

大同大學106 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) Uncertainty and significant figure? Specific gravity and density are? (何謂未確定數與有效數字? 何謂比重與密度?)
 - (2) Dalton's law of partial pressure of gases? (何謂道爾頓的氣體分壓定律?)
 - (3) What is the standard state? (標準狀態的定義為何?)
 - (4) What are definitions of ionization energy and electron affinity? (游離能 I_1 與電子親和力 E_1 的定義為何?)
 - (5) What conditions will make a bond to be an ionic bonding? (在什麼條件下一個化學鍵可稱為離子鍵?)
 - (6) Bonding molecular orbital and anti-bonding molecular orbital? (何謂鍵結分子軌域? 何謂反鍵結分子軌域?)
2. Give the English and Chinese names and symbols of the following elements and compounds separately : (10%)

(註:寫出下面各元素與化合物未列出的英文名、中文名與化學符號三種中的其餘二種名稱與符號)

 - (1) Pt, (2) 汞, (3) 氯化鐵, (4) N_2O_5 , (5) Sodium bicarbonate.
3. The density of a gas was measured at 1.50 atm and $27^\circ C$ and found to be 1.65 g/L. Calculate the molar mass of the gas? (一氣體在 1.5 atm, $27^\circ C$ 下密度為 1.65 g/L, 試計算此氣體的分子量?) (10%)
4. Consider gases in a cylinder with a piston; its original volume is 40 cm^3 . If the gases in the cylinder expand against a constant pressure of 650 torr and releases 950 J of energy to the surroundings. Calculate the final volume of the gases in a cylinder? If all the release energy is converted into work to push the piston. (設原先體積為 40 cm^3 具有活塞的氣缸內之某一氣體, 使用 950 J(焦耳)對著外界為 650 torr 壓力的活塞做膨脹功後, 計算其膨脹後的總體積變成多少 cm^3) (10%)
5. 將 $35^\circ C$, 1.0 atm 46 L 的 He 氣與在 $50^\circ C$, 1.5 atm 12 L 的 O_2 氣一齊灌入 5.0 L 的鋼瓶混合後, 鋼瓶溫度保持在 $25^\circ C$ 。則此時兩氣體在容器中的分壓各多少 atm? 莫耳分率各多少? (10%)
6. 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?) (10%)
 - (1) ${}_{23}\text{V}$ (2) ${}_{50}\text{Sn}$ (3) ${}_{29}\text{Cu}$
7. Calculate ΔH for each of the following reactions in the gas phase. (使用已知的鍵能 E_B 來計算下列二反應式的反應熱 ΔH ?)

Bond energy (鍵能): $E_B(\text{H}-\text{H}) = 432\text{ kJ/mol}$; $E_B(\text{Cl}-\text{Cl}) = 239\text{ kJ/mol}$; $E_B(\text{H}-\text{Cl}) = 427\text{ kJ/mol}$
 $E_B(\text{N}-\text{H}) = 391\text{ kJ/mol}$; $E_B(\text{N}\equiv\text{N}) = 941\text{ kJ/mol}$.

 - (1) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ $\Delta H_1 = ?\text{ kJ}$
 - (2) $2\text{NH}_3 \rightarrow \text{N}_2 + 3\text{H}_2$ $\Delta H_2 = ?\text{ kJ}$(10%)
8. For each of the following molecules, write the Lewis structures, predict the geometric structure. (寫出下列各項: (a)最穩定的路易士構造? (b)幾何形狀?) (10%)
 - (1) ClO_2^- (2) SOCl_2 (3) IF_3 (4) NO_3^- (5) XeO_3