

淡江大學九十三年學年度碩士班招生考試試題

系別：化學學系

科目：分析化學

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本試題共 3 頁

1. a) As is Figure 1, please describe the detail about the three modes of solid phase microextraction (SPME) operation.
 b) Describe the applications of solid phase microextraction (SPME). (10%)

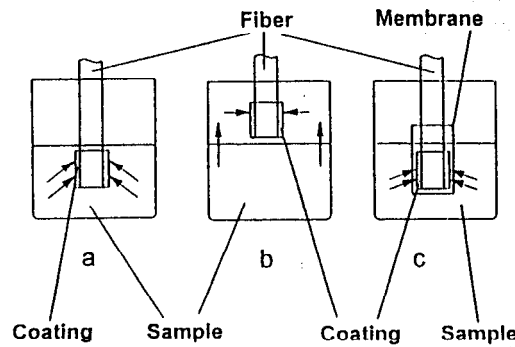
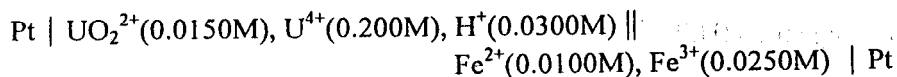
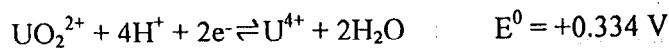


Figure 1 Modes of SPME operation: direct extraction (a), headspace extraction (b) and membrane-protected SPME (c)

2. Calculate the potential of the following cell and indicate whether it is galvanic or electrolytic.



The two half-reactions are



3. Calculate the molar absorptivity (ϵ_{max}) of KMnO_4 using the following data :

A KMnO_4 solution at $\lambda_{\text{max}}=522\text{nm}$ gave an absorbance=1.236 in A 10mm cell. The Mn concentration is 30mg/L (Relative atomic masses are

K=39.098, Mn=54.938, O=15.999).

(8%)

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4. Fig. 5.3c shows the UV spectra of azobenzene (Az, concentration $3.73 \times 10^{-3} \text{ g dm}^{-3}$) and phenanthrene (P, $3.23 \times 10^{-3} \text{ g dm}^{-3}$) both recorded in *iso*-octane on a standard UV/visible spectrophotometer. The wavelength drive on the instrument was 10 nm cm^{-1} and the absorbance range was 2 a.u.f.s. Measurements were made against *iso*-octane using 10 mm cells.

What wavelength would you choose:

- (i) To detect Az without detecting P;
- (ii) To detect P without detecting Az;
- (iii) To detect both of them;
- (iv) To detect Az at maximum sensitivity?

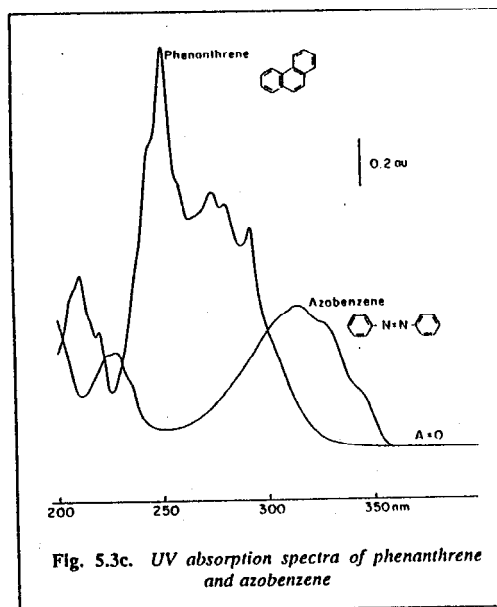


Fig. 5.3c. UV absorption spectra of phenanthrene and azobenzene

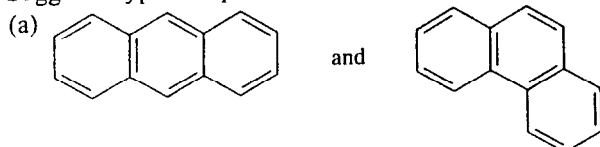
(10%)

5. How do gas-liquid and gas-solid chromatography differ? (10%)

6. Define the following terms (HPLC) :

- a) reversed-phase packing
- b) normal-phase packing (10%)
- c) extra-column broadening

7. Suggest a type of liquid chromatography that would be suitable for the separation of



- (b) $\text{CH}_3\text{CH}_2\text{OH}$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$,
- (c) Ba^{2+} and Sr^{2+} .
- (d) $\text{C}_4\text{H}_9\text{COOH}$ and $\text{C}_5\text{H}_{11}\text{COOH}$.
- (e) high-molecular-weight glucosides.

(10%)

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8. What is the principle of micellar electrokinetic capillary chromatography? How does it differ from capillary zone electrophoresis?
(10%)
9. How do the spectra for electron-impact, field ionization, and chemical ionization sources differ from one another (Molecular mass spectrometry)?
(10%)
10. The following data were collected by finding the absorbance (x_i) of replicate solutions of a colored complex of iron. Determine the mean and standard deviation for the five data.
(10%)

Solution	x_i
1	0.752
2	0.756
3	0.752
4	0.751
5	0.760

$$s = \sqrt{\frac{\sum_{i=1}^N x_i^2 - \frac{\left(\sum_{i=1}^N x_i\right)^2}{N}}{N-1}}$$