This unit deals with the concept of combustion, the reaction responsible for a wide range of phenomena, such as the burning of candles. It also addresses fire extinguishment, the opposite of combustion and a concept that must be studied in order to live safely.

By studying this area, students should discover the conditions required for a substance to undergo combustion or extinguishment by observing the phenomenon of burning and learn that new substances are created as a result of combustion through experiments. They also develop the ability and mindset needed to manage emergency situations in everyday life.
The grade 6 English science unit, Combustion, meets the academic content standards set in the Korean curriculum, which state students should:

a) Learn through observation the common phenomena that occur as a result of the combustion of substances.

b) Know the conditions of combustion and fire extinguishment as well as understand combustion and fire extinguishment in relation to each other.

c) Examine the substances produced as a result of combustion through experiments.

d) Be aware of fire prevention and safety measures and know how to properly handle a fire extinguisher.
What’s my target?

Every year people die in fires. It is important to know what to do should a fire break out in your home or school so that you can save your own life.

If there is a small fire, using a fire extinguisher can help stop it getting out of control. The P.A.S.S acronym is an easy way to remember how to use a fire extinguisher:

P stands for Pull out the safety pin.
A stands for Aim at the base of the fire.
S stands for Squeeze the levers.
S stands for Sweep from side to side.

What do I need to do?

1. Mix 50mL of vinegar and half a tablespoon of baking soda together in the bottle.
2. Put a straw in a stopper that has a hole in the middle and place this on the bottle.
3. Light a candle. Carefully tilt the bottle near the flame.

What happened?

Draw a picture to show how your fire extinguisher put out the flame.

What did I learn?

1. What is the acronym to help you remember how to use a fire extinguisher?

__________________________________________________________________________________________

2. Explain the evacuation route from your science laboratory?

__________________________________________________________________________________________
Candle Seesaw

What’s my target?

Candles consist of a wick surrounded by wax. The wick is usually made from cotton braided together and the wax is made from hydrogen and carbon atoms.

When a candle is lit, the wax melts and goes up the wick. The heat from the flame turns the hydrogen and carbon particles into gases where they react with the oxygen from the air to create heat, light, water vapor and carbon dioxide.

The heat from the flame keeps melting the wax which allows the combustion process to continue until all the wax is used up.

What do I need to do?

1. Remove the wax around the end of the bottom of the candle to reveal the wick.
2. Find the center of gravity of the candle and drill a hole through it. Push through the nail.
3. Balance the candle between two glass cups and quickly light both ends of the candle.

What happened?

Draw a picture showing how your candle seesaw works.

What did I learn?

1. What is the wax of a candle made from?

   ________________________________________________________________

2. How does the wax help keep the flame of a candle burning?

   ________________________________________________________________

   ________________________________________________________________
**What’s my target?**

The fire triangle is a simple model that shows the three things necessary for fires to start. Fires need oxygen, heat and fuel. Examples of fuel include wood, gas or petroleum.

Once a fire starts, it will continue as shown in the fire tetrahedron. However, if you take way one of the things from the fire triangle, the fire can be extinguished. For example, putting sand over a fire will take away the oxygen it needs or pouring water on it can reduce the heat it needs.

**What do I need to do?**

1. Cut the end of a teabag and remove all the tea.
2. Stand the empty teabag on some fireproof material.
3. Use a lighter to set the top of the teabag on fire.

**What happened?**

Draw a picture to show what happened to the bottom of the teabag.

**What did I learn?**

1. What three things does a fire need to start?

2. Why did the fire on the teabag eventually go out?
What’s my target?

Heat is one thing needed to start combustion. Different materials will start to burn at different temperatures. The lowest temperature required for a substance to start burning is known as the kindling point. A substance that burns in air is called flammable.

What do I need to do?

1. Break three matches in half.
2. Put the matchheads on one side of the metal bowl and the wooden ends on the other side.
3. Turn on the heater and observe what happens.

What happened?

Draw a picture showing which part of the matches started burning first.

What did I learn?

1. What part of a match will burn first?

2. What does kindling point mean?
**What’s my target?**

One of the things needed for a fire to start is fuel. The most common examples are natural gas, propane, kerosene, diesel, petrol, charcoal, coal, and wood.

Combustion of a liquid fuel happens in the gas phase. It is the vapor that burns, not the liquid. Therefore, a liquid will normally catch fire only above a certain temperature: its flash point. The flash point of a liquid fuel is the lowest temperature at which it can form an ignitable mix with air. It is the minimum temperature at which there is enough evaporated fuel in the air to start combustion.

**What do I need to do?**

1. For solid fuels: Put a crayon in a clip.
2. Stand the crayon up in a metal bowl. Light the crayon by aiming the flame of the lighter to the side of the top of the crayon.
3. For liquid fuels: Your teacher will pour some rubbing alcohol in a tall glass jar and swirl it around. They will light the vapor in the jar using a lighter.

