

Quiz # 1

10

Name: ..

Reg.NC

Q1: In the following figure;

a. What is the name of the glassware?

1. Beaker 2. Graduated Cylinder 3. Erlenmeyer flask 4. Pipet

b. The Volume of the liquid and the error in the volume are

(67.0) ± (0.5)



Q2. A student performed an experiment to determine the density of a liquid, the following result was obtained:

Mass of empty beaker = 37.102 g

Mass of beaker and 25.00 ml liquid = 65.125 g

Calculate the density of the liquid, consider the significant numbers in your answer.

Mass liquid = 28.023 g

$d = \frac{m}{V} = \frac{28.023}{25.00} = 1.121 \text{ g/ml}$

Q3. Calculate the molar mass of $[KAl(SO_4)_2 \cdot 12H_2O]$, given that atomic mass of K=39.0, Al=27.0, S=32 O= 16.0 and H= 1.0 g/mole

~~molar mass = 39.0 + 27.0 + 20(32) + 8(16.0) +~~
molar mass = 39.0 + 27.0 + 2(32) + 20(16.0) + 24(1.0)
= 474

3

Quiz (1)

Q1)

a) 2. Graduated cylinder

b) 67.0 ± 0.5 mm

Q2)

$$d = \frac{m}{V} = \frac{65.125 - 37.102}{25.00}$$

$$= 1.121 \text{ g/ml}$$

48.5

Q3) $\text{KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}$

$$\text{M.w} = 39 + 27 + 2 \times 32 + 8 \times 16 + 24 \times 1 + 12 \times 16$$

$$= 474 \text{ g/mol}$$



ID No.:

Section ID:

4.

[1.] In the following image, the names of the glassware and equipment are

- (A) erlenmeyer flask and crucible tongs.
- (B) erlenmeyer flask and clamp.
- (C) volumetric flask and crucible tongs.
- (D) volumetric flask and clamp.
- (E) erlenmeyer flask and test tube holder.



16/20

[2.] You must wear goggles in the lab because

- (A) they look cool and are a trendy fashion statement.
- ~~(B)~~ they protect your eyes from chemical splashes.
- (C) they protect your eyes from fumes and odors.
- (D) they improve your vision.
- (E) the instructor wants all students to have uniform eyewear.

[3.] An unused/leftover chemical should be

- (A) returned back to its original container right before you leave the lab.
- (B) taken outside the lab and dumped on the soil to fertilize it.
- (C) disposed of in the designated waste container.
- (D) sent out to the Safety Committee.
- (E) left on the bench for the technician to take care of it.

[4.] If the balance reading was taken as 0.2525, then it should be reported as

- (A) 0.2525 ± 0.0001 g
- (B) 0.2525 ± 0.1000 g
- (C) 0.2525 ± 0.0100 g
- (D) 0.2525 ± 0.0001 g
- (E) 0.2525 ± 0.0010 g

[5.] A metal sphere weighing 9.6 g is added to 21.5 mL water in a graduated cylinder. The water level rises to 24.5 mL. Calculate the density of the metal.

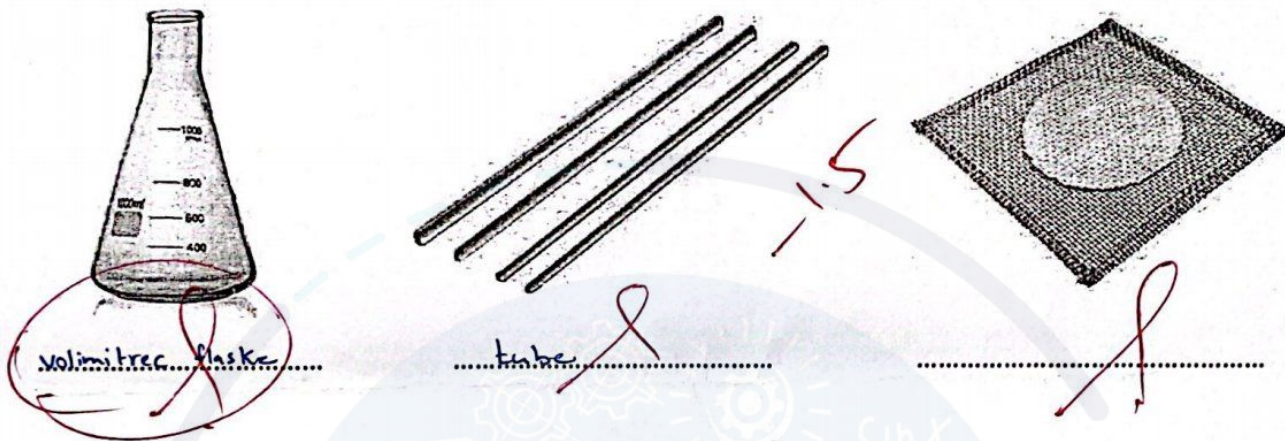
- (A) 3.20 g/mL
- (B) 3.2 g/L
- (C) 0.45 g/mL
- (D) 0.39 g/mL
- (E) 3.2 g/mL

