# 國立臺灣大學九十四學年度碩士班招生考試試題

科目：分析化學(A)

題號：67



I 計算題（每題五分，共三十分）

1. If the ionic strength of $K_2CO_3$ aqueous solution is 0.03 M, what is the concentration of $K_2CO_3$?
2. A chloride ion-selective electrode has a selectivity coefficient $k_{Cl^-,OH^-} = 0.2$. What will be the change in electrode potential when 0.1 mM $Cl^-$ at pH 6.0 is raised to pH 10.0?
3. Calculate the concentration of $Mg^{2+}$ after titration of 25.00-mL 0.10 M $Mg^{2+}$ with 25.00-mL 0.10 M EDTA. ($K_f = 6.2 \times 10^8$ and $\alpha_{Y^{4-}} = 0.5$)
4. An analyte with a retention time of 100 s has a width at the base of 10 s on a column of 200 cm long. What is the plate number if the column is changed to 100 cm?
5. The migration time for a neutral compound is 4.0 min at 20 kV when using a 50-cm capillary (effective length is 40 cm). What is the electroosmotic flow mobility?
6. Calculate the solubility of $Hg_2I_2$ in aqueous solution. ($K_{sp} = 1.1 \times 10^{-28}$)

II 畫圖回答下列問題（每題八分，共二十四分；需標明圖中重要部份，但不需說明）

1. An instrumental design for an atomic emission spectrometer.
2. An instrumental design for a high-performance liquid chromatographic apparatus.
3. An instrumental design for an UV-vis spectrometer using a photodiode array detector.

III 簡單回答下列問題（每題四分，共二十分）

1. Compare the difference between the selectivity and sensitivity for a method?
2. What is cyclic voltammetry?
3. What is the Scatchard plot?
4. An optical method to measure the oxygen concentration in aqueous solution.
5. The differences between masking agent and matrix modifier.

IV 計算溶液之 pH 值（十分）

Consider the titration of 25.00 mL 0.10 M dibasic base ($pK_{b1} = 4.00$ and $pK_{b2} = 9.00$) with 0.1 M HCl. What are the pH values after adding 20.00 mL and 40.00 mL HCl, respectively?

V 螢光（每題四分，共十六分）

1. Write down the relationship between the fluorescence intensity of a fluorophore and its concentration as well as all necessary parameters.
2. What is the effect of scattering on the quantitative determination of the fluorophore?
3. Define the quantum yield of the fluorophore.
4. What is the difference between the excitation and emission spectra of the fluorophore? (**General consideration**)

試題隨卷繳回