



## A Nifty Natural Gas Story

Hundreds of millions of years ago, long before the dinosaurs roamed, most of the Earth was covered with vast, deep oceans. Tiny plants and animals lived in these oceans.

The sun produces lots of light from a process called nuclear fusion. The sun's radiant energy was changed into chemical energy by the plants, which helped them grow. The animals ate the plants, and both the plants and animals stored the sun's energy in their bodies as chemical energy.

When they died, they sank to the ocean floor. As more and more plants and animals died, they sank and made a thick layer deep under the water.

Over time, more layers of rock, sand, and other dead plants and animals built up. As the layers built up, they pressed down hard on the layers beneath.

As the layers of rock built up, the deepest layers got hot. They were under very high pressure with all that weight on top of them. They waited some more - millions of years!

Eventually, those dead plants and animals under all those layers of rock changed. Now they weren't plants or animals. Now they were special molecules called hydrocarbons, with only hydrogen and carbon in them. The hydrocarbons became trapped in tiny holes in the rocks. Then they waited.

Many years ago, people began to notice bubbles coming out of the ground beneath ponds and lakes. They discovered that the bubbles were flammable – they could fuel a fire. The people used bamboo and other hollow plant stems to carry the bubbling gas to their villages.

Today, geologists search for the layers of rock that contain the hydrocarbons. They use a lot of special equipment and computers to find natural gas. Then they drill an exploratory well. Eight or nine times out of ten, they are successful!

The natural gas is pumped out of the ground at the well. It is separated from any liquids and water that might be mixed with it, and compressed into high pressure gas pipelines. The gas moves to the processing facility.

Natural gas has no odor, so at the final processing facility, a chemical called mercaptan is added. Mercaptan smells like rotten eggs! That is what you smell if natural gas is leaking. Because it is flammable, it is important to use it safely. If you ever smell natural gas, leave the area immediately and then call 911.

After processing more pipelines carry natural gas to where it is used. Electrical power plants might use natural gas to generate electricity for homes, businesses, and schools. Most homes also use natural gas to heat water and stay warm in cold weather.

Natural gas produces almost no air pollution when it is burned. All of those tiny plants and animals millions of years ago are now providing us a clean energy source that is easy to use. Do you think they would be happy to know so many people rely on them?

