LAD D3 (pg 1 of 2) Percent of Oxygen in Air

Name_____Per___

Introduction

As you probably already know, iron reacts with oxygen and makes rust. In this lab, you will use this fact to determine the % of oxygen in air. By measuring the part of air that reacts with the steel wool (which is iron), you can assume that this is the approximate percentage of oxygen in air (which is a mixture of oxygen and nitrogen). We will assume that after a day or two, all of the oxygen in the air under the test tube will have reacted and no longer exists in gas form. Nitrogen (the other gas in air) does not react with the steel wool. As oxygen is used up, water will fill in the space showing you how much oxygen had been originally present in the air.

Procedure

1. Fill a beaker with tap water about 3/4 full. Place the test tube open side down, straight down, into the beaker of water. Observe how far the water "projects up" into the test tube, then take the tube out of the water again.
2. You will be given a small piece of steel wool (iron). Use the tongs and swish it in a little bit of vinegar for about 5 seconds. The vinegar is an acid and will clean the steel wool off so that "fresh clean" iron will be available to react.
3. Do not roll the steel wool into a ball. Stuff the loose, fluffy steel wool into a test tube and use a spatula to push the iron all the way to the bottom. Then place the test tube with steel wool open side down, straight down, into the beaker of water.
4. With the test tube resting flat on the bottom of the beaker, measure and record the height (in centimeters) that the water rises up into the test tube. You should put the ruler right into the water. After measuring, you may allow the tube to lean against the side when you leave it overnight. Put your test tube on your class tray. As a class, we will set up one empty test tube for a "control."
5. Use the data/results table below to record your data/calcs.
6. The next day, again hold the test tube resting on the bottom of the beaker (standing straight up), measure and record the height (preferably in centimeters) that the water has risen up in the test tubes. Do **NOT** measure the amount of water in the **BEAKER**. Measure the amount of water that is projecting up into the test tube
7. Pull out the steel wool with the white spatula, and observe to answer Post Lab Question #2, then toss in the trash can.

Data / Results Table

these letters →	A	B	C	D	E	F
correspond to the letters in the diagram below.	Height of water projecting up into the test tube # (cm)		Height of the test tube # (cm)	Amount of oxygen that was originally in the tube before the reaction (cm)	Original amount of air that was in the test tube (cm)	Percent of oxygen in the original air %
	start	after				
steel wool test tube						
control tube						

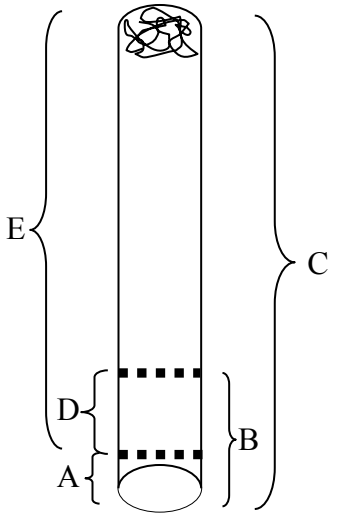
Processing the Data

Use letters in the diagram with the letters above the columns in the data table to help guide your calculations.

D. Calculate the amount of oxygen that must have been in the tube before the reaction.

E. Calculate the original total amount of air in the tube before the reaction.

F. A percent calculation: $\frac{part}{total} \times 100$, will allow you to calculate the % of oxygen in the original air. Show your work below and put your result in the table above.



Don't miss the Post Lab Questions on the back →

Post LAD Questions

1. When you initially put the tubes into the water, why didn't the tubes fill with water?

2. After pulling out the steel wool with the white spatula, what observation(s) give evidence a chemical reaction may have occurred inside the tube with the steel wool in it.

3. In the tube with steel wool, where do you suppose the missing gas went?

4. If you had massed the steel wool before the experiment, , and then allowed the steel wool to dry off after the experment, do you suppose the mass of the steel wool would be larger, smaller, or no change after the reaction? Explain your answer.

5. Write a balanced chemical equation that represents the reaction between iron and oxygen gas. (*We will work this together.*)

6. Look up "control" in the dictionary and report the definition that is appropriate to a chemistry experiment. What was the control that we ran in this experiment, and what did the control tell us?

7. What is the theoretical percentage of oxygen in air? Look up the percentage on line if you do not already know an approximate value. How close is this to the percentage of oxygen that you calculated?