

# 國立屏東大學 105 學年度學士班暨進修學士班轉學考試

## 普通化學 試題

### (應用化學系學士班)

\*注意事項：

(1) 本試題共 4 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 4 分，共 80 分)

- Hydrocarbons containing only single bonds between the carbon atoms are called \_\_\_\_\_.  
(A) alkenes (B) alkynes (C) aromatics (D) alkanes (E) ketones
- The coordination number of platinum in complexes is always \_\_\_\_\_.  
(A) 4 (B) 5 (C) 2 (D) 3 (E) 6
- The oxidation state of copper in  $\text{Cu}_2\text{S}$  is \_\_\_\_\_.  
(A) +6 (B) +2 (C) +4 (D) 0 (E) +1
- In metallic hydrides, the oxidation number of hydrogen is considered to be \_\_\_\_\_.  
(A) -2 (B) -1 (C) 0 (D) +1 (E) +2
- The gain of electrons by an element is called \_\_\_\_\_.  
(A) reduction (B) oxidation (C) disproportionation (D) fractionation (E) sublimation
- A reaction that is spontaneous as written \_\_\_\_\_.  
(A) is very rapid  
(B) will proceed without outside intervention  
(C) is also spontaneous in the reverse direction  
(D) has an equilibrium position that lies far to the left  
(E) is very slow
- Which one of the following pairs cannot be mixed together to form a buffer solution?  
(A)  $\text{C}_5\text{H}_5\text{N}$ ,  $\text{C}_5\text{H}_5\text{NHCl}$  (B)  $\text{HC}_2\text{H}_3\text{O}_2$ ,  $\text{NaOH}$  ( $\text{C}_2\text{H}_3\text{O}_2^-$  = acetate)  
(C)  $\text{KOH}$ ,  $\text{HI}$  (D)  $\text{NH}_2\text{CH}_3$ ,  $\text{HCl}$  (E)  $\text{NaClO}$ ,  $\text{HNO}_3$

8. The molar concentration of hydronium ion in pure water at 25 °C is \_\_\_\_\_.
- (A) 0.00 (B)  $1.0 \times 10^{-7}$  (C)  $1.0 \times 10^{-14}$  (D) 1.00 (E) 7.00
9. At equilibrium, \_\_\_\_\_.
- (A) all chemical reactions have ceased  
 (B) the rates of the forward and reverse reactions are equal  
 (C) the rate constants of the forward and reverse reactions are equal  
 (D) the value of the equilibrium constant is 1  
 (E) the limiting reagent has been consumed
10. The rate of a reaction depends on \_\_\_\_\_.
- (A) collision frequency (B) collision energy (C) collision orientation  
 (D) all of the above (E) none of the above
11. Which contains both covalent bonds and ionic bonds?
- (A) HCl (B) NaCl (C) NH<sub>3</sub> (D) NH<sub>4</sub>Cl
12. Of the following, which element has the highest first ionization energy?
- (A) Al (B) Cl (C) Na (D) P
13. How many valence shell electrons does an atom of aluminum have?
- (A) 1 (B) 2 (C) 3 (D) 13
14. Calculate the energy change for the formation of LiCl(s) from its elements in their standard states and the following tabulated information:
- |  |               |
|--|---------------|
| $\text{Li}(s) + 1/2 \text{Cl}_2(g) \rightarrow \text{LiCl}(s)$ | ?             |
| $\text{Li}^+(g) + \text{Cl}^-(g) \rightarrow \text{LiCl}(s)$   | -853 kJ/mol   |
| $\text{Li}(s) \rightarrow \text{Li}(g)$                        | +159.4 kJ/mol |
| $1/2 \text{Cl}_2(g) \rightarrow \text{Cl}(g)$                  | +121.7 kJ/mol |
| $\text{Cl}(g) + e^- \rightarrow \text{Cl}^-(g)$                | -348.6 kJ/mol |
| $\text{Li}(g) \rightarrow \text{Li}^+(g) + e^-$                | +520.2 kJ/mol |
- (A) +1305.7 kJ/mol  
 (B) +296.9 kJ/mol  
 (C) -400.3 kJ/mol  
 (D) -627.2 kJ/mol
15. Which compound is most likely to exist as a gas at room temperature?
- (A) Al<sub>4</sub>C<sub>3</sub> (B) CF<sub>4</sub> (C) CaF<sub>2</sub> (D) WC

16. Which depends only on the initial and final state?

- (A)  $q$       (B)  $w$       (C)  $q + w$       (D)  $q - w$

17. Which of the following equations represents "Boyle's law"?

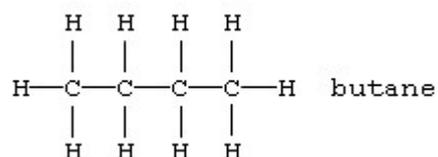
- (A)  $\frac{P}{V} = k$       (B)  $\frac{V}{T} = k$       (C)  $PV = k$       (D)  $V = nk$

18. Which has the **smallest** dipole-dipole forces?

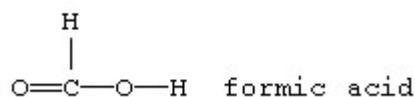
- (A)  $\text{CH}_3\text{F}$       (B)  $\text{HCl}$       (C)  $\text{N}_2$       (D)  $\text{CO}$

19. Which should be **least** soluble in water?

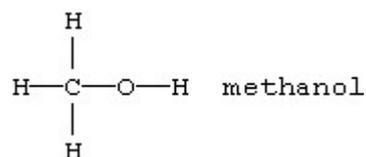
(A)



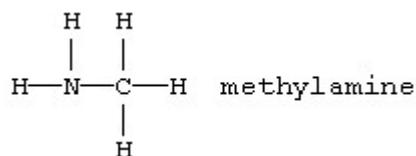
(B)



(C)



(D)



20. An acidic solution at  $25^\circ\text{C}$  will have a hydronium ion concentration \_\_\_\_\_ and a pH value \_\_\_\_\_.

- (A)  $[\text{H}_3\text{O}^+] > 1 \times 10^{-7} \text{ M}$ ,  $\text{pH} > 7.00$   
(B)  $[\text{H}_3\text{O}^+] > 1 \times 10^{-7} \text{ M}$ ,  $\text{pH} < 7.00$   
(C)  $[\text{H}_3\text{O}^+] < 1 \times 10^{-7} \text{ M}$ ,  $\text{pH} > 7.00$   
(D)  $[\text{H}_3\text{O}^+] < 1 \times 10^{-7} \text{ M}$ ,  $\text{pH} < 7.00$

## 二、問答題 (20 分)

1. A compound that is composed of carbon, hydrogen, and oxygen contains 70.6% C, 5.9% H, and 23.5% O by mass. The molecular weight of the compound is 136 amu. What is the molecular formula? (5分)
2. For which of the molecules is the molecular geometry (shape) the same as the VSEPR electron domain arrangement (electron domain geometry)? (5分)  
(i)  $\text{PCl}_3$       (ii)  $\text{CCl}_4$       (iii)  $\text{TeCl}_4$       (iv)  $\text{XeF}_4$       (v)  $\text{SF}_6$
3. Draw structures corresponding to these IUPAC names: (10分)  
(a) 2-Ethyl-2-buten-1-ol  
(b) 3-Cyclohexen-1-ol