**What happened?**

Draw a picture showing what happened to the crayon and vapor after the lighter was used.

**What did I learn?**

1. What are some examples of fuels?

2. For liquid fuels, is it the liquid that burns? Please explain.
What's my target?

A fire needs oxygen to start and to continue burning. One of the products that a fire makes is carbon dioxide. If you put a candle in a jar, the fire will go out when all the oxygen is used up and the jar is full of the carbon dioxide it produced.

Carbon dioxide is slightly soluble in water. Limewater is often used to test for carbon dioxide. If this gas is present, then the limewater will turn milky.

As the inside of the jars cool when the fires go out, the pressure inside the jars drop. The limewater that is outside the jar will be forced inside by the higher pressure outside.

What do I need to do?

1. Put one candle in each of the petri dishes.
2. Put some limewater in each of the petri dishes and light both the candles quickly.
3. Put the small jar on one of the candles and the large jar on top of the other candle at the same time. Note which candle goes out first.

What happened?

Draw a picture showing the two candles at the point when the first candle went out.

What did I learn?

1. Which candle went out first?

2. What happened to the limewater? What does this show?
What’s my target?

Steel wool is made up mostly of iron. This metal is not usually found pure, as it combines with water and oxygen to form rust. This shows that iron likes to join with oxygen to form iron oxides.

One of the things that a fire needs to start is oxygen. Iron can react directly with oxygen to produce heat. As the heat from the reaction increases, the surrounding areas of the steel wool will also start burning.

Steel wool burns well because a large surface area is in contact with the air. The steel wool is also made up of thin strands of iron allowing enough heat to be made to keep the reaction going.

What do I need to do?

1. Cut open a ball of steel wool using scissors and unroll it.
2. Place the unrolled steel wool on a metal tray.
3. Set fire to the middle of the steel wool with the lighter.

What happened?

Draw a picture showing what happened after you set the lighter to the steel wool.

What did I learn?

1. What two things does iron like to combine with?
   ________________________________________________________________

2. Why does steel wool burn so well?
   ________________________________________________________________
   ________________________________________________________________
What’s my target?

Every year people enjoy watching fireworks as they brighten the night skies. The colors in fireworks come from the combustion of different elements.

Lithium or strontium adds a red color to the fireworks. Sodium helps produce the gold and yellow colors. Magnesium helps to make bright white flames. Barium is used to create green fireworks. Copper creates the blue colors. Aluminum creates silver sparks and flames. Titanium also helps to make sparks. Antimony helps to make the glitter effects.

Phosphorous is used to ignite the fireworks in the air.

What do I need to do?

1. Light up the different sparklers.

What happened?

<table>
<thead>
<tr>
<th>Sparkler</th>
<th>Color</th>
<th>Possible Element Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What did I learn?

1. Why do fireworks come in different colors?

2. What two elements could be used to create red fireworks?
What’s my target?

Fuels burn when they react with oxygen and there is enough heat. Many fuels are hydrocarbons, which mean they are made up of hydrogen and carbon. The oxygen from the air will join with the hydrogen to form water and the oxygen will join with the carbon to make carbon dioxide gas. If this happens, it is known as complete combustion.

However, if there is not enough air we get incomplete combustion. The hydrogen will still combine with the oxygen to make water, but the gas made here is only carbon monoxide. In this case, carbon is also released as soot or smoke.

What do I need to do?

1. Mix 10g of baking soda with 40g of sugar.
2. Pour some lighter fluid on the sand in a metal bowl. Then, put the baking soda/sugar mixture on top in a mountain shape.
3. Light the “mountain” from the bottom.

What happened?

Draw a picture showing what happened.

What did I learn?

1. What things are made during complete combustion?

_________________________________________________________________________________________________________

2. How is incomplete combustion different to complete combustion?

_________________________________________________________________________________________________________

_________________________________________________________________________________________________________
**What’s my target?**

People usually think of large, whirling winds when they hear the word tornado, but it can be more than just the air. In very bad forest fires, firefighters sometimes have to battle against fire tornadoes. This effect happens as the winds blow through the trees and collide with the warm, rising air from a wildfire. As the warm air rises, cooler air moves into the bottom of the fire, providing more oxygen for the fire and also helping to twist the flames into the shape of a tornado. These fire tornadoes can be up to 50 meters tall. This phenomenon shows how a fire can spread quickly through a forest.

**What do I need to do?**

1. Your teacher will pour some rubbing alcohol into the crucible.
2. They will tape the crucible onto the middle of the rotating stand.
3. They will light the rubbing alcohol and spin the rotating stand.

**What happened?**

Draw a picture showing the fire tornado.

**What did I learn?**

1. What do firefighters sometimes have to battle against in bad wildfires?
   
   ________________________________________________________________

2. How is a real fire tornado made in the forests?
   
   ________________________________________________________________
   ________________________________________________________________

**Things I need:**

- Rotating stand
- Steel mesh bin
- Rubbing alcohol
- Crucible
- Lighter