淡江大學 105 學年度日間部寒假轉學生招生考試試題

8-1

系別：化學系化學與生物化學組二年級　科目：普通化學

考試日期：12 月 3 日(星期六) 第 3 節　本試題共 2 大題， 3 頁

本試題雙面印刷

**********請按題序作答並標示清楚答案之題號**********

第一部份：選擇題 （單選，每題 3 分，30 分）

1. The energy of the light emitted when a hydrogen electron goes from n = 2 to n = 1 is what fraction of its ground-state ionization energy?
   (A) 1/9 (B) 1/8 (C) 1/4 (D) 1/2 (E) 3/4

2. The small, but important, energy differences between 3*s*, 3*p*, and 3*d* orbitals are due mainly to
   (A) the number of electrons they can hold
   (B) their principal quantum number
   (C) the Heisenberg uncertainty principle
   (D) the penetration effect
   (E) Hund's rule

3. For which of the following elements does the electron configuration for the lowest energy state show half-filled *d* and *s* orbitals?
   (A) Cr (B) Mn (C) Cu (D) Ga (E) none of the above

4. Which of the following bonds would be the most polar without being considered ionic?
   (A) C-O (B) Mg-O (C) N-O (D) O-O (E) Si-O

5. The molecular structure of $SOCl_2$ is
   (A) pyramidal (B) bent (C) octahedral (D) trigonal planar (E) tetrahedral

6. Consider the benzene molecule. Which of the following statements about the molecule is false?
   (A) Each carbon atom is sp^2 hybridized.
   (B) The pi bonds of carbon involve sp^2 orbitals.
   (C) It has delocalized pi bonding in the molecule.
   (D) All six C–C bonds are known to be equivalent.
   (E) The localized electron model must invoke resonance to account for the six equal C–C bonds.

7. The rate of effusion of an unknown gas was measured and found to be 13.4 mL/min. Under identical conditions, the rate of effusion of pure oxygen (O_2) gas is 15.7 mL/min. Based on this information, the identity of the unknown gas could be:
   (A) CO_2 (B) CO (C) C_2H_6 (D) N_2 (E) none of these

背面尚有試題

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8. Which one of the following decreases as the strength of the attractive intermolecular forces increases?
   (A) The heat of vaporization
   (B) The normal boiling temperature
   (C) The extent of deviations from the ideal gas law
   (D) The sublimation temperature of a solid
   (E) The vapor pressure of a liquid

9. A certain solid substance that is very hard, has a high melting point, and is nonconducting unless melted is most likely to be:
   (A) Graphite (B) NaCl (C) Fe (D) Diamond (E) Cu

10. How many of the following statements about enzymes is (are) incorrect?
   I. They are proteins that catalyze specific biologic reactions.
   II. The molecules they react with are called substrates.
   III. They are equal to inorganic catalysts in efficiency.
   IV. The enzyme reaction usually involves 4 steps: adsorption and activation, migration, reaction, and desorption.
   V. The active site is usually on the surface of the enzyme.
   (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

第二部份：計算問答題（共 70 分）

1. Describe how to measure the standard electrode potential of an $Ag/Ag(S_2O_3)_2^{3-}$ electrode. (10%)

2. Describe the physical meanings of the following quantum numbers. (10%)
   (a) Magnetic quantum number
   (b) Angular momentum quantum number

3. Design a titration method to estimate the acid dissociation constant K_a for a weak acid HA. Include the principle and procedure in your answer. (10%)

4. Draw the Lewis structures for the following molecules and calculate the formal charges of the atoms in the molecule. (10%)
   (a) NO^+
   (b) SO_4^{2-}

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5. Write the Arrhenius equation of chemical kinetics and define all the terms in the equation. (10%)

6. Consider the following reaction:

$$A_2 + B_2 \rightarrow 2AB \qquad \Delta H = -415 \text{ kJ}$$

The bond energy for A_2 is half the amount of AB. The bond energy of B_2 = 419 kJ/mol. Calculate the bond energy of A_2. (10%)

7. Write the types of chemical bonding formed in the polymerization reaction for the following biopolymers. (10%)
   (a) DNA
   (b) Protein
   (c) Cellulose