

Activity 4.5: What Happens When Ethanol Burns? Reading

Ethanol, C_2H_5OH , is made through fermenting grains, such as corn. Fermentation is the process during which decomposers break down the sugar in grains. One of the products of this chemical change is ethanol. Ethanol has many uses, because of its properties. You have been studying its combustibility. Because of this property, it is one of the components of gasoline. You can see on gas pumps the percentage of ethanol in the fuel. Ethanol also can kill bacteria. For this reason, it is used for cleaning to prevent infections, such as in hospitals. Another property of ethanol is that it evaporates quickly. It is found in some perfumes and colognes, because it evaporates leaving the molecules with fragrance on the skin.

As you read this text, complete the graphic organizer to trace what happens to matter and energy when ethanol burns.

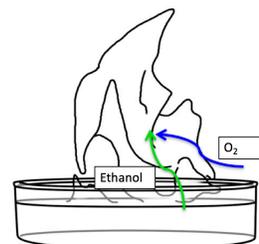
Using Four Steps to Explain Combustion

We can explain the combustion—burning—of ethanol by answering the four numbered questions on the Three Questions handout:

1. How do molecules move to the location of the chemical change (combustion)?

Two things are necessary to keep the ethanol flame burning: ethanol and oxygen.

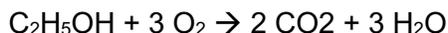
Ethanol In: All flames need a fuel and oxygen. Ethanol (C_2H_5OH) is a fuel that has chemical energy stored in high energy carbon-carbon (C-C) and carbon-hydrogen (C-H) bonds. Ethanol molecules evaporate from the container of ethanol and enter the bottom of the flame. Evaporation is a physical change that transforms liquid into gas. When ethanol evaporates, its molecular structure remains the same.



Oxygen In: All flames also need Oxygen (O_2) from the air. Oxygen also enters at the bottom of the flame.

2. How are atoms in molecules rearranged into different molecules?

Inside the flame the ethanol and oxygen molecules come together and go through a chemical change. Let's think about matter—the atoms. The atoms in both the ethanol (C_2H_5OH) and the oxygen (O_2) molecules rearrange into carbon dioxide (CO_2) and water (H_2O). The number of atoms does not change. We can use a chemical equation to show how the atoms are rearranged:

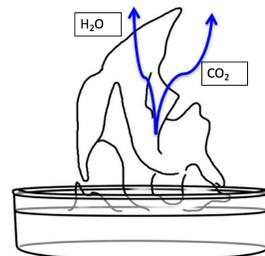


3. What is happening to energy?

As the atoms in the ethanol and oxygen are rearranged, energy is released. Chemical energy is released as heat and light when the high-energy C-C and C-H bonds of ethanol are replaced by low-energy H-O and C=O bonds in carbon dioxide and water.

4. How do molecules move away from the location of the chemical reaction?

Carbon Dioxide and Water Out: During combustion, the atoms in ethanol and oxygen are rearranged into carbon dioxide and water. The carbon dioxide and water leave the top of the flame.



Reading Strategy

Reread this text using your 4.5 Matter Tracing Tool. Fill in each of the four sections using information from this text.