NAME: Emily (Yuqi) Dong QUIZ SECTION: AG

LAB PARTNER: Jinghua Chang STUDENT ID #: 1935536

CHEM 142 Experiment #3: Stoichiometry

Goals of this lab:

- Using experimental data, calculate the stoichiometry of the reaction of hydrogen peroxide with bleach
- Apply the mechanics of dimensional analysis to calculate moles from dilute solution volumes and masses
- Analyze and interpret graphical data for the experiment
- Develop lab skills in operating digital pipettes, gas collection apparatus, and other lab equipment
- Assess the accuracy of experimental data and identify sources of error

Your lab report will be graded on the following criteria using a poor/good/excellent rating system (see the Lab 3 Self-Assessment for more details):

- Calculations are complete are correct, with proper use of significant figures and units
- Data and results are careful and accurate
- Lab report is clear and neat with legible handwriting
- Error analysis is well-supported and valid
- All graphs and tables and clearly and accurately labeled

By signing below, you certify that you have not falsified data, that you have not plagiarized any part of this lab report, and that all calculations and responses other than the reporting of raw data are your own independent work. Failure to sign this declaration will result in 5 points being deducted from your lab score.

Signature: Emily Dong

This lab is worth 60 points: 10 points for notebook pages, 50 points for the lab report.
(Do NOT include your notebook pages when you scan your report for upload into Gradescope.)

DATA, CALCULATIONS AND GRAPHS

Concentration of stock solutions

Bleach, NaOCl(aq)	6	%m/m NaOCl
Hydrogen Peroxide, H_2O_2(aq)	3	% m/m H_2O_2

Measurement	Mass of 0.500 mL Bleach, g	Density of Bleach g/ml
1	0.528	1.056
2	0.533	1.066
3	0.536	1.072
4	0.537	1.074

Average Density, g/mL : 1.067

NAME: Emily (Yuqi) Dong QUIZ SECTION: AG

Enter your measurement #1 mass from the bottom of page 1:	

Show your calculation of the density of the bleach solution using the mass data from measurement #1.

$$d = \frac{\text{mass}}{\text{volume}} = \frac{0.528\,g}{0.500\,mL} = 1.056\,g/mL$$

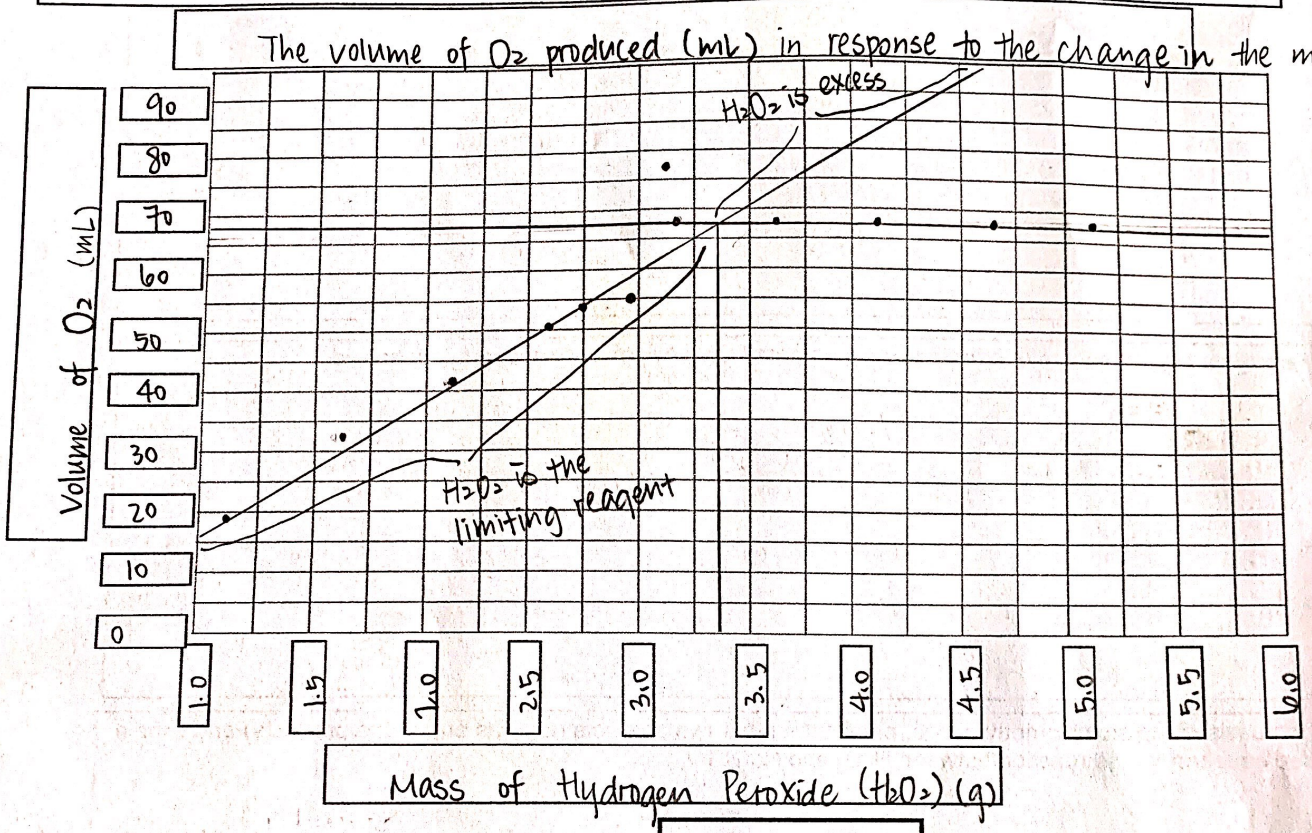
Show your calculation of the average density of the bleach solution using the mass data from all four measurements.