$$\begin{aligned}
 m(\text{solid}) &= 9.6 \text{ g} \\
 V_1 &= 21.5 \text{ mL} \\
 V_2 &= 24.5 \text{ mL} \\
 d &= \frac{m}{V} = \frac{9.6}{24.5 - 21.5} = \frac{9.6}{3} = 3.2 \text{ g/mL}
 \end{aligned}$$

Q1: Which of the following statements are true (T) and which are false (F):

- Toxic chemicals can't be used outside the fume hood (~~T~~)
- Fire extinguishers is a safety equipment (T)
- You must read the label on reagent bottles when you are dealing with them (F)
before

Q2: Write the name of the following glassware:



Q3: An empty beaker weighs 23.7524g. A 10.00 mL sample was transferred to the beaker. The total mass of the beaker and the sample was 39.4507. Calculate the density of the liquid.

$$d = \frac{\text{mass}}{\text{Volume}}$$

$$\text{mass of the sample} = \text{total mass} - \text{empty beaker} = 39.4507 - 23.7524$$

$$d = \frac{15.6983}{10.00} = 1.569 \text{ g/mL}$$

$$= \boxed{15.6983 \text{ g}}$$

Q4: How would the calculated X value be affected in the following cases:

a) If some hydrated salt is spilled from the crucible after it is weighted:
(Greater than, less than, same as) the true value

b) If the dehydration is not completed:
(Greater than, less than, same as) the true value

Q₁ - False

• True

• False

Q₂ 1) Erlenmeyer Flask

2) thermometer

3) wire gauze

Q₃

$$d = \frac{\text{mass}}{\text{Volume}} = \frac{39.4507 - 23.7524}{0.01000}$$

$$= \frac{15.6983}{0.01000}$$

$$= 1.569 \text{ g/ml} \quad 4. \text{S.F.}$$

Q₄ a. mol anhydrous salt ↓, X ↑

b. mol anhydrous salt ↑, X ↓

Quiz # 2

Name: _____

Reg.# _____

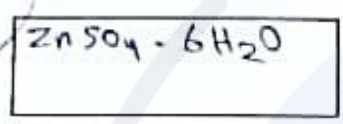
Q1. 1.39 g of hydrated zinc sulfate was heated in a crucible; the mass percent of anhydrous salt ($ZnSO_4$) is 57.5%. Given that the atomic mass of Zn= 65.38, S=32 O= 16.0 and H= 1.0 g/mole

a. The mass percent of water of crystallization is

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$$\%m = 100\% - 57.5\% = 42.5\%$$

b. The formula of hydrated salt is

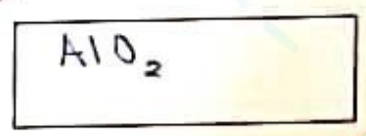


Q2. A student burned 0.105 g of Aluminum in a crucible to get 0.204 g of white oxide. Given that the atomic mass of Al= 26.9, and O= 16.0 g/mole

a. Mass percent of Al in the oxide

$$\%m = \frac{0.105}{0.204} \times 100\% = 51.5\%$$

b. Find the empirical formula of Aluminum oxide.



