

(107) 輔仁大學轉學生招生考試試題

考試日期：107 年 7 月 9 日 第二節

本試題共：1 頁 (本頁為第 1 頁)

科目：普通化學

系所組：化學系

年級：二

- 1) Set energy as the y-axis, atomic number as the x axis. Draw the plot to show the trend of ionization energy for the second period of elements. (20 pts)
- 2) Determine the electron configurations of (a) Ti (b) Cr (c) Cu (d) Mg. (20 pts)
- 3) Draw the structure that shows bonded atoms and lone pairs of AlCl_3 and also identify the hybridization of the central atoms. (20 pts)
- 4) 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? $\Delta T, \Delta P, \Delta V, q, w, \Delta E$. (20 pts)
- 5) For the reaction: $2 \text{N}_2\text{O}_5 \rightarrow 4 \text{NO}_2 + \text{O}_2$, its rate law is: $\frac{d[\text{O}_2]}{dt} = k[\text{N}_2\text{O}_5]$
the elementary processes are:
$$\text{N}_2\text{O}_5 \xrightleftharpoons[k_{-1}]{k_1} \text{NO}_2 + \text{NO}_3$$
$$\text{NO}_2 + \text{NO}_3 \xrightarrow{k_2} \text{NO} + \text{NO}_2 + \text{O}_2$$
$$\text{NO}_3 + \text{NO} \xrightarrow{k_3} 2 \text{NO}_2$$

Calculate the rate constant k in terms of k_1, k_{-1}, k_2 and k_3 by using steady state approximation. (20 pts)

※ 注意：1. 考生須在「彌封答案卷」上作答。

2. 本試題紙空白部分可當稿紙使用。

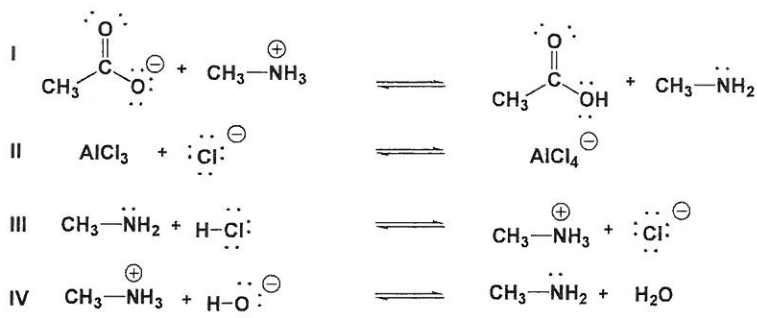
3. 考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。

科目：有機化學

系所組：化學系

年級：三

1. Which are acid-base reactions according to Brønsted-Lowry theory? (5 pts)



(a) I, III (b) I, II, IV (c) I, II, III (d) I, III, IV (e) I, II

2. Which compounds are Lewis bases? (5 pts)

(I) (II) (III) (IV)

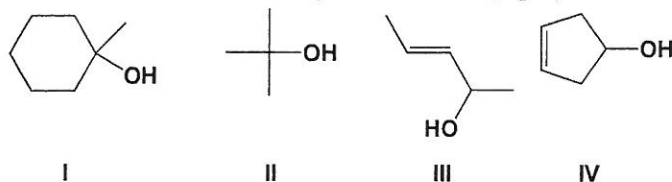


(a) I, II (b) I, III (c) III, IV (d) II, III (e) I, IV

3. Stereoisomers that are not mirror images are called: (5 pts)

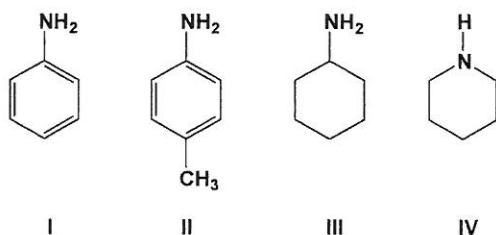
(a) enantiomers (b) diastereomers (c) meso compounds (d) stereogenic (e) symmetrical

4. Which molecules are secondary alcohols? (5 pts)



(a) I, III (b) III, IV (c) II, III (d) I, IV

5. Arrange the amines in order of increasing basicity (from weakest to strongest base). (5 pts)



(a) I, II, III, IV (b) II, I, III, IV (c) IV, II, III, I (d) II, I, IV, III

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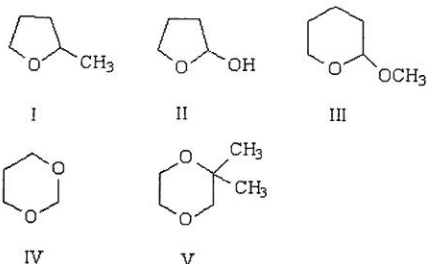
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科目：有機化學

系所組：化學系

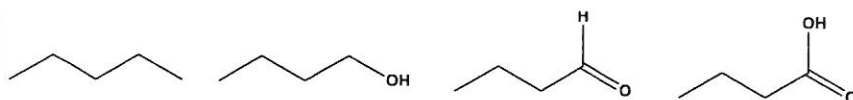
年級：三

6. Which compounds are acetals? (5 pts)

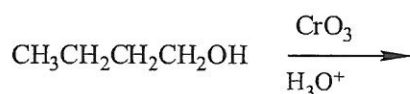
(a) I, II (b) II, III (c) III, IV (d) IV, V

7. Which compound has the highest boiling point? (5 pts)

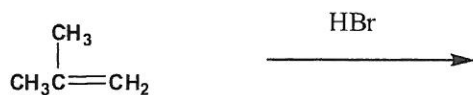
(a) (b) (c) (d)

8. Which compound is the *best* nucleophile in a S_N2 reaction? (5 pts)(a) CH_3CO_2^- (b) OH^- (c) H_2O (d) CH_3OH 9. Predict the major products of the following reaction. (50 pts.)

