

國立屏東教育大學 100 學年度學士班轉學考試

普通化學 試題

(先進薄膜製程學士學位學程)

*注意事項：

- (1) 本試題共 3 頁，答案請「橫式」書寫，並依規定上下翻頁，否則不予計分。
(2) 不必抄題，但請依序將題號標出，並寫在答案紙上。

一、選擇題 (每題 5 分，共 80 分)

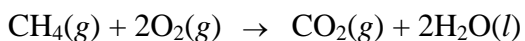
1. A hydrocarbon (a compound consisting solely of carbon and hydrogen) is found to be 85.6% carbon by mass. What is the empirical formula for this compound?
(A) CH (B) CH₂ (C) C₂H (D) C₃H (E) CH₄
2. The enthalpy of fusion of ice is 6.020 kJ/mol. The heat capacity of liquid water is 75.4 J/mol·°C. What is the smallest number of ice cubes at 0°C, each containing one mole of water, necessary to cool 500 g of liquid water initially at 20°C to 0°C?
(A) 1 (B) 7 (C) 14 (D) 15 (E) 126
3. Which of the following pairs is isoelectronic?
(A) Li⁺ and K⁺ (B) Na⁺ and Ne (C) I⁻ and Cl⁻ (D) S²⁻ and Ne (E) Al³⁺ and B³⁺
4. The hybridization of the central atom in XeF₅⁺ is:
(A) sp (B) sp² (C) sp³ (D) dsp³ (E) d²sp³
5. Consider a solution containing liquids A and B where the mole fraction of B is 0.60. Assuming ideality, calculate the mole fraction of B in the vapor at equilibrium with this solution at 25°C. (The vapor pressures of pure liquid A and B at 25°C are 193.3 torr and 400.0 torr, respectively.)
(A) 0.24 (B) 0.32 (C) 0.42 (D) 0.68 (E) 0.76

6. Consider the following data concerning the equation:

	H_2O_2	3I^-	2H^+	I_3^-	$2\text{H}_2\text{O}$	
	$[\text{H}_2\text{O}_2]$	$[\text{I}^-]$	$[\text{H}^+]$			rate
I	0.100 M	5.00	10^{-4} M	1.00	10^{-2} M	0.137 M/sec
II	0.100 M	1.00	10^{-3} M	1.00	10^{-2} M	0.268 M/sec
III	0.200 M	1.00	10^{-3} M	1.00	10^{-2} M	0.542 M/sec
IV	0.400 M	1.00	10^{-3} M	2.00	10^{-2} M	1.084 M/sec

The rate law for this reaction is

- (A) rate = $k[\text{H}_2\text{O}_2][\text{I}^-][\text{H}^+]$
 (B) rate = $k[\text{H}_2\text{O}_2]^2[\text{I}^-]^2[\text{H}^+]^2$
 (C) rate = $k[\text{I}^-][\text{H}^+]$
 (D) rate = $k[\text{H}_2\text{O}_2][\text{H}^+]$
 (E) rate = $k[\text{H}_2\text{O}_2][\text{I}^-]$
7. A 20.0-g sample of methyl alcohol (CH_3OH , molar mass = 32.04 g/mol) was dissolved in 35.6 g of water. The mole fraction of CH_3OH is:
 (A) 0.316 (B) 0.624 (C) 0.360 (D) 4.17 (E) 0.240
8. Which factor listed below is most important in determining the strength of an oxyacid?
 (A) the size of the molecule
 (B) the ability of the molecule to change atomic orientation
 (C) the identity of the central atom in the molecule
 (D) the number of oxygen atoms present in the molecule
 (E) none of these
9. When the equation $\text{Cl}_2 \rightarrow \text{Cl}^- + \text{ClO}_3^-$ (basic solution) is balanced using the smallest whole-number coefficients, the coefficient of OH^- is:
 (A) 1 (B) 3 (C) 4 (D) 6 (E) 12
10. Determine ΔG° for the following reaction:



Substance	ΔG_f° (kJ/mol)
$\text{CH}_4(g)$	-50.68
$\text{O}_2(g)$	0
$\text{CO}_2(g)$	-394.4
$\text{H}_2\text{O}(l)$	-237.4

- (A) -581.1 kJ (B) -919.9 kJ (C) -818.5 kJ (D) -682.5 kJ (E) 131.1 kJ

11. How many protons, neutrons, and electrons does the atom ^{208}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. What is the molar mass of ethanol ($\text{C}_3\text{H}_7\text{OH}$)?
(A) 45.07. (B) 38.90. (C) 46.07. (D) 60.09. (E) 74.12.
13. What volume of 2.0 M HCl can be prepared from 250 mL of 10.0 M HCl?
(A) 50 mL. (B) 125 mL. (C) 500 mL. (D) 1.00 L. (E) 1.25 L.
14. The conjugate acid of a weak base is
(A) a strong base. (B) a weak base. (C) a strong acid. (D) a weak acid.
(E) none of these.
15. The carbon atom in CH_2Cl_2 has what hybridization?
(A) sp (B) sp^2 (C) sp^3 (D) sp^4 (E) they are not hybridized
16. Predict the geometries of SF_6 using the VSEPR method.
(A) Linear (B) Trigonal planar (C) Tetrahedral (D) Trigonal bipyramidal
(E) Octahedral

二、問答題：

For the species O_2 , O_2^+ , and O_2^- , give the electron configuration and the bond order for each. Which has the strongest bond? (20%)