$$\frac{1.056\,g/mL + 1.066\,g/mL + 1.072\,g/mL + 1.074\,g/mL}{4} = 1.067\,g/mL$$

Run Number	mL of Bleach solution	Grams of Hydrogen Peroxide Solution	mL of Oxygen Generated
Run 1	4mL	1.03g	19mL
Run 2	4mL	1.630g	32mL
Run 3	4mL	2.14g	41 mL
Run 4	4mL	2.552g	51 mL
Run 5	4mL	3.107g	77 mL
Run 6	4mL	3.616g	68 mL
Run 7	4mL	4.070g	68 mL
Run 8	4mL	4.597g	68 mL
Run 9	4mL	5.098g	68 mL
Run 10	4mL	3.122g	68 mL
Run 11	4mL	2.751g	54 mL
Run 12	4mL	2.988g	55mL

NAME: Emily (Yuqi) Dong (QUIZ SECTION: AG

In the space below, plot Volume (mL) of O_2 vs Mass (g) of H_2O_2. Title the graph and label the X and Y axis, including the correct units. Be sure to use an appropriate interval on each axis. Draw the following three straight lines using a straight edge: 1) best fit for the data where H_2O_2 is limiting, 2) best fit for the data where H_2O_2 is in excess, and 3) a vertical line from the intersection of lines 1 and 2 down to the x-axis in order to clearly identify the equivalence/ stoichometric point. Indicate (label) on your graph where the H_2O_2 is the limiting reagent and where it is in excess.



Grams of H_2O_2 solution at the Eqv Point: 3.375 g

Show your calculation for the moles of H_2O_2 at the equivalence point.

$$\text{moles} = \frac{3.375\text{g}}{(2\times1.008+2\times16.00)\text{g/mol}} \times 0.03 = 0.002977\text{mol}$$

3×10^{-3} mol

Show your calculation for the moles NaOCl at the equivalence point.

$$\text{moles} = \frac{0.06 \times 4\text{mL} \times 1.056\text{g/mL}}{(22.99+16.00+35.45)\text{g/mol}} = 0.003405\text{mol}$$

3×10^{-3} mol

Stoichiometry: moles H_2O_2/moles NaOCl 1:1

NAME: Emily (Yuqi) Dong QUIZ SECTION: AG

Results and Discussion

Enter your stoichiometry conclusion from the bottom of page 3:	1:1

1. The expected stoichiometry is 1:1. How does your result compare (calculate the % error between your mole ratio and the expected value)?

My result is the same as the expected stoichiometry.

Therefore, the % error between my mole ratio and the expected value is 0%.

2. What is your biggest source of error in this experiment? Give evidence to support your answer.

There is one trail that is an outlier based on the graph, where we measured 77 mL of O_2 while mixing 4mL of NaOCl with 3.107g of H_2O_2. This error may came from our reading mistake of the graduated cylinder, or the measuring mistake when measuring the H_2O_2.

3. On the basis of the stoichiometry above, predict the other two products (O_2 was one of the products) and write a balanced equation for the reaction between H_2O_2 and NaOCl.

The stoichiometry of NaCl and H_2O is also 1:1 based on the equation.

$$H_2O_2 + NaOCl \rightarrow O_2 + NaCl + H_2O$$

Laboratory Waste Evaluation

Laboratory waste is considered anything generated during an experiment that is disposed of down the sewer drain, thrown in the garbage, collected in a container for disposal by the UW Environmental Health & Safety department, or released into the environment. Based on the written lab procedure and your actions during the lab, list the identity and approximate amount (mass or volume) of waste that you generated while performing this experiment.

There is water remnants (H_2O), bleach (NaOCl), and Hydrogen Peroxide (H_2O_2) in it. The approximate amount of waste generated during this lab is about 120 mL.