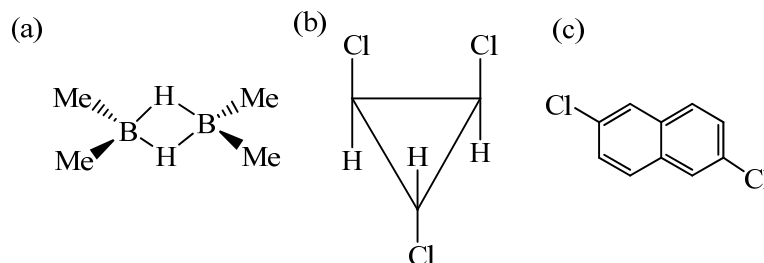無機與分析化學（無機部份）

1. Construct the molecular orbital of CO and explain how it bonds to metal. (10%)

2. Draw the Crystal Field splitting for an octahedral complex by considering (a) the σ bonding only (b) effects of π bonding. (6%)

3. Determine the point group of the following molecules. (9%)

4. Write down the electronic configuration and bond order of (a) Be_2 (b) C_2. (6 %)

5. Calculate the spin-only magnetic moment for the following ions (a) Fe^{2+} (b) Cu^{2+}. (6%)

6. Alkynes react with metals to form metal alkynes complexes where the alkyne binds to metal in 2e-donor type or in 4e- donor type. Please draw the bonding model and compare their relative bond lengths. (6%)

7. A conjugate base mechanism is proposed for the following reaction

$[Co(NH_3)_5X]^{2+}$ + OH^- → $[Co(NH_3)_5(OH)]^{2+}$ + X^-
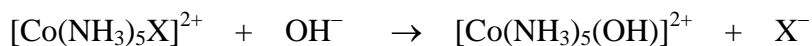
How can this mechanism be verified? (7%)

無機與分析化學 (分析部分)

1. A 0.2 mol of the weak acid HA ($Ka = 1.0 \times 10^{-4}$) was mixed with 0.08 mol of its conjugate base

   Na^+A^- in 1.00 L to prepare for a buffer. Find the pH of the buffer. (10%)

2. Explain why the following cell does not work, and how to improve to make it work. The solution

   contains $Cd(NO_3)_2$ and $AgNO_3$. (10%)

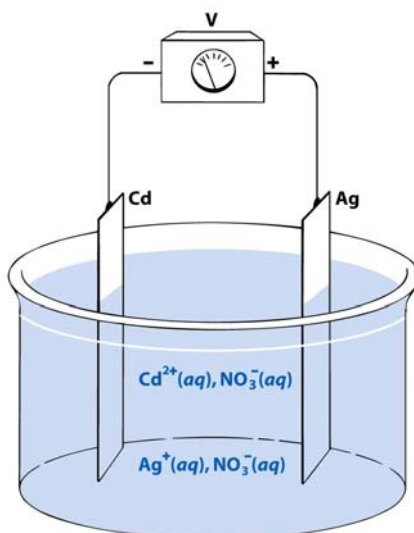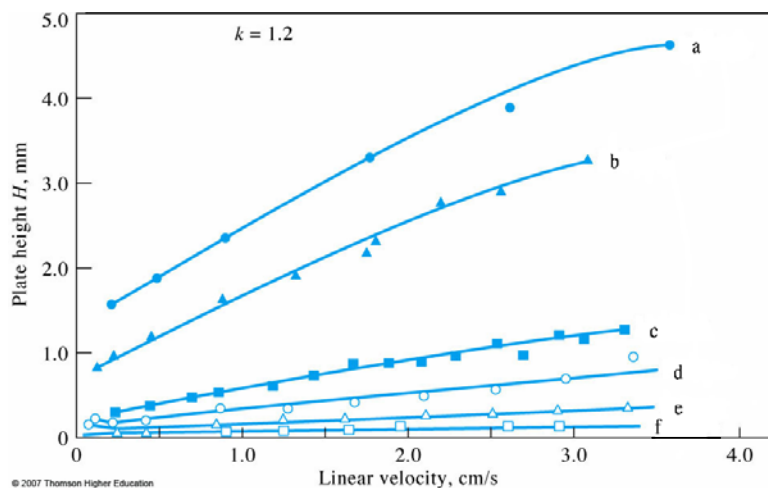

Figure 14-5
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3. The following figure shows the effect of particle size of packing and flow rate on plate height H for

   HPLC separation. Match particle sizes of 6.1, 8.8, 13.2, 22.6, 34.9 and 44.7 μ m with a, b, c, d, e and f

   lines. (12%)
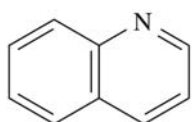
4. The following figure shows chromatography separation at three resolution values: R_s = 1.5, 1.0 and 0.75. Match profiles (a), (b) and (c) with an appropriate R_s value. (6%)
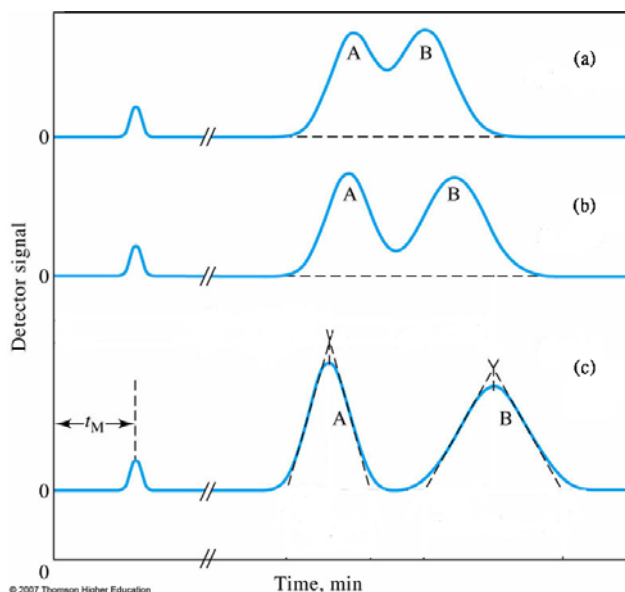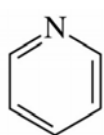
5. Which of the following compounds exhibits fluorescence? Which does not? (8%)
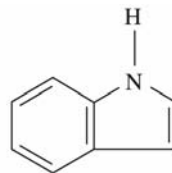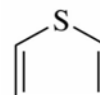
(a)   (b)   (c)   (d)

6. The maximum wavelength of absorbance for compound (a) is 184 nm. Match maximum wavelengths 250 and 217 nm with compounds (b) and (c). (4%)

$CH_3CH_2CH_2CH{=}CH_2$ (a)

$H_2C{=}CHCH{=}CH_2$ (b)

$H_2C{=}CHCH{=}CHCH{=}CH_2$ (c)