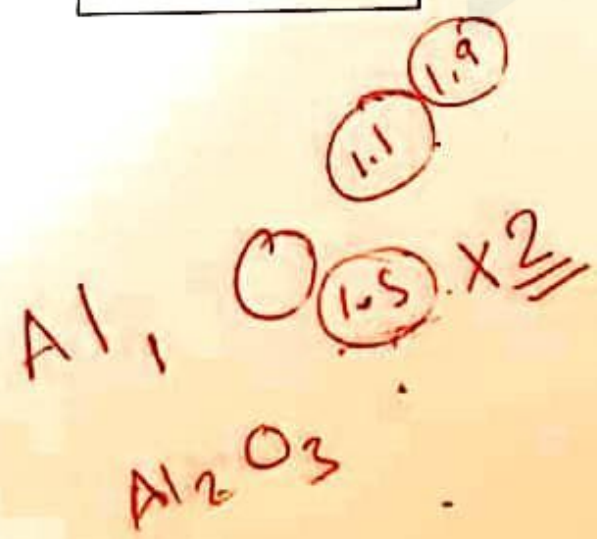
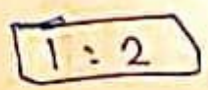
$$m_o = m_{oxide} - m_{Al} = 0.204 - 0.105 = 0.099$$

$$n_{Al} = \frac{0.105}{26.9} = 0.00390$$

$$n_o = \frac{0.099}{16.0} = 0.00619$$

$$\frac{0.00390}{0.00390} : \frac{0.00619}{0.00390}$$

$$1 : 1.59$$



Quiz (2)

Q1) mass% of H₂O :

$$100\% - 57.5\% = 42.5\%$$

$$X = \frac{w_{H_2O}}{w_{\text{anhydrous salt}}}$$

$$X = \frac{(\text{mass}/\text{m.w})}{(\text{mass}/\text{m.w})} = \frac{(42.5\% \times 1.39 / 18)}{(57.5\% \times 1.39 / 161.38)}$$

$$X = 6.6 \approx 7$$

Q2) a. Al% = $\frac{0.105}{0.204} \times 100\% = 51.5\%$

b.

	Al	O
mass	0.105	0.204 - 0.105

mol	$\frac{0.105}{26.9}$	$\frac{0.099}{16}$
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ratio $\left(\frac{0.0039}{0.0039} = 1 \quad \frac{0.0062}{0.0039} = 1.5 \right) \times 2$

ABC

→ Al₂O₃



20
20

Chem 109
Quiz 2

The University of Jordan
School of Science
Department of Chemistry

ID No.	Section ID
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[1] A 3.178 g sample of tin(II) chloride hydrated salt was heated to 150 °C. All of the water (molar mass = 18.02 g/mol) of hydration was driven off, leaving 2.670 g of the anhydrous salt (molar mass = 189.61 g/mol). Determine the formula of the hydrated salt.

- (A) $\text{SnCl}_2 \cdot 6\text{H}_2\text{O}$ (B) $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$
 (C) $\text{SnCl}_2 \cdot 3\text{H}_2\text{O}$ (D) $\text{SnCl}_2 \cdot 4\text{H}_2\text{O}$
 (E) $\text{SnCl}_2 \cdot 5\text{H}_2\text{O}$

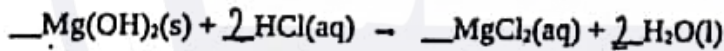
sample = 3.178g
 mass anhydrous = 2.67g
 $x = \frac{3.178}{2.67} = 1.19$
 $n = \frac{2.67}{18.02} = 0.148$
 $n \cdot x = 0.148 \cdot 1.19 = 0.176$
 $\frac{0.176}{0.176} = 1$
 $x = 2$

[2] A 2.350 g sample of Nickel (atomic weight = 58.69 g/mol) is oxidized in a crucible. The final mass of the Nickel Oxide is 3.310 g. What is the mass percent of Nickel in the Nickel Oxide? Given that the atomic weight of Oxygen = 16.00 g/mol.

- (A) 29.00% (B) 71.00%
 (C) 65.00% (D) 52.00%
 (E) 43.00%

~~3.310~~
 $\text{NiO} = 3.310 \text{ g}$
 $\text{Ni} = 2.35 \text{ g}$
 $\text{mass \% Ni} = \frac{\text{mass Ni}}{\text{mass NiO}} \cdot 100$

[3] After balancing the following chemical equation, its stoichiometric coefficients are:



- (A) 2, 1, 2, 1 (B) 1, 2, 1, 2
 (C) 1, 2, 2, 1 (D) 1, 1, 1, 1
 (E) 2, 1, 1, 2

[4] Which one of the following formulas does not represent an alum?

