

SNC 2DI Acetylene Combustion Lab

Acetylene is a hydrocarbon also known as ethyne (C_2H_2). It is a gas often used in welding. In this lab, we will be determining the ratio of acetylene to air that gives **complete combustion**.

Before you begin your investigation, write down your hypothesis about how the amount of air influences the type of combustion.

Procedure:

In the steps that follow you will be filling the test tube with different amounts of acetylene. That is, each time the test tube is used, it will contain a different amount of acetylene.

- i) **Trial 1** will contain 75% acetylene and 25% air- using a ruler, measure and put a mark on the test tube to show the 75% mark.
- ii) **Trial 2** will contain $\frac{1}{2}$ acetylene and $\frac{1}{2}$ air – using a ruler, measure and put a mark on the test tube to show the 50% mark.
- iii) **Trial 3** will contain $\frac{1}{10}$ acetylene and $\frac{9}{10}$ air - using a ruler, measure and put a mark on the test tube to show the 10% mark.

1. Half-fill a 600 mL beaker with water.
2. Fill a small test tube entirely with water and place a piece of paper towel over the top of the test tube.
3. Place the inverted test tube in the water. Remove the paper towel from the beaker. Check that there are no bubbles in the test tube. If bubbles remain, repeat steps 1-3.
4. Using forceps, drop a granule of calcium carbide (CaC_2) in the beaker and collect the acetylene gas by placing the test tube over top the granule.
5. Collect acetylene gas until it reaches the **75%** mark on your test tube. You may have to use several calcium carbide granules in order to collect the desired amount of acetylene.
6. Keeping the test tube inverted, take the test tube out of the water and let the excess water drain from the test tube. Quickly stopper the test tube while inverted. Gently shake the test tube to mix the acetylene with the air.
7. Ignite the contents of the test tube by inserting a burning splint into the mouth of the upside-down test tube containing the acetylene/air mixture and record your observations pertaining to their burning rate and any evidence of complete or incomplete combustion. *Any black material observed indicates that there is soot being produced.* Make detailed observations and record them in a chart (example provided).
8. Clean out the test tube and dump the beaker water and cloudy precipitate down the sink.
9. Repeat steps 1 to 8 for each of the other two amounts of acetylene.

Sample Observation Chart:

| Amount of Acetylene | Amount and Location of Soot | Flame Colour and Position | Description of the Sound |
|---------------------|-----------------------------|---------------------------|--------------------------|
| 75% | | | |
| 50% | | | |
| 10% | | | |

You will be required to submit a full lab report for this experiment according to the “HHSS Junior Laboratory Report Outline” provided. Include the answers to the questions below in the “inquiry” section.

Inquiry Questions:

1. Write the balanced chemical equation (including states) for the **production** of acetylene gas.
2. Write the balanced chemical equation (including states) for the **complete combustion** of acetylene gas.
3. Oxygen is needed in order for combustion to occur. What is the source of oxygen in this experiment? What percentage of this source is actually oxygen? (include a reference)
4. Which test tube(s) gave incomplete combustion? What observations support your decision? WHY was combustion incomplete?
5. Which test tube(s) gave complete combustion? What observations support your decision? WHY was combustion complete?
6. What were the ratios of acetylene to **oxygen** (not air) for each of the three trials. Compare these ratios to the ratio of acetylene to oxygen from your balanced chemical equation in question 2 to determine which trial had the closest ratio to that of complete combustion. Does the closest ratio agree with your observations?
7. Seasonal furnace maintenance is essential to make sure your furnace is running efficiently and safely. A furnace that is not running at peak performance can be deadly due to the production of a toxic gas. Name this toxic gas and describe its effect on a red blood cell.

YOUR TYPED LAB REPORT IS DUE THURSDAY OCTOBER 19th

For this lab only you must submit a full lab report that follows the format provided.