淡江大學八十七學年度碩士班入學考試試題

系别: 化學系

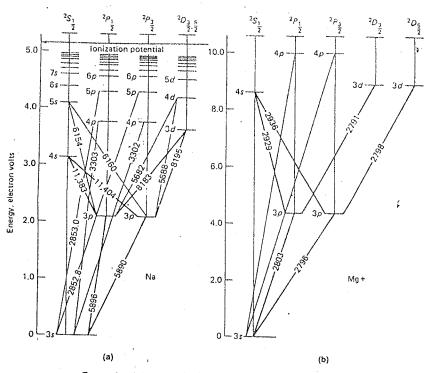
科目: 分析化學

本試題共 2 頁

※不得在本試題紙上作答,否則不予計分※

1. The infrared spectrum of CO shows a vibrational absorption peak at 2170cm⁻¹. What is the force constant for the CO bond? (10%)

2. For Na and Mg⁺, compare the ratios of the number of particles in the 3p excited state to the number in the ground state in a natural gas/air flame (2100K). (10%)



Energy level diagrams for (a) atomic sodium and (b) magnesium(l) ion.

3. Define: (a) Electrospray Ionization (ESI) (b) Matrix assisted laser desorption (MALD) (10%)

4. For a normal-phase separation, predict the order of elution of the following compounds: n-hexane, n-hexanol, benzene. (10%)

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- 5. How can spin-spin splitting lines be differentiated from chemical shift lines? (10%)
- 6. Which of the following would be expected to absorb light of the longest and shortest wavelength? Why? Consider only the $\pi \rightarrow \pi^*$ transition. (10%)

- 7. What would be the effect of the following on the plate height of a column? Explain. (20%)
- (a) Decreasing the rate of sample injection.
- (b) Increasing the injection port temperature.
- (c) Increasing the flow rate.
- (d) Reducing the particle size of the packing.
- (e) Decreasing the column temperature.
- 8. A silver electrode immersed in 1.00 x $10^{\text{--}2}\,M\ \mathrm{Na_2SeO_3}$ saturated with Ag₂SeO₃ acts as a cathode when coupled with a standard hydrogen electrode. Calculate K_{sp} for Ag₂SeO₃ if this cell develops a potential of 0.450 V.

Standard Electrode Potentials*

Reaction	E° at 25°C
$Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-$	+1.359
$O_2(g) + 4H^+ + 4e^- \rightleftharpoons 2H_2O$	+1.229
$Br_2(aq) + 2e^- \rightleftharpoons 2Br^-$	+.1.087
$Br_2(1) + 2e^- \Rightarrow 2Br^-$	+1.065
$Ag^+ + e^- \rightleftharpoons Ag(s)$	+0.799
$Fe^{3+} + e^{-} \rightleftharpoons Fe^{2+}$	+0.771
$I_3^- + 2e^- \rightleftharpoons 3I^-$	+0.536
$Hg_2Cl_2(s) + 2e^- \rightleftharpoons 2Hg(l) + 2Cl^-$	+0.268
$AgCl(s) + e^- \rightleftharpoons Ag(s) + Cl^-$	+0.222
$Ag(S_2O_3)_2^{3-} + e^- \rightleftharpoons Ag(s) + 2S_2O_3^{2-}$	+0.010
$2H^+ + 2e^- \rightleftharpoons H_2(g)$	0.000
$AgI(s) + e^- \rightleftharpoons Ag(s) + I^-$	-0.151

9. Calculate the PH of a solution that is 0.200 M in NH3 and 0.300 M in NH₄Cl. The acid dissociation constant K_a for NH₄⁺ is 5.70 x 10^{-10} .