- (A) $\text{KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}$ (B) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 (C) $\text{KCr(SO}_4)_2 \cdot 12\text{H}_2\text{O}$ (D) $\text{NH}_4\text{Al(SO}_4)_2 \cdot 12\text{H}_2\text{O}$
 (E) $\text{NaAl(SO}_4)_2 \cdot 6\text{H}_2\text{O}$

$\text{Al}^+ \text{Al}^{III} (\text{SO}_4)_2 \cdot x \text{H}_2\text{O}$

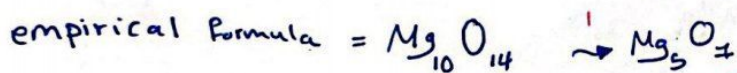
[5] In the empirical formula of an oxide, the purpose of the second heating step is

- (A) to test if there is any remaining NH_3 gas.
 (B) to convert Mg(OH)_2 to MgO and to expel both NH_3 and H_2O gases.
 (C) to convert Mg(OH)_2 to MgO .
 (D) to expel both NH_3 and H_2O gases.
 (E) to produce MgO and Mg_3N_2 compounds.

Q1: A 2.4 g of Mg metal was burned with excess amount of air, and the resultant product Mg_xO_y weighs 4.56 g , find the Formula $\text{Mg}_{n_1}\text{O}_{n_2}$, the empirical formula of the oxide, and the % error in the experiment (Mm Mg= 24 g/mol , Mm O= 16 g/mol)

$$\begin{aligned} \# \text{ of moles} &= \frac{m}{Mm} \quad (\text{Mg}) \\ &= \frac{2.4}{24} = 0.1 \text{ mol} \end{aligned}$$

$$\begin{aligned} \text{mass of O} &= 4.56 - 2.4 \\ &= 2.2 \\ \rightarrow \frac{2.2}{16} &= 0.14 \text{ mol} \approx \underline{\underline{0.135}} \end{aligned}$$

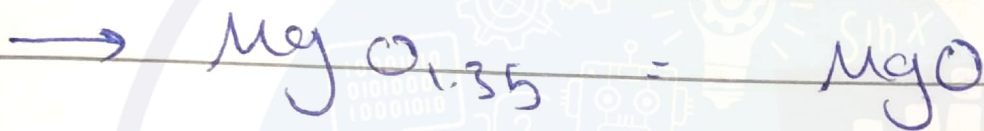


Factor

Q2: Fill the blanks with the correct answers:

- In today's experiment, adding phenolphthalein indicator will change its color in Basic medium to ~~pink~~ And in acidic medium to ~~pink~~
- Not washing the precipitate in limiting reactant experiment with enough amount of hot water will ~~decrease~~ (Increase, decrease) the percentage of excess.
- In determination of the limiting reactant test, the reagent added to the filtrate solution and cause precipitation is called ~~excess~~ limiting (Limiting or excess reactant).

	Mg	O
mass	2.4	4.56 - 2.4
mol	0.1	2.16
ratio	1	1.35



→ Mg% experimentally X_1 : $\frac{2.4}{4.56} \times 100\%$
 $= 52.6\%$

→ Mg% Calculated For MgO : $\frac{24}{24+16} \times 100\%$
 $\stackrel{X_2}{=} 60\%$

→ error % = $\frac{X_2 - X_1}{X_2} \times 100\%$
 $= \frac{60 - 52.6}{60} \times 100\%$
 $= 12.3\%$

Q2: a. pink , colorless

b. decrease

c. limiting

2021

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Name:

..... Reg.NO..

Q1. The vapor of unknown volatile liquid occupies a 279 mL Erlenmeyer flask at 98.5 °C and 745 mmHg. The mass of vapor is 0.841 g, calculate the molar mass of the liquid?

Q2. 10.00 ml sample of concentrated bleach bottle needs 25.70 ml of 0.31 M $\text{Na}_2\text{S}_2\text{O}_3$.

a. The mass% of NaClO in the original solution "Assume the density of bleach solution is 1.084 g/ml.)

b. By mistakes, unknown volume of water was added to the original bottle. If 10.00 ml from diluted solution was titrated with 0.31 M $\text{Na}_2\text{S}_2\text{O}_3$ and the solution turned clear after adding 6.60 ml. How many times the original solution was diluted

Q4. Q1. 0.333 g sample of antacid was dissolved in 50.00 ml of 0.14 M HCl solution, the excess HCl was titrated with 0.0250 M NaOH solution.

