the distribution ratio is a function of pH.

(30 marks)

c) A 0.200M aqueous solution of the weak organic acid (HA) was prepared and three 50.0 ml aliquots were transferred to 100.0 ml volumetric flasks. Solution 1 was diluted to 100 ml with 1.0M $HClO_4$, solution 2 was diluted to the mark with 1.0 M NaOH and solution 3 was diluted to the mark with water. Each aliquot (25.0 ml) were extracted with 25.0 ml of n-hexane. The extract from the basic solution 2 contained no detectable trace of A-containing species (indicates A^- is not soluble in the organic solvent). The extract from solution 1 contained no ClO_4^- or $HClO_4$ but was found to be 0.0737 M in HA. The extract of solution 3 was found to be 0.0320 M in HA. Assume HA does not associate or dissociate in the organic solvent and calculate

i) The partition coefficient for HA between the two solvents.

(15 marks)

ii) The concentration of the species HA and A^- in the aqueous solution 3 after extraction

(20 marks)

iii) The dissociation constant for HA in water.

(15 marks)

2) a) Suggest a method for the separation of

i) Au^{3+} and Al^{3+}.
ii) MnO_4^- and ReO_4^-.
iii) Carbonyl compounds and alcohols (Hint: Carbonyl compounds can form a negative complex with $NaSO_3H$)

(30 marks)

b) Discuss with examples the use of ion exchange chromatography in analytical separation.

(30 marks)

c) Give suitable location reagent for the following classes of compounds in Thin layer chromatography.

i) Carboxylic acid. ii) Carbonyl compounds.

iii) Phenols iv) Amino acids.

(20 marks)

d) If R_f values of some of the components of a particular mixture are almost identical for a given solvent, it results in poor resolution of the mixture due to incomplete separation. What kind of chromatographic techniques overcome this difficulty? Explain.

(20 marks)