

國立屏東教育大學 101 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 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 4 分，共 60 分)

1. Which of the following pairs is incorrect?

- (A) ethane – C_2H_4
(B) pentane – C_5H_{12}
(C) hexane – C_6H_{14}
(D) heptane – C_7H_{16}
(E) octane – C_8H_{18}

2. It is desired to determine the concentration of arsenic in a lake sediment sample by means of neutron activation analysis. The nuclide $^{75}_{33}\text{As}$ captures a neutron to form $^{76}_{33}\text{As}$, which in turn undergoes β decay. The daughter nuclide produces the characteristic γ rays used for the analysis. What is the daughter nuclide?

(A) $^{75}_{34}\text{Se}$	(B) $^{76}_{32}\text{Ge}$	(C) $^{74}_{31}\text{Ga}$	(D) $^{76}_{34}\text{Se}$	(E) $^{74}_{34}\text{Se}$
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3. Which of the following is true for the cell shown here? $\text{Zn(s)} \mid \text{Zn}^{2+}(\text{aq}) \parallel \text{Cr}^{3+}(\text{aq}) \mid \text{Cr(s)}$

- (A) The electrons flow from the cathode to the anode.
(B) The electrons flow from the zinc to the chromium.
(C) The electrons flow from the chromium to the zinc.
(D) The chromium is oxidized.
(E) The zinc is reduced.

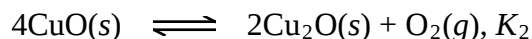
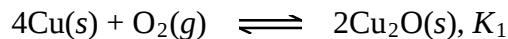
4. Which of the following compounds has the lowest solubility in mol/L in water at 25°C?

- (A) Ag_3PO_4 $K_{\text{sp}} = 1.8 \times 10^{-18}$
(B) Sn(OH)_2 $K_{\text{sp}} = 3 \times 10^{-27}$
(C) CdS $K_{\text{sp}} = 1.0 \times 10^{-28}$
(D) CaSO_4 $K_{\text{sp}} = 6.1 \times 10^{-5}$
(E) Al(OH)_3 $K_{\text{sp}} = 2 \times 10^{-33}$

5. A solution contains 0.500 M HA ($K_a = 1.0 \times 10^{-8}$) and 0.320 M NaA. What is the $[H^+]$ after 0.10 mole of HCl is added to 1.00 L of this solution?

(A) $1.0 \times 10^{-8} M$	(B) $4.5 \times 10^{-8} M$	(C) $3.7 \times 10^{21} M$	(D) $2.7 \times 10^{-8} M$	(E) none of these
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6. Given the equilibrium constants for the following reactions:



what is K for the system $2\text{Cu}(s) + \text{O}_2(g) \rightleftharpoons 2\text{CuO}(s)$ equivalent to?

(A) $(K_1)(K_2)$	(B) $[(K_2)/(K_1)]^{1/2}$	(C) $[(K_1)/(K_2)]^{1/2}$	(D) $(K_2)^{1/2}/(K_1)$	(E) $(K_1)(K_2)^{1/2}$
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7. At a given temperature, you have a mixture of benzene (vapor pressure of pure benzene = 745 torr) and toluene (vapor pressure of pure toluene = 290. torr). The mole fraction of benzene in the solution is 0.590. Assuming ideal behavior, calculate the mole fraction of toluene in the vapor above the solution.

(A) 0.213	(B) 0.778	(C) 0.641	(D) 0.359	(E) 0.590
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- 8.. Which best explains the following trend?

Element b.p. (K)

He 4

Ne 25

Ar 95

Kr 125

Xe 170

- (A) London dispersion forces
 (B) dipole-dipole interaction
 (C) hydrogen bonding
 (D) Le Chatelier's principle
 (E) none of these

9. The hybridization of the central atom, Al, in AlBr_3 is

(A) sp	(B) sp^2	(C) sp^3	(D) dsp^3	(E) d^2sp^3
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10. Calculate the work for the expansion of CO_2 from 1.0 to 5.8 liters against a pressure of 1.0 atm at constant temperature.

(A) 4.8 L·atm	(B) 5.8 L·atm	(C) 0 L·atm	(D) -4.8 L·atm	(E) -5.8 L·atm
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11. You have equal masses of different solutes dissolved in equal volumes of solution. Which of the solutes would make the solution having the highest molar concentration?

(A) NaOH	(B) KCl	(C) LiOH	(D) KOH	(E) all the same
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12. What is the molar mass of propanol (C_3H_7OH)?

(A) 59.09 g/mol	(B) 36.07 g/mol	(C) 60.09 g/mol	(D) 30.03 g/mol	(E) 149.04 g/mol
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13. The reaction $H_2SeO_3(aq) + 6I^-(aq) + 4H^+(aq) \rightarrow 2I_3^-(aq) + 3H_2O(l) + Se(s)$ was studied at $0^\circ C$ by the method of initial rates:

$[H_2SeO_3]_0$	$[H^+]_0$	$[I^-]_0$	Rate (mol/L s)
1.0×10^{-4}	2.0×10^{-2}	2.0×10^{-2}	1.66×10^{-7}
2.0×10^{-4}	2.0×10^{-2}	2.0×10^{-2}	3.33×10^{-7}
3.0×10^{-4}	2.0×10^{-2}	2.0×10^{-2}	4.99×10^{-7}
1.0×10^{-4}	4.0×10^{-2}	2.0×10^{-2}	6.66×10^{-7}
1.0×10^{-4}	1.0×10^{-2}	2.0×10^{-2}	0.41×10^{-7}
1.0×10^{-4}	2.0×10^{-2}	4.0×10^{-2}	13.4×10^{-7}
1.0×10^{-4}	4.0×10^{-2}	4.0×10^{-2}	5.33×10^{-6}

The numerical value of the rate constant is

(A) 5.2×10^5	(B) 2.1×10^2	(C) 4.2	(D) 1.9×10^{-6}	(E) none of these
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14. The carbon atom in CH_2CH_2 has what hybridization?

(A) sp (B) sp^2 (C) sp^3 (D) sp^4 (E) they are not hybridized

15. Predict the geometries of PCl_6 using the VSEPR method.

(A) Linear (B) Trigonal planar (C) Tetrahedral (D) Trigonal bipyramidal (E) Octahedral

二、問答與計算題(不使用計算器)

- A cell at $25^\circ C$ with 1.0 M $AgNO_3$ in the right compartment and 1.0 M $NaCl$ along with excess $AgCl(s)$ in the left compartment. The measured cell potential is 0.585 V. Calculate the K_{sp} value for $AgCl$ at $25^\circ C$. (antilog 0.1 = 1.26, antilog 0.2 = 1.6, antilog 0.3 = 2.00) (20 分)
- Calculate the pH of a 1.0 M solution of an organic amine ($K_b = 4 \times 10^{-4}$). ($\log 2 = 0.3010$) (20 分)