BIRZEIT UNIVERSITY

Chemistry Dept

Chemistry 111

1St. Semeste

Final Exam
Time:90 minutes

Lecturer: Dr. Z. Abdul Majed
Lab Instructors: Mr.A. Qamhieh
Mr. N. Wahbeh
Ms . R. Smoğrı
Mr. M. Samirah

Atomic Masses: Na(23), Ba(137), P (31), O (16), H(1)
Cl(35.5), C (12), N(14),

5. A catalyst is a substance that :

(a) it's mass doesn't change before and after the reaction.

(b) speed up the reaction.

(c) provides a lower energy path that leads from reactants to products.

(d) All of the above.

6. 42 gm of nitrogen combined with 96 gm of oxygen, the simplest formula of the compound formed is

(a) N_3O_6

(b) NO_2

(c) (a) and (b)

(d) NO

7. Sodium hydroxide cannot be used as a primary standard because:

(a) of its unknown molecular formula.

(b) its reaction with acid is slow.

(c) it absorbs water and reacts with CO_2 quickly.

(d) it has a very high melting point.

8. A 16.920 gm sample of $Na_3PO_4.12H_2O$ and $BaCl_2.2H_2O$ was stirred in H_2O. It gave 8.03 gm of $Ba_3(PO_4)_2$. The percentage of $BaCl_2.2H_2O$ in the sample is: (considering $BaCl_2.2H_2O$ is the limiting reactant).

(a) 67.80%

(b) 63.99%

(c) 60.00%

(d) 30.00%

PART A: CIRCLE THE CORRECT ANSWER: (15 points)

1. A quadruple beam balance was used in weighing a sample. Which of the following figures should you report:

(a) 1.500 g
(b) 1.5 g
(c) 1.50 g
(d) 0.15x10 g

2. To fire polish a glass tube, one should :

(a) make a scratch across the tube, heat until the glass is soft , then remove from the flame.
(b) heat the center of the tube until it is soft, remove it then pull the ends.
(c) heat the ends of the tube with a rotary motion in the edge of the flame until sharp edges become rounded.
(d) heat the tube, rotate it until it is soft, remove it and bend.

3. What is the volume occupied by a piece of metal having a mass of 2.50 gm and a density of 0.830 gm/cm^3 ?

(a) 2.08 cm^3
(b) 0.332 cm^3
(c) 3.01 cm^3
(d) 3.01 ml
(e) c and d are correct.

4. In the determination of the empirical formula of magnesium oxide experiment, 15 drops of water were added to MgO in order to

(a) convert any magnesium nitride to magnesium oxide.
(b) [illegible] of magnesium with oxygen.

Part (B):

Name the piece of equipment or material that you would use to perform the following: (9 points)

1. Measure the freezing point of cyclohexane: Thermometer
2. Transfer 25.00 ml of standard HCl to a flask: pipette
3. Remove a hot crucible from the flame: tongs
4. A container used in measuring the heat of neutralization: calorimeter
5. Show the endpoint in a titration reaction: indicator
6. Hold a crucible while heating it on a Bunsen burner: triangle
7. Tackle a laboratory fire: extinguishers
8. Slow delivery of the titrant during titration: stopcock
9. A place where unpleasant vapors can be suctioned out of the laboratory: hood

$PV = nRT \Rightarrow n = \frac{PV}{RT}$ / $n_{CO_2} = \frac{P_{CO_2} V_{CO_2}}{RT}$

$P_{CO_2} = P_{atm} - P_{H_2O} = 724 - 15.5 = 708.5$ mmHg $= \frac{708.5}{760}$ atm $= 0.932$ atm

$V_{CO_2} = 25$ ml $= 0.025$ L // $T = 18 + 273 = 291$ K

$n = \frac{0.932 \times 0.025}{0.0821 \times 291} = \frac{0.0233}{23.89} = 0.000975$

# of moles of CO_2 = # of moles of $NaHCO_3$ $\Rightarrow n = n$

13. In the determination of the composition of $NaHCO_3$ by gas evolution analysis, if 0.1gm of the unknown was obtained and the following data was recorded after doing the experiment:

$2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2CO_2 + 2H_2O$

Volume of CO_2 = 25.00ml
R = 0.0821 L.atm/mole.K
Barometric pressure=724mmHg
Room temperature=18c

$P_{water\ vapor}$ = 15.5 mmHg

The percentage of $NaHCO_3$ in the unknown =

(a) 64.32%
(b) 81.9%.
(c) 74.10%.
(d) 83.70%.