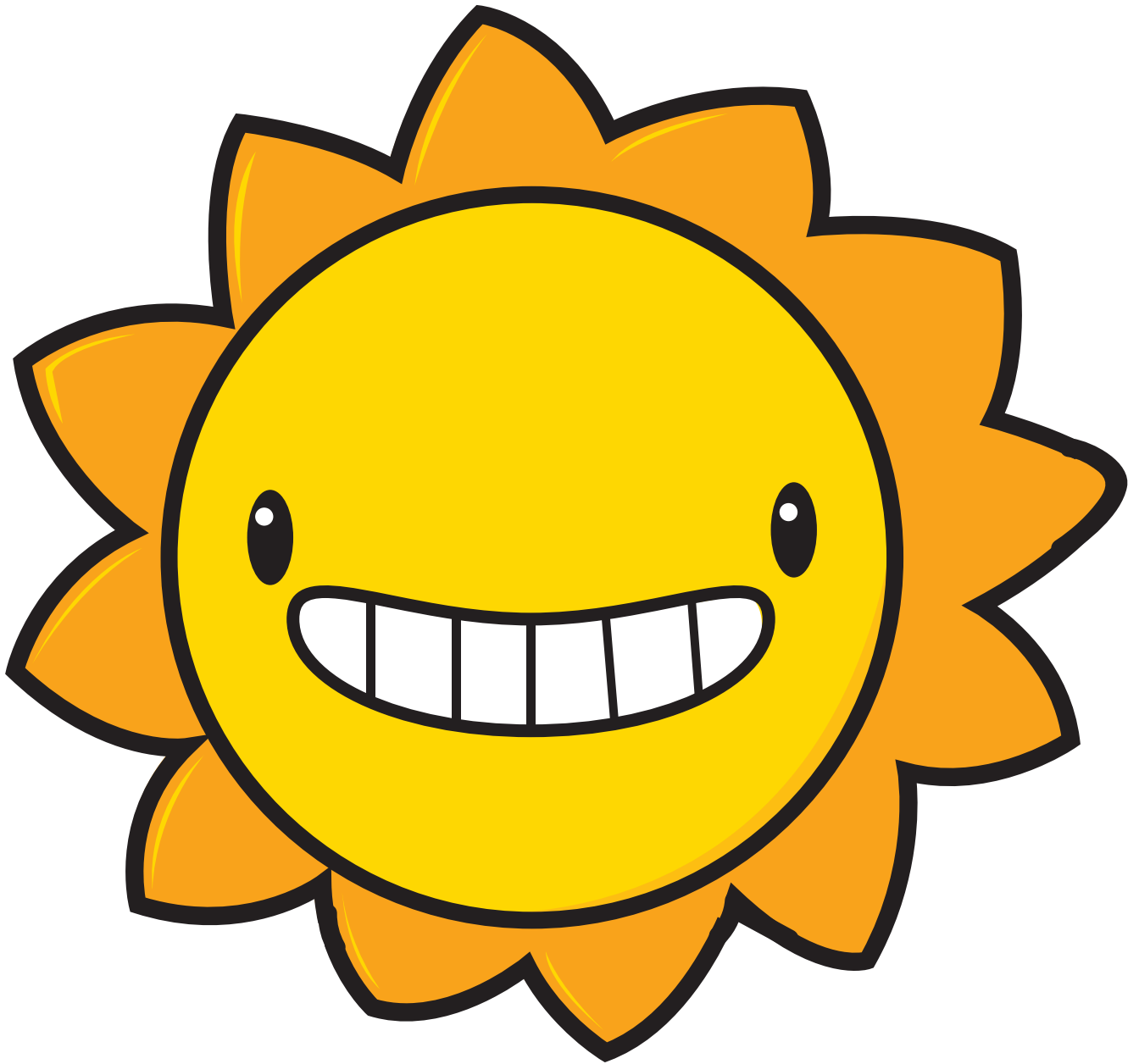


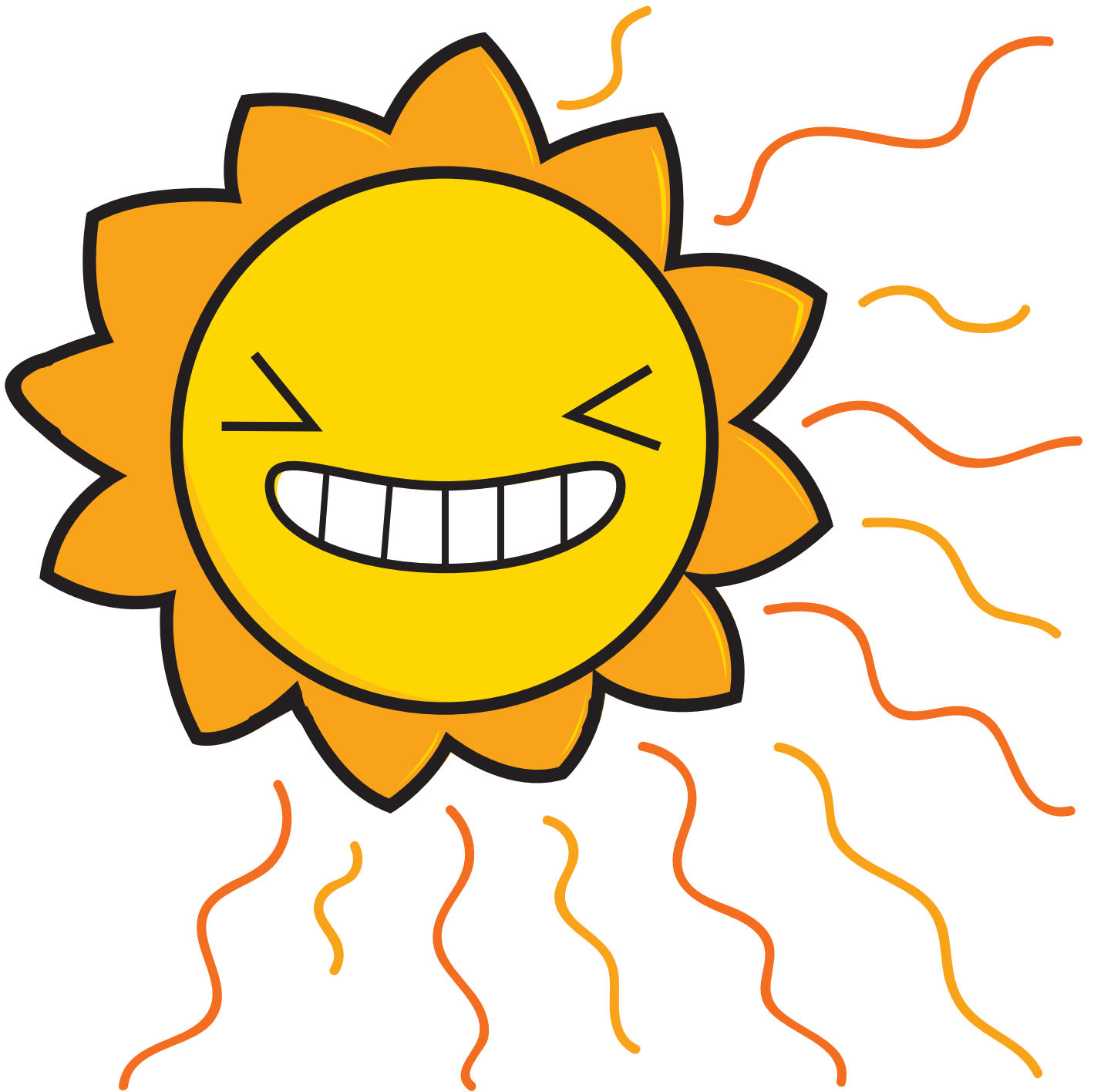
## A Nifty Natural Gas Story Pantomime

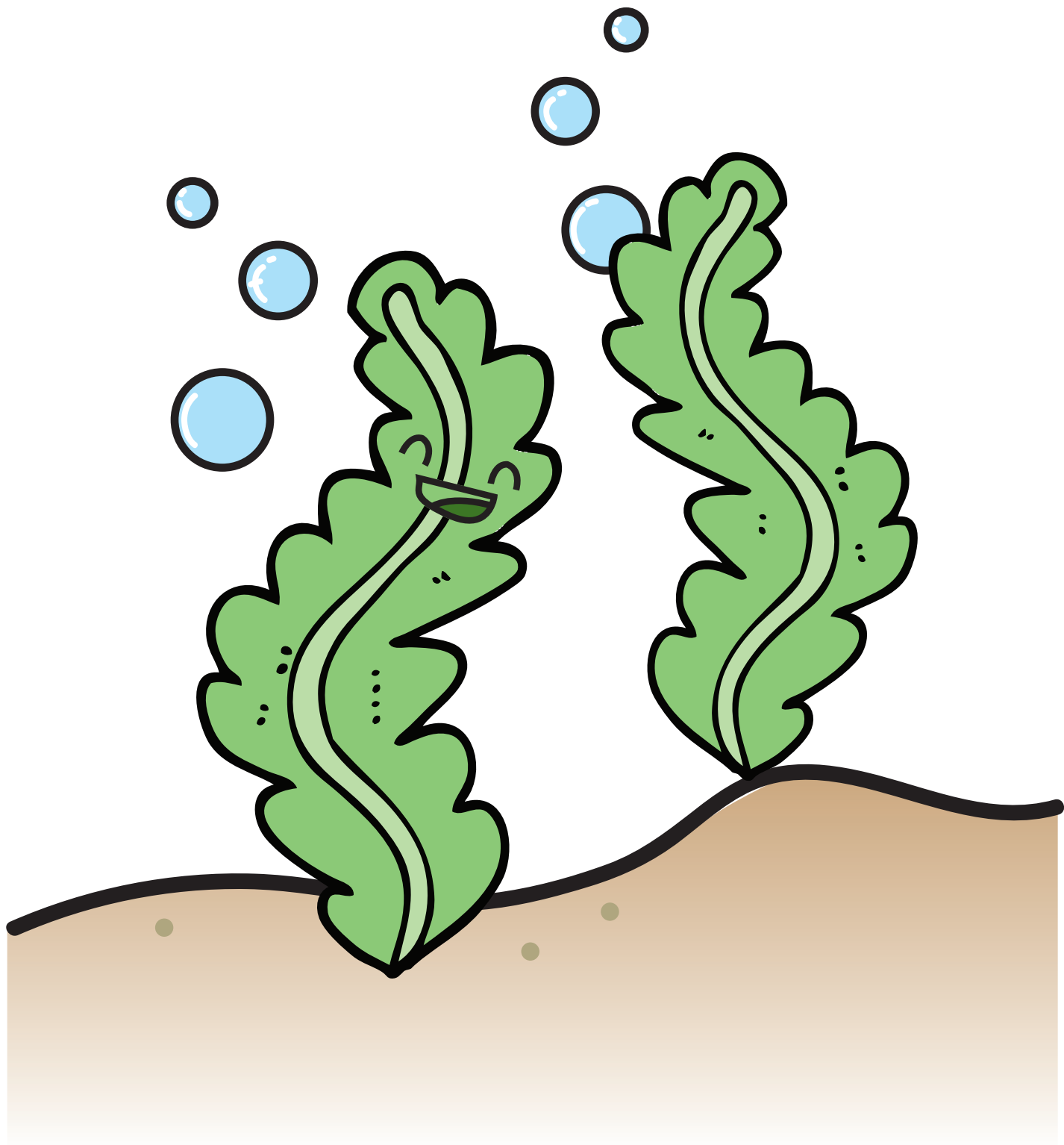
Students will demonstrate the flow of energy to heat homes using props. Depending on the audience, signs with the different forms of energy can be used by the students to identify the energy transformations. This activity with different props can also be used to demonstrate other energy flows, like coal to electricity, biodiesel, ethanol, etc.

