銘傳大學八十七學年度管理科學研究所碩士班招生考試

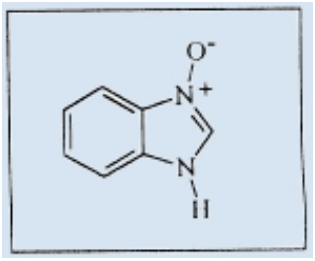
（甲組）第一節

普通化學 試題

10 points for each question

1. The ^{235}U isotope is separated from ^{238}U by a diffusion process for gaseous UF_6 molecule. Calculate the enrichment factor of ^{235}U at each diffusion barrier.
2. A sample of gas changes from P_1, V_1, and T_1 to P_2, V_2, and T_2 by one path and then back to P_1, V_1 and T_1 by another path. Which of the following must be zero for the gas in this cycle? ΔE, ΔH, ΔS, ΔG, q, and w. Give the definition of these terms.
3. If concentrations are measured in moles per liter and time in seconds, what are the units of rate constant for the following? a) a first-order reaction b) a second-order reaction c) a third-order reaction.
4. Complete and balance the following reaction：
   a） $Cr_2O_7^{2-} + C_2H_4O \rightarrow C_2H_4O_2 + Cr^{3+}$ for acidic aqueous solution
   b） $ClO^- + Fe(OH)_{3(s)} \rightarrow Cl^- + FeO_4^{2-}$ for basic aqueous solution

5. If H_2S is bubbled into a solution that is 0.1M in Zn^{2+}, 0.1M in Fe^{2+} and has a final H_3O+ ion concentration of 0.3M, will the Zn^{2+} and Fe^{2+} be quantitatively separated？
6. Use screening effect and orbitals to explain why heliun has a higher ionization energy than hydrogen while lithium has a lower value.
7. Using the molecular orbital theory predict the structure of H3+ ion(linear or cyclic). Give your proposed energy level diagram.
8. Predict the structure of the following species: a) XeF_2 b) SO_2 c) $[Ni(CN)_4]^{2-}$
9. Predict the product of the following reaction：
   a) $CH_3COCH_3 \xrightarrow{LiAlH_4}$
   b) $CH_3CH=CH_2 + H_2O \xrightarrow{H_2SO_4}$
   c) $(CH_3)_2C=C(CH_3)_2 \xrightarrow[cold]{KMnO_4}$
10. Draw the resonance structures（including formal charge） for the benzimidazol-N-oxide molecule.



* atomic weight of F＝19

* ZnS $K_{sp} = 2x10^{-25}$ * H_2S $K_{a1} = 9.5x10^{-8}$

FeS $K_{sp} = 6x10^{-19}$ $K_{a2} = 1.0x10^{-19}$

試題完