HCl moles that dissolved the antacid sample	$n = MV = 0.14 \times 50.00 \times 10^{-3}$
Initial reading of burette	(0.70) ml \pm (0.05)
Final reading of burette	(15.60) ml \pm (0.05)
Neutralizing Capacity of antacid (mole HCl / g of antacid)	$\frac{6.6 \times 10^{-3}}{0.333} = 0.019 \text{ mol/g}$

$$Q_1) M.w = \frac{m \cdot R \cdot T}{P \cdot V}$$

$$= \frac{0.841 \cdot 0.0821 \cdot (98.5 + 273)}{0.279 \cdot (745/760)}$$

$$= 93.8 \text{ g/mol}$$

$$Q_2) a. 2 \text{ mol } ClO^- = \text{mol } S_2O_3^{2-}$$

$$M = \frac{0.0257 \times 0.31}{2 \times 0.01}$$

$$= 0.398$$

$$ClO^- \% = \frac{0.398 \times 74.4 \%}{10 \times 1.084}$$

$$= 2.7\%$$

$$b. M = \frac{0.0066 \times 0.31}{2 \times 0.01} = 0.102$$

$$\# \text{ diluted Factor} = \frac{0.398}{0.102} = 3.9 \approx 4$$

Q4:

$$[1] \quad 0.05 \times 0.14 = 7.0 \times 10^{-3}$$

$$[2] \quad 0.7 \text{ ml} \pm 0.05$$

$$[3] \quad 15.60 \pm 0.05$$

$$C = \frac{7.0 \times 10^{-3} - (0.025 \times (15.60 - 0.7))}{0.333}$$

$$= 0.019 \text{ mol/l}$$



Chem 109
Quiz 3

The University of Jordan
School of Science
Department of Chemistry

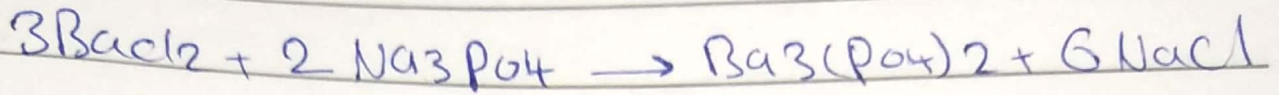
ID No. _____

Section ID: _____

- [1] A mixture of 1.20 g $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ and 1.20 g $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ was dissolved in water. Calculate the mass of precipitate $\text{Ba}_3(\text{PO}_4)_2$ formed. Molar masses: $\text{BaCl}_2 \cdot 2\text{H}_2\text{O} = 244.27 \text{ g/mol}$; $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O} = 380.18 \text{ g/mol}$; $\text{Ba}_3(\text{PO}_4)_2 = 601.93 \text{ g/mol}$.

- [2] 5.00 mL of vinegar solution is titrated with 39.0 mL of 0.200 M NaOH. Calculate the mass percent of acetic acid (Molar mass = 60.05 g/mol) in vinegar. Assume the density of the vinegar is 1.00 g/mL.

Q₁:



BaCl₂

$$\rightarrow \frac{1.20}{244.27} \times \frac{1}{3} = 0.00164 \text{ mol of } \text{Ba}_3(\text{PO}_4)_2$$

Na₃PO₄

$$\rightarrow \frac{1.20}{380.18} \times \frac{1}{2} = 0.00158 \text{ mol of } \text{Ba}_3(\text{PO}_4)_2$$

#1.2

$$\text{mass of } \text{Ba}_3(\text{PO}_4)_2 = 0.00158 \times 601.93$$
$$= 0.951 \text{ g}$$

Q₂:

$$\text{mol Cl}^- = \text{mol NaOH}$$

$$M_{\text{Cl}^-} = \frac{0.039 \times 0.2}{0.005}$$

$$= 1.56$$

$$\text{Cl}^- \% = \frac{1.56 \times 60.05}{1 \times 10} \%$$

$$= 9.37\%$$

Name:

Quiz (3)

Date: 21/12/2021

Registration Number:

