國立成功大學

115學年度碩士班招生考試試題

編　號：55

系　所：化學工程學系

科　目：分析化學與儀器分析

日　期：0203

節　次：第 2 節

注　意：1.可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

(I) 名詞解釋 (每題 2 分，共 20 分)：

(a) an amphiprotic solute

(b) a zwitterion

(c) magnetic anisotropy

(d) chemical-shift parameter

(e) coupling constants

(f) Gel Permeation Chromatography

(g) Time-of-Flight (TOF)

(h) Inductively Coupled Plasma

(i) difference between equilibrium and equivalence

(j) a reference electrode and a working electrode

(II) 計算題 (40 分):

(1) Describe the preparation of 500 mL of 0. 075M $AgNO_3$ (Mw 170) from the solid reagent (5 分).

(2) Describe the preparation of 2.0 L of 0.325 M HCl, starting with a 6.0 M solution of reagent (5 分).

(3) The solubility products for a series of iodides are:

$$CuI \quad K_{sp} = 1\times10^{-12}$$
$$AgI \quad K_{sp} = 8.3\times10^{-17}$$
$$PbI_2 \quad K_{sp} = 7.1\times10^{-9}$$
$$BiI_3 \quad K_{sp} = 8.1\times10^{-19}$$

List these 4 compounds in order of decreasing molar solubility in water (10 分).

(4) Use the retention data given in the following table to calculate the retention index of 1-hexene. Furthermore, the retention index for n-pentane is 500 (I_0). (10 分)

Retention index $I = I_0 + (\log T_C - \log T_A)/(\log T_B - \log T_A) \times 100\%$

	Sample	Retention Time, min
	Air	0.571
(A)	*n*-pentane	2.16
(C)	*n*-hexane	4.23
(B)	1-hexene	3.15

(5) Express the following absorbance of 0.245 in terms of percent transmittance while converting transmittance data of 23.8% to absorbances. (10 分)

(III) 問答題: (40 分)

(1) In UV-VIS instrument, what is the difference of absorbance between UV and VIS? Please provide sources of light (or lamps) for UV and VIS. Explain of Beer's law for UV-VIS. (10 分)

(2) Identify the acid on the left and its conjugate base on the right in the following equations. (10 分)

(a) $PO_4^{3-} + H_2PO_4^- \rightleftharpoons 2HPO_4^{2-}$

(b) $NH_4^+ + H_2O \rightleftharpoons NH_3 + H_3O^+$

(c) $HONH_2 + H_2O \rightleftharpoons HONH_3^+ + OH^-$

(d) $2HCO_3^- \rightleftharpoons H_2CO_3 + CO_3^{2-}$

(e) $HOCl + H_2O \rightleftharpoons H_3O^+ + OCl^-$

(3) What are the 3 major carrier gases, 2 different columns, 3 useful detectors, and what kinds of mixtures are separated by gas chromatography (GC)? (10 分)

(4) What is Differential Scanning Calorimetry (DSC)? Provide the differential thermogram of encountered polymeric materials. Provide a typical thermogram where Y represents endothermic and exothermic, while X represents temperature. (10分)