

淡江大學 107 學年度日間部寒假轉學生招生考試試題

5

系別：水環系環工組二年級

科目：化學

5-1

考試日期：1月13日(星期日) 第1節

本試題共 3 大題，2 頁

本試題雙面印刷

第一部份：選擇題 (單選，每題 3 分，30 分)

1. The Cl-P-Cl bond angles in PCl_5 are:

- (A) 72° only (B) 109.5° only (C) 90° and 120° (D) 90° and 180°
(E) 90° , 120° , and 180°

2. A decrease in the reaction temperature causes a decrease in the rate of reaction due to the decrease in _____.

- (A) the reaction enthalpy
(B) the concentrations of reactants
(C) the activation energy of the forward reaction.
(D) the activation energy of the reverse reaction.
(E) the fraction of collisions with total kinetic energy larger than activation energy.

3. For the central atoms of the following molecules, which **does not** display sp^3 hybrid orbital?

- (A) SiH_4 (B) H_3O^+ (C) NH_3 (D) CH_3^+ (E) PO_4^{3-}

4. Which of the following species is a polar molecule?

- (A) CCl_4 (B) SO_3 (C) CO_2 (D) NF_3 (E) XeF_4

5. The acid strengths for hydrogen halides HX change as X varies within the halogen group of the periodic table. Which of the following factors dominates in affecting the acid strength?

- (A) Polarity
(B) Solubility
(C) Bond strength
(D) Electron withdrawing effects
(E) Percent ionic character of H-X bond

6. Which ion is planar?

- (A) NH_4^+ (B) SO_3^{2-} (C) CO_3^{2-} (D) ClO_3^- (E) PBr_3

7. Which element will display an unusually large jump in ionization energy values between the 2nd and the 3rd ionization energies?

- (A) Na (B) Mg (C) Al (D) Si (E) P

8. In condensation polymerization, a common by-product is:

- (A) Alcohol (B) Water (C) Ethylene (D) Aldehyde (E) Hydrogen

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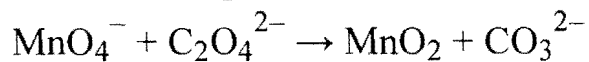
考試日期：1月13日(星期日) 第1節

本試題共 3 大題，2 頁

9. Which of the following molecules contains the shortest carbon-carbon bond?

- (A) C₂H₂ (B) C₂H₄ (C) C₂H₆ (D) C₂Cl₄ (E) C₆H₆

10. Balance the following redox reaction in basic solution:



What is the molar ratio of MnO₄⁻ to CO₃²⁻ in the balanced equation?

- (A) 1/3 (B) 1/2 (C) 1 (D) 2 (E) 3

第二部份：填充題 (每個空格 3 分，共 15 分)

1. (a) ~ (e)

Element (in English)	Symbol	Atomic number	Electron configuration
___(a)___	O	8	___(b)___
Sodium	Na	11	[Ne]3s ¹
Chromium	Cr	24	___(c)___
Lead	___(d)___	___(e)___	[Xe]6s ² 4f ¹⁴ 5d ¹⁰ 6p ²

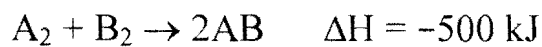
第三部份：計算問答題 (共 55 分)

1. Name the quantum numbers, *n*, *ℓ*, and *m_ℓ*, and describe their respective physical meanings. (15%)

2. *S* represents the solubility of Ba(IO₃)₂. Please derive the expression of *S* in terms of the solubility-product constant **K_{sp}** of Ba(IO₃)₂. (10%)

3. When solid AlCl₃ is dissolved in water, the resulting solution is acidic. Calculate the pH of a 0.012-M AlCl₃ solution. The acid dissociation constant of the hydrated Al³⁺ is 1.40 × 10⁻⁵. (10%)

4. In the following reaction, B₂ is half the bond energy of A₂, and AB is four times the bond energy of B₂. Calculate the bond energy of A₂. (10%)



5. The % NaHCO₃ in an antacid tablet can be determined by conducting the following reaction at high temperature.



Ignition of a 0.400-g sample of an antacid tablet containing NaHCO₃ and nonvolatile impurities yielded a residue weighing 0.260 g. Calculate the % NaHCO₃ of the sample. The molar masses of NaHCO₃, Na₂CO₃, CO_{2(g)}, and H₂O are 84.0, 106.0, 44.0, and 18.0 g/mol, respectively. (10%)