

淡江大學九十學年度碩士班招生考試試題

系別：化學學系

科目：分析化學

准帶項目請打「○」否則打「×」	
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本試題共 2 頁

本試題雙面印製

- Define (a) Chemical oxygen demand (COD), (b) Biochemical oxygen demand (BOD). (6%)
- A 0.8040 g sample of an iron ore is dissolved in acid. The iron is then reduced to Fe^{2+} and titrated with 47.22 mL of 0.02242 M KMnO_4 solution. Calculate the results of this analysis in terms of (a) % Fe (55.847g/mol) and (b) % Fe_3O_4 (231.54g/mol). The reaction of the analyte with the reagent is described by the reaction

$$\text{MnO}_4^- + \text{Fe}^{2+} + \text{H}^+ \rightarrow \text{Mn}^{2+} + \text{Fe}^{3+} + \text{H}_2\text{O} \quad (12\%)$$
- Calculate the theoretical potential for the following cell and indicate whether it is galvanic or electrolytic.

$$\text{Ag} \mid \text{AgCl}(\text{sat'd}), \text{HCl}(0.0200\text{M}) \mid \text{H}_2(0.800 \text{ atm}), \text{Pt}$$

The two half-reactions are

$$\begin{array}{l} 2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g}) \quad E_{\text{H}^+}^{\circ} = 0.000 \text{ V} \\ \text{AgCl}(\text{s}) + \text{e}^- \rightleftharpoons \text{Ag}(\text{s}) + \text{Cl}^- \quad E_{\text{AgCl}}^{\circ} = 0.222 \text{ V} \end{array} \quad (12\%)$$
- Calculate the absorptives 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). (15%)
 - Molar Absorptivity, ϵ_{max}
 - Absorptivity, $E_{1\%}^{1\text{cm}}$ (which is the absorptivity representing the absorbance of a 1% solution in a 1 cm path length cell).
- Which of the following three techniques does not require a light sources.
 - atomic absorption spectroscopy (AAS) (6%)
 - atomic emission spectroscopy (AES)
 - atomic fluorescence spectroscopy (AFS)
- Define "A microwave-induced helium plasma". (6%)
- What is the principle of separation by capillary eletrophoresis (CE)? (6%)

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8. What is a bonded phase in liquid chromatography? (6%)

9. What is the advantage of temperature programming in gas chromatography? (6%)

10. What is the difference between a concentration-sensitive and a mass-sensitive detector (for gas chromatography)? Indicate which type of device the following detectors are:
 (a) thermal conductivity, (b) photoionization, (c) atomic emission,
 (d) flame ionization, (e) flame photometry. (10%)

11. Fig. 1 shows the structure of some conjugated oestrogens. The task is to separate these from one another, and from excipients, in a commercial tablet. Look at the structure and see if you can suggest:
 (a) What sort of common packing is needed for the separation (HPLC method);
 (b) What sort of mobile phase should be used (HPLC method);
 (c) Whether or not the compounds would be soluble in the mobile phase;
 (d) Which detector would be the most suitable. (15%)

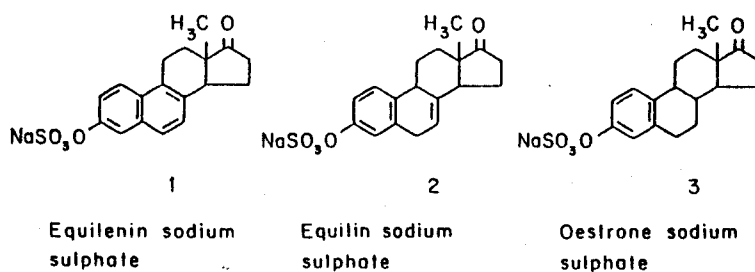


Fig. 1. Structure of conjugated oestrogens