

系所組別： 化學系

考試科目： 分析化學

考試日期：0219，節次：4

※ 考生請注意：本試題 可 不可 使用計算機

請勿在本試題紙上作答，否則不予計分

A 8% for each Question

1. Giving the standard reduction potential of Calcium $E^\circ = -0.267 \text{ V}$, and the K_{sp} of CaF_2 equals 4.0×10^{-11} . Please calculate the cell voltage for saturated Calcium fluoride.
2. Why usually the instrument of FTIR but not IR is used for quantitative analysis?
3. Please compare their advantages and disadvantages for spectroscopic instruments of single beam, beam split double beam and beam chopped double beam.
4. Please compare their separation efficiency, sample capacity for packed column and capillary open tubular chromatographic columns.
5. Please calculate the pH value if 50 mL of 0.10 M NH_3 solution is mixed with 50 mL of 0.040 M HCl solution? (The K_a value of NH_3 is 1.8×10^{-5})

B Multiple choice question (answers from 0 to all answers), 5% for each question

6. Which of the following statement is/are not the line broadening processes for an atomic spectrum?
 - a). Solvent effect
 - b). Quantum yield effect
 - c). Pressure effect
 - d). Uncertainty effect
 - e). Doppler effect
7. Which of the following Ionization method used for condensed phase type samples in mass spectrometers?
 - a). Electron impact
 - b). Fast atom bombard
 - c). Field desorption
 - d). Matrix assistant laser desorption/ionization
 - e). Chemical ionization
8. Corrected retention times for ethyl, n-propyl and n-butyl alcohols on a column are 0.69, 1.51, and 3.57 respectively. Predict approximate retention times for the next two members of the homologous series.
 - a). 5.60, 10.40
 - b). 7.50, 12.20
 - c). 7.60, 14.50
 - d). 8.20, 18.80
 - e). 9.50, 22.9
9. The commonly used detector material for FTIR type instrument is
 - a). Photon multiplier
 - b). Thermal transducers
 - c). Mercury/cadmium telluride transducer
 - d). Pyroelectric transducers
 - e). Photo films

(背面仍有題目,請繼續作答)

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10. Derivatization reactions are often used in preparation samples for chromatographic separation, which of the following statements are the advantages of these reactions?
- For increasing the detection sensitivity
 - For increasing the application range of chromatographic analysis
 - For increasing separation resolution
 - For decreasing the analytes reaction with the separation column
 - For decreasing the separation retention time
11. Which of the following test can be used to determine system error for experiment?
- Blank test
 - Student t test
 - Duplicate test
 - Standard reference material test
 - Q test
12. The commonly used detector for gas chromatographic analysis of halogen containing sample is
- Flame ionization detector
 - Flame photometric detector
 - Nitrogen-phosphor detector
 - Electron capture detector
 - Thermo conductance detector
13. Which of the following ionization methods used in mass spectrometer are commonly producing multiple charged particles?
- Electron impact
 - Electrospray
 - Thermospray
 - Field ionization
 - Matrix assistant laser desorption/ionization
14. A student used a gas chromatography column to analysis a compound, the separation results showed that this column has a minimum plate height of 3.0 mm, and he calculate the "B" and "C" term are 12 and 0.083, from Van Deemer equation, respectively. Please calculate the optimum speed, "H" at 5 times of optimum speed and "A" term from these given values.
- 12.0, 6.0, 1.0
 - 6.0, 12.0, 1.0
 - 20.0, 7.0, 1.5
 - 15.0, 6.2, 1.5
 - 12.0, 4.5, 1.2
15. Which of the following statements of activity coefficients (fugacity) are correct?
- Always will be unity for neutral compound
 - Always increase with increase of ionic strength of solution
 - Fugacity is for gases and will deviated from unit for non-ideal gases
 - Increase after the concentration of solution more than 1 M for most compound
 - Depends on compound, no rules

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16. Which of the following electrophoresis method can be used for analysis of neutral analytes?
- Free zone electrophoresis
 - Gel electrophoresis
 - Isotacho-electrophoresis
 - Micellar electro kinetic chromatography
 - Isoelectric focusing electrophoresis
17. A 0.7512 g sample that might contain NaOH, Na_2CO_3 , NaHCO_3 , or a mixture of NaOH + Na_2CO_3 or $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$ is titrated with 0.1025 M HCl standard solution by the two-indicator method. If it is found that 42.36 mL of the acid is required to reach the phenolphthalein end point and additional another 25.24 mL of acid solution is needed to titrated this sample to reach methyl orange end point. Please identify and calculate their percentages for each component contained in this sample.
- NaHCO_3 only, 48.55%
 - $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$, 48.55% + 24.76%
 - $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$, 2.4% + 28.9%
 - NaOH + Na_2CO_3 , 9.3% + 36.51%
 - NaOH + $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$, 9.3% + 28.9% + 61.8%