CH 150 Summer 2026: **“Percent Potassium Chlorate”** ***Lab*** **-** *Instructions*

Step One:

Get a printed copy of this lab! You will need a printed (hard copy) version of pages I-7-3 through I-7-6 to complete this lab. If you do not turn in a printed copy of the lab, there will be a 2-point deduction.

Step Two:

Watch the **video introduction** for this lab **here: http://mhchem.org/t/7.htm**

The video introduction will help prepare you for the lab and assist you in completing the work before turning it in to the instructor.

Step Three:

Bring the printed copy of the lab with you on Monday, July 13. During lab, you will use these sheets (with the valuable instructions!) to gather data, all of which will be recorded in the printed pages below.

Step Four:

Complete the lab work and calculations on your own, then **turn it in (**pages I-7-5 through I-7-6 *only* to avoid a point penalty**) at 8 AM on Tuesday, July 14.** The graded lab will be returned to you the following week during recitation.

If you have any questions regarding this assignment, please email (mike.russell@mhcc.edu) the instructor. Good luck on this assignment!

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Percent Potassium Chlorate Lab

Once we are able to describe pure substances in terms of atoms and molecules, and in terms of compounds and elements, we can begin to understand chemical reactions in a quantitative manner. We can predict product amounts and develop economical ways to produce the many synthetic substances we need. Furthermore, we have the ability to analyze substances based upon the amount of products formed in a reaction. This experiment is an illustration of just such a technique.

Potassium chlorate ($KClO_3$) decomposes on heating to produce potassium chloride and oxygen according to the equation below:

$$\mathbf{2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)}$$

Since the decomposition of 2 moles of $KClO_3$ releases 3 moles of oxygen, you can determine the amount of $KClO_3$ in a sample from the mass loss due to loss of oxygen. In this experiment, you will determine the percent $KClO_3$ in an unknown mixture containing an unreactive chloride. By converting the mass loss to moles of oxygen lost, we calculate the moles of potassium chlorate in the starting material. From the moles of potassium chlorate we can convert to mass and then the percent of potassium chlorate in the unknown mixture.

A catalyst, MnO_2 (manganese (IV) oxide), is added to the reaction mix to speed up the reaction. Like all catalysts, the same amount of catalyst is present at the end of the reaction as in the beginning. Therefore, we will include the mass of the catalyst in with the mass of the test tube.

In a thermal decomposition such as this, the product must be heated to a constant mass before you can be sure the decomposition is complete. After the first heating, cooling and measuring, the sample must be heated again, cooled and the mass recorded again. This process is continued until two successive mass values are within 5 mg (0.005 g) of each other (three or four heatings.)

PROCEDURE: - *You must wear safety goggles while performing this lab!*
Also, while waiting for the mixture to heat or cool, consider working on the postlab questions.

1. Set up a ring stand with a triangle as demonstrated by your teacher. The small white crucible should fit inside the triangle.

2. Place about 0.5 g of manganese(IV) oxide into a clean, dry small white crucible. Heat the crucible and catalyst with a Bunsen burner for about 3 minutes to drive off any moisture that may be in the catalyst or crucible.

3. When the crucible is cool enough to touch, record the entire mass to the nearest 0.001g.

4. Add between 2.0 to 2.5 grams of the unknown mixture to the crucible. Mix the contents to obtain a somewhat uniform mixture. Record the mass of the crucible plus catalyst plus mixture to the nearest 0.001 g. Be sure to also record your unknown number!

5. Begin heating the crucible gently at first followed by a more aggressive treatment for a total of 10 minutes. Be aware that the sample may begin to bubble and spurt; if this happens, turn the flame down a bit.

6. Allow the sample to cool to room temperature. Record the mass to the nearest 0.001 g.

7. Reheat your sample for 5 minutes. Cool and record the mass. If your mass is within 0.005 g of the mass after the first heating, congratulations, you can move on to calculations. If not, you must reheat, cool, and mass until you have two successive masses within 0.005 g of each other.

8. Clean up! Complete postlab questions.

CALCULATIONS: *Remember to show relevant calculations on your lab sheet*

1. Write a balanced equation for the decomposition of potassium chlorate.
2. Determine the **mass of oxygen lost** (**α**, below in the equation).
3. Use the balanced equation to determine the mass of potassium chlorate decomposed (**λ**, below, in the equation.) You will also need to calculate the **molar mass of O_2** (**β,** below) and the **molar mass of $KClO_3$** (**δ**, below).
4. Determine the percentage of potassium chlorate in the original white mixture.

The following equation might prove useful for this lab:

$$\lambda \text{ g KClO}_3 = (\alpha \text{ g O}_2 \text{ lost}) * \left(\frac{\text{mol O}_2}{\beta \text{ g O}_2}\right) * \left(\frac{2 \text{ mol KClO}_3}{3 \text{ mol O}_2}\right) * \left(\frac{\delta \text{ g KClO}_3}{1 \text{ mol KClO}_3}\right)$$

PERCENT POTASSIUM CHLORATE

Name:
Lab Partner(s):

DATA:

Unknown Number __________

1. Mass of crucible + catalyst
   (after drying moisture & before adding unknown __________

2. Mass of crucible + catalyst + unknown
   (before heating) __________

3. Mass after first heating __________

4. Mass after second heating __________

   Mass after third heating (if necessary) __________

   Mass after fourth heating (if necessary) __________

CALCULATIONS: (Show set up for each calculation)

7. Mass of oxygen lost __________

8. Mass of potassium
   chlorate decomposed __________

9. Mass of unknown __________

10. % $KClO_3$ in unknown mixture __________

CONCLUSION: (Unknown # and calculated %$KClO_3$; possible sources of error)

POSTLAB QUESTIONS:

1. Calculate the % oxygen by mass for the following (show calculations). Use at least four significant figures.
   a) lithium nitrate
   b) sodium hydrogen carbonate

2. Would the calculated % $KClO_3$ in the unknown be higher or lower if all the moisture was not removed from the catalyst in the first heating, before adding the unknown mixture? Explain your prediction.

3. A white powder is a mixture of potassium chlorate and potassium chloride. Upon heating, the potassium chlorate decomposes into potassium chloride and oxygen. If you start with 2.220 g of the mixture and after heating are left with 1.700 g of potassium chloride, calculate the mass percent of potassium chlorate in the original mixture.