

Time: 80 minutes

Chemistry 101  
Lab-Final Exam

January 14, 1999  
H. Deeb

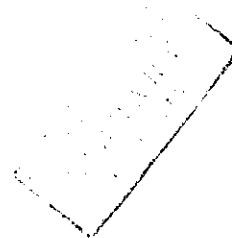
Family Name: \_\_\_\_\_

First Name: \_\_\_\_\_

Student No: \_\_\_\_\_

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

Name of Instructor: \_\_\_\_\_



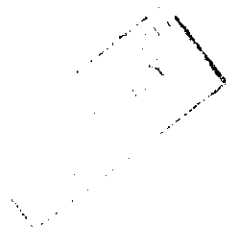
**Grading :**

I ...../70

II...../15

III...../15

**Total:**                   /100



1) Circle the letter that precedes the correct answer in each of the following. (There is one correct answer. No double penalty).

• The only measurement that is reported to four significant figures among the following is:

a- 0.0030kg

b-  $0.0030 \times 10^3$ g

c- 30.00g

d-  $0.300 \times 10^2$ g

• Given the following arithmetic operation:  $79500 \div (2.5 \times 10^2)$   
The correct answer for this operation is:

a- 318

b-  $3.2 \times 10^2$

c-  $3.18 \times 10^2$

d-  $3.1800 \times 10^2$

• A student measured the volume of NaOH needed to titrate an acid sample by filling the buret twice, knowing that the absolute uncertainty of the buret is 0.02 ml. The accepted reported volume to the correct uncertainty is:

a-  $62.1 \pm 0.02$  mls

b-  $62.10 \pm 0.04$  mls

c-  $62.1 \pm 0.08$  ml

d-  $62.10 \pm 0.08$

• Which of the following should not be done while reading a certain volume using a buret ?

a- View horizontally with eyes on the same level as the meniscus.

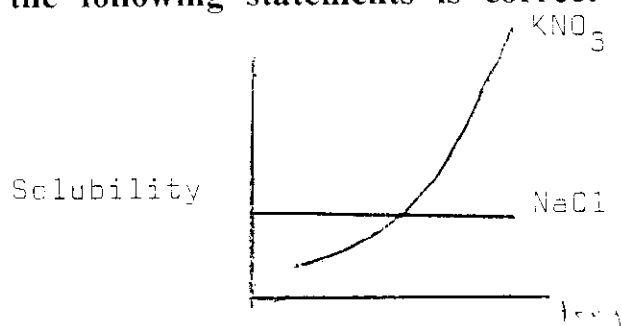
b- Read the graduation which is tangent to the meniscus.

c- Use a white background in order to see the graduations better.

d- View the meniscus side wise horizontally.



- Which of the following statements is correct in reference to the diagram:

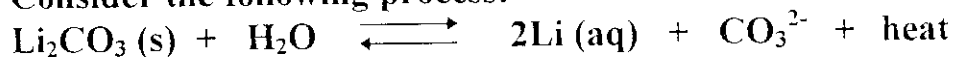


- a- When  $\text{KNO}_3$  is dissolved in  $\text{H}_2\text{O}$ , heat is evolved
- b-  $\text{NaCl}$  is less soluble in  $\text{H}_2\text{O}$  than  $\text{KNO}_3$  at any given temperature
- c- When  $\text{NaCl}$  is dissolved in  $\text{H}_2\text{O}$ , heat is evolved
- d- When  $\text{KNO}_3$  is dissolved in  $\text{H}_2\text{O}$ , heat is absorbed

- A sample of  $\text{Al}_2(\text{SO}_4)_3$  (molecular weight = 342g) is decomposed completely to  $\text{Al}_2\text{O}_3(\text{s})$  and  $\text{SO}_3(\text{g})$ . If the volume of  $\text{SO}_3(\text{g})$  collected at STP is 49.1 liters, what is the weight of  $\text{Al}_2(\text{SO}_4)_3$  used ?

- a- 250 g
- b- 750 g
- c- 147 g
- d- 70.0 g

- Consider the following process:



- a- The hydration energy of  $\text{Li}_2\text{CO}_3$  is smaller than its lattice energy.
- b- The hydration energy of  $\text{Li}_2\text{CO}_3$  is greater than its lattice energy.
- c-  $\Delta H$  of the above reaction is positive.
- d- The solubility of  $\text{Li}_2\text{CO}_3$  is independent of temperature.

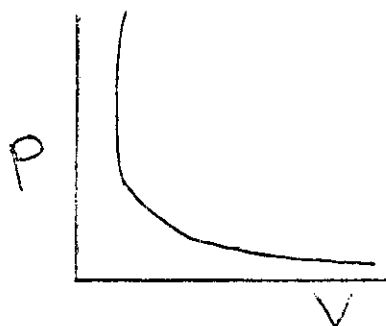
- While preparing KHP standard solution using 250ml volumetric flask, a student did a mistake by adding excess water above the mark. The best way to minimize the error without repeating the preparation is:

- a- To homogenize the solution, by shaking thoroughly, then to remove the excess water to the mark and discard it.
- b- To remove the excess water to the mark before homogenizing.
- c- To continue the work ignoring the mistake, since the additional water will not affect the results significantly.
- d- To measure accurately the volume of additional water after homogenizing and correct the total volume of the solution.