14. In an attempt to verify Boyle's law, a student obtained the following data at 25 c:

V_1=56.00ml P_{atm}=720 mmHg
V_2=54.44ml P_{water}=27.2cm

$P_{water\ vapor}$=20mmHg

From this data we conclude that:

(a) the percent error in P2 is around 5%.
(b) P_2=720mmHg.
(c) $V_1/V_2 = P_1/P_2$
(d) $P_1/V_1 = P_2/V_2$.

15. The purpose of making a tiny hole in the aluminum cap in the Volatile Liquid experiment is:

(a) to equalize the atmospheric pressure and the vapor pressure.
(b) to get rid of the excess vapor.
(c) to return back the air during condensation.
(d) all of the above.
(e) none of the above.

4. Adding 20 ml of 0.1 M NaCl solution to 10.0ml of 0.3 M $AgNO_3$ solution would form the precipitate AgCl. The filtrate would most likely contain:

a) Ag^+ and NO_3^-

b) Na^+, Ag^+, and Cl^-

c) Na^+ and Cl^- only

d) Na^+, Ag^+ and NO_3^-

5. The process of removing the supernatant from the residue by using a beaker (as a receiver) and a glass rod is called:

a) Filtration.

b) Titration.

c) Decantation.

d) Diffusion

6. Adding water to the flask during titration will ....

a) increase the calculated molecular weight of the acid in the flask.

b) increase the normality of NaOH in the burette.

c) affect the indicator in the flask.

d) none of the above.

7. If the weight of the vinegar used in acid base titration experiment was 30.00 grams, and the amount of (2.50 N) sodium hydroxide needed to the acetic acid in the vinegar was 35.00 mls. The percentage of acetic acid in vinegar will be:

a) 5.25%

b) 17.50%

c) 35%

d) 0.50%

8. A brown precipitate was formed on your hand during the Oxidation Reduction Titration experiment. The best and safer way to remove this precipitate is by washing with:

a) dilute sulfuric acid

b) oxalic acid solution

c) sodium bisulfite solution

d) warm water

9. In the empirical formula experiment, if the cover of the crucible was broken into small pieces before the last weighing, then ...

a) the weight of O_2 will be less than the true value.

b) the weight of Mg will be less.

c) the weight of MgO will be more.

d) the weight of Mg will be more.

10. ml of 0.1011 HCl needs 10.00 mls of NaOH solution. If the burette was not rinsed with NaOH solution, the concentration of NaOH will be

a) 0.2N b) 0.2M

c) 0.1M d) slightly less than 0.2N

11. g of oxalic acid ($H_2C_2O_4$) was titrated with 11.26 mls of 0.088 M KMnO4 solution .We can conclude that:

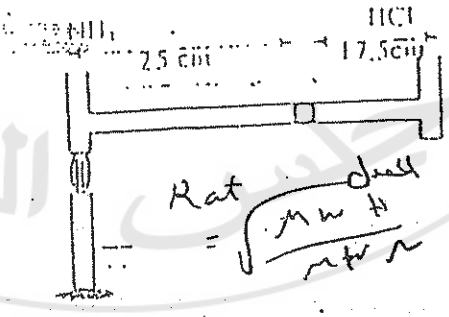
a) the equivalent weight of the acid is 45.0 gm/eq.

b) the molecular weight of the acid is 90.0 gm/mole.

c) the acid is anhydrous.

d) all of the above. c) none of the above.

12.



According to the drawing above :

a) $\frac{\text{Rate } NH_3}{\text{Rate HCl}}$ (experimentally) =1.43

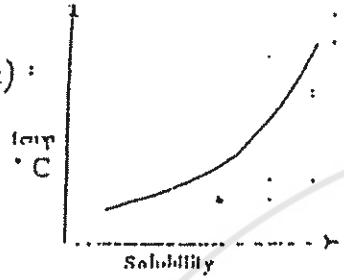
b) % error =2.15%

c) $\frac{\text{Rate } NH_3}{\text{Rate HCl}}$ (experimentally) =0.7

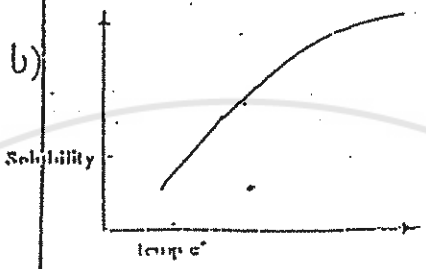
d) none of the above

16. Choose one of the following curves which best represent the solubility experiment:

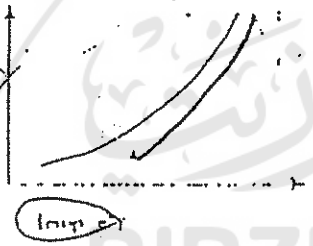
a)



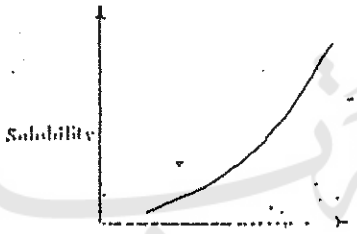
b)



c)



d)



Note: ◄ represents the point of the analytical-method.

