國立高雄師範大學 105 學年度學士班轉學生招生考試試題

系所別：化學系三年級

科　目：分析化學

※注意：1.不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上，於本試題上作答者，不予計分。
2.限用藍色或黑色之鋼筆、原子筆作答，以鉛筆或其他顏色作答者不予計分。

1. Please explain the following terms:（20％）
   (a) Amphiprotic species

   (b) quantitative analysis

   (c) accuracy

   (d) sensitivity

   (e) internal standard method

2. What are sources of systematic error?（10％）

3. Calculate the molar solubility of $Ba(IO_3)_2$ ($K_{sp} = 1.57 \times 10^{-9}$) in a solution that is 0.02 M in $Ba(NO_3)_2$.（10％）

4. What is a buffer solution, and what are its properties?（10％）

（背面有題　續翻背面）

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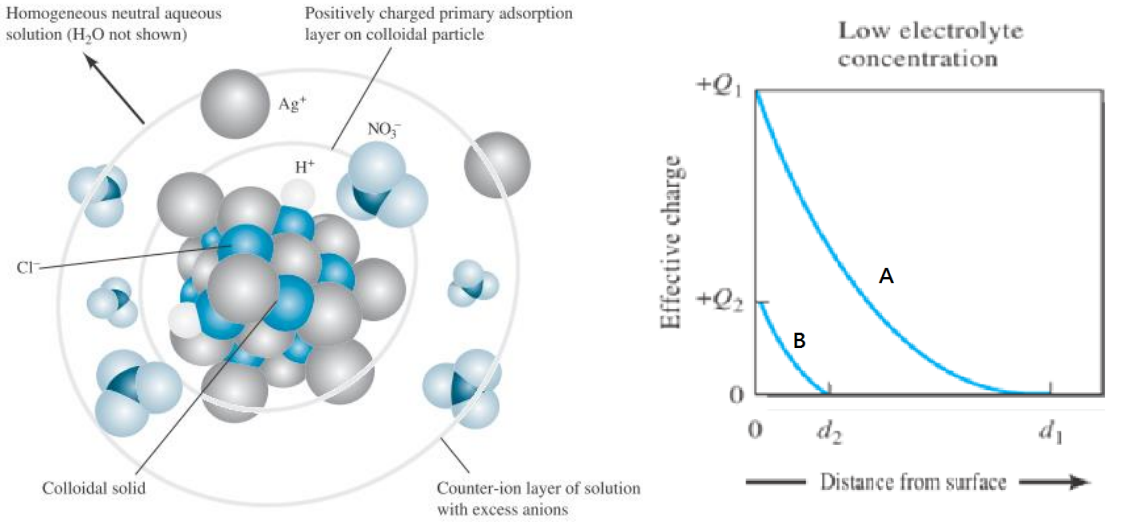
5. The following figure on the left shows a colloidal silver chloride particle suspended in a solution of silver nitrate. Attached directly to the solid surface is the primary adsorption layer. Surrounding the charged particle is a layer of solution, called the counter-ion layer.



According to the figure shown above on the right, which demonstrates the effective charge on two silver chloride particles.

(a) Curve A or curve B represents a particle in a solution that contains a reasonably large excess of silver nitrate? Please give your explanation.（4%）

(b) Curve A or curve B depicts a particle in a solution that has a much lower silver nitrate content? Please give your explanation.（4%）

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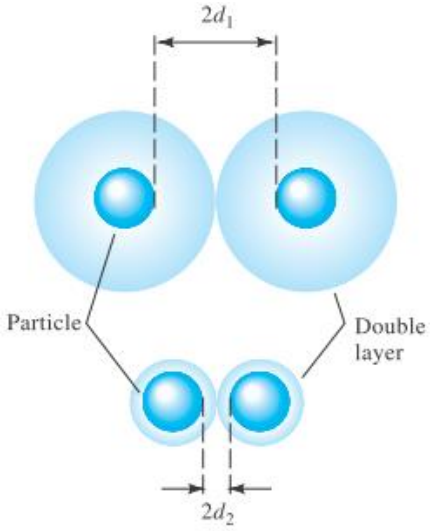
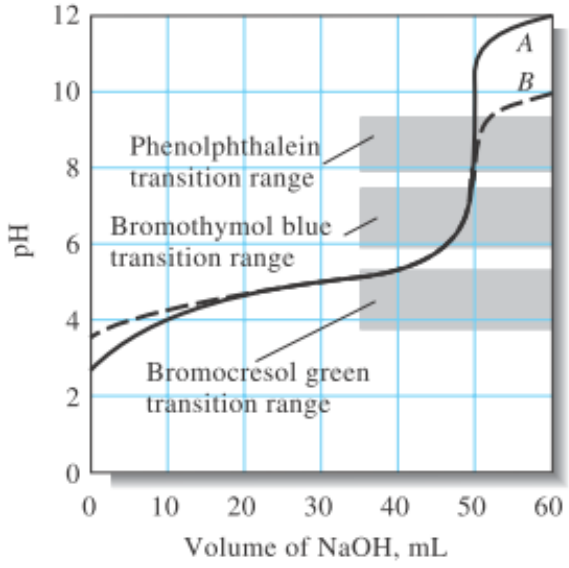
6. Increasing the electrolyte concentration has the effect of **(a) decreasing or increasing** the volume of the counter-ion layer, thereby **(b) decreasing or increasing** the chances for coagulation.
   (a) Is **decreasing or increasing** （3%）