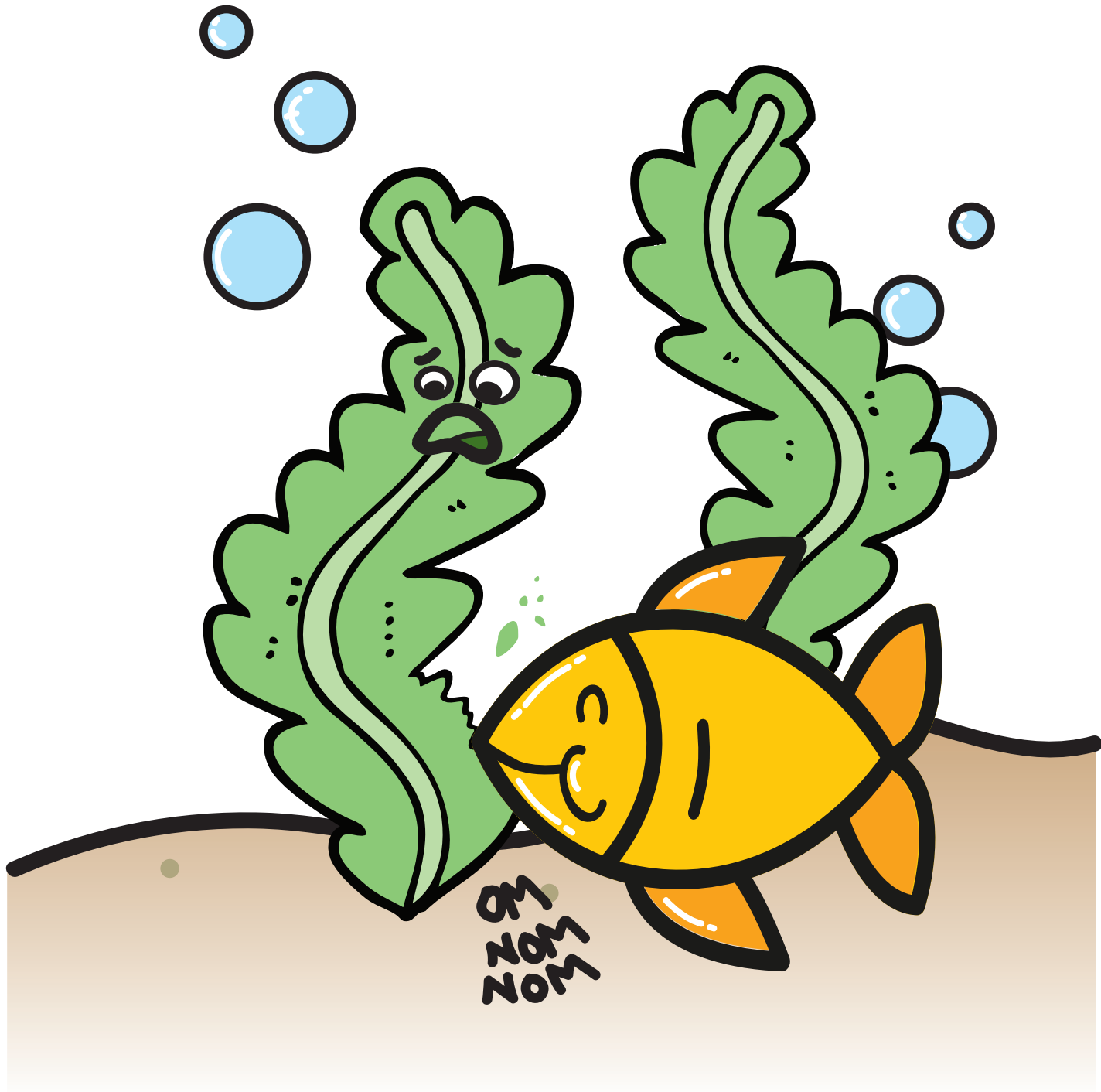
<b>Earth – Oceans</b>	The earth was covered with vast, deep oceans. Tiny plants and animals lived in those oceans
Prop & Action	Blue ball
<b>Sun – Nuclear Energy to Radiant Energy</b>	Nuclear fusion in the sun produces vast amounts of energy. The sun's radiant energy is transferred to Earth by electromagnetic waves.
Prop & Action	Yellow ball; long yellow ribbons waved in the air away from the ball
<b>Plants – Radiant Energy to Chemical Energy</b>	Radiant energy from the sun is absorbed by tiny green plants in the ocean and changed to chemical energy by photosynthesis
Prop & Action	Artificial plants or paper "seaweed"; students move up from the floor and "float" around
<b>Storing Chemical Energy</b>	Tiny animals in the ocean ate the plants and stored their chemical energy.
Prop & Action	Sock puppets; sock puppet animals "eat" the plants
<b>Animals changing to Natural Gas</b>	The plants and animals died and they sank to the bottom of the ocean, where they were covered by layers of rocks and soil.
Prop & Action	Large pieces of brown and black paper and cardboard (several different types and colors); The sock puppets are dropped to the floor and a couple layers of "sediment" are stacked on top of them
<b>Burying</b>	Over millions of years, more and more rocks and soil layered on top of the plants and animals.
Prop & Action	Add more layers of paper "sediment"
<b>Heat, Pressure, Time</b>	As the layers of rocks and soil got thicker and thicker, more and more pressure built up over the plants and animals. The pressure made the temperature increase. Over a long time, the pressure and temperature kept increasing, and the plants and animals changed into natural gas.
Prop & Action	Place a heavy rock or some heavy books on the paper "sediment." Students hold a large thermometer and a large clock, representing heat and time