A. A student titrated 10.00 mL of acetic acid and 17.35 mL of 0.150 M NaOH were needed.

1. Find the concentration of acetic acid

2. Find % mass of acetic acid solution assuming density of solution is 1.1 g/mL (M. wt: 60 g/mol)

B. In antacid experiment,

1. Write a balanced equation for the reaction of HCl and NaHCO_3

2. How many moles of HCl are needed to react with 0.47 g NaHCO_3 (Mwt: 84 g/mol)

3. The color change of bromothymol blue indicator is fromto.....

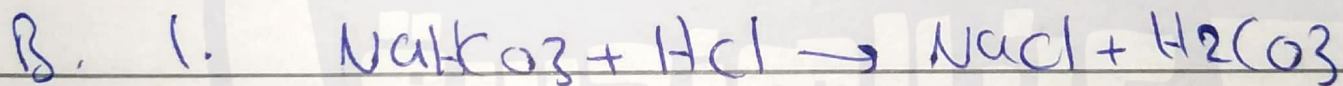
$$A. 1. \text{ mol CH}_3\text{COOH} = \text{ mol NaOH}$$

$$M \cdot V = M \cdot V$$

$$M = \frac{0.0735 \times 0.150}{0.01000}$$

$$= 0.260$$

$$2. \text{ CH}_3\text{COOH} \% = \frac{0.260 \times 60 \%}{10 \times 1.1} \times 100$$
$$= 1.42 \%$$



$$2. \text{ mol HCl} = \text{ mol NaHCO}_3$$

$$\text{ mol HCl} = \frac{0.47}{84}$$

$$= 0.00560$$

3. Yellow \rightarrow Blue

Quiz # 4

8

Name:

Reg.NO

Q1. A student reacts 200g of sodium metal (Na) with 250g of iron (III) oxide (Fe_2O_3) according to the following chemical equation. Given that the atomic mass of Fe=55.8, Na= 23 and O= 16.0 g/mole



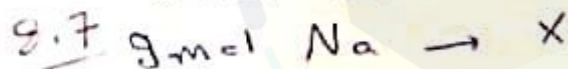
a. Which reagent is the limiting reactant?

$$\text{Na} : \frac{200}{23} = 8.7 \text{ mol} \quad \frac{8.7}{6} = 1.45 \text{ LR}$$

$$\text{Fe}_2\text{O}_3 : \frac{250}{2 \times 55.8 + 3 \times 16.0} = 1.6 \text{ mol} \quad \frac{1.6}{1} = 1.6$$

Na is Limiting reactant

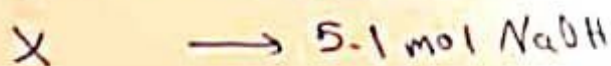
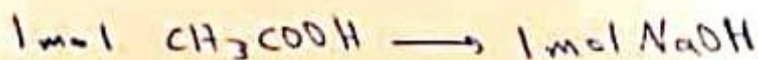
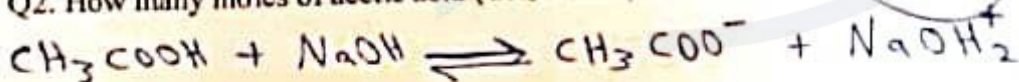
b. The mass of iron metal that precipitated during the reaction.



$$x = 3 \text{ mol}$$

$$\text{mass} = 3 \times 55.8 = 167 \text{ g}$$

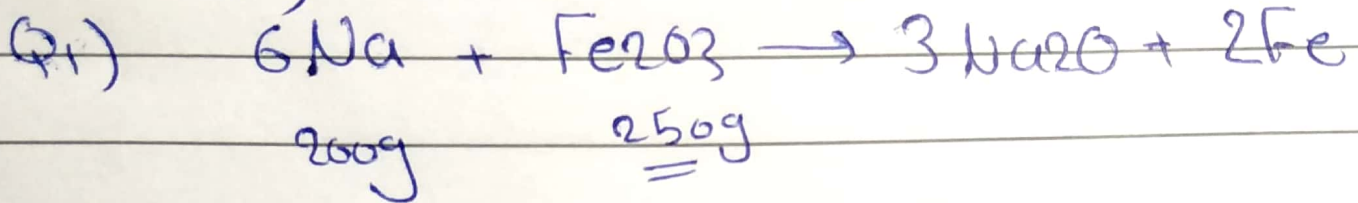
Q2. How many moles of acetic acid (CH_3COOH) needs to react with 25.30 ml of 0.20 M NaOH



$$n(\text{CH}_3\text{COOH}) \rightarrow 5.1 \text{ mol}$$

$V \Rightarrow L$

Quiz 2 (4)