17. The heat of neutralization of HCl with NaOH is :

a) exothermic reaction. b) endothermic reaction.

c) isobaric reaction. d) no heat evolves .

18. In the volatile liquid experiment, if the vapor is at low temperature (to condense) then :

a) the vapor is not an ideal gas

b) the molecular weight will be less than the true value.

c) the molecular weight will not change.

d) $PV = nRT$ for this vapor

19. The purpose of making a tiny hole in the aluminum cap in the Volatile Liquid experiment is:

a) to get rid of the excess vapor.

b) to equalize the atmospheric pressure and the vapor pressure.

c) to return back the air during condensation.

d) all of the above. e) non of the above.

13. In determination of percentage composition of $NaHCO_3$ by gas evolution method, which statement is correct?

a) CO_2 is produced by heating $NaHCO_3$ sample.

b) The amount of CO_2 is determined by mass loss in $NaHCO_3$

c) The weight of the gas is determined from volume measurement and application of gas laws.

d) CO_2 produced by the action of acid on NaCl in the sample.

14. A student obtained the following data on the "Colligative Properties, Molecular weight Determination experiment":

$\Delta T = 2$ K weight of solvent = 8.50gm

weight of solute 0.1gm Molecular weight of the solute = 180gm

K_f for the solvent is:

a) 30.6 k.kg/mole b) 30.7 k.kg/mole

c) 30.8 C°.kg/mole d) b and c are correct.

15. In an attempt to verify Boyle's law, a student obtained the following data at 25 c :

$V_1 = 56.00$ml $P_{atm} = 720$ mmHg $P_{water\ vapor} = 20$mmHg

$V_2 = 54.44$ml $P_{water} = 27.2$cm

From this data we conclude that:

a) the percent error in P_2 is around 5%.

b) $P_1V_1 = 3920$ cm · Hg

c) $P_1/V_1 = P_2/V_2$

d) $V_1/V_2 = P_1/P_2$

Sample exam

Chem 111

Birzeit University
Chemistry Department
Lab 111
Instructor : Salih Al.jabour

Q1: Calculate the empirical formula of a compound that formed from 1.67 g of the Cerium (Ce) and 4.54 g of the Iodine (I)?
The Molar mass of (Ce) = 140 g/mol and Iodine (I) =127 g/mol.

Q2 : if 2.55 g of unknown sample react completely with H_2SO_4 according to this balanced equation
$2\ Unknown + 2\ H_2SO_4 \longrightarrow X_2SO_4 + 2\ CO_2 + 2\ H_2O$
and the pressure of the collected gas is 772 mmHg and with volume 24 ml at 25 C what is the formula weight of the unknown ?

722 mmHg

Q3 : Calculate the mass of the Carbon in the 60 g of $CH_3COCH_2NH_2$?

Q4 : In the decomposition of $KClO_3$ we heat the $KClO_3$ to get the oxygen gas after the Composition , according to this equation :
$KClO_3 \xrightarrow{HEAT} KCl + 3/2\ O_2.$
You think if we mix in the unknown that contain $KClO_3$ with MgO_2 ,can we calculate the percentage of the $KClO_3$ in the unknown according to the ideal gas law , why ?