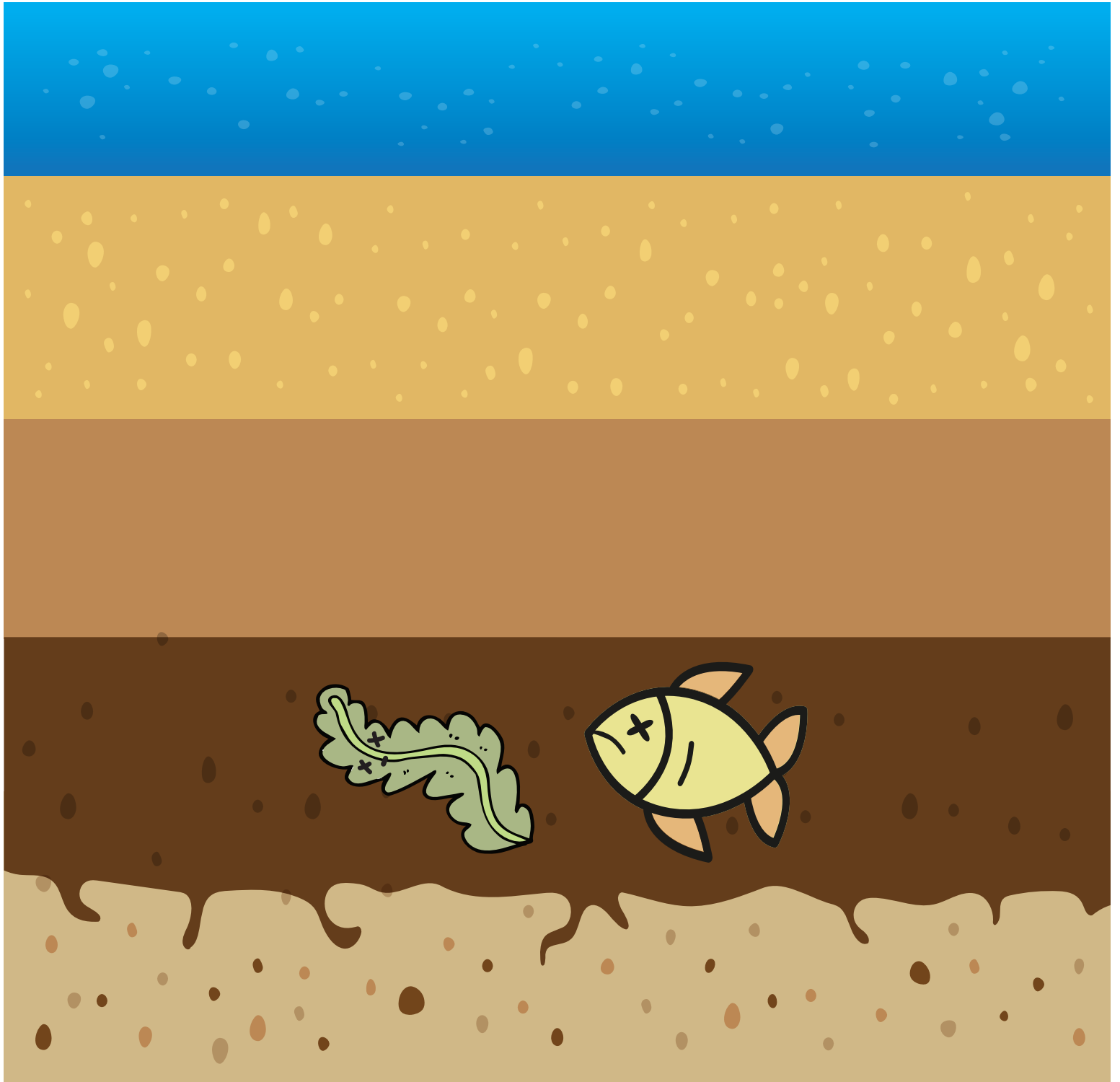
<b>Bubbles of gas</b>		The natural gas was trapped in tiny holes in the rocks.
	Prop & Action	Bottle of bubbles
<b>Natural Gas Exploration and Production</b>		A well is drilled into the ground to locate natural gas. The gas is brought out of the ground through the well.
	Prop & Action	Long, hollow cardboard tube, or a rolled-up piece of paper; hold the tube vertically with hands over the head, and push the tube downward to the floor. Use one hand to wave fingers over the top of the tube in a wiggling motion to indicate the flowing of natural gas.
<b>Separation, Dehydration, and Compression</b>		The raw natural gas from the ground is separated from impurities and water, and compressed to high pressure.
	Prop & Action	Plastic mixing bowl or bottle; student uses hand to simulate separating the gas from the impurities, and another student pushes both hands together in a compressing motion to load the "gas" into the "pipeline"
<b>Processing</b>		At the processing facility a chemical called mercaptan is added to the gas to make it smell like rotten eggs. If you ever smell natural gas, leave the area immediately and call 911.
	Prop & Action	One long piece of garden hose or other tubing, and one eye dropper; one student holds the tubing from the separator to the processing facility, and one student holds the end of the tubing in one hand and the dropper in the other. The dropper is used to simulate adding mercaptan to the gas
<b>Distribution</b>		The processed gas is transported by pipeline to businesses and homes.
	Prop & Action	Another long piece of garden hose or other tubing; student holds it between the processing facility and the end use location
<b>End Use – Chemical Energy to Electricity or Thermal Energy</b>		Electric utilities burn natural gas to boil water into steam and turn a turbine, generating electricity. In our homes, natural gas is burned to heat water and keep us warm in cold weather.
	Prop & Action	Small lighter; rope to represent transmission lines; Student lights lighter and other students hold their hands to flame to warm them.





