

Time: 90 min.

Chemistry 205

Final Exam

Jan. 26, 1998

H. Deeb

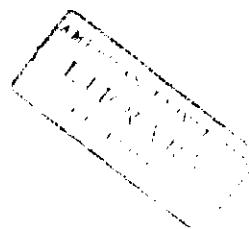
Family name: \_\_\_\_\_

First name: \_\_\_\_\_

Student no: \_\_\_\_\_

Major: \_\_\_\_\_

Section: \_\_\_\_\_



Grading :

I /50

II /20

III /30

IV /25

V /14

VI /12

VII /12

VIII /12

Total : \_\_\_\_\_ / 175

i) Circle the letter that precedes the correct answer in each of the following . ( there is only one correct answer ) .

\* During titration , the student was obliged to fill a buret twice to transfer 74.96 mls . If the absolute uncertainty of the buret is 0.02 ml ; then the relative uncertainty of the above transferred volume is :

- a- 0.08
- b- 0.04
- c- 0.001
- d- 0.0005

\* A proper indicator for an acid - base titration is :

- a- Phenolphthalein , since it shows a recognizable change in color.
- b- An indicator that changes color at  $\text{pH} = 7$  .
- c- A weak acidic indicator .
- d- An indicator that changes color around the pH which corresponds to the end point .

\* A good experimental data , when plotted vs, number of measurement should follow a normal distribution :

- a- Because of systematic error .
- b- Because of random error that can not be eliminated .
- c- The wider this normal curve the more accurate the data .
- d- The narrower the curve the more accurate the data .

\* **Mercurous chloride is soluble in :**

- a-  $\text{H}_2\text{O}$
- b- Conc.  $\text{HCl}$  solution .
- c- Dilute  $\text{HCl}$  solution .
- d- Dilute  $\text{NaCl}$  solution .

\*  **$\text{HgS}$  and  $\text{AgCl}$  slightly soluble salts :**

- a- are soluble in conc.  $\text{HNO}_3$  .
- b- are insoluble in conc.  $\text{HNO}_3$  .
- c- are white salts .
- d- both have cations that belong to group II ions .

\*  **$\text{Fe}^{+3}$  ions can be separated from  $\text{Al}^{+3}$  ions :**

- a- by addition of conc. base .
- b- by addition of dilute base .
- c- by addition of  $\text{KSCN}$  .
- d- by addition of Aluminum dye .

\* **Among the following , the only compound that can not react with  $\text{NH}_3$  is :**

- a-  $\text{AgCl}$
- b-  $\text{Hg}_2\text{Cl}_2$
- c-  $\text{PbCl}_2$
- d-  $\text{Bi}(\text{OH})_3$

\* To increase the solubility of AgCl in a saturated aqueous solution :

- a- Conc.  $\text{NH}_3$  may be added .
- b- Dilute HCl may be added .
- c- Dilute  $\text{HNO}_3$  may be added .
- d- Any base may be added .

\*  $K_{sp}$  of  $\text{PbI}_2$  at  $25^\circ\text{C}$  is  $1.4 \times 10^{-8}$  . The maximum mass of  $\text{PbI}_2$  that can dissolve in 1.0 L of water at  $25^\circ\text{C}$  is :

- a-  $1.5 \times 10^{-3}$  g
- b-  $3.0 \times 10^{-3}$  g
- c- 0.31 g
- d- 0.69 g

\* If 25.0 mls of 0.0010 M  $\text{AgNO}_3$  are mixed with 75.0 mls of 0.0010 M  $\text{Na}_2\text{CO}_3$  at  $25^\circ\text{C}$  , (  $K_{sp}$  of  $\text{Ag}_2\text{CO}_3 = 6.2 \times 10^{-12}$  at  $25^\circ\text{C}$  ) :

- a-  $\text{Ag}_2\text{CO}_3$  precipitate will form .
- b-  $\text{Ag}_2\text{CO}_3$  precipitate will not form .
- c-  $\text{AgCO}_3$  precipitate will form if the concentration of  $\text{AgNO}_3$  solution is decreased .
- d- None of the above .

**II) Explain the effect of adding dilute HCl solution on the solubility of each of the following in a saturated aqueous solution . Use chemical equations if applicable , to clarify your answer .**

a- AgCl

b- Phthalic acid

c- ZnS

d- ZnCO<sub>3</sub>

• III) Write complete balanced equation(s) that represent(s) each of the following :

a- Reaction  $\text{Al}^{+3}$  when heated with thioacetamide

b- Confirmatory test for  $\text{Cu}^{+2}$

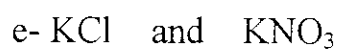
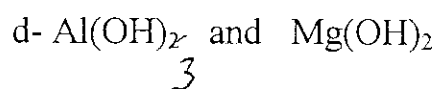
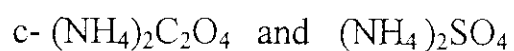
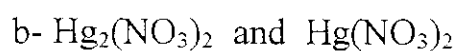
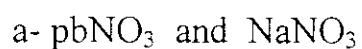
c- Reactions that show the amphoteric properties of  $\text{pb}(\text{OH})_2$

d- Confirmatory test of  $\text{Mg}^{+2}$

e- Reaction of any of Group II sulfides with  $\text{HNO}_3$  .

f- Addition of hot concentrated  $\text{HCl}$  to  $\text{AgCl}$  .

- IV) How can you distinguish among each of the following compounds by unusual chemical means. Write the chemical equation(s) involved and indicate observation :



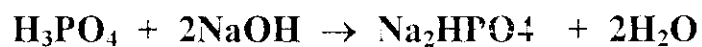
V) In general unknown analysis , the first step done was addition of Group I reagent .

a- Can instead thioacetamide be added as the first step before addition of HCl . Explain .

b- " Selective precipitation" was applied in general unknown analysis , at which stage this was done ? Explain .



- VII) A 0,300 g sample containing phosphoric acid and inert material was diluted with water and titrated with 0.0500 M NaOH according to the following reaction :



The end point was reached after 29.00 ml titrant was added .  
Calculate the % of  $\text{H}_3\text{PO}_4$  in the sample .

- VII) Calculate the volume of 1.00 M HCL that must be added to 100.0 ml of 0.100 M NaOH to reach a pH of 11.9 .

VIII) If a 0.0100 M solution absorbs 55% at some wave length . What will be the % transmittance for a 0.0200 M solution of the same substance .