

國立中山大學 106 學年度碩士暨碩士專班招生考試試題

科目名稱：分析化學【海資系碩士班丙組】

題號：452004

※本科目依簡章規定「不可以」使用計算機(混合題)

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請注意：(a)若涉及計算，請將演算過程列出，否則不予計分

(b)選擇題請畫答案卡，否則不予計分

(c)問答題請寫在本試卷，否則不予計分

一、Multiple choice(單選選擇題)

1. Which one is the right order of High-performance liquid chromatography ? (A) Column→Pump→Injector→Detector (B) Pump→Injector→Column→Detector (C) Injector→Pump→Column→Detector (D) Injector→Column→Pump→Detector. (4%)
2. Which one is not correlated with the column efficiency in liquid chromatography? (A) Effects of particle size of packing (B) Sample size (C) Extra-column band broadening (D) Temperature. (4%)
3. If we are going to set up the temperature for the quality analysis of Methyl tertiary butyl ether (MTBE) in a gasoline sample using GC. The boiling point of MTBE is 120°C. What is the appropriate temperature for the sample injector system? (A) 50°C (B) 100°C (C) 120°C (D) 170°C (4%)
4. Electronic transitions among certain of the energy levels can be brought about by the absorption of radiation. Which energy is required to induce the transition is large than the other transitions? (A) $\sigma \rightarrow \sigma^*$ (B) $n \rightarrow \sigma^*$ (C) $\sigma \rightarrow \pi^*$ (D) $\pi \rightarrow \pi$. (4%)
5. Please list the order of wavenumber in infrared spectra (from large to small) (A) C-C > C≡C > C=C (B) C≡C > C=C > C-C (C) C=C > C-C > C≡C (D) C≡C > C-C > C=C. (4%)
6. Which one is NOT the auxochrome? (A) -OH (B) -SH (C) C=C (D) -Cl. (4%)
7. Which molecule could absorb the longest wavelength of radiation energy among these four chemical molecules? (A) CH₃CH₂CH=CHCH₃ (B) CH₂=CHCH₂CH₂CH=CH₂ (C) CH₂=CHCH₂CH₂CH₂CH=CH₂ (D) CH₂=CH-CH=CHCH₂CH₃ (4%)
8. Instruments for measuring the absorption of ultraviolet, visible, and near-infrared radiation are made up of some components. Please set the right order of the instrument components. (A) Filter→Cell→Detector→Source (B) Cell→Filter→Detector→Source (C) Source→Cell→Detector→Filter (D) Source→Filter→Cell→Detector. (4%)
9. Which one is the material of the cells or cuvettes for the ultraviolet/visible molecular absorption spectrometry? (A) Ceramic Rod (B) KBr (C) Plastic Rod (D) Quartz. (4%)
10. This mirror-image relationship of the excitation and emission spectra is very useful in determining the (A) Electronegative (B) Molecular weight (C) Purity (D) Chemical structure of a fluorescent substance. (4%)
11. What is the Wrong description about exclusion chromatography? (A) It is a powerful technique that is particularly applicable to different molecular size species (B) From this equation, $V_r = V_m + K_d V_s$, values of K_d range from zero to ten to achieve the purpose of isolation (C) For molecules too large to enter the gel pores, $K_d = 0$ (D) V_s is the total of a column packed with a porous polymer. (4%)
12. Which one is the most common used of carrier gas in gas chromatography? (A) CO₂ (B) CH₄ (C) O₂ (D) N₂. (4%)
13. What kind of characteristic of silica gel to make it be the stationary phase in adsorption chromatography? (A) The enriched amino groups in the surface (B) The enriched hydroxyl group in the surface (C) The enriched negative charge in the surface (D) The enriched positive charge in the surface. (4%)
14. One of the wavelengths of fluorescence is right. (A) It is shorter than ultraviolet (B) It is longer than infrared (C) It is near infrared (D) It includes ultraviolet, visible, and near-infrared. (4%)
15. Which one is belong to strong cationic exchanger? (A) Polyamine (B) Quaternary amine (C) Carboxylic acid (D) Sulfonic acid. (4%)
16. Suggest a type of chromatographic method that would be suitable for separate two kinds of amino acid in the milk. (A) Paper chromatography (B) Gas chromatography (C) High-pressure liquid

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chromatography (D) (B) and (C). (4%)

17. The following description is wrong about gradient elution? (A) The components of the mobile phase is changed in the chromatographic process (B) The components of the mobile phase is not changed in the chromatographic process (C) It can be used in the isolation of multiple components (D) The time for isolating multiple components is less than isocratic elution. (4%)
18. The dispersion that takes place in open tubular column, results from the parabolic velocity profile that occurs under conditions of (A) Multiple flow (B) Single flow (C) Longitudinal flow (D) Newtonian flow. (4%)

二、Questions and problems

1. Substance A and B were found to have retention times of 16.40 and 17.63 min, respectively, on a 30.0 cm column. An unretained species passed through the column in 1.30 min. the peak widths (at base) for A and B were 1.11 and 1.21 min, respectively. Calculate (A) the column resolution; (B) the average number of the plates in the column; (C) the plate height; (D) the length of column required to achieve a resolution of 1.5. (20%)
2. A solution containing the complex formed between Bi(III) and thiourea has a molar absorptivity of $9.32 \times 10^3 \text{ L mol}^{-1} \text{ cm}^{-1}$ at 470 nm. (4%)
(A) What is the absorbance of a $3.79 \times 10^{-5} \text{ M}$ solution of the complex at 470 nm in a 1.00-cm cell?
3. In a normal-phase column, a solute was found to have a retention time of 29.1 min, while an unretained species required 1.05 min for elution when the mobile phase was 50% methanol and 50% water. Calculate the capacity factor k' . (4%)