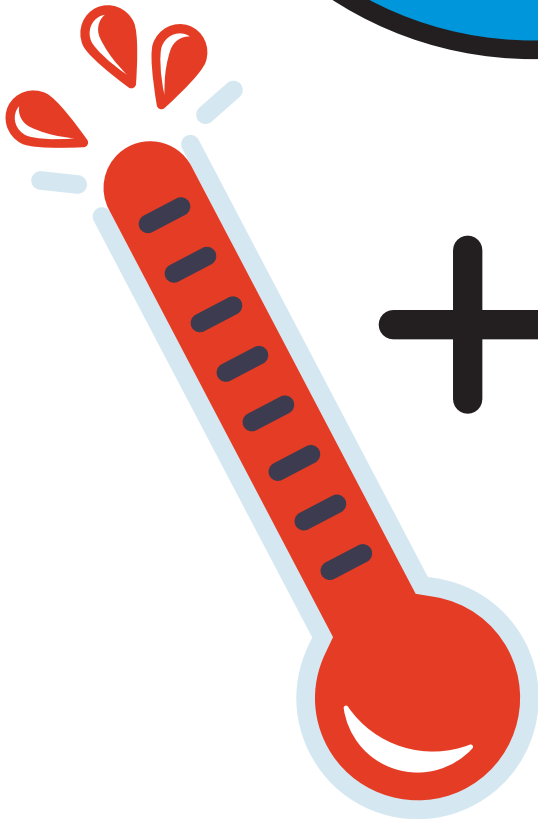
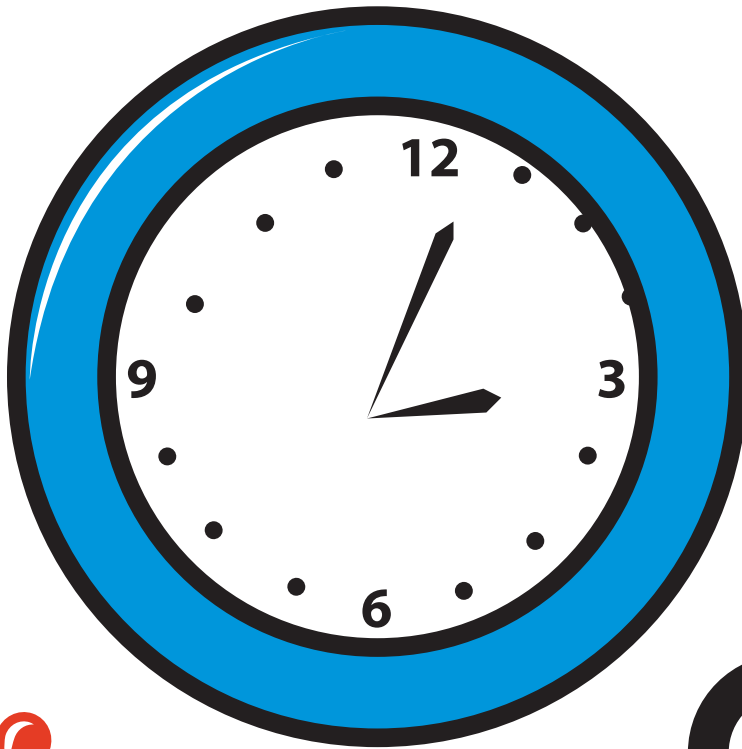






