

大同大學 100 學年度轉學入學考試試題

考試科目：化學

所別：化學工程學系

第 1/1 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 可以使用計算器。

1. Explain the following terms: (40%)
 - (1) State function? (何謂狀態函數?)
 - (2) The van der Waal's equation for real gases? (何謂凡得瓦爾真實氣體方程式? 修正了那些項目?)
 - (3) Heisenberg "Uncertainty Principle"? (何謂海森堡的測不準原理?)
 - (4) Hydrogen bonding? Give an example. (何謂氫鍵? 試舉例說明)
 - (5) Bond Energy? (何謂鍵能?)
2. A star is estimated to have a mass of 2.0×10^{36} kg. Assuming it to be a sphere of average diameter 1.4×10^6 km, calculate the average density of the star in units of grams per liter (g/L)? (10%)
3. Calculate ΔH for each of the following reactions in the gas phase. (使用鍵能計算下列反應式的反應熱?)
 - (1) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ $\Delta H = ?$ kJ
 - (2) $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ $\Delta H = ?$ kJBond energy : $E_B(\text{H}-\text{H}) = 432$ kJ/mol, $E_B(\text{Cl}-\text{Cl}) = 239$ kJ/mol, $E_B(\text{H}-\text{Cl}) = 427$ kJ/mol
 $E_B(\text{N}-\text{H}) = 391$ kJ/mol, $E_B(\text{N}\equiv\text{N}) = 941$ kJ/mol. (10%)
4. (1) What is the symbol (${}^A_Z\text{X}$) for an atom with atomic number = 9 and mass number = 19?
 - (2) What is the symbol (${}^A_Z\text{X}^{\pm n}$) for an ion with 17 protons, 18 electrons, and 20 neutrons?
 - (3) What is the symbol (${}^A_Z\text{X}^{\pm n}$) for an ion with 50 protons, 68 neutrons, and 48 electrons? (10%)
5. Write the Lewis structure and predict the geometric structure of the following molecule or ion?
(分別畫出下列各分子或離子的 (a) 路易士構造, 與其 (b) 幾何形狀?)
 - (1) ClF_3 (2) XeO_3 (3) PCl_4^+ (4) XeF_4 (5) IF_5 (10%)
6. Consider the reaction between 50.0 mL of liquid methyl alcohol, CH_3OH (density = 0.850 g/mL), and 22.8 L of O_2 at 27°C and a pressure of 2.00 atm. The products of the reaction are CO_2 (g) and H_2O (g). Calculate the number of moles of H_2O formed if the reaction goes to completion. (CH_3OH : 32.04 g/mole) (10%)
7. To determine the molar mass of a certain protein, 0.250 g of it was dissolved in enough water to make 100 mL of solution. The osmotic pressure of this solution was found to be 2.80 torr at 25.0°C . Calculate the molar mass of the protein? (將 0.250g 蛋白質加水溶成 100 mL 水溶液, 在 25.0°C 下測得其滲透壓為 2.80 torr, 試計算此蛋白質的分子量?) (10%)