

大同大學 107 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 : (回答下列各問題?) (20%)
 - (1) What are the critical temperature (臨界溫度) and critical pressure (臨界壓力) in phase diagrams?
 - (2) What is the osmotic pressure of a solution? Reverse osmosis? (何謂溶液的滲透壓? 何謂逆滲透? 圖解說明)
 - (3) What is the reaction mechanism? What are four conditions that all steps must obey? (何謂反應機構? 其所有步驟必須符合哪四個條件?)
 - (4) What are the acidic oxides and basic oxides? What properties of them? (何謂酸性氧化物與鹼性氧化物? 它們有何特性?)

2. 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, HCl, HBr, HI ; (2) CH₄, C₂H₆, C₃H₈, C₄H₁₀ ; (3) HF, NH₃, CH₄, H₂O (10%)

3. What type of solid will each of the following solid substances form? (下列物質各屬於那種固體: 網狀固體, 金屬固體, 分子固體, 離子固體?)
 - (1) H₂O ; (2) SiO₂ ; (3) S₈ ; (4) Au ; (5) NaCl (10%)

4. In the phase diagram of H₂O, triple point is at (0.0089°C, 0.006 atm) and the critical point is at (374.4°C, 217.7 atm). What phases are present under the following conditions? (水的三相點為(0.0089°C, 0.006 atm), 臨界點為(374.4°C, 217.7 atm), 求水在下列各項中之相別(氣、液、固相或...)?
 - (1) (10°C, 0.005 atm), (2) (20°C, 1.5 atm), (3) (380°C, 220 atm), (4) (0°C, 0.006 atm), (5) (0.0089°C, 0.006 atm) (10%)

5. Nickel (Ni) crystal has a face-centered cubic unit cell with a density of 8.91 g/cm³. What is the radius of nickel in pm (10–12 m)? (Molecular weight of Ni = 58.7 g/mol) (鎳Ni金屬是屬於面心立方最密堆積, 鎳金屬的密度D = 8.91 g/cm³, 鎳金屬的原子量為58.7 g/mole, 試計算鎳金屬的原子半徑為多少pm (1pm = 10⁻¹² m))? (10%)

6. 下表數據為定溫下 2N₂O(g) → 2N₂(g) + O₂(g) 在反應中 N₂O(g) 濃度對反應時間 t 的變化量:
 - (1) 請問此反應為零階反應(n = 0)嗎? 為什麼?
 - (2) 計算此反應的反應速率常數 k 之值?
 - (3) 計算 N₂O(g) 在 t = 0 時的起始濃度 [N₂O]₀ = ? (mol/L) (15%)

t (sec)	[N ₂ O] (mol/L)
200	0.160
400	0.150
800	0.130
1200	0.110

7. For a second order reaction 2A → P, 25.0 mol% of A are reacted to form P in 18 min. (二階反應 2A → P, 當反應 18 分鐘後 25% [A]₀ 被反應掉)
 - (1) What are the first and second half-lives for this reaction? (第一個半衰期時間? 與第二個半衰期時間?)
 - (2) How long does it take for 90.0 mol% of A being reacted? (計算當 90%的[A]₀ 被反應掉所費的時間?)
 - (3) If [A]₀ = 1.20 M, then calculate the value of k_A? (若起始濃度[A]₀ = 1.20 M, 求反應常數 k_A 之值?) (15%)

8. In which direction will the position of equilibrium : (N_{2(g)}+3H_{2(g)} ⇌ 2NH_{3(g)} ΔH < 0) be shifted for each of the following changes? (判斷反應 (N_{2(g)}+3H_{2(g)} ⇌ 2NH_{3(g)} ΔH < 0) 分別做了下列改變後, 反應會往何方向移動?) (5%)
 - (1) Catalyst is added? (加入觸媒)
 - (2) The pressure is increased by adding NH_{3(g)}? (反應器的體積固定, 加入 NH_{3(g)} 氣使總壓增加?)
 - (3) The temperature is increased? (升高反應溫度?)
 - (4) The volume of the container is doubled? (反應器的體積加倍?)

9. To rank the following bases from strongest to weakest. (將下列各組中物質的鹼度由大至小排列)

CH₃COO⁻ (K_b = 5.6 × 10⁻¹⁰), NH₃ (K_b = 1.8 × 10⁻⁵), C₅H₅N (K_b = 1.7 × 10⁻⁹), NO₃⁻, H₂O (5%)