私立臺北醫學院 九十二 學年度第 一 學期 期中/期末 考試 命(試)題紙

系級	科目	授課教師	考試日期	學號	姓名
醫一	分析化學	張怡怡	93年 1月 14日第 2,3,10節		

※①請注意本試題共 5 張。如發現頁數不足及空白頁或缺印，應當場請求補齊，否則缺少部份概以零分計。
②每張試題卷務必填寫(學號)、(姓名)。

I. Select the best answer (60%)

1. Which statement is independent on the solution of ionic strength?
(A) nature of the electrolyte (B) charge on the species (C) activity coefficient (D) effective diameter of the hydrated ion..... ( )

2. In gravimetric methods for organic functional groups determination:
Organic + $H_2NNHC_6H_3(NO_2)_2$ → R-CH=NNHC$_6$H$_3$(NO$_2$)$_{2(s)}$ + H_2O
(A) carbonyl (B) aromatic carbonyl (C) methoxyl (D) azo group
Choice the correct functional group..... ( )

3. (A) Surface adsorption (B) Gathering agent (C) Mixed-crystal formation (D) Occlusion is a type of coprecipitation in which a contaminant ion replaces an ion in the lattice of a crystal..... ( )

4. An aqueous solution contains $NaNO_3$ and KSCN. The thiocyanate ion is precipitating as AgSCN by addition of $AgNO_3$. After an excess of the precipitating reagent has been added.
(1) What is the charge on the surface of the coagulated colloidal particles? (A) Ag^+ (B) Na^+ (C) K^+ (D) NO_3^- (E) SCN^-..... ( )
(2) What ions predominate in the counter-ion layer? (A) Ag^+ (B) Na^+ (C) K^+ (D) NO_3^- (E) SCN^-..... ( )

5. For a given ionic strength, the activity coefficient becomes (A) smaller (B) larger (C) unity (D) Constant as the charge of the chemical species increases..... ( )

6. Find the pH of a solution prepared by dissolving 12.00 g of tris (FW=121.14) plus 4.00 g of tris-hydrochloride (FW=157.60, pKa=8.08) in 1.00 L of water? ( ) (A) 8.67 (B) 7.35 (C) 6.40 (D) 5.56 If we add 12.00 mL of 1.000 M HCl to this buffer solution, what will be the new pH? ( ) (A) 8.45 (B) 7.10 (C) 6.32 (D) 5.28

7. Consider the diprotic acid H_2A with $K_{a1}=1.00\times10^{-4}$ and $K_{a2}=1.00\times10^{-8}$. Find pH of the following solutions
a. ( ) 0.100 M H_2A (A) 2.51 (B) 3.20 (C) 3.85 (D) 4.32
b. ( ) 0.100 M NaHA (A) 5.32 (B) 6.00 (C) 6.52 (D) 7.28

8. What factors can not affect end-point sharpness in an acid/base titration? (A) indicator choice (B) reagent concentration (C) reaction completeness (D) analyte concentration ..... ( )

9. In the Volhard method, if you forgot to removal silver chloride before back-titration, the result leads to (A) higher (B) lower (C) same (D) unstable values for the chloride analysis. ..... ( )

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10. Eirochrome Black T forms red complexes with metal ions. Thus, for metal ion detection, it is necessary to adjust the pH to (A) pH≧7 (B) pH≦7 (C) 3<pH<6 (D) 2<pH<9 ... ...( )

11. In the Kjeldahl method, the decomposition step is frequently the most time-consuming. In the most widely used modification, (A) potassium sulfate (B) selenium (C) hydrogen peroxide (D) pyridine can be added to increase the boiling point of the sulfuric acid solution... ...( )

12. (A) Carboxylic acid groups (B) Amines groups (C) Ester groups (D) Hydroxyl groups (E) Carbonyl groups in organic compounds can be determined with a solution of hydroxylamine hydrochloride.....( )

13. (A) Tungesten (B) Deuterium (C) Xenon (D) Hallow-cathode lamps are most often used to provide continuum radiation in the UV region... ... .( )

14. A solute moves through a chromatography column with a retention time 407 s and a width at the base of 13 s (on a column 12 m long)