- 0.642g of KHP (Mol. Weight = 204.2g) was dissolved in enough water using a 250 ml volumetric flask and the volume is made up to 250 mls. The normality of the prepared KHP is:

- a- 0.01259 N
- b- 0.02519 N
- c-  $3.148 \times 10^{-3}$  N
- d-  $6.295 \times 10^{-3}$  N

- Consider the following graphical representation for a certain gas:



- a- The graph expresses Chart's Law
- b- The graph expresses Boyle's Law
- c- The graph expresses Graham's Law
- d- None of the above

- The volume of 2.107 M NaOH solution needed to completely neutralize 26.40 mls of 1.653 M H<sub>2</sub>SO<sub>4</sub> is:

- a- 20.71 mls
- b-  $20.71 \times 10^3$  mls
- c- 41.42 mls
- d- 82.84 mls

- The equivalent weight of KMnO<sub>4</sub> in a reaction the leads to the formation of MnO<sub>2</sub> is:

a-  $\frac{\text{Mol. weight}}{3}$

b-  $\frac{\text{Mol. weight}}{7}$

c- Mol. weight

d- Can not be predicted, unless the complete equation is given

- Of the following volumetric equipment, the equipment that is calibrated to deliver a certain definite volume is:

- a- Buret
- b- pipet
- c- volumetric flask
- d- Graduated cylinder

- Which of the following statements is correct ?

- a- An accurate set of results is necessarily precise.
- b- A set of results with the least % error is the most accurate.
- c- A set of results with the least % error is the most precise.
- d- A precise set of results is necessarily accurate.

- While titrating, the walls of the Erlenmeyer flask have to be washed occasionally with the minimum amount of distilled water:

- a- To dilute the solution, so as a clear end point is observed.
- b- To wash in any splashed droplets of the titrated solution.
- c- If the walls are washed as mentioned above, the concentration of the titrated solution is changed, consequently wrong results will be obtained.
- d- This washing can be done only if the volume of distilled water used for that purpose is accurately measured.

- A 50.0g sample of calcium carbonate is allowed to react with 35.0g of  $\text{H}_3\text{PO}_4$  to produce calcium phosphate  $\text{Ca}_3(\text{PO}_4)_2$ :

- a- Calcium carbonate is the limiting reagent.
- b-  $\text{H}_3\text{PO}_4$  is the limiting reagent.
- c- The no. of moles of  $\text{H}_3\text{PO}_4$  used is more than that of calcium carbonate.
- d- the no. of moles of  $\text{H}_3\text{PO}_4$  used is less than that of  $\text{CaCO}_3$ , consequently  $\text{H}_3\text{PO}_4$  is the limiting reagent.



• Which of the following statements is incorrect !

- a- The rate of diffusion of  $N_2$  is higher than that of HCl.
- b- The rate of diffusion of  $N_2$  is less than that of  $NH_3$ .
- c- The white ring, seen in the tube used to compare the rate of diffusion of HCl and that of  $NH_3$  is due to  $NH_3$  vapor.
- d- the white ring seen in the tube used to compare the rate of diffusion of HCl and that of  $NH_3$  is due to the formation of  $NH_4Cl$ .

• Of the following solutions, the only one that yields white precipitates when ammonium sulfide is added:

- a-  $CuSO_4$
- b-  $Al(NO_3)_3$
- c-  $Pb(NO_3)_2$
- d-  $AgNO_3$

• Of the following ions, the only one that yields a gas when treated with ammonium carbonate is:

- a-  $Cu^{+2}$
- b-  $Pb^{+2}$
- c-  $Fe^{-2}$
- d-  $Ag^{-}$

• A solution of potassium iodide and a solution of ammonium nitrate were stored in two different unlabeled bottles, the best way to identify each is to add a solution of:

- a- Ammonium carbonate
- b-  $Fe(NO_3)_3$
- c-  $CuSO_4$
- d-  $Al(NO_3)_3$

III- Solve each of the following, show your calculations clearly and report your answer to the proper number of significant figures.

a. The volume of  $\text{CO}_2$  gas evolved from the reaction of  $\text{CaCO}_3$  and  $\text{HCl}$  at 769.5 mm Hg and  $21.20^\circ\text{C}$  is 261.2 mls. The weight of this  $\text{CO}_2$  sample is 0.5031 g.

1- Calculate the molecular weight of  $\text{CO}_2$ .

2- Calculate the % error, knowing that the theoretical molecular weight of  $\text{CO}_2 = 44.01\text{g}$ .



b. 2.1304 g of Mg reacts completely with enough HCl at 76.78 cm Hg and 25.60 °C to produce H<sub>2</sub> gas.

1- What is the volume of H<sub>2</sub> gas evolved.

2- How many equivalents of H<sub>2</sub> gas are obtained.

b- The corrected complete balanced equations are:

IV- Knowing that differentiation based on color only is insufficient, how can you differentiate by visual chemical means between each of the following pair of ions? (write chemical equations involved with the observation).

a-  $\text{Fe}^{+2}$  and  $\text{pb}^{+2}$

b-  $\text{Ag}^+$  and  $\text{Al}^{+3}$

c-  $\text{NH}_4^+$  and  $\text{Ca}^{+2}$

d-  $\text{Hg}_2^{+2}$  and  $\text{Fe}^{+3}$