

系別：化學學系二年級

科目：普通化學

8-1

准帶項目請打「V」

簡單型計算機

本試題共 2 頁

本試題雙面印刷

第一部分：選擇題（單選，每題 5 分，共 20 分）

1. Give the number of protons and neutrons in the nucleus of  $^{60}_{27}\text{Co}$  is  
 a. 60                      b. 27                      c. 33                      d. 87
2. Which of the following molecules has the highest H-X bond energy?  
 a. HF                      b. HCl                      c. HBr                      e. HI
3. Which of the following molecules has the shortest C-C bond length?  
 a. ethyne                      b. polyethylene                      c. C-C of the five-member ring in  $\text{C}_{60}$
4. Which of the following molecules is polar?  
 a.  $\text{CCl}_4$                       b.  $\text{PH}_5$                       c. NO                      d.  $\text{C}_{60}$

第二部分：填充題（每個空格 4 分，共 40 分）

5. Identify the hybrid orbitals (e.g.  $sp$ ,  $sp^2$ ,  $sp^3$ ) used by the underlined atoms in the following molecules:  
 (a)  $\text{H}_2\text{C}\underline{\text{C}}\text{CH}_2$  \_\_\_\_\_  
 (b)  $\text{H}_2\underline{\text{C}}\text{CCH}_2$  \_\_\_\_\_  
 (c)  $\text{CH}_3\underline{\text{N}}\text{NN}$  \_\_\_\_\_
6. Write the expected electron configuration for these atoms:  
 a. Si: \_\_\_\_\_      b. Al: \_\_\_\_\_
7. Place the species below in order of shortest to longest N-N bond.  
 $\text{N}_2$ ,  $\text{N}_2\text{F}_4$ ,  $\text{N}_2\text{F}_2$       \_\_\_\_\_ < \_\_\_\_\_ < \_\_\_\_\_
8. Write down the names of the elements with the following electron configurations:  
 a.  $1s^2 2s^2 2p^4$ : \_\_\_\_\_      b.  $1s^2 2s^2 2p^6 3s^2 3p^6$ : \_\_\_\_\_

# 淡江大學 95 學年度轉學生招生考試試題

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## 第三部分：問答題（共 40 分）

9. One of the most commonly used white pigments in paint is a compound of titanium and oxygen that contains 59.9% Ti (average atomic mass: 47.88 amu) by mass. Determine the empirical formula of this compound. (10 分)
10. For VSEPR, repulsions from a lone pair and a bonding pair are different. Explain (10 分)
11. The allene molecule has the following structure:  
$$\text{H}_2\text{C}=\text{C}=\text{CH}_2$$
  
Are all four hydrogen atoms in the same plane? Explain your answer. (10 分)
12. X-rays from a copper X-ray tube ( $\lambda = 1.54 \text{ \AA}$ ) were diffracted at an angle of 30.00 degrees by a crystal of silicon. Assuming first order diffraction ( $n = 1$ ), what is the inter-planar spacing in silicon? (write down the equation) (10 分)