Yes

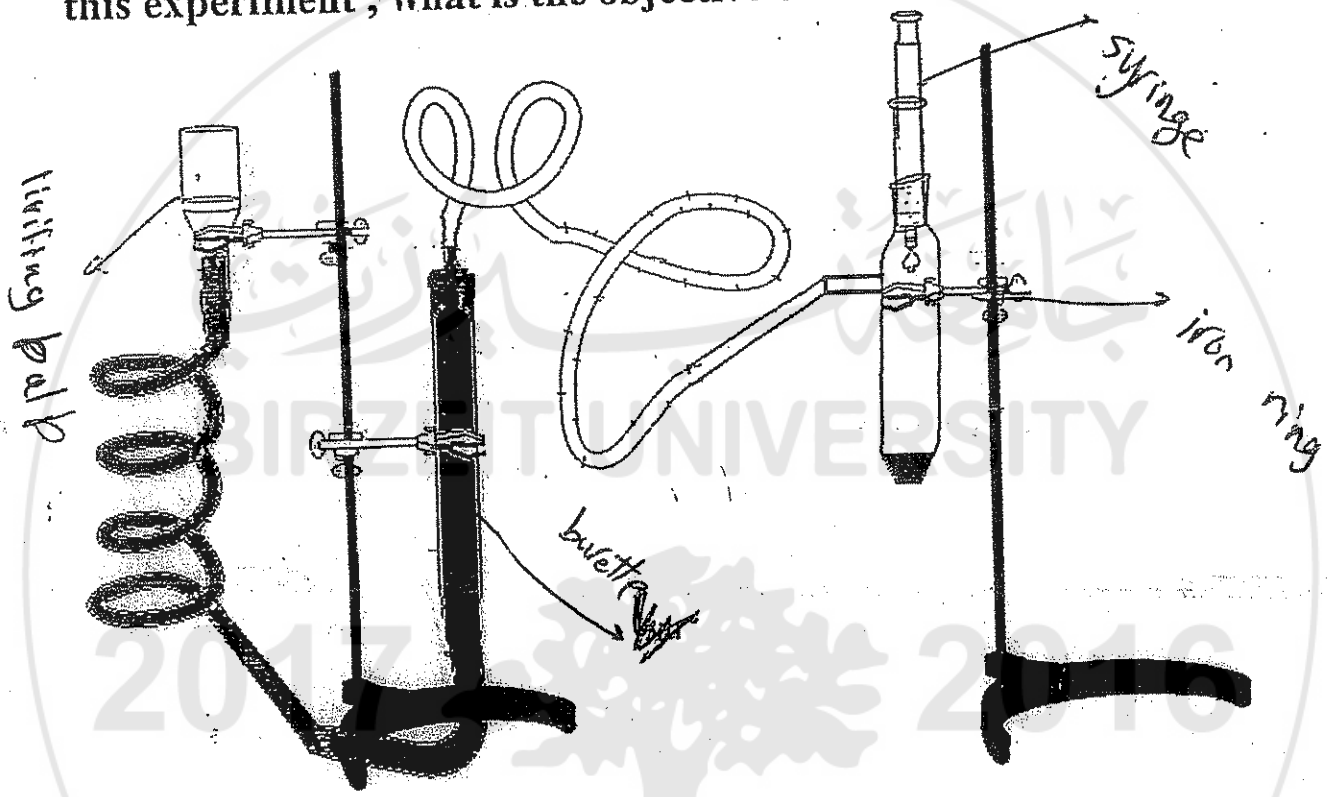
Q5 : To reached the saturated phase we must dissolve 3.5 g of $KClO_3$ in the 30 ml water (D.I), calculate the solubility of the $KClO_3$?

Q6 : When 0.645 g of $BaCl_2.2H_2O$ and 0.877 g of $NaPO_4.12H_2O$ mix with water forming 1000 ml of solution, which compound is the limiting reactant and how many grams of $Ba_3(PO_4)_2$ will precipitate ?

What we mean by (.H_2O) in each compound ?

Hydrate Compound.

Q7: Name each part of these equipment , what is the name of this experiment , what is the objective of it?



Birzeit University
Chemistry Department
Lab 111 – General Test

Name: _____ Id#: _____

Q1: You should pipette by mouth:

1- Always. It's a fast and efficient method of measuring liquids.
2- Only when you can't find a pipette bulb or think it might be dirty.
3- Only when you are sure your instructor, lab assistant, or co-worker isn't looking.
(4) Never. And if you thought about answering yes to any other, the other choices should be slapped.

Q2: When you are finished using a bunsen burner you should:

1- Leave it on for the next person to use. It's the only considerate choice.
2- Cover the burner with an inverted beaker to suffocate the flame. It works well for candles, too.
3- Pull off the hose connecting the burner to the gas. The burner won't have gas, so it won't be on fire.
(4) Turn off the gas. Duh!

Q3: If you feel dizzy or sick while working near the fume hood you should:

1- Head out to grab a cola or a snack. Maybe it's low blood sugar. Don't tell anyone - why bother them.
2- Meh, no big deal. Do nothing. Fume hoods always protect you from harmful chemicals. The sooner you get finished the sooner you can leave.
3- Report your symptoms to whoever is responsible for that fume hood. It might be nothing, but on the other hand, maybe the hood wasn't functioning properly and you were exposed to something. Look up the MSDS for whatever was in the hood, too.
(4) Leave the lab, after contacting the proper person.

