大葉大學九十二學年度　研究所碩士班　招生考試試題紙

系　所	組　別	考　試　科　目 （中　文　名　稱）	考　試 日　期	節　次	備　註
環工所	乙	普通化學	4月13日	第　2　節 10:30 ﹏ 12:00	可用計算機 共2頁

P2-1

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

I. 選擇題(全部單選), 每題 5 分

1. For the chemical reaction A $\rightarrow$ C, a plot of 1/A versus time was found to give a straight line with a positive slope. What is the order of reaction with respect to A?
(A). zero　(B). first　(C). second　(D). Such a plot cannot reveal the order of reaction.

2. Complete and balance the following redox equation. What is the coefficient of OH⁻ when the equation is balanced with the set of smallest whole numbers?
$MnO_4^- + I^- \rightarrow MnO_2 + IO_3^-$ (basic solution)
(A). 1　(B). 2　(C). 4　(D). none of the above.

3. Two moles of chlorine gas at 20.0℃ are heated to 350℃ while the volume is kept constant. The density of the gas
(A). increases.　(B). decreases.　(C). remains the same.　(D). Not enough information is given to correctly answer the question.

4. The equilibrium constants (expressed in atm) for the chemical reaction
$N_{2(g)} + O_{2(g)} \rightleftharpoons 2 NO_{(g)}$
Are $K_p = 1.1 \times 10^{-3}$ and 3.6×10^{-3} at 2,200K and 2,500K, respectively, Which of the following statements is true?
(A). The reaction is exothermic　(B). the partial pressure of $NO_{(g)}$ is less at 2,200K
(C). K_p is less than K_c by (RT).　(D). The total pressure at 2,200 K is the same as at 2,500K

5. $Ca_3(PO_4)_2$ 之 $Ksp = 1.3 \times 10^{-26}$, $Ca_3(PO_4)_2$ 之莫耳溶解度(molar solubility)?
(A). 2.6×10^{-6}M　(B). 1.3×10^{-26}M　(C). 1.5×10^{-7}M　(D). 4.6×10^{-6}M

6. 醋酸鈉與醋酸之濃度比若干才能配成具有 pH=4.74 的緩衝溶液? (醋酸 Ka = 1.8×10^{-5}) (A). 1.0/1.0　(B). 0.4/1　(C). 2.0/1.0　(D). 0.75/1.0

7. 對一氧化還原反應之 $\triangle E°$,下列何者敘述正確 (A). $\triangle E°$ 愈大則平衡常數 K 愈大 (B). $\triangle E°$ 愈大則反應速率愈快 (C). 方程式各係數加倍後則 $\triangle E°$ 亦加倍 (D). $\triangle E°$ 值與溫度無關

8. $O + O_3 \rightarrow 2 O_{2(g)}$
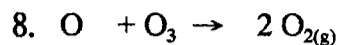
上述反應之活化能為 25 kJ/mol. 其反應熱 $\triangle H$= -388 kJ/mol. 試問上述反應之逆反應的活化能為 (A). 388 kJ (B). 363kJ (C). 25 kJ (D). 413 kJ

II. 計算題: 請詳列計算步驟否則概不計分(可使用計算機), 每題 15 分

1. $2 NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)}$,為單一步驟之平衡反應, 在 25℃ 條件下若正反應之速率常數 k_f= 7.1x10^{9}M^{-2},則在相同溫度下逆反應之速率常數 k_r 為?

[$NO_{(g)}$, $O_{2(g)}$, $NO_{2(g)}$ 之標準生成自由能分別為 86.7 kJ/mole, 0 kJ/mole, 51.8 kJ/mole]

2. 在一定容反應瓶中置入 $(CH_3)_2O_{(g)}$ 並進行反應, $(CH_3)_2O_{(g)} \rightarrow CH_{4(g)} + H_{2(g)} + CO_{(g)}$, 若 $(CH_3)_2O_{(g)}$ 為一級反應分解,其速率常數 k = 3.2x10^{-4}s^{-1} (450℃), $(CH_3)_2O_{(g)}$ 之起始壓力為 0.350atm,試問反應 8 分鐘後氣體總壓力為多少 atm?

3. The SO_2 present in air is mainly responsible for the acid rain phenomenon. Its concentration can be determined by titrating against a standard permanganate solution as follows:

$5SO_2 + 2MnO_4^- + 2H_2O \rightarrow 5SO_4^{2-} + 2Mn^{2+} + 4H^+$
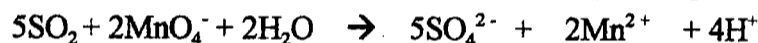
Calculate the number of grams of SO_2 in a sample of air if 7.37 mL of 0.00800 M $KMnO_4$ Solution are required for the titration. (AW: S=32, O=16)

4. On heating a gaseous compound A dissociates as follows:

$A_{(g)} \rightleftharpoons B_{(g)} + C_{(g)}$

In an experiment A was heated at a certain temperature until its equilibrium pressure reached 0.14 P, where P is the total pressure. Calculate the equilibrium constant (K_p) of this reaction.