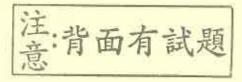
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※選擇題請在答案卡內作答,非選擇題請在答案卷內作答

## Entrance examination - analytical chemistry (part I)

- 第一部份(1-10 題)為選擇題: 單選題: 每題 5 分。
- 請選擇最正確的答案(只有一個正確答案) " 若複選或未作答, 此題以 0 分計。
- 選擇題請務必作答於答案卡(電腦讀卡), 否則將不予計分!
- 1. Which variable obtained during chemical analysis has no units (by definition)?
  - A) potential of an electrode
  - B) power of light
  - C) mass of a sample
  - D) absorbance of a sample
  - E) molarity of a compound
- 2. A sample of a boron compound was inserted to the flame of Bunsen burner. What color of the flame most likely indicates the presence of boron in the sample?
  - A) violet
  - B) blue
  - C) pink
  - D) green
  - E) red
- 3. You have 600 mL of 0.01 mM stock solution of pesticide standard dissolved in ethanol. Using this stock solution and water as diluent, what is the best way to prepare a 5 mL aliquot of 5 µM solution of the standard?
  - A) Take 2500  $\mu L$  of the stock solution and add exactly 2500  $\mu L$  of water.
  - B) Take 2500 μL of water and add exactly 2500 μL of the stock solution.
  - C) Take 2500 µL of the stock solution and add water to the final volume of exactly 5 mL.
  - D) Take 0.05 mL of the stock solution and add exactly 0.495 mL of water.
  - E) Take 0.5 mL of the stock solution and add water to the final volume of exactly 5 mL.
- 4. Which of the following methods/devices can easily be used to distinguish so-called reducing sugars from non-reducing sugars?
  - A) UV spectroscopy
  - B) Kjeldahl's method
  - C) Geiger-Müller counter



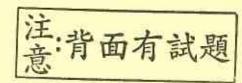


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## ※選擇題請在答案卡內作答,非選擇題請在答案卷內作答

- D) immunochemistry
- E) Fehling's test
- 5. Why optical microscopes using visible light are not normally used to observe metal nanoparticles?
  - A) because of high cost
  - B) because of the so-called diffraction limit
  - C) because the analysis takes more time than using electron microscopes
  - D) because metal nanoparticles are transparent to photons
  - E) because visible light normally causes ablation of nanoparticles
- 6. According to the Van Deemter plot for liquid chromatography, theoretical plate height:
  - A) is always proportional to linear velocity of mobile phase
  - B) is always inversely proportional to linear velocity of mobile phase
  - C) directly depends on the polarities of the separated molecules
  - D) is influenced by longitudinal diffusion of the separated molecules as well as other processes
  - E) is never influenced by eddy diffusion
- 7. Which of the following analytical techniques relies on detection of ions in the gas phase?
  - A) transmission electron microscopy
  - B) mass spectrometry
  - C) cyclic voltammetry
  - D) Raman spectroscopy
  - E) fluorimetry
- 8. Which process has to occur on the dynodes of photomultiplier tube so that the intensity of a photon beam impinging on the photocathode can be measured?
  - A) emission of secondary electrons
  - B) emission of photons
  - C) emission of protons
  - D) emission of neutrons
  - E) recombination of positrons and electrons
- 9. Which of the following is the critical component of the electrospray ion source for mass spectrometry?
  - A) photoresist
  - B) plasma generator
  - C) signal amplifier





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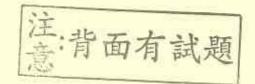
※選擇題請在答案十內作答,非選擇題請在答案卷內作答

- D) high voltage power supply
- E) laser
- 10. You have received a sample containing from 0.005 to 0.050 M of phenylalanine (in water) for analysis. Which technique is definitely not suitable for analysis of this sample?
  - A) potentiometry with phenylalanine-ion-selective electrode
  - B) inductively coupled plasma mass spectrometry
  - C) ion chromatography coupled with UV absorption detection
  - D) electrospray ionization mass spectrometry
  - E) capillary electrophoresis with UV absorption detection

## Entrance examination - analytical chemistry (part II)

- 以下第二部分為問答題(每題10分)
- 計算題應詳列計算過程,無計算過程者不給分。
- A 5x10<sup>-4</sup> M solution of compound A exhibited an absorbance of 0.624 at 260 nm in a 1.000 cm cuvet. A blank had an absorbance of 0.029. The absorbance of an unknown solution of compound A was 0.386. Find the concentration of A in the unknown.

The terms "sensitivity" and "detection limit" are often used interchangeably, but actually
have very different meanings. Explain the difference between these two terms.



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※選擇題請在答案卡內作答,非選擇題請在答案卷內作答

3. The most common detector used in FT-IR is the so-called TGS (Triglycine Sulfate) detector which is a thermal detector and has poor sensitivity. Explain why a photoemissive detector (like the photomultiplier tube commonly used in UV/Vis spectrometry) cannot be used in FT-IR.

4. Explain the difference between a fluorescence emission spectrum and a fluorescence excitation spectrum. Which more closely resembles an absorption spectrum?

 Please illustrate how the van Deemter curve for HPLC differs when using 10 μm particles and 3 μm particles for column packing. Explain why these curves are different.



注:背面有試題