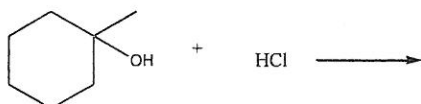
(a)



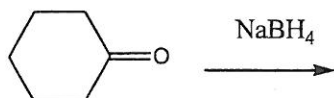
(b)



(c)



(d)



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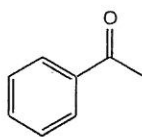
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科目：有機化學

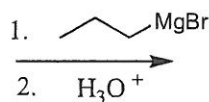
系所組：化學系

年級：三

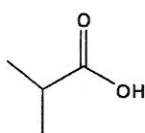
(e)



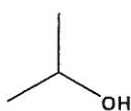
(f)



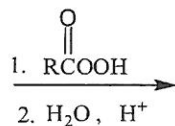
(g)



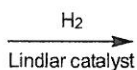
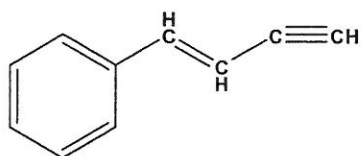
+

 $\xrightarrow{\text{H}_2\text{SO}_4}$

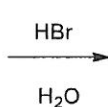
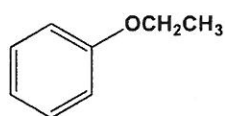
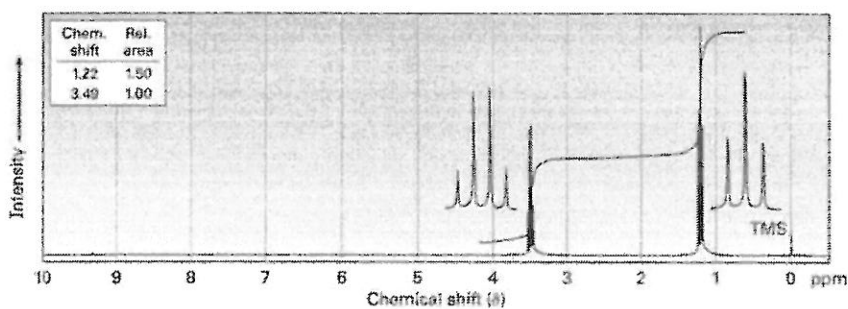
(h)



(I)



(J)

10. Propose a structure for the following compounds whose ^1H NMR spectra is shown. (10 pts.) $\text{C}_4\text{H}_{10}\text{O}$ 

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考試日期：107 年 7 月 9 日 第 三 節

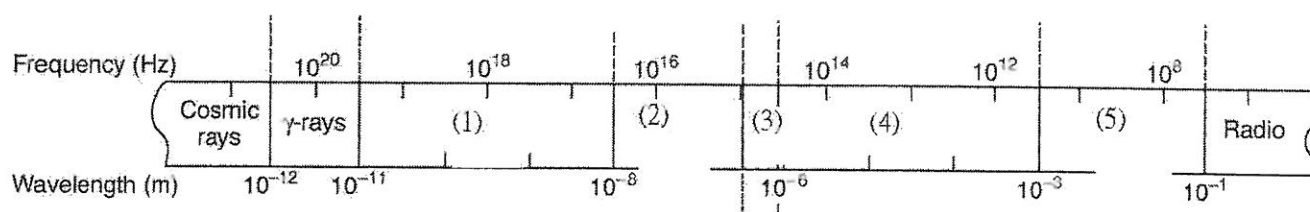
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科目：分析化學

系所組：化學系

年級： 三

1. Define (a) molarity(3pt) (b) molality(3pt) (c) parts per million (2pt) (d) parts per billion (2pt)
2. Describe the preparation of 750 mL of 6.00 M H_3PO_4 from the commercial reagent that is 86% H_3PO_4 (w/w) and has a specific gravity of 1.71. (H_3PO_4 , 98.0 g/mol) (10pt)
3. Calculate the ionic strength of a solution that is
(a) 0.01 M in KNO_3 .
(b) 0.05 M in KNO_3 and 0.1 M in Na_2SO_4 .(10pt)
4. Write the charge-balance equations for an aqueous solution that contains NaCl , $\text{Ba}(\text{ClO}_4)_2$, and $\text{Al}_2(\text{SO}_4)_3$. (10pt)
5. Can Fe^{3+} and Mg^{2+} be separated quantitatively as hydroxides from a solution that is 0.10 M in each cation? If the separation is possible, what range of OH^- concentrations is permissible? (10pt) ($\text{Fe}(\text{OH})_3 : K_{\text{sp}} = 2.0 \times 10^{-39}$, $\text{Mg}(\text{OH})_2 : K_{\text{sp}} = 7.1 \times 10^{-12}$)
6. What is the pH of a solution that is 2.00×10^{-8} M in NaOH ? (Hint: In such a dilute solution you must take into account the contribution of H_2O to the hydroxide ion concentration.) (10 pt)
7. EDTA 是甚麼 ? (英文全名 + 化學式 + 用途) (10 pt)
8. Draw the electrolytic cell for $\text{Cu} | \text{Cu}^{2+}(0.0200 \text{ M}) || \text{Ag}^+(0.0200 \text{ M}) | \text{Ag}$ (10 pt)
9. 請填入下列(1)~(5)適當的光源名稱及分子吸光後產生的反應或能階變化(20 pt)



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