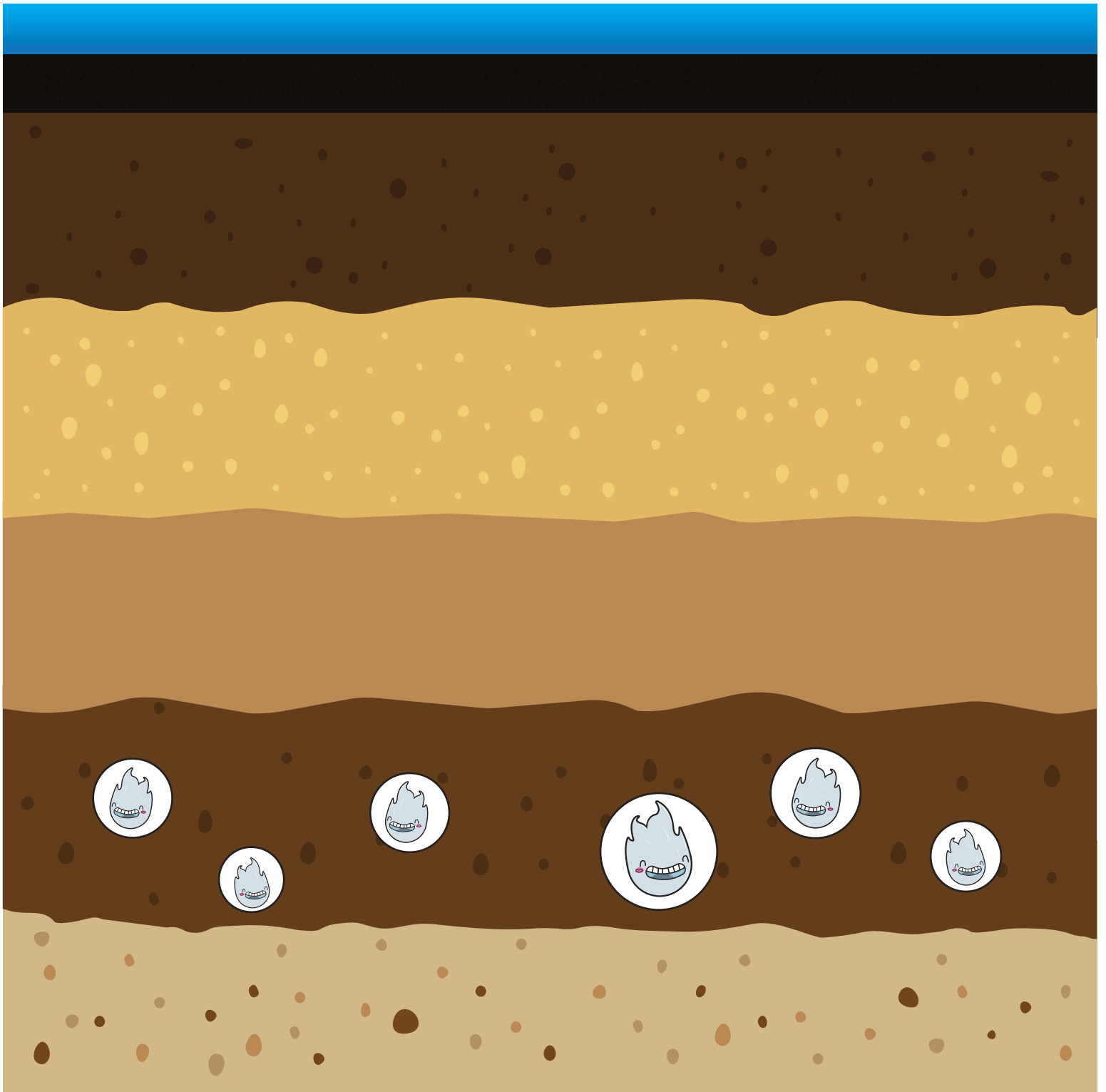


