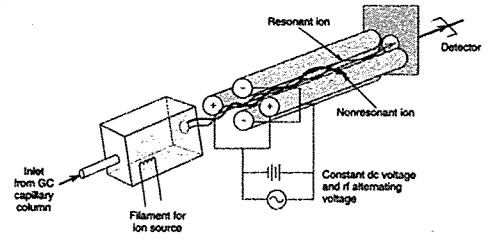


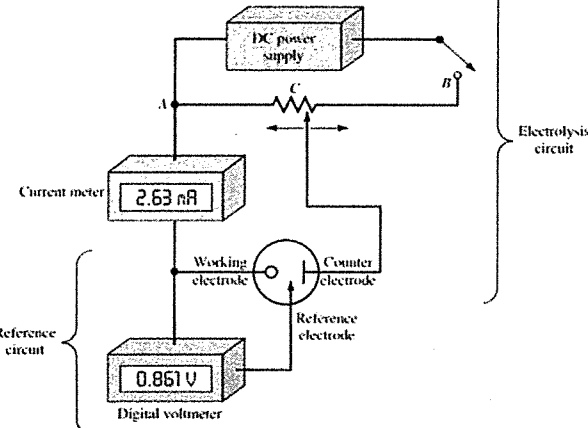
(G)



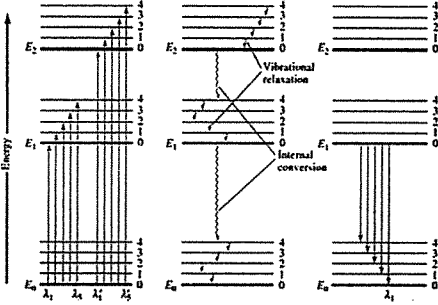
(H)

$$H = A + \frac{B}{u} + C_s u$$

(I)



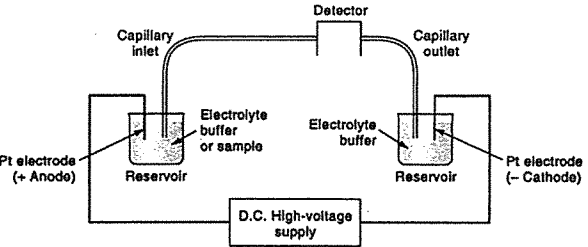
(J)



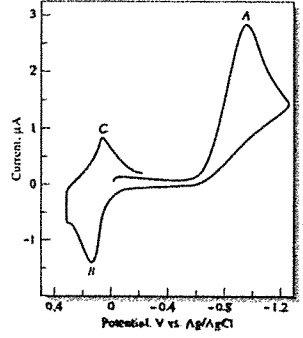
(L) (M) (N)

$$(i_d)_{\max} = 708nD^{1/2}m^{2/3}t^{1/6}c$$

(K)



(O)



(P)

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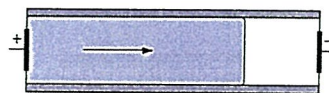
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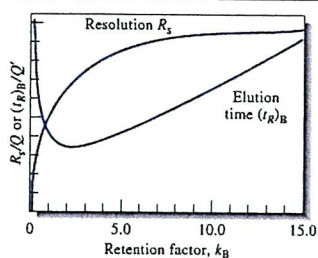
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$$R_s = \frac{\Delta Z}{\frac{W_A}{2} + \frac{W_B}{2}} = \frac{2\Delta Z}{W_A + W_B} = \frac{2[(t_R)_B - (t_R)_A]}{W_A + W_B}$$

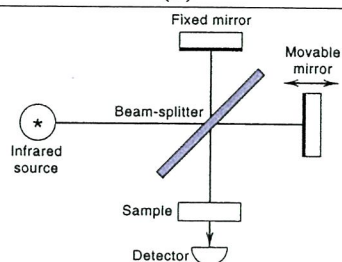
(Q)



(R)



(S)



(T)

Section B. Concepts

(Please write down your explanation in detail)

8. Why are amino acids called amino acids, not carboxyl bases? (10%)
9. Explain the theory behind chromatography's separation. (10%)

試題隨卷繳回

※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

Section A. Multiple Choice Questions

(Each question may contain single or multiple answers)

