

科目：分析化學 適用：應化系

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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## 一、單選題：(20% total, 2% each)

1. Which of the following GC detector is not very sensitive, but it responds to both organic and inorganic species?
 

A) flame ionization detector

C) electrolytic conductivity detector

E) thermal conductivity detector

B) electron-capture detector

D) chemiluminescence detector
2. To increase the value of  $K$  for the exothermic reaction  $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons \text{H}_2\text{O}(\text{g})$ , we should
 

A) increase the total pressure.

C) increase the temperature.

E) Two of these are necessary.

B) decrease the total pressure.

D) decrease the temperature.
3. Which of the following mode of capillary electrophoresis is able to separate neutral compounds?
 

A) MEKC

B) CZE

C) CGE

D) CIEF

E) CITP
4. The following acids are listed in order of decreasing acid strength in water.
 
$$\text{HI} > \text{HNO}_2 > \text{CH}_3\text{COOH} > \text{HClO} > \text{HCN}$$
 According to Brønsted-Lowry theory, which of the following ions is the weakest base?
 

A)  $\text{I}^-$

B)  $\text{NO}_2^-$

C)  $\text{CH}_3\text{COO}^-$

D)  $\text{ClO}^-$

E)  $\text{CN}^-$
5. Which of the following quantity is measured by the paired thermal method?
 

A) mass : DTA

D) weight % : DSC

B) heat flow : DSC

E) thermal conductivity : DTA
6. Buffers in the human body
 

A) help to keep the body temperature constant.

B) help to maintain a constant blood pH.

C) help change the blood plasma pH when foods are eaten.

D) precipitate proteins so enzymes are inactive.

E) none of these
7. Which of the following would be the best reducing agent?
 

A)  $\text{Cl}_2$  ( $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$   $E^\circ = +1.36 \text{ V}$ )

C)  $\text{Na}$  ( $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$   $E^\circ = -2.71 \text{ V}$ )

B)  $\text{F}_2$  ( $\text{F}_2 + 2\text{e}^- \rightarrow 2\text{F}^-$   $E^\circ = +2.87 \text{ V}$ )

D)  $\text{Na}^+$   $E^\circ = \dots$

E)  $\text{F}^-$

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8. Solid calcium hydroxide is dissolved in water until the pH of the solution is 10.94. What is the hydroxide ion concentration  $[\text{OH}^-]$  of the solution?

- A)  $1.1 \times 10^{-11} \text{ M}$       B) 3.06 M      C)  $8.7 \times 10^{-4} \text{ M}$       D)  $1.0 \times 10^{-14} \text{ M}$

9. Which of the followings is the ion source for nucleic acids and proteins?

- A) EI      B) CI      C) FI      D) MALDI      E) none of these

10. Which of the followings is not atomic mass spectrometry?

- A) ICPMS      B) SSMS      C) GDMS      D) SIMS      E) ESI-MS

## 二、簡答題：(80%)

1. Explain the difference between

- (a) precipitation and coprecipitation (5%)
- (b) the equivalent point and the end point of a titration (5%)
- (c) the anode and the cathode of an electrochemical cell (5%)
- (d) potentiometry and voltammetry (5%)
- (e) absorbance and transmittance (5%)
- (f) filters and monochromators as wavelength selectors (5%)
- (g) fluorescence and chemiluminescence (5%)
- (h) field-flow fraction and chromatography (5%)
- (i) wavenumber and frequency (5%)

2. What are the inherent advantages of Fourier transform spectrometry? (10%) Why? (4%)

3. Describe the differences between conventional and diode-array spectrophotometers and list any particular advantages possessed by one over the other. (10%)

4. What is HPLC? (3%) Draw a diagram to show components of a typical apparatus for HPLC. (8%)