

編號：H 57 系所：化學系

科目：分析化學

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

1. (10) Calculate the pH values for 0.0750 M of NH_3 and 0.0750 M of NH_4Cl solutions, respectively. K_b value for ammonium equilibrium is 1.75×10^{-5} .
2. (10) Calculate the standard deviation for the result of $[[14.3(\pm 0.2) - 11.6(\pm 0.2)] \times 0.050(\pm 0.001)] / [[820(\pm 10) + 1030(\pm 5)] \times 42.3(\pm 0.4)] = 1.725(\pm?) \times 10^{-6}$
3. (10) Draw atomic and molecular energy diagrams and explain the differences for a line spectrum and a band spectrum. Explain whether or not the X-Ray line spectra are affected by the electronic state of an element?
4. (8) A grating monochromator with a reciprocal linear dispersion of 1.2 nm/mm is to be used to separate the sodium lines at 589.0 and 589.6. In theory, what slit width would be required?
5. (10) Explain the differences between fluorescence and phosphorescence. How to experimentally differentiate these two types of emission?
6. (10) Calculate the ratios of the $(M+1)^+$ to M^+ peak heights for the following two compounds: $\text{C}_6\text{H}_4\text{N}_2\text{O}_4$ and $\text{C}_{12}\text{H}_{24}$. The natural isotopic ratios are given in below: $^2\text{H}/^1\text{H} = 0.015\%$; $^{13}\text{C}/^{12}\text{C} = 1.08\%$; $^{15}\text{N}/^{14}\text{N} = 0.37\%$; $^{17}\text{O}/^{16}\text{O} = 0.04\%$; $^{18}\text{O}/^{16}\text{O} = 0.20\%$.
7. (10) In atomic absorption spectrometry, it is often found that the calcium absorbance is decreased with increasing concentrations of sulfate or phosphate until the anion-to-calcium ratio is about 0.5 and then becomes independent of anion concentration. Provide logical reasoning for this observation and also provide one method to minimize such effect.

(背面仍有題目,請繼續作答)

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8. (12) Several important electroanalytical methods are based upon current-voltage curves, which are obtained by measuring the variation in current in a cell as a function of its potential. Draw the current-voltage curve for a cell showing ideal nonpolarized behavior and departure from ideal behavior by real electrodes. Indicate the working regions for electrolytic and galvanic cells.
9. (10) Describe three general methods for improving resolution in partition liquid chromatography.
10. (10) What kind of gas chromatography (gas-liquid or gas-solid) is more suitable for separating the components of air? Provide one example of the stationary phase material that could be useful.