1. Choose the correct descriptions for the properties of **activity**. (10%, no partial credit)
 - (A) The activity coefficient for a given species is only dependent on the ionic strength in a high ionic strength solution.
 - (B) In very dilute solutions in which the ionic strength is minimal, this effectiveness becomes constant, and the activity coefficient is unity.
 - (C) For a given ionic strength, the activity coefficient of an ion decreases more dramatically from unity as the charge on the species decrease.
 - (D) The activity coefficient of an uncharged molecule is approximately unity, even in a high ionic strength solution.
 - (E) At any given ionic strength, the activity coefficients of ions with the same charge are still very different.
 - (F) The activity coefficient of a given ion describes its effective behavior in all equilibria in which it participates.
2. Choose the best description for the **T test**. (10%, no partial credit)
 - (A) It's used to determine if all the result fall within the expected random error.
 - (B) It's used to determine if two sets of measurements are statistically different.
 - (C) It's the likelihood that the true value falls within the range.
 - (D) It's used to indicate whether there is a significant difference between two methods based on their standard deviation.
 - (E) It's the boundary test of the range defined by the mean and the standard deviation within a given probability.
 - (F) It's a signal test above the background signal by three times the standard deviation of the background signal.
3. How many grams of ammonium chloride (53.5 g/mol) and how many milliliters of 3.0 M sodium hydroxide (40.0 g/mol) should be added to 200 mL water and then diluted to 500 mL to prepare a pH 9.5 buffer with a ammonium chloride concentration of 0.10 M? (pK_a of $\text{NH}_4^+ = 9.24$) (10%, no partial credit)
 - (A) 7.49 g; 50 mL (B) 12.48 g; 30 mL (C) 7.49 g; 30 mL (D) 12.48 g; 50 mL (E) 12.48 g; 100 mL
4. Which of the following is a monoprotic acid? (10%, no partial credit)
 - (A) oxalic acid (B) acetic acid (C) sodium hydroxide (D) phosphoric acid (E) carbonic acid

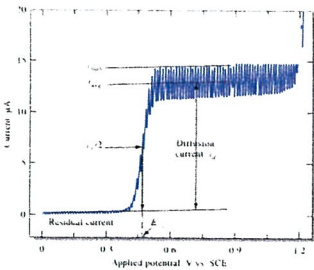
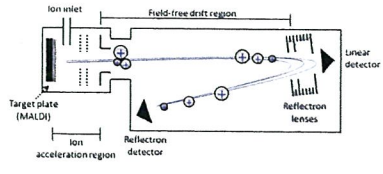
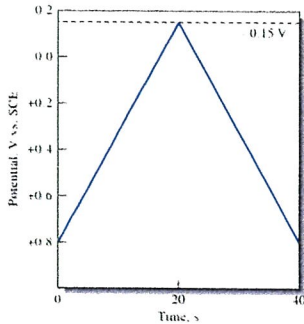
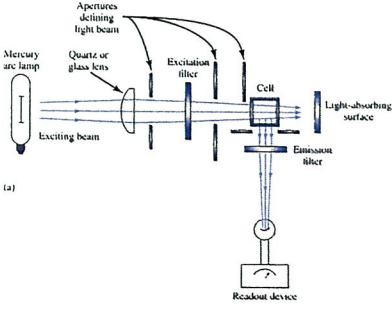
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5. A 0.8040 g sample of an iron ore is dissolved in acid. The iron is then reduced to Fe^{2+} and titrated with 47.22 mL of 0.02242 M KMnO_4 (M.W. = 158.03 g/mol) solution. How much Fe_3O_4 (M.W. = 231.54 g/mol) does this iron ore sample contain in percentage? (10%, no partial credit)
 (A) 50.81% (B) 40.68% (C) 33.87% (D) 36.77% (E) 18.38%
6. At a platinum cathode, the Fe(III) in a 0.82 g sample was determined by coulometric reduction to Fe(II) . Calculate the percentage of $\text{Fe}_2(\text{SO}_4)_3$ (M.W. = 399.88) in the sample if 158 C were required for the reduction reaction. (Faraday constant: 96485 C/mol) (10%, no partial credit)
 (A) 13% (B) 20% (C) 26% (D) 40% (E) 80%
7. Several analytical techniques and figures or equations are shown below. Please assign the appropriate items to the corresponding techniques. (Tick all that apply)
- 7-1. Voltammetry (5%, no partial credit.)
 7-2. Gas chromatography (5%, no partial credit.)
 7-3. Mass spectrometry (5%, no partial credit.)
 7-4. Fluorescence spectroscopy (5%, no partial credit.)

 <p>(A)</p>	 <p>(B)</p>	$\phi_F = \frac{k_F}{k_F + k_{nr}}$ <p>(C)</p>
 <p>(D)</p>	 <p>(E)</p>	$N = \frac{\mu_e V}{2D}$ <p>(F)</p>

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