

東吳大學 105 學年度碩士班研究生招生考試試題

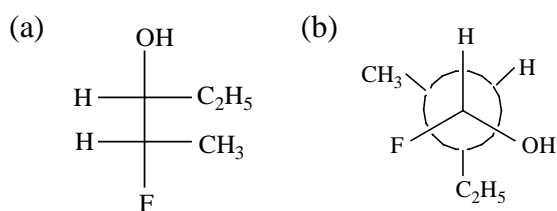
第 1 頁，共 2 頁

系級	化學系碩士班	考試時間	100 分鐘
科目	綜合化學	本科總分	100 分

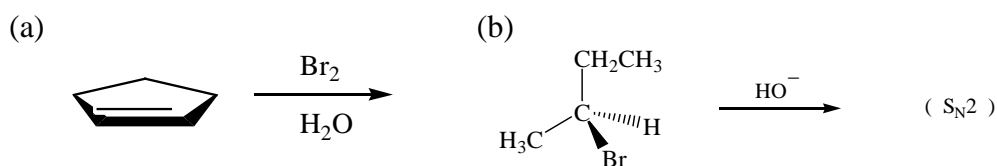
1. Give the structure for each of the following compounds (6 分)

- (a) *sec*-butylchloride (b) isopropylalcohol
 (c) *cis*-1-ethyl-3-methylcyclohexane

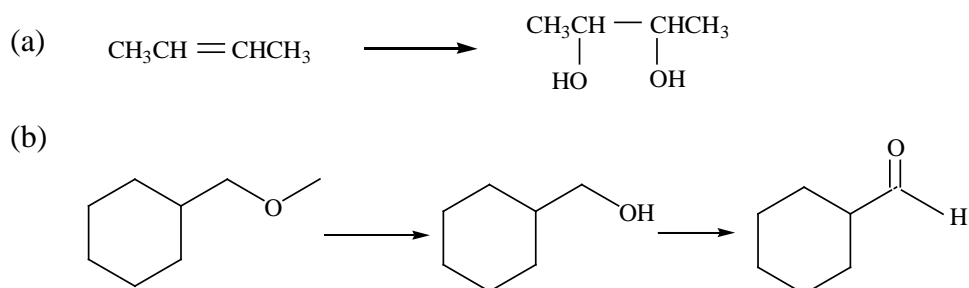
2. Label each chiral carbon as (R) or (S). (4 分)



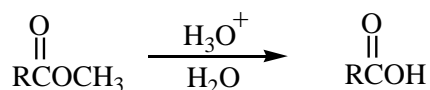
3. Give the products for each of the following reactions. (4 分)



4. Provide necessary reagents for each of the following conversions: (6 分)



5. Give the mechanism for the following reaction: (5 分)



6. Calculate the $[\text{H}_3\text{O}^+]$ of a solution that is 0.4 M in HA and 1.0 M in NaA: (10 分)

K_a of HA is 1.6×10^{-4}

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第 2 頁，共 2 頁

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7. Describe the theory and application of mass spectrometry (7 分)

8. Describe the theory and application of UV/Vis spectrometry (8 分)

9. Which of the following is not a state function? (A) Enthalpy (B) Entropy (C) Work (D) Free energy (E) Helmholtz energy (5 分)

10. What is the ratio of $C_{p,m}/C_{v,m}$ for an ideal monatomic gas? (5 分)

11. Please give adequate formula for the following terms: (A) Heisenberg uncertainty principle (海森堡測不準原理) (B) Ideal Gas Equation (理想氣體方程式) (10 分)

12. The enthalpy of reaction of $2 \text{NO}_{2(g)} = \text{N}_2\text{O}_{4(g)}$ is about -55 kJ at 298 K. If the system is at equilibrium at 298 K and the temperature is raised, which component will increase in concentration? (5 分)

13. For each of the following molecules, predict the point groups of the molecules, and the molecular geometry by VSEPR, and the hybrid orbitals of central atom, (a) BF_3 (b) OH_2 (c) SF_6 (d) PF_5 (e) CO_2 (15 分)

14. Under constant-volume condition, the heat of combustion of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is 15.57 kJ/g. A 3.500 g sample of glucose is burned in a bomb calorimeter. The temperature of the calorimeter increased from 20.94 °C to 24.72 °C. What is the total heat capacity of the calorimeter? (5 分)

15. Draw the possible Lewis structures of NCO^- ion. (5 分)