大同大學 106 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 <u>不可以參考自己的書籍及筆記</u>；　<u>不可以使用字典</u>；　<u>可以使用計算器</u>。

1. Answer the following questions：(回答下列各問題?)　　　　　　　　　　　　　(20%)
   (1) Surface tension and viscosity of a liquid? (何謂液體的表面張力? 何謂液體的黏度?)
   (2) Colligative properties of electrolyte solution? What is the van't Hoff factor i? (何謂電解質溶液的依數性? 何謂凡得霍夫係數i?)
   (3) What is the Le Chatelier's principle in chemical equilibrium? What factors can affect the chemical equilibrium? Give an example. (何謂勒沙特列原理? 影響化學平衡的因素有那些? 舉例說明)
   (4) What is the common ion effect? Give an example. (何謂共同離子效應? 舉例說明)

2. What type of solid will each of the following solid substances form?
   (下列各屬於那一種固體：網狀固體, 金屬固體, 分子固體 或 離子固體?)
   (1) CO_2；(2) SiO_2；(3) P_4；(4) Co；(5) NaCl　　　　　　　　　　　　(10%)

3. The concentrated hydrochloric acid has density 1.188 g/mL and contains 37.0 wt% pure HCl. Calculate molarity (M) and molality(m) of this HCl aqueous solution? (HCl：36.5 g/mole)
   (濃鹽酸水溶液的密度為1.188 g/ml，內含37.0 wt%純鹽酸，HCl分子量為36.5 g/mole。試計算此濃鹽酸水溶液中HCl的體積莫耳濃度 M(mol/L)? 與重量莫耳濃度m(mol/kg)? (HCl：36.5 g/mole))　　　(10%)

4. In which direction will the position of equilibrium ：(2 NOCl(g) ⇌ 2 NO(g) + Cl₂(g) ΔH = 4.23 kcal) be shifted for each of the following changes?
   (判斷上列反應分別做了下列改變後，反應會往何方向移動?)　　　　　　　　　(10%)
   (1) Catalyst is added? (加入觸媒)
   (2) The pressure is increased by adding He(g)? (加入 He(g)氣，反應器總體積不變而總壓增加?)
   (3) The temperature is decreased? (降低反應的溫度?)

5. Compare the following sets in order of most acidic to least acidic. (將下列各組中物質的酸度由大至小排列)
   (1) HOCl, HOBr, HOI, HOCH₃.　　(電負度 Electro negativity：F > Cl > Br > I > C)
   (2) CH₃COOH, FCH₂COOH, F₂CHCOOH, F₃CCOOH
   (3) KOH, KCl, HCN, NH₄Cl, HCl.　(已知：HCN (k_a = 6.2 x 10⁻¹⁰), NH₄OH (k_b = 1.8x10⁻⁵))　　(10%)

6. Compare the boiling point of the following compounds from high to low? (比較下列各組化合物之沸點高低由大至小排列?)
   (1) HF, NH₃, CH₄, H₂O；(2) CH₄, C₂H₆, C₃H₈, C₄H₁₀；(3) H₂O, H₂S, H₂Se, H₂Te　　(10%)

7. For a second order reaction 2A → P, 25.0 mol% of A are reacted to form P in 16 min. (二階反應2A → P，當反應16分鐘後25% [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?)
   (2) How long does it take for 85.0 mol% of A being reacted? (當 85%的[A]₀被反應掉的時間?)
   (3) What relationship between k_A and [A]₀? (反應常數k_A與起始濃度[A]₀之間的關係方程式為何?)　　(10%)

8. An aqueous solution of HCOOH (K_a = 1.8 x 10⁻⁴) has a pH of 2.70. Calculate the percent dissociation of formic acid?　　(10%)
   (設一甲酸HCOOH(其K_a = 1.8 x 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%?)

9. You have 75.0 mL of 0.10 M HA. After adding 15.0 mL of 0.20 M NaOH, the pH of the mixture is 4.50. Calculate Ka of HA?
   (將 75.0 mL, 0.10M 的單質子酸 HA 水溶液與 15.0 mL, 0.20M NaOH 水溶液混合後會形成 pH 值為 4.50 的緩衝溶液。試計算此單質子酸 HA 的 Ka 值?)　　　　　　　　(10%)