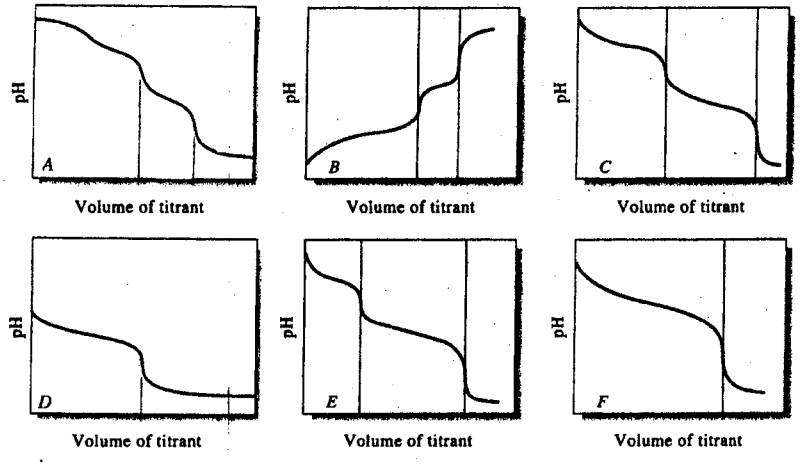
1. The number of plates is (A) 1.57×10^4 (B) 2.43×10^4 (C) 3.22×10^5 (D) 3.58×10^5 ... ...( )

2. A neighboring peak is eluted at 424 s with a width of 16 s. The resolution for these two components is (A) 1.2 (B) 1.8 (C) 2.2 (D) 3.5... ... .( )

15. Identify by letter the curve you would expect in the titration of a solution containing

( ) (a) $Na_2CO_3 + NaHCO_3$

( ) (b) $NaOH+Na_2CO_3$



臺北醫學大學 九十二 學年度第 一 學期 期中/期末 考試 命(試)題紙

系級	科目	授課教師	考試日期	學號	姓名
醫一	分析化學	張怡怡	93年1月16日第 2:00 3:10 節		

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II. A solution contains 1×10^{-4} M of both Fe^{2+} and Cd^{2+}. Sulfide ions are slowly added to this solution to precipitate either FeS or CdS. Determination which ion precipitates first and the range of S^{2-} concentration that will allow a clean separation of the two ions. (Ksp of FeS= 8×10^{-19} , CdS= 1×10^{-27}) (8%)

III. Calculate the % relative error in hydronium ion concentration by using concentrations instead of activities in calculating the pH of a solution that is 0.100 M HOAc and 0.200 M NaOAc.
(Ka of HOAc = 1.75×10^{-5}) (8%)

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醫一	分析化學	張怡怡	93年1月14日第2,3節		

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IV. The calcium and magnesium in a urine sample were precipitated as oxalates. A mixed precipitate of CaC_2O_4 and MgC_2O_4 resulted and was analyzed by a thermogravimetric procedure. The precipitate mixture was heated to form $CaCO_3$ and MgO. This second mixture weighted 0.0433g. After ignition to form CaO and MgO, the resulting solid weighed 0.0285g. What was the mass of Ca in the original sample. (Ca = 40.1, O = 16.0, C = 12.0, Mg = 24.3) (8%)

V. The digestion of a 0.1417g sample of a phosphorus-containing compound in a mixture of HNO_3 and H_2SO_4 resulted in the formation of CO_2, H_2O and H_3PO_4. Addition of ammonium molybdate yield a solid having the composition $(NH_4)_3PO_4 \cdot 12MoO_3$ (1876.3 g/mol). This precipitate was filtered, washed, and dissolved in 50.00 mL of 0.2000 M NaOH:

$$(NH_4)_3PO_4 \cdot 12MoO_{3\,(s)} + 26\ OH^- \rightarrow HPO_4^{2-} + 12\ MoO_4^{2-} + 14\ H_2O + 3\ NH_3\ (g)$$

After the solution was boiled to move the NH_3, the excess NaOH was titrated with 14.17 mL of 0.1741 M HCl to a phenolphthalein end point. Calculate the percentage of phosphorus in the sample. (P = 31.0) (8%)

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VI. Consider the titration of Ca^{2+} with EDTA

(a) Calculate the equivalence-point pCa for the titration of 50.0 mL of 0.00500 M Ca^{2+} with 0.0100 M EDTA in a solution buffered to a constant pH of 10.0.

(b) Determine the transition ranges for Eriochrome Black T for Ca^{2+} in this titration. Why isn't Eriochrome Black T a suitable indicator for this titration?

($K_{CaY^{2-}}=5.0\times10^{10}$, $K_{CaIn^-}=2.5\times10^{5}$, K_2 of EBT$=2.8\times10^{-12}$) (8%)

Table 1 Values for α_4 for EDTA at selected pH values

pH	α_4	pH	α_4
2.0	3.7×10^{-14}	7.0	4.8×10^{-4}
3.0	2.5×10^{-11}	8.0	5.4×10^{-3}
4.0	3.6×10^{-9}	9.0	5.2×10^{-2}
5.0	3.5×10^{-7}	10.0	3.5×10^{-1}
6.0	2.2×10^{-5}	11.0	8.5×10^{-1}
		12.0	9.8×10^{-1}