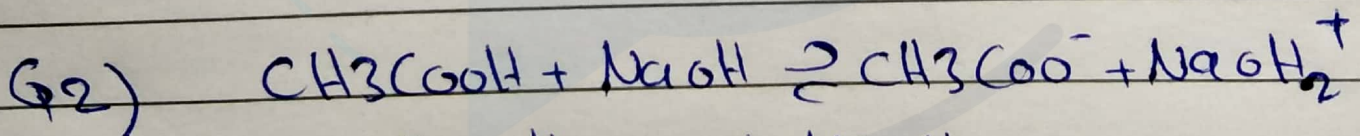
a. $200/6 < 250/11 \rightarrow \text{Na} \rightarrow \text{L.R}$

$\text{L} \rightarrow \frac{200}{23} \times \frac{3}{6} = 4.3 \text{ mol of Na}_2\text{O}$

$\text{L.R} \quad \frac{250}{159.6} \times \frac{3}{1} = 4.7 \text{ mol of Na}_2\text{O}$

b. mass of Fe:

$$\frac{200}{23} \times \frac{2}{6} \times 55.8$$
$$= 162 \text{ g}$$



$$\text{mol CH}_3\text{COOH} = \text{mol NaOH}$$

$$= M \times V$$

$$= 0.2 \times 0.0253$$

$$= 0.00506 \text{ mol}$$

$$= 5.1 \times 10^{-3} \text{ mol}$$



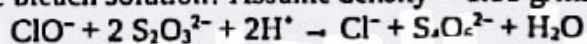
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Section ID

4

- [1] A 0.200 g of antacid was neutralized with 10.0 mL of 0.100 M HCl. Calculate the neutralizing capacity of antacid?

- [2] A 3.00 mL bleach (NaOCl is the active ingredient) sample is mixed with potassium iodide and acid to completely form triiodide ions, which titrated with 0.10 M thiosulfate solution. The endpoint is reached when 30.0 mL of the thiosulfate solution is added. What is the mass percent of NaClO in the bleach solution? Assume density = 1.00 g/mL.



$$Q_1: \text{mol HCl} = \text{mol antacid}$$

$$\rightarrow 0.01 \times 0.1$$

$$= 0.001 \text{ mol}$$

$$C = \frac{0.001}{0.2} = 5 \times 10^{-3} \text{ mol/g}$$

Q2:

$$\text{mol } \text{SO}_3^{2-} = 2 \text{ mol } \text{ClO}^-$$

$$\text{mol } \text{ClO}^- = \frac{0.1 \times 0.03}{2 \times 0.003}$$

$$= 0.5$$

$$\text{ClO}^- \% = \frac{0.5 \times 74 \%}{10 + 1}$$

$$= 3.722\%$$

Q1: Consider the following results on bleach experiment:

- Volume of diluted solution experiment = 15.0 ml
- Volume of 0.15 M $\text{Na}_2\text{S}_2\text{O}_3$ solution needed to titrate completely the diluted bleach solution = 22.00 mL
- Dilution factor of the original bleach solution = 30 $\frac{V_1}{V_2}$
- Calculate the molarity and the mass % of the original bleach solution (density = 1.10 g/mL, Molar mass of NaClO = 74.5 g/mole)

Q2: The vapor from an unknown volatile liquid occupies a 285 mL Erlenmeyer flask at 99.6 °C and 735 torr. The mass of vapor is 0.841 g, calculate the molar mass of the V.L and the density of the vapor at STP

$$Q_1: \text{mol } S_2O_3^{2-} = 2 \text{ mol } ClO^-$$

$$M_{ClO^-} = \frac{0.15 + 0.022}{2 \times 0.015}$$

$$= 0.11$$

$$M_{\text{original}} = 0.11 \times 30$$
$$= 3.3$$

$$ClO\% = \frac{3.3 \times 74.5}{10 + 1.1} \%$$
$$= 22.35\%$$

$$Q_2: M \cdot w = \frac{w \cdot R \cdot T}{P \cdot V}$$

$$= \frac{0.841 \times 0.0821 \times (99.6 + 273)}{(735/760) \times 0.285}$$

$$= 93.45$$

$$D = \frac{P \cdot M \cdot w}{R T} = 2.95 \text{ g/L}$$