

滿分 100 分。※注意：請於試卷內之「選擇題」及「非選擇題」(標明題號) 作答區依序作答。

一、選擇題 (每題 12 分；共 36 分)

1. What is the pH of a 3.00% (w/w) $\text{HCl}_{(\text{aq})}$ (molar mass of HCl: 36.46) solution with a density of 1.015 g/mL? (A) 0.085 (B) 0.082 (C) 0.078 (D) 0.074
2. The iodine-containing sample (1.55 g) was treated with an excess amount of bromine (reaction as: $3\text{H}_2\text{O} + 3\text{Br}_2 + \text{I}^- \rightarrow 6\text{Br}^- + \text{IO}_3^- + 6\text{H}^+$) and then added an excess of barium ion to precipitate the iodate (reaction as: $\text{Ba}^{2+} + 2\text{IO}_3^- \rightarrow \text{Ba}(\text{IO}_3)_2$). 0.0598 g of barium iodate was recovered. What is the percentage of potassium iodide in the sample? Molar masses of barium iodate ($\text{Ba}(\text{IO}_3)_2$), iodide (I^-), and potassium iodide (KI) are 487.13, 126.90 and 166.00, respectively. (A) 5.25% (B) 3.25% (C) 9.22% (D) 3.85%
3. What is the percent relative error of an analysis result for the yield of silver that is low by 0.39 mg when the mass of silver in the sample is 487.5 mg? (A) 0.06% (B) -0.08% (C) 0.02% (D) -0.04%

二、問答題 (共 64 分)

1. Please select four out of the seven analysis methods below to describe and introduce their principles and applications, and you may use illustrations (5 pt each; total 20 pt).
 - (1) Electron spin resonance (ESR)
 - (2) Inductively coupled plasma-mass spectrometer (ICP-MS)
 - (3) High-performance liquid chromatography (HPLC)
 - (4) Supercritical fluid chromatography (SFC)
 - (5) Capillary electrophoresis (CE)
 - (6) Nuclear magnetic resonance (NMR)
 - (7) Polarography

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2. What are the difference between electrogravimetric and coulometric methods, especially in currents, voltages, and instrumentation (10 pt)?
3. What types of interferences are encountered in ICPMS (10 pt)?
4. KBrO_3 (0.1321 g) (molar mass 167.00) was dissolved in dilute HCl and treated with an unmeasured excess amount of KI . The liberated iodine required 40.59 mL of a sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) solution. Calculate the molar concentration of the $\text{Na}_2\text{S}_2\text{O}_3$ (8 pt).
5. How to prepare 2.0 L of 0.12 M HClO_4 from the commercial reagent [71.0% HClO_4 (w/w), sp gr 1.67] (8 pt)?
6. Determine the mean, median, deviation from mean and mean deviation for each of the following sets of data (8 pt).
 - (1) 0.0104 0.0110 0.0105
 - (2) 194 187 188 190

試題隨卷繳回