

# 淡江大學 104 學年度日間部轉學生招生考試試題

系別：化學學系二年級

科目：普通化學

考試日期：7月25日(星期六) 第3節

本試題共 3 大題， 2 頁

第一部份：選擇題 (單選，每題4分，共20分)

1. Which of the following has the greatest bond strength?

- (A)  $B_2$  (B)  $O_2^-$  (C)  $CN^-$  (D)  $O_2^+$  (E)  $NO^-$

2. Which of the following is the correct order of boiling points for  $C_2H_6$ ,  $CH_3OH$ ,  $KNO_3$ , and Ne?

- (A)  $Ne < C_2H_6 < KNO_3 < CH_3OH$   
(B)  $C_2H_6 < Ne < CH_3OH < KNO_3$   
(C)  $KNO_3 < CH_3OH < C_2H_6 < Ne$   
(D)  $Ne < C_2H_6 < CH_3OH < KNO_3$   
(E)  $Ne < CH_3OH < C_2H_6 < KNO_3$

Use the following to answer questions 3 & 4:

Given the reaction  $2A(g) \rightleftharpoons 2B(g) + C(g)$ , the equilibrium constant  $K = 100.0$  at  $T_1 (> 0^\circ C)$ .

3. If you mixed 10.0 mol A, 10.0 mol B, and 5.0 mol C in a one-liter container at  $T_1$ , which direction would the reaction initially proceed?

- (A) To the right.  
(B) To the left.  
(C) The above mixture is the equilibrium mixture.  
(D) Cannot tell from the information given.  
(E) None of these (A-D).

4. At  $T_2 (> T_1)$ ,  $K = 1.0$ . Placing the equilibrium mixture in an ice bath will

- (A) cause  $[A]$  to increase  
(B) cause  $[B]$  to increase  
(C) have no effect  
(D) cannot be determined  
(E) none of the above

5. If a compound has several individual dipoles, then:

- I: It is ionic.  
II: It is polar overall.  
III: It is a planar molecule.  
IV: It doesn't have resonance.  
V: There is an electronegativity difference between the bonded atoms.

- (A) I only (B) II only (C) V only (D) II, V (E) All of the above statements are correct.

本試題雙面印刷

背面尚有試題

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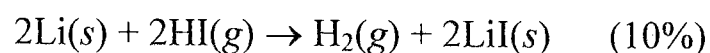
第二部份：填充題 (每個空格4分，共20分)

1. Which of the following elements show a partially filled  $d$  orbital in the electron configuration with the lowest energy? Ti, Cr, Ni, Cu, Zn, Ga \_\_\_\_\_
2. How many electrons can be contained in all of the orbitals with  $n = 4$ ? \_\_\_\_\_
3. Write down the formula for the fluoride of an element whose electron configuration is  $[\text{Kr}] 5s^2 4d^{10} 5p^2$ . \_\_\_\_\_
4. Which of the following molecules have a trigonal bipyramidal electron pair arrangement?  $\text{Br}_2$ ,  $\text{BF}_3$ ,  $\text{CHBr}_3$ ,  $\text{CO}$ ,  $\text{SF}_4$ ,  $\text{XeCl}_2$  \_\_\_\_\_
5. The quantitative relation between the  $K_a$  of a weak acid, the  $K_b$  of its conjugate base, and the water autoionization constant  $K_w$ . \_\_\_\_\_

第三部份：計算問答題 (共60分)

1. Describe and explain how to use a titration method to determine the analytical concentration  $C_{\text{HA}}$  and the  $\text{p}K_a$  value of a weak acid HA. Define all the quantities used in your answer. (20%)
2. The following questions are related to a Zn-Cu Galvanic cell. (15%)
  - (a) Draw the setup and indicate the cathode and anode, the positive and negative electrodes, and all the components in the cell.
  - (b) Explain where and how the liquid junction potential occurs in the cell.
3. For the reaction:  $\text{CaCO}_3(s) \rightleftharpoons \text{CaO}(s) + \text{CO}_2(g)$   $K_p = 1.00$  at  $727^\circ\text{C}$ .  
If a 48.8-gram sample of  $\text{CaCO}_3$  (100.0 g/mol) is put into a 10.0-L container and heated to  $727^\circ\text{C}$ , what percent of the  $\text{CaCO}_3$  will react to reach equilibrium? (15%)

4. According to the provided information in the right table, calculate  $\Delta H$  for:



Reaction	$\Delta H(\text{kJ/mol})$
(1) $\text{Li}(s) \rightarrow \text{Li}(g)$	166
(2) $\text{HI}(g) \rightarrow \text{H}(g) + \text{I}(g)$	295
(3) $\text{Li}(g) \rightarrow \text{Li}^+(g) + e^-$	520
(4) $\text{I}(g) + e^- \rightarrow \text{I}^-(g)$	-295
(5) $\text{Li}^+(g) + \text{I}^-(g) \rightarrow \text{LiI}(s)$	-737
(6) $\text{H}_2(g) \rightarrow 2\text{H}(g)$	432