國立中央大學八十四學年度碩士班研究生入學試題卷

所別：環境工程研究所　丁組　科目：分析化學　共 2 頁 第 1 頁

1.Choice the best answer: (9%)

a.In the following calculation:

$$\frac{4.10(\pm 0.02)\times 0.0050(\pm 0.0001)}{1.97(\pm 0.04)} = 0.0104(\pm ?)$$

(1)0.0001 (2)0.0002 (3)0.0003 (4)0.0004——————( )

b.The solubility product Ksp for the AgX is $4.0(0.4)\times 10^{-6}$. The solubility of AgX in water is 2.0×10^{-4}.What is the uncertainty in the calculated solubility of AgX in water ?

(1) 0.1 (2) 0.2 (3) 0.3 (4) 0.4——————( )

c.Determine the significant figure:

$$\frac{24\times 4.020}{100.0} = 0.9648...$$

(1)0.90 (2)0.96 (3)0.965 (4)0.970——————( )

2.Choice the best answer: (3×7%)

a.For determination of water-hardness (i.e., Ca^{2+} and Mg^{2+}) with EDTA, the titration is carried out in a buffer-solution of

(1) HOAc-NaAC(pH4.5) (2) NaH_2PO_4(pH6.5)

(3) Citric acid-NH_4OH(pH9) (4) NH_3-NH_4Cl(pH10)

(5) NaOH(pH13)——————( )

b.The pH of first equivalence point for the titration of 25.0 ml of 0.1000 M maleic acid with 0.1000 M NaOH is ($K_1=1.20\times 10^{-2}$, $K_2=5.96\times 10^{-7}$)

(1)4.07 (2)4.12 (3)4.30 (4)4.72——————( )

c.What is the ionic strength of a solution that is 0.120 M solution of HNO_3 and 0.050 M in NaCl,

(1)0.05 M (2)0.27 M (3)0.120 M (4)0.240 M——————( )

d.A certain aqueous sample contains the following ions at the listed concentraitons (in M): sodium (0.10),magnesium (0.02), zinc (0.05), nitrate (0.16) and chloride (0.08). If 10.0 ml of this sample are passed through a strong cation exchanger in the hydrogen form,

(1)17 (2)24 (3)48 (4)41 (5)none of the above——————( )

e.A student is determining chloride by the Volhard method and forgets to add nitrobenzene.The error could cause the results to be

(1)High (2)low (3)the error would have no effect.——————( )

f.Give the reason for the neutralization titration:

(a)the carboxylic acid need dissolve in ethanol and titrated with aqueous base.

(b)the amines need titrated in nonaqueous solvents.

(c)the carboxylic acid need titrated in nonaqueous solvents.

(d)the amines need dissolve in ethanol and titrated with aqueous base.

(1)a,b (2)a,d (3)b,c (4)c,d——————( )

g.A 0.6000g sample of a pure weak diprotic acid, H_2A. is dissolved in exactly 30.0ml of water and titrated potentiometrically, with 0.100N NaOH, if the volume of titrant which is required to reach the first equivalence point is 30.0ml, the molecular weight (g/mole) of the acid is:

(1)100 (2)150 (3)200 (4)400 (5)none of the above.——————( )

h.What are the acid-base indicator transition range ?

(a)pK_{a1} (b)K_{sp1} (c)pK_{f1}

(1)a,b (2)a. (3)b,c (4)a,c——————( )

3.The silver ion in a 25.00 ml sample was converted to dicyanoargentate(I) ion by the addition of an excess of a solution containing $Ni(CN)_4^{2-}$:

$$Ni(CN)_4^{2-} + 2Ag^+ \rightarrow 2Ag(CN)_2^- + Ni^{2+}$$

The liberated nickel ion was titrated with 43.77 ml of 0.02408 M EDTA. Calculate the molar concentration of the silver solution. (9%)

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參考用

4. 請說明分析儀器中光電倍增管(photomultiplier tube)的工作原理 (10%)。

5. 請指出分析空氣中懸浮微粒元素組成的儀器方法有那幾種？並請簡單說明其工作原理 (10%)。

6. 請說明實驗數據管制圖(control chart)的製作方法及其顯示的意義 (10%)。

7. 請說明實驗數據品質管制(quality control)和品質保證(quality assurance)的意義及兩者之差異 (20%)。