

國立中央大學八十五學年度碩士班研究生入學試題卷

所別: 化學研究所 不分組

科目: 分析化學

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10% 1. Why is it that in general the resolving power of the monochromator used in a flame atomic absorption spectrometer does not need to be as good as the one used in a ICP-atomic emission spectrometer?

6% 2. Which of following processes or properties that limits the sensitivity of the FAAS? Please choose and explain.

- sample introduction
- light intensity of the HCL
- detection efficiency of the PM tube
- poor resolution resulted from the monochromator

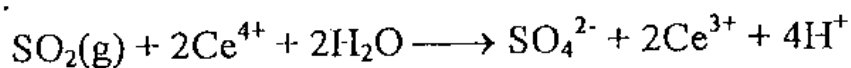
10% 3. A bullet was found in a victim's body at the crime scene, two days later a suspect was arrested with a suspected murder weapon, a handgun. If you were a forensic chemist, which of the following techniques would you choose to reasonably convince the judge that the bullet was actually fired from that gun. Please also give your reasons.

- GC-MS
- HPLC
- NAA
- X-Ray Fluorescence
- AAS or AES

10% 4. A cell consisting a saturated calomel electrode and a lead ion electrode developed a potential of -0.4706 V when immersed in 50.00mL of a sample. A 5.00mL addition of standard 0.02000 M lead solution caused the potential to shift to -0.4490 V. Calculate the molar concentration of lead in the sample.

10% 5. Air in the vicinity of a fire power plant was analyzed for its SO₂ content by drawing the air through 50.0mL of 0.01081 M Ce(SO₄)₂ at the rate of 3.20L/min.

Reaction:



Upon completion of a 75.00min sampling period, the excess Ce(IV) was titrated with 13.95 mL of 0.03764 M Fe(II). Please calculate the SO₂ concentration in the air.

- 10% 6. Please draw instrumental block diagrams and optical path for AAS, IR, and UV.
- 12% 7. Calculate the absolute standard deviation for the following y values:
 a) $y = -1.02(\pm 0.02) \times 10^7 - 3.54(\pm 0.2) \times 10^8$
 b) $y = 0.0010(\pm 0.0005) \times 18.10(\pm 0.02) \times 200(\pm 1)$
 c) $y = 100.2(\pm 0.08) - 99.62(\pm 0.06) + 0.200(\pm 0.004)$
- 10% 8. A solution containing a complex compound that has a molar absorptivity of $9.32 \times 10^3 \text{ L cm}^{-1} \text{ mol}^{-1}$ at 470 nm.
 a) What is the absorbance of a $6.24 \times 10^{-5} \text{ M}$ solution of the complex at 470 nm in a 1.00cm cell?
 b) What is the percent transmittance of the solution described in (a)?
 c) What is the molar concentration of the complex in a solution has the absorbance described in (a) when measured at 470 nm in a 5.00 cm cell?
- 10% 9. A gas chromatograph is equipped with two different detectors i.e., a electron capture detector and a flame ionization detector, which are connected in series in an attempt to measure halogenated and nonhalogenated hydrocarbons. Please choose a correct configuration between A and B, and also give your reasons.
- A.

GC	—	FID	—	ECD	—	RECORDER
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- B.

GC	—	ECD	—	FID	—	RECORDER
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- 12% 10. Please name and describe three different analytical techniques used to separate a mixture of chemical compounds based on their physical properties.