

# 國立屏東教育大學 102 學年度學士班轉學考試

## 普通化學(B) 試題

### (先進薄膜製程學士學位學程)

\*注意事項：

- (1) 本試題共 2 頁，答案請「橫式」書寫，並依規定上下翻頁。  
(2) 不必抄題，但請依序將題號標出，並寫在答案紙上，否則不予計分。

#### 一、選擇題（每題 5 分，共 60 分）

1. Which of the following processes require(s) chemical methods?  
(A) Separating a homogeneous mixture into pure substances.  
(B) Separating a heterogeneous mixture into pure substances.  
(C) Distilling a saltwater mixture.  
(D) Breaking a compound into its constituent elements.  
(E) At least two of the above (a-d) require chemical methods.
2. What is the correct name of the compound that results from the most stable ion for sulfur and the metal ion that contains 24 electrons?  
(A) iron(II) sulfate      (B) iron(III) sulfide      (C) chromium(II) sulfide  
(D) nickel(III) sulfate      (E) iron(II) sulfide
3. Calculate the mass of water produced when 9.47 g of methane,  $\text{CH}_4$ , reacts with an excess of oxygen in the following **unbalanced** reaction.  $\text{CH}_4(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$
- |             |                          |            |             |            |
|-------------|--------------------------|------------|-------------|------------|
| (A) 10.64 g | (B) $3.41 \times 10^2$ g | (C) 21.3 g | (D) 0.526 g | (E) 1.18 g |
|-------------|--------------------------|------------|-------------|------------|
4. Draw the Lewis structures for the following compounds to assist you in answering this question.  
 $\text{CBr}_2\text{H}_2$        $\text{BH}_3$        $\text{XeCl}_4$        $\text{SF}_4$        $\text{HCl}$   
Which compound has a see-saw shape?
- |                              |                   |                     |                   |                  |
|------------------------------|-------------------|---------------------|-------------------|------------------|
| (A) $\text{CBr}_2\text{H}_2$ | (B) $\text{BH}_3$ | (C) $\text{XeCl}_4$ | (D) $\text{SF}_4$ | (E) $\text{HCl}$ |
|------------------------------|-------------------|---------------------|-------------------|------------------|
5. Magnesium metal reacts with hydrochloric acid to form magnesium chloride and hydrogen gas. Suppose we react an excess of magnesium metal with 19.8 mL of a 3.00 M solution of hydrochloric acid and collect all of the hydrogen in a balloon at  $25^\circ\text{C}$  and 1.00 atm. What is the expected volume of the balloon?
- |              |             |            |             |            |
|--------------|-------------|------------|-------------|------------|
| (A) 0.0609 L | (B) 0.726 L | (C) 1.45 L | (D) 0.323 L | (E) 60.9 L |
|--------------|-------------|------------|-------------|------------|

6. 9740 J of energy is added to 1.6 mol (29 g) of  $\text{H}_2\text{O}$  as an ice sample at  $0^\circ\text{C}$ . The molar heat of fusion is 6.02 kJ/mol. The specific heat of liquid water is 4.18 J/g K. The molar heat of vaporization is 40.6 kJ/mol. The resulting sample contains which of the following?
- (A) only water                      (B) only ice                      (C) ice and water  
(D) water and water vapor      (E) only water vapor
7. Which of the following statements is/are correct?
- (A) In an acidic solution,  $[\text{H}^+] > [\text{OH}^-]$ .      (B) In a basic solution,  $[\text{OH}^-] > [\text{H}^+]$ .  
(C) In a neutral solution,  $[\text{H}^+] = [\text{OH}^-]$ .      (D) None of the above statements (A-C) are correct.  
(E) All of the above statements (A-C) are correct.
8. Which of the following reactions does **not** involve oxidation–reduction?
- (A)  $\text{CH}_4 + 3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{CO}_4$                       (B)  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$   
(C)  $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$                       (D)  $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{Cl}_2 + 2\text{H}_2\text{O} + \text{MnCl}_2$   
(E) All are oxidation-reduction reactions.
9. The primary structure of proteins is
- (A) the pleated sheet      (B) the peptide linkage      (C) the alpha-helix  
(D) the order of amino acids      (E) none of these
10. In lecture, the professor named a molecule 2-ethyl-4-tertiary-butylpentane. An alert student pointed out that although the correct structure could be drawn from this name, the name did not follow systematic rules. What is the correct systematic name for the molecule?
- (A) 2-*t*-butyl-5-methylhexane                      (B) 2-ethyl-4,5,5-trimethylhexane  
(C) 3,5,6,6-tetramethylheptane                      (D) 2,2,3,5-tetramethylheptane  
(E) undecane
11. How many protons, neutrons, and electrons does the atom  $^{208}\text{Pb}$  have?
- (A) 82 protons, 82 neutrons, 82 electrons.      (B) 82 protons, 82 neutrons, 126 electrons.  
(C) 82 protons, 82 neutrons, 208 electrons.      (D) 82 protons, 126 neutrons, 126 electrons.  
(E) 82 protons, 126 neutrons, 82 electrons
12. A 18.23 g sample of HCl is dissolved in water to give 2000 mL of solution. The concentration of the solution is
- (A) 0.25 M.      (B) 0.5 M.      (C) 1.0 M.      (D) 2.0 M.      (E) 4.0 M.

## 二、問答題：

1. Explain the terms, (a) dipole-dipole attraction, (b) N-type semiconductor, (c) anode, (d) Hund's rule      (20%)
2. For the species  $\text{O}_2$ ,  $\text{O}_2^+$ , and  $\text{O}_2^-$ , give the electron configuration and the bond order for each. Which has the strongest bond?      (20%)