

編號： 58 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）

(一) 填空题。每空格代表一英文單字或專有詞。每格五分。請將答案寫在答案卷上。

1. All analytical methods depend on a final measurement X of a physical or chemical property of the analyte. The process of finding the relationship between the concentration of the analyte and the measurement X is called _____.
2. There is general agreement that the sensitivity of an instrument or an analytical method is a measure of its ability to discriminate between small differences in analytical concentration. Give the mathematical expression of analytical sensitivity (γ): $\gamma =$ _____.
3. In most of the situations encountered in chemical analysis, the true value of the mean μ cannot be determined because a huge number of measurements (approaching infinity) would be required. With statistics, however, we can establish an interval surrounding an experimentally determined mean within which the population mean is expected to lie with a certain degree of _____.
4. A chemical analysis is most often performed on only a small fraction of the material whose composition is of interest. Clearly, the composition of this fraction must reflect as closely as possible the average composition of the bulk of the material if the results are to have value. The process by which a representative fraction is acquired is termed _____.
5. Every analytical instrumental measurement is made up of two components. One component, the signal, carries information about the analyte that is of interest to the chemist. The second, called noise, is made up of extraneous information that is unwanted because it degrades the accuracy and precision of an analysis and also places a lower limit on the amount of analyte that can be detected. What is the relationship between the signal-to-noise ratio and standard deviation: _____.

(背面仍有題目,請繼續作答)

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6. Extensive studies have revealed that the magnitude of the electrolyte effect is highly dependent on the charges of the participants in an equilibrium. When only neutral species are involved, the position of equilibrium is essentially independent of the electrolyte concentration. In general, the effect of added electrolyte on equilibria is independent of the chemical nature of the electrolyte but depends on a property of the solution called the ____.
7. Series RC circuits are often used as filters to attenuate high-frequency signals while passing low-frequency components (a low-pass filter) or are alternatively used to reduce low-frequency components while passing the high frequencies (a high-pass filter). Draw a typical circuit for a high-pass filter: ____.
8. The most common type of mass analyzer used in inductively coupled plasma mass spectrometer (ICPMS) is ____.
9. The first multichannel detector used in spectroscopy was a photographic plate or a film strip that was placed along the length of the focal plane of a spectrometer so that all the lines in a spectrum could be recorded simultaneously. Modern multichannel transducers consist of an array of small photoelectric-sensitive elements arranged either linearly or in a two-dimensional pattern on a single semiconductor chip. Give any two of the multichannel photon transducers: ____ and ____.

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(二) 問答題。每題十分。

1. Absorption of carbon dioxide by a standardized solution of sodium hydroxide leads to a negative systematic error in analyses in which an indicator with a basic range is used; no systematic error is incurred when an indicator with an acidic range is used. Why?
2. In selective precipitation of metal ions by sulfide or selective complexation of metal ions by EDTA are generally achieved by pH control. Explain how it is possible.
3. Write mass-balance expressions for the system formed when a 0.010 M NH_3 solution is saturated with AgBr.
4. What are indicator electrode, working electrode, and generator electrode?
5. For quantitative analysis in absorption spectroscopy, such as infrared, ultraviolet and visible, X-ray, the measured quantity, either the transmittance or the absorbance, is related to the concentration of an analyte by Beer's law. What are the limitations of the Beer's law.