Q4: If you catch on fire you should:

1- Panic. Yelling FIRE at the top of your lungs to let others know about the danger is good. Be sure to run as quickly as possible to blow out the flame.
2- Water fixes everything. Head for the nearest safety shower and drown the flame.
3- Pull the fire alarm and look for help. Hope the fire doesn't burn you too badly before you can take some form of action.
(4) Smother the flame. Those blankets in the lab are there for a reason. Some fire doesn't really care about water, but all flames need oxygen. Get help, too. You weren't working alone in the lab though, right?

Q5: The following acid-base reaction is performed in a coffee cup calorimeter:

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

The temperature of 110 g of water rises from 25.0°C to 26.2°C when 0.10 mol of H+ is reacted with 0.10 mol of OH .-

1- Calculate q water
2- Calculate ΔH for the reaction
3- Calculate ΔH if 1.00 mol OH- reacts with 1.00 mol H +

Q6: A sample of helium gas at 25°C is compressed from 200 cm^3 to 0.240 cm^3. Its pressure is now 3.00 cm Hg. What was the original pressure of the helium ?
PV = nRT, where P is pressure, V is volume, n is number of moles, R is the gas constant, and T is temperature .

Determine the molarity of a solution made by dissolving 20.0 g of NaOH in sufficient water to yield a 482 cm^3 solution .

Q7: Let's say that I was given 6 grams of H2 and 160 grams of O2. What is the limiting reagent and what is the theoretical yield in grams? If 20 grams of water is actually formed, what would be the Percent Yield ?

$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$

Q8: In experiment number 13 (The determination the solubility curve of KCLO3), can you draw the step up that we used in part II in this experiment?

Lap Chem 111

Birzeit University
Chemistry Department
Quiz

Name:
St #:

Q #1: Why do we use MnO_2 (Manganese Dioxide) in today's experiment?

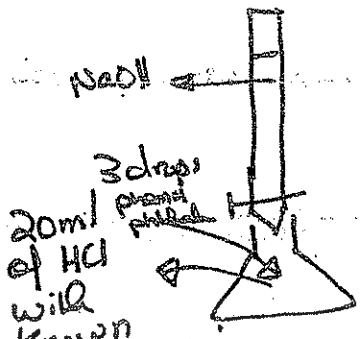
Q #2: Complete the reactions

- $KClO_3 \xrightarrow[MnO_2]{Heat}$ ——— + ———

- $KClO_3 + KCl \xrightarrow[MnO_2]{Heat}$ ——— + ——— + ———

Good Luck
☺

How to use pipette.



20

at the endpoint

# of eq. of acid = # of eq. of base

$N \times V = N \times V$

$0.106 \times 20 = ? \times 25ml$

$N = \frac{N \times V}{V} = ?$

⟶ 3 trials.

* % of acetic acid (2 trials)

# of eq. of base = # of eq. of acid

10 ml Vinegar

$CH_3COOH \Longrightarrow$ M.wt = 60 g/l

$\Longrightarrow CH_3COOH \rightarrow CH_3COO^- + H^+$

n = 1

$\overline{N \times V(L)} = \frac{wt}{eq.wt} = \frac{wt}{\frac{60}{1}}$

$\Longrightarrow N \times V \times 10^{-3} \times 60 =$ wt of acetic acid

% of CH_3COOH in Vinegar. $= \frac{\text{wt of acetic acid}}{\text{wt of Vinegar}} \times 100\%$

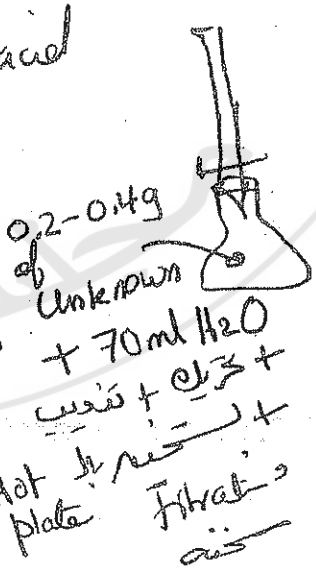
$= \frac{wt}{10} \times 100\%$ density = 1

(2 trials) * Molecular weight of solid acid

$N \times V \times 10^{-3} = \frac{wt}{eq.wt}$.