   (b) Is **decreasing or increasing** （3%）



7. Curve A and B are both for the titration of acetic acid with sodium hydroxide at various concentrations. Which curve illustrates the titration of more dilute solution?（4%）



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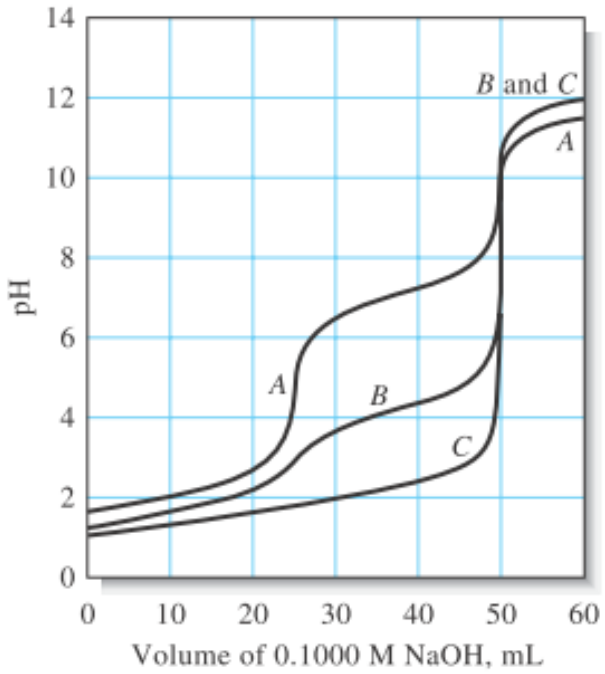
8. Curves A, B, and C are the titration of polyprotic acids (25.00 mL) with a 0.1000 M NaOH solution.

(a) Which curve is the titration of 0.1000 M H_3PO_4 ($K_{a1} = 7.11 \times 10^{-3}$, $K_{a2} = 6.32 \times 10^{-8}$, $K_{a3} = 4.5 \times 10^{-13}$)?（4%）

(b) Which curve is the titration of 0.1000 M oxalic acid ($pK_{a1} = 1.27$, $pK_{a2} = 4.26$)?（4%）

(c) Which curve is the titration of 0.1000 M H_2SO_4 (K_{a1} = large, $K_{a2} = 1.2 \times 10^{-2}$)?（4%）



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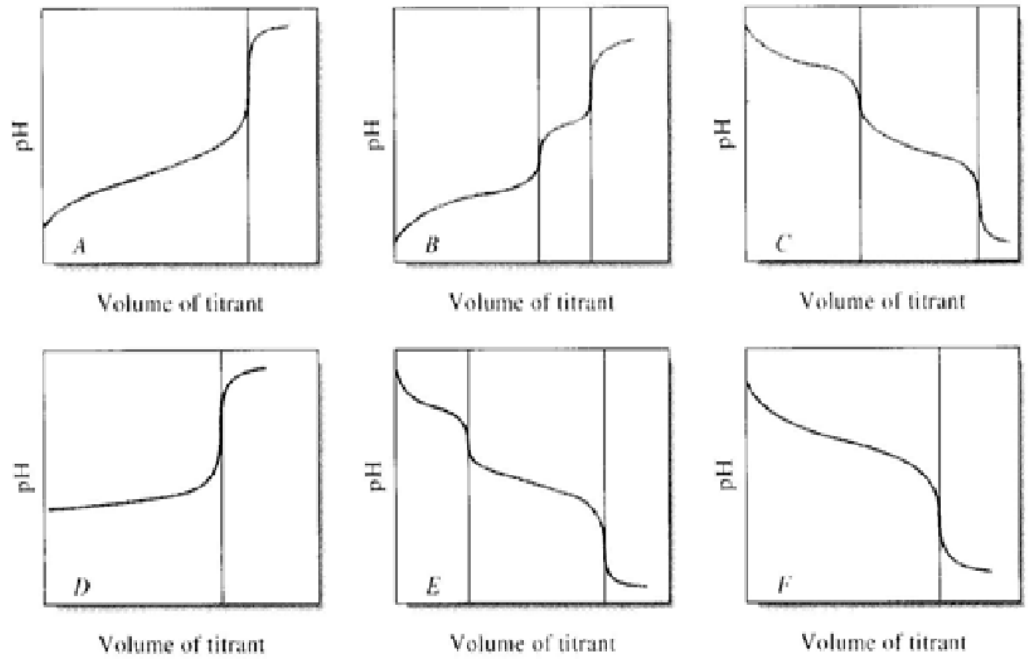
9. Identify by letter of the curve you would expect in the titration of the solution containing.

