LAD 3.2 (pg 1 of 1) Rusting to Determine the Percent of Oxygen in Air

Name_____

Introduction

As you probably already know, oxygen reacts with iron and makes rust. In this LAD, 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 couple of days, 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 - Set this up on Friday afternoon/evening and

1. Get a small piece of steel wool (see the sample size) and swish it in a little bit of vinegar for about 15 seconds, then rinse it off briefly with water. The vinegar is an acid with will clean the steel wool off so that "fresh clean" iron will be available to react.
2. Stuff the steel wool into one test tube and use a spatula to push it all the way to the bottom.
3. Half fill a beaker with tap water. Place the control tube (with nothing in it) open side down, straight down, into the beaker of water. The place the test tube with steel wool open side down, straight down, into the beaker of water.
4. With the test tubes resting flat on the bottom of the beaker, measure and record the height (preferably in centimeters) that the water rises up in the test tubes. You should put the ruler right into the water. You may allow the tube to lean against the side when you leave it overnight.
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 tube.

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						

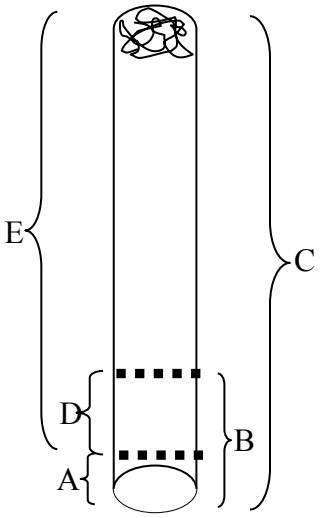
Processing the Data

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 was originally 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. Put your calculation in the data/results table above.



Post LAD Questions

1. When you put the tube into the water, why didn't it fill with water?
2. If possible, pull out the steel wool with a pencil. What observation(s) is evidence a chemical reaction may have occurred inside the tube with the steel wool in it.
3. Where do you suppose the missing gas went?
4. If you had massed the steel wool before the experiment, do you suppose it would be larger or smaller mass after the two day went by?
5. 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 it tell us?
6. What is the theoretical percentage of oxygen in air? Look it in your text or on line. How close is this to the percentage of oxygen that you calculated?