$N \times V \times 10^{-3} = \frac{wt}{eq.wt}$

?



Question 1 for two experiments

At the eq. point

# of eq. of base = # of eq. of acid

$$N \times V(L) = N \times V(L) = \frac{\text{mass}}{\text{eq. mass}}$$

* $$N = \frac{\text{eq.}}{V(L)} = \frac{\text{mass}}{\text{eq. mass}} \times \frac{1}{V(L)}$$

$$= \frac{\text{mass}}{\frac{\text{molass mass}}{n}} \times \frac{1}{V(L)}$$

$$= \frac{\text{mass} \times n}{\text{molar mass}} \times \frac{1}{V(L)}$$

$$= \frac{\text{moles}}{V(L)} \times n$$

$$N = M \times n$$

* ~~Primary solution~~ . Standart solution (exactly when we prepare it, it will have a concentration of ——— .

* Standerization of prepared NaOH solution

→ we will prepare ~ 0.1 N NaOH solution

→ we will weight 2g of NaOH in 500ml H_2O in 1L beaker.

$$\frac{\frac{2}{40}}{0.5} = \frac{0.05}{0.5} = \frac{5 \times 10^{-2}}{5 \times 10^{-1}} = 10^{-1} = 0.1\,N$$

→ we cannot take this concentration

1st ⟹ this is a commercial NaOH powder (not pure)

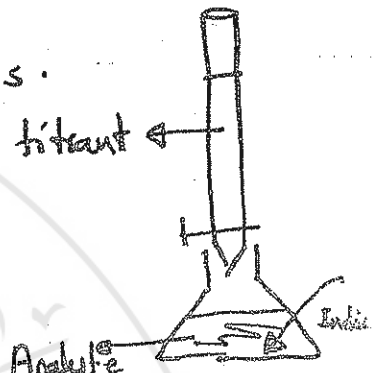
2nd ⟹ we take approximately 500ml in beaker which is not accurate.

3rd ⟹ some of CO_2 may dissolve in water

$CO_2 + H_2O \rightarrow H_2CO_3$ will react with the NaOH and reduce its conc.

* Acid-base Titration

① Titration: is a type of analysis that allows us to measure the amount of solution required to react completely with other solution.



— Usually we deal with Volume in titration analysis.

* Acid-base titration
A-Base

* Indicator :- a chemical material that has a color in base, and another color in acid and it changed its color at the end point

* Acid-base titration, the base in the burette, the acid in the flask, the indicator is phenolphthalein which is colorless in acid, and pink in base

— equivalent point → exactly when all the acid will be neutralized with base

— end point → its one drop after the equivalent point when the indicator change its color.

— How to fill burette, How to read burette., the Part which is not fitted graduated

* Equivalent ⟹ Moles = $\frac{\text{mass}}{\text{M. mass}}$ $M = \frac{\text{moles}}{V(L)}$

- eq. mass = $\frac{\text{molar mass}}{n}$
- equivalent = $\frac{\text{mass}}{\text{eq. mass}}$

n in acid = # of protons H_2SO_4 $n=2$; HCl $n=1$; H_3PO_4 $n=3$

n in base = # of OH^- groups $NaOH$ $n=1$; $Ca(OH)_2$ $n=2$

$N = \frac{\#\text{ of eq.}}{V(L)}$

9/10

CHEM 111

Quiz #4

Name : [redacted]

1) What is the name and objectives of the experiment?

(1) to determine the N of MnO_4^-

to determine the Eq. wt of unknown reducing agent

name of exp ?? (-1)

2) what is the oxidation state of Mn in MnO_4^-?

MnO_4^- oxidation # of Mn + 2-x4 = 1-

oxidation # of Mn + -8 = 1-

oxidation # of Mn = +7

9. In the oxidation-reduction titration, $KMnO_4$ reacts with oxalic acid to give Mn^{2+} and CO_2. Which statement is correct regarding this reaction?

(a) the normality of the oxalic acid was 2X its molarity.

(b) Phenolphthalein was used as an indicator.

(c) the normality of $KMnO_4$ is determined from the volume of CO_2.

(d) equivalent weight of oxalic acid was 90.0 g/eq.

10. Dilute sulfuric acid is added to oxalic acid during the oxidation reduction titration in order to:

(a) have a complete neutralization reaction.

(b) avoid formation of MnO_2 precipitate.

(c) get rid of the dissolved O_2 in the solution.

(d) none of the above.

11. The process of removing the supernatant from the residue by using a beaker and a glass rod is called:

(a) Decantation.

(b) Filtration.

