

大同大學 九十一 學年度研究所碩士在職專班入學考試試題

考試科目：基礎化學

所別：化學工程研究所

第 1/2 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 可以使用計算器。

I. General Chemistry : 50%

- 1.1 填入適當數字：(a) 1 liter = _____ dm³ = _____ cm³ = _____ m³
 (b) 1 μm = _____ cm = _____ nm = _____ km (5%)

1.2 試問攝氏溫度與華氏溫度在那一溫度下，兩者的溫度計上顯示的數字是一樣的？ (5%)

1.3 一玻璃瓶中裝有一氦氣He，在25°C、1.960 atm下，把其中部分氦氣抽出，調整壓力至1 atm、25°C下，量得此抽出氣體之體積為1.75 cm³。原玻璃瓶中氦氣壓力則變成1.710 atm (25°C)，試計算此玻璃瓶之體積為多少 ml？ (He: 4 g/mol) (10%)

1.4 預測下列各分子之分子構造為何幾何形狀？ (10%)

- (a) XeCl₄ (b) ICl₃ (c) TeF₄ (d) PCl₅ (e) NH₃

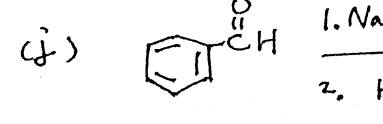
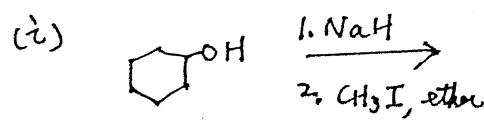
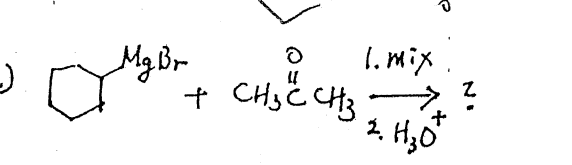
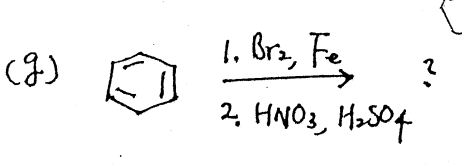
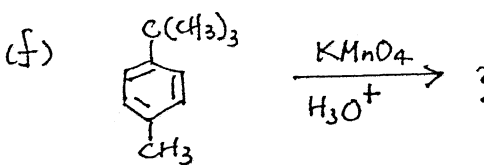
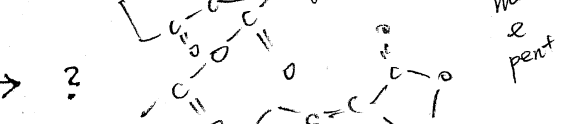
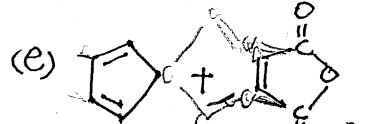
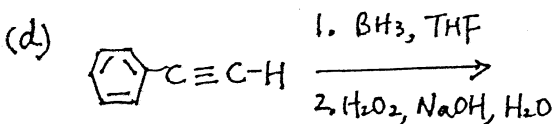
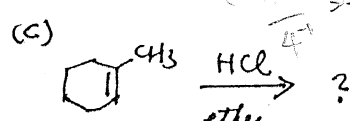
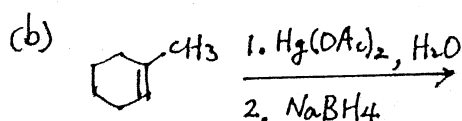
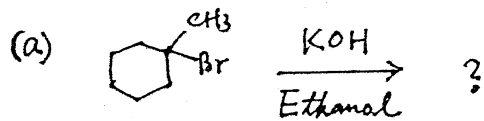
1.5 一反應 $aA \xrightarrow{k} P$ 為 n 階反應，其反應速率方程式為 $-R_a = -dC_A/dt = kC_A^n$ 。若將 A 的起始濃度增為原來的 2 倍，結果反應的半生期 (half-life) 變成原來的四分之一，試計算 n 值為何？ (10%)

1.6 The activation energy for the reaction $NO_{2(g)} + CO_{(g)} \longrightarrow NO_{(g)} + CO_{2(g)}$ is 125 kJ/mol and The heat of the reaction is - 216 kJ/mol. What is the activation energy for the reaction: $NO_{(g)} + CO_{2(g)} \longrightarrow NO_{2(g)} + CO_{(g)}$? (10%)

II. Organic Chemistry and Instrumental Analysis: 50%

2.1 (a) Draw all isomers of C₄H₉Br, name them (give IUPAC name). (4%) (b) Which one is chiral? (2%) (c) Arrange them in order of decreasing reactivity in the S_N2 reaction. (4%)

2.2 Predict the major product(s) for each of the following reactions. (20%)



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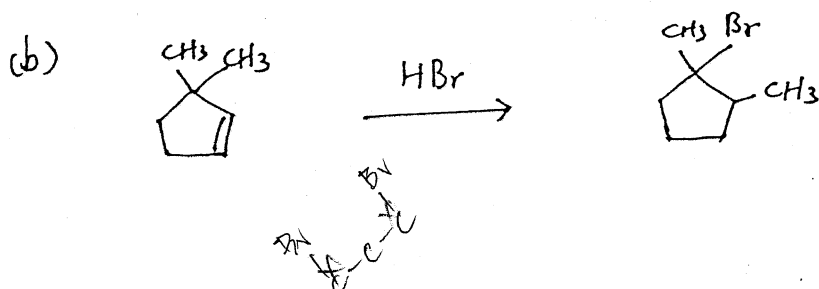
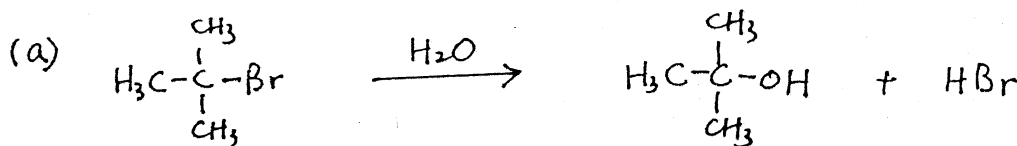
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第 2/2 頁

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2.3 Write the complete stepwise mechanism for the following reactions. Be sure to show all intermediate structures and all electron flow using curved arrows. (10%)



2.4 (a) When 2-bromopropane reacts with ethoxide ion (OCH_2CH_3), ~~two products~~ are formed; one is the product of $\text{S}_{\text{N}}2$ substitution and the other is the product of $\text{E}2$ elimination. Write the structures of both products, and tell how they could be distinguished using IR spectroscopy. (6%)

(b) Propose a structure for a compound with the following ^1H NMR spectrum. (4%)

