

國立臺灣師範大學 113 學年度碩士班招生考試試題

科目：分析化學

適用系所：化學系

注意：1.本試題共 4 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

I. Questions and Answers

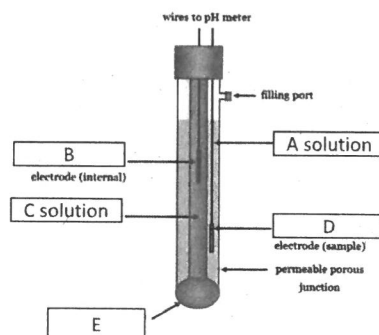
1. Complete the following reactions: (12 points)



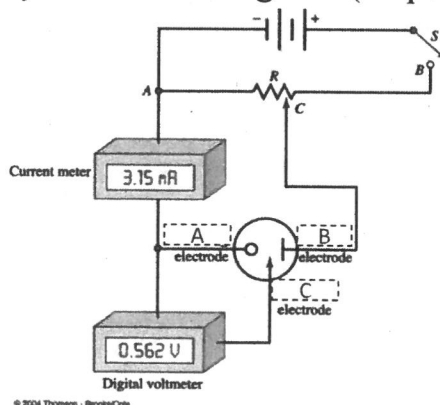
(Please re-write the whole reaction equations on your answer sheet!)

2. When AgCl is added to a 0.02 M NaCl solution, only a very small fraction of solid will be dissolved. List all possible reactions that occur in this aqueous solution. (10 points)

3. Fill the blanks in following diagram: (Write A ~ E = ?) (10 points)

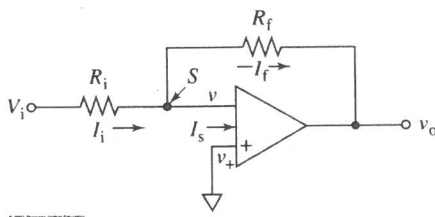


4. Gives the names and functions of these electrodes (A ~C) according to their position in this voltammetry instrument diagram. (12 points)



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5. See below diagram, if $R_i = 1\text{ k}\Omega$, $R_f = 20\text{ k}\Omega$, $v_o = 3\text{ V}$. Please show your calculation (or reason) and answer $V_i = ?\text{ V}$ (4pt), the voltage at S point = ? V (2 points)



II. Multiple-choice question (Choose the **best** answer for each question)(單選題) (4 points each)

- Which of a typical quantitative analysis step is frequently the most difficult step and the source of greatest error?
 (A) acquiring the sample (B) choosing an analytical method
 (C) processing the sample (D) eliminating interferences
 (E) calibrating and measuring concentration
- The vibrational changes in atoms and molecule is mainly associated with which of the following bands of radiation
 (A) NMR (B) Microwave (C) Infrared (D) Ultraviolet (E) X/Gamma rays
- Which of the following material is **not** suitable as sample container for Ultraviolet spectrometric analysis?
 (A) LiF (B) Fused Silica (C) Quartz (D) Glass (E) NaCl
- The process between the lower vibrational levels of an excited electronic state and the higher vibrational levels of another electronic state is known as
 (A) absorption (B) internal conversion (C) intersystem crossing
 (D) fluorescence (E) phosphorescence
- Which of the following is the most direct and rapid instrumental method for the identifying inorganic species?
 (A) microwave spectroscopy (B) infrared spectroscopy
 (C) absorption spectroscopy (D) emission spectroscopy
 (E) inductively coupled plasma mass spectrometry

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6. Detector are often used in conjunction with Liquid Chromatography. Among the following popular detectors, which one is generally most sensitive?
(A) thermal conductivity (B) electrochemical (C) absorption
(D) fluorescence (E) mass spectrometry
7. Which of the following is not a method of separation?
(A) distillation (B) hydrolysis (C) extraction (D) chromatography
(E) electrophoresis
8. Which of the following term is unrelated to van Deemter equation (For evaluation of resolving power of the column)?
(A) polarity of mobile phase (B) Eddy-diffusion (C) diffusion coefficient
(D) mass transfer coefficient (E) flow rate of mobile phase
9. Which of the following is **not** a component of Liquid Chromatography?
(A) Monochromator (B) Pump (C) Injector/Autosampler (D) Column
(E) Detector
10. Which of the following is not a mass analyzer of a mass spectrometer?
(A) Magnetic sector (B) Time-of-flight (C) Quadrupole (D) Ion trap
(E) Electrospray

III. Calculation questions (5 points each)

1. The method of one-point standard addition was used to determine phosphate by molybdenum blue method. A 5.00-mL urine sample was treated with molybdenum blue reagents to produce a species absorbing at 820 nm, after which sample was diluted to 100.00 mL. A 10.00-mL aliquot gave an absorbance of 0.222. Addition of 1.00 mL of solution of 0.05 mg of phosphate to a second 10.00 mL aliquot gave an absorbance of 0.339. Use these data to calculate the concentration of phosphate in mg/mL, assuming a linear relationship between absorbance and concentration and a blank measurement has been made.

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2. Substances A and B have retention times of 10.10 and 11.45 min, respectively, on a 10.0-cm column. An unretained species passes through the column in 1.01 min. The peak widths (at base) for A and B are 0.66 and 0.79 min, respectively.

Calculate

- A. the column resolution
- B. the average number of plates in the column