

大同大學105 學年度(寒)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 :

(30%)

(1) The laws of definite proportion and multiple proportion and definite composition? Give examples.

(何謂「定比定律」、「倍比定律」、「定組成定律」? 分別舉例說明。)

(2) The Van der Waals' equation of real gas? What terms are modified from the ideal gas law?

(寫出真實氣體適用的凡得瓦爾氣體方程式? 它修正了理想氣體定律中的那兩個項目?)

(3) What are main gases of air pollution? How acid rains are produced in the atmosphere?

(大氣中主要的空氣污染氣體有那些? 寫出大氣中酸雨形成的各種反應方程式?)

(4) What are the Pauli's exclusion principle and Hund's rule? (何謂包立不相容原理? 何謂罕德定律?)

(5) Definition of σ bond and π bond? Give examples. (在共價鍵的鍵結中, 何謂 σ 鍵與 π 鍵? 舉例說明)

(6) Compare the size of the following ions : S^{2-} , Mg^{2+} , K^+ , Na^+ , Cl^- ? Which two groups of ions are the isoelectronic ions?

(下列離子 S^{2-} , Mg^{2+} , K^+ , Na^+ , Cl^- : (a)比較各離子的半徑大小? (b)其中那二群離子彼此為等電子離子?)

2. Diamonds are measured in carats, and 1 carat = 0.200 g. The specific gravity of diamond is 3.51. How much carats of a diamond which has a volume of 0.0316 in^3 ? (1 in = 2.54 cm)

(鑽石 1 克拉 = 0.200 g, 鑽石的比重為 3.51, 求體積為 0.0316 in^3 的鑽石為多少克拉? (1 in = 2.54 cm))

(10%)

3. There is a He gas at 1.2 atm and 30°C . Calculate its (1) Root mean square velocity? (2) Average kinetic energy of this helium gas? (試計算在 1.2 atm, 30°C 下氦(He)氣體(原子量 = 4 g/mole)其 (1)方均根速度 U_{rms} (m/s)? (2)平均動能 KE.(J/mole)?)

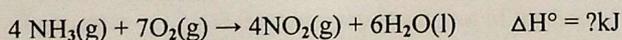
(10%)

4. Write the electron configuration and give the core electrons and valence electrons of the following atoms:

(寫出各原子的電子組態? 並標出電子組態中那些是核心電子? 那些是價電子?) (1) ${}_{14}\text{Si}$ (2) ${}_{26}\text{Fe}$ (3) ${}_{47}\text{Ag}$

(10%)

5. Calculate the standard enthalpy change ΔH° for the following reaction? (計算下列反應式的標準反應熱: ΔH° ?)



(已知標準生成熱焓: $\Delta H^\circ_{\text{f}, \text{NH}_3} = -46 \text{ kJ/mole}$; $\Delta H^\circ_{\text{f}, \text{NO}_2} = 34 \text{ kJ/mole}$; $\Delta H^\circ_{\text{f}, \text{H}_2\text{O}} = -286 \text{ kJ/mole}$)

(10%)

6. If an electron in hydrogen atom absorbs energy of a photon and arises from $n = 2$ to $n = 4$ energy state of orbital. Calculate the energy (ΔE) and the wavelength $\lambda(\text{nm})$ of this photon? ($\Delta E = -2.178 \times 10^{-18} \text{ J} \times (1/n_2^2 - 1/n_1^2)$)

(氫原子的電子若吸收一光子的能量後, 其軌域由 $n = 2$ 升至 $n = 4$, 試計算此光子的能量(ΔE)與波長 $\lambda(\text{nm})$?) (10%)

7. For each of the following molecules, write the Lewis structures, predict the geometric structure.

(寫出下列各項的 (a)最穩定路易士構造? (b)幾何形狀?)

(1) SO_2 (2) XeF_4 (3) RnCl_2 (4) SOCl_2 (5) CO_3^{2-}

(20%)