大同大學 103 學年度(暑)轉學入學考試試題

考試科目:化學　　所別:化學工程學系　　第全頁

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. Answer the following questions：(問答題) (15%)

(1) The first law of thermodynamics? (何謂熱力學第一定律?)

(2) The differences between σ bond and π bond? (何謂 σ 鍵與 π 鍵? 兩者有何不同?)

(3) Surface tension and Viscosity of a liquid? (何謂液體的表面張力與液體的黏度?)

(4) Derive half life of a second order reaction of 2A → P? (試導出 2A → P 二階反應的半生期公式?)

(5) The catalyst and activation energy? Give examples. (何謂觸媒? 何謂化學反應的活化能? 舉例說明。)

2. Perform each of the following conversions: (單位換算) (15%)

(1) 50 mL = ? (μm)^3 = ? cm^3

(2) 128 mg = ? kg = ? ng

(3) 36 ℃ = ? K = ? °F

(4) 20 cm/min^2 = ? m/s^2 = ? km/hr^2

(5) 250 torr = ? atm = ? Pa (N/m^2)

3. Give the English and Chinese names of the following metals separately：(寫出下列各式之中文與英文名稱) (10%)

(1) Sn, (2) Pt, (3) Hg, (4) NaCl, (5) KOH

4. 甲烷與氧氣兩種氣體在 67℃下被充填入一 10.5 L (公升)的固定容器內後，測得甲烷的分壓爲 0.175 atm.氧氣的分壓爲 0.250 atm.。試計算在固定容器內甲烷與氧氣的莫耳數各多少? (假設甲烷與氧氣均符合理想氣體與理想溶液定律) (10%)

5. Consider the reaction：$2ClF_3(g) + 2NH_3(g) \rightarrow N_2(g) + 6HF(g) + Cl_2(g)$　反應熱 $\triangle H° = -1196$ kJ

Calculate $\triangle H°_f$ for $ClF_3(g)$? (已知 HF 與 NH_3 的標準生成熱焓：$\triangle H°_{f,HF} = -271$ kJ/mole; $\triangle H°_{f,NH3} = -46$ kJ/mole)

(試計算 $ClF_3(g)$的標準生成熱焓 $\triangle H°_{f,ClF3}$ =?) (10%)

6. If an electron in hydrogen atom drops from n = 5 to n = 2 energy state and releases a photon. Calculate the wavelength (λ) of this photon in nm? ($\triangle E = -2.178 \times 10^{-18}\ J \times [(1/n_2)^2 - (1/n_1)^2]$ ，$\triangle E = hC/\lambda$，$h = 6.626 \times 10^{-34}$ J・s)

(若氫原子的電子由 $n_1 = 5$ 的軌域掉至 $n_2 = 2$ 的軌域時，試計算其所放射出的光子之波長 λ(nm)?) (10%)

7. Give the core electrons and valence electrons of the following atoms: (1) $_{16}S$ (2) $_{14}Si$ (3) $_{24}Cr$

(分別寫出下列各原子的核心電子與價電子的電子組態? (1) $_{16}S$ (2) $_{14}Si$ (3) $_{24}Cr$) (10%)

8. For each of the following molecules, write the Lewis structures, and predict the molecular structure.

(寫出下列各分子之(a) Lewis構造, (b)分子之幾何形狀?) (1) CO_2 (2) ICl_4^- (3) ClF_3 (10%)

9. The electrolyte in automobile lead storage batteries is a 3.25 M $H_2SO_4(aq)$ that has a density of 1.230g/ml. Calculate the molality (m) of H_2SO_4 in this electrolyte? (H_2SO_4分子量 = 98 g/mole) (汽車用的鉛蓄電池之電解液中硫酸的濃度爲3.25 M，電解液密度爲1.230 g/ml，H_2SO_4分子量 = 98 g/mole，求電解液中硫酸的重量莫耳濃度爲多少m?) (10%)