(a) Pyruvic acid with standard base. ($CH_3COCOOH$, $K = 3.2 \times 10^{-3}$)
Curve _____ （4%）

(b) Sodium carbonate with standard acid. (Carbonic acid, $K_1 = 4.45 \times 10^{-7}$ and $K_2 = 4.69 \times 10^{-11}$)
Curve _____ （4%）



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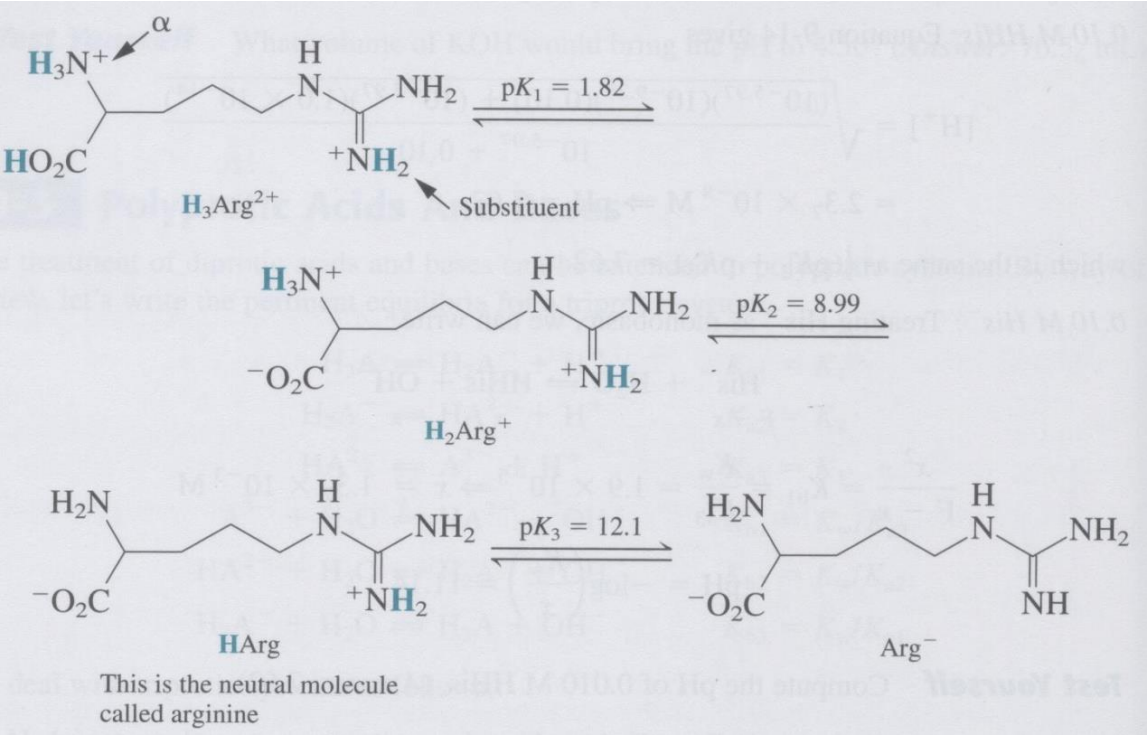
10. The amino acid arginine has the following forms: [pK_1 = 1.82 (COOH), pK_2=8.99 (NH_3)]



α-amino ammonium group (at the left of the structure) is more acidic than the substituent (at the right).

(a) What is the principal form of arginine at pH 10.0?（4％）

(b) Approximately what fraction is in this form?（4％）

(c) What is the second most abundant form at this pH 10.0?（4％）