(c) Titration.

(d) Diffusion.

12. If 4.30gms of oxalic acid ($H_2C_2O_4$) were dissolved in 100ml volumetric flask. Then 25.00mls of NaOH were required to neutralize 20.00mls of the acidic solution, the normality of the solution is:

(a) 0.764N.

(b) 1.24 N.

(c) 0.782N.

(d) 0.382N.

جامعة بيرزيت

Chemistry Department

Chemistry 111

Final Exam **1st Sem.2014/2015**

Time: 80 min.

Coordinator:Adi Qamhieh

Student Name----------

Student Number----------

Please Circle Your Lab. Section:

	Instructor Name	Teaching Assistant Name		Classes Time
Lab 1	Mazen Hamed	Manal Zahran	S	08:00 - 10:50
Lab 2	Mazen Hamed	Ahd Bsharat	S	08:00 - 10:50
Lab 3	Hani Awad	Raheeq Naser	T	08:00 - 10:50
Lab 4	Imad Qamhiyeh	Rima Siam	M	08:00 - 10:50
Lab 5	Jack Mustaklem	Maysaa Rabee	W	08:00 - 10:50
Lab 6	Jack Mustaklem	Ahd Bsharat	W	08:00 - 10:50
Lab 7	Hani Awad	Shimaa Kamel	T	08:00 - 10:50
Lab 8	Sami Sayrafi	Iman Hammad	W	14:00 - 16:50
Lab 9	Simon Kuttab	Iman Hammad	R	11:00 - 13:50
Lab 10	Simon Kuttab	Riham Sawaftah	R	11:00 - 13:50

Good Luck

Circle the best correct answer.(4 points each)

1. It was found that 0.23 gram of $KClO_3$ dissolves in 4.50 gram water at 17°C. The solubility of $KClO_3$ at 17°C is:

   (a) 5.11 b) 0.23 c) 51.1 d) 19.57

2. In the determination of solubility curve of $KClO_3$,the error that caused the recorded temperature (when crystallizations just begins) to be higher than the actual temperature was:

   a) some solid spilled and was not dissolved in water after being weighed.
   (b) some water was lost through excessive heating.
   c) the first crystals were not observed immediately.
   d) the salt tend to give supersaturated solution.

3. Thermal decomposition of 1.75 gram of $KClO_3$ yielded 0.600 gram of O_2. The percentage yield of O_2 was (atomic mass of O = 16, K =39, Cl =35.5):

   a) 76.2% (b) 87.5% c) 60.0% d) 68.3%

4. The role of MnO_2 in the thermal decomposition of $KClO_3$ is to :

   a) act as a catalyst.
   b) lower the activation energy of the reaction.
   c) decrease the time needed to complete the decomposition.
   (d) all the above is correct.

5. Which of the following would not affect the calculated empirical formula of magnesium oxide?

   a) Magnesium was partially converted to magnesium oxide.
   b) The crucible was wet before the initial weighing.
   c) A flake of the final oxide was blown out of the crucible just before the final weighing.
   (d) Magnesium was heated strongly for one hour instead of heating strongly for fifteen minutes.

6. In the determination of the empirical formula of magnesium oxide, 15 drops of water were added to the residue in the crucible in order to:
   a) covert magnesium nitride into magnesium oxide.
   b) speed up the combustion of magnesium.
   c) remove any combustible matter.
   d) wash the product before the final weighing.

7. If $Na_3PO_4.12H_2O$ was the limiting reactant, and the mass of $BaCl_2.2H_2O$ was 2.44 gram, the mass of barium phosphate formed would be :(F.wt. of $BaCl_2.2H_2O$ = 244g/mol, F.wt. of $Na_3PO_4.12H_2O$ = 380g/mol, F.wt. of $Ba_3(PO_4)_2$ =602g/mol).
   a) 6.02 g b) 3.01 g c) 2.01 g d) none of the above.

8. In the redox titration of potassium permanganate with oxalate ion,_____is reduced and_____ is oxidized.
   a) oxalate ion, permanganate ion.
   b) permanganate ion, sulfuric acid.
   c) permanganate ion, oxalate ion.
   d) oxalate ion, carbon dioxide.

9. If the burette is not rinsed with $KMnO_4$ solution when titrating oxalate ion with permanganate ion, this would :
   a) decrease the volume of $KMnO_4$ needed.
   b) decrease the calculated concentration of $KMnO_4$.
   c) increase the calculated concentration of $KMnO_4$.
   d) would not affect the calculated concentration.

