大同大學 104 學年度(暑)轉學入學考試試題

考試科目:化學　　系別: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) What is the Torricelli's barometer? 1 atm. =? Pa. (何謂 Torricelli 的氣壓計? 1 大氣壓 =? Pa.)

(2) The range of wavelength of visible light? (寫出可見光的波長範圍?)

(3) Compare the size of the following ions：S^{-2}, Mg^{2+}, K^{+}, Al^{3+}, Ca^{2+}? (比較下列各離子的半徑大小：S^{-2}, Mg^{2+}, K^{+}, Al^{3+}, Ca^{2+}?)

(4) Surface tension and viscosity of a liquid? (何謂液體的表面張力? 何謂液體的黏度?)

(5) What is the osmotic pressure of a solution? (何謂溶液的滲透壓? 圖解說明)

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

(1) D = 7.2 kg/m^3 = ? g/mL = ? lb_m/ft^3　　(1 lb_m = 453.6 g, 1 mL = 1 cm^3)

(2) W = 2.5 x 10^5 mg = ? lb_m = ? Gg = ? pg　　(1 mile = 1760 yd, 1 yd = 3 ft, 1 ft = 12 in)

(3) T = 36.5 ℃ = ? K = ? °F = ? °R　　(1 ft = 0.3048 m, 1 in = 2.54 cm)

(4) S = 80 km/hr = ? mile/hr = ? m/s　　(hr =小時, s =秒)

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)

(1) Cr　(2) Pt　(3) HCN　(4) K_2SO_3　(5) $FeCl_2$ (10%)

4. 在固定體積的容器內有 1.50 mole 的氣體 A，於 25℃下其壓力為 400 torr，今將另一氣體 B 加入此容器內與氣體 A 混合後容器內溫度變成 50℃，壓力變成 800 torr。試計算 A 與 B 氣體在容器內的莫耳分率? (假設氣體 A 與 B 均符合理想氣體定律) (10%)

5. 乙烯 C_2H_4 與氟 F_2 反應形成二氟乙烷 $C_2H_4F_2$ ： $C_2H_4(g) + F_2(g) \rightarrow C_2H_4F_2(g)$ 反應熱 $\triangle H = -549$ kJ。已知的鍵能 E_B 如下：
$E_B(C-C) = 347$ kJ/mol, $E_B(C=C) = 614$ kJ/mol, $E_B(F-F) = 154$ kJ/mol。試計算在 $C_2H_4F_2$ 中 C－F 之鍵能 $E_B(C-F)$ = ? (kJ/mol) (10%)

6. If an electron in hydrogen atom drops from n = 3 to n = 1 energy state and releases a photon. Calculate the wavelength (λ) of this photon in nm?
($\triangle E = -2.178 \times 10^{-18}\ J \times [(1/n_2)^2 - (1/n_1)^2]$ ，$\triangle E = hC/\lambda$，$h = 6.626 \times 10^{-34}\ J \cdot s$)
(若氫原子的電子由 $n_1 = 3$ 的軌域掉至 $n_2 = 1$ 的軌域時，試計算其所放射出的光子之波長 λ(nm)?) (10%)

7. An aqueous solution of HCOOH ($K_a = 1.8 \times 10^{-4}$) has a pH of 2.70. Calculate the percent dissociation of formic acid?
(設一甲酸 HCOOH(其 $K_a = 1.8 \times 10^{-4}$)水溶液的 pH 值是 2.70，試計算此甲酸在水中的百分解離度為多少%?) (10%)

8. For a second order reaction 2A → P, 75.0 mol% of A are reacted to form P in 36 min. (二階反應 2A → P，當反應 36 分鐘後 75% $[A]_0$ 被反應掉)
(1) What are the first and second half-lives for this reaction? (第一個與第二個半生期的時間各多少分鐘?)
(2) How long does it take for 90.0 mol% of A being reacted? (當 90%的$[A]_0$ 被反應掉時須費時多少分鐘?) (10%)

9. The concentrated acetic acid has density 1.05 g/mL and contains 99.8 wt% CH_3COOH and 0.2 wt% H_2O. Calculate molarities (M) of this acetic acid solution? (CH_3COOH：60.0 g/mole) (濃醋酸水溶液密度為 1.05 g/ml，內含純醋酸 99.8 wt%、水 0.2 wt%，CH_3COOH 分子量 60.0 g/mole。試計算此濃醋酸水溶液的濃度為多少 M(mol/L)?) (10%)