10. A diluted solution of NaOH (≈ 0.1 M) can be prepared by dissolving ≈ 2 grams of solid NaOH in 500 mL H_2O, the prepared solution:
   a) has to be standardized before it can be used for vinegar analysis.
   b) does not have to be standardized because NaOH is a primary standard.
   c) has to be standardized with another basic solution.
   d) have to be diluted when used to titrate 0.1 M HCl solution.

11. In the determination of the molecular weight of a monoprotic acid , 0.210 gram of the solid acid needs 36.00 mL of 0.120 M NaOH to reach the phenolphthalein end point. The calculated molecular weight of the acid is:

a) 15.9 g/mol b) 63.0 g/mol (c) 48.6 g/mol d) 97.9 g/mol

12. The term standardization means:

a) adding equal volumes of both the acid and the base.
b) determining which of the reagents was the limiting reactant.
(c) finding the exact concentration of the acid or a base using a base or an acid of known concentration.
d) determining how much indicator should be used.

13. Phenolphthalein is:

a) colorless in solution with pH > 7.
b) pink in solution with pH < 7.
(c) pink in solution with pH > 7.
d) pink in distilled water.

14. A sample of unknown hydrate weighing 0.490 gram was heated, its mass became 0.250 gram. The calculated percentage of water in this salt should be:

a) 64.9% b) 96.0% (c) 49.0% d) 51.1%

15. In order to determine the formula of $CoCl_2.xH_2O$,a student heated 4.00 gram of hydrate. The mass of residue was 2.20 gram. What is the approximate value of(x)?
(F.wt. of $CoCl_2$ = 129.93g/mol, F.wt. Of. H_2O = 18 g/mol)

a) 3 b) 2 (c) 6 d) 5

16. The brown precipitate that was formed when ammonia gas was diffused to a test tube containing an aqueous solution of ferric chloride was:

a) $FeCl_3$ b) NH_4Cl (c) $Fe(OH)_3$ d) Fe_2O_3

17. The white ring that formed when concentrated ammonia and concentrated hydrochloric acid diffused from opposite ends in a glass tube was:

a) NH_4OH (b) NH_4Cl c) NH_3 d) NaCl

18. In the determination of $\%NaHCO_3$ by gas evolution analysis, which of the following statements was not correct?

a) CO_2 was considered an ideal gas.
b) the evolved CO_2 was collected in a gas burette.
(c) H_2SO_4 was considered the limiting reactant.
d) moles of CO_2 evolved = moles of $NaHCO_3$ reacted.

19. Vinegar is a diluted solution of:

a) sulfuric acid b) sodium bicarbonate
(c) acetic acid d) hydrochloric acid

20. The process of removing the supernatant from the residue using a beaker and a glass rod is called:

a) titration
(b) decantation
c) diffusion
d) none of the above.

21. The purpose of making a tiny hole in the aluminum cap in the volatile liquid experiment is to:

a) equalize the atmospheric pressure with vapor pressure.
b) get rid of excess vapor.
c) return back the air during condensation.
(d) all the above are correct.

22. The item that was used to measure 15.62 mL of a liquid was:

a) a graduated cylinder.
b) a volumetric pipette.
(c) a burette.
d) a small beaker.

23. consider the top-load balance found in the lab. The button labeled "Tare" is used to :

a) heat the substance.
b) measure the mass.
c) set the instrument to zero.
d) measure the weight.

24. In a calorimeter, 30 mL of 2.0 M HCl were mixed with 30 mL of 2.0 M NaOH. The following data were obtained:

$T_{initial}$ = 20.0°C Density of salt mixture = 1.01 g/mL

T_{final} = 28.0°C Heat capacity of calorimeter = 10.0 Cal. $°C^{-1}$

Specific heat of salt mixture = 0.93 Cal.g^{-1}. $°C^{-1}$ (Atomic mass: H =1, Cl = 35.5, O = 16)

The calculated molar heat of neutralization:

a) 8.85 Kcal/mol
b) 10.7 Kcal/mol
c) 17.7 Kcal/mol
d) 15.0 Kcal/mol

25. In the volatile liquid experiment to determine the molecular weight of an unknown, the following data were obtained:

Mass of condensed liquid = 0.42 gram. Volume of vapor = 320 mL

Barometric pressure = 720 mmHg Temperature of vapor 96°C

Ideal gas constant = 0.0821 atm.L/mol.K

The calculated molecular weight of the unknown is:

a) 52.2 g/mol
b) 42.0 g/mol
c) 65.2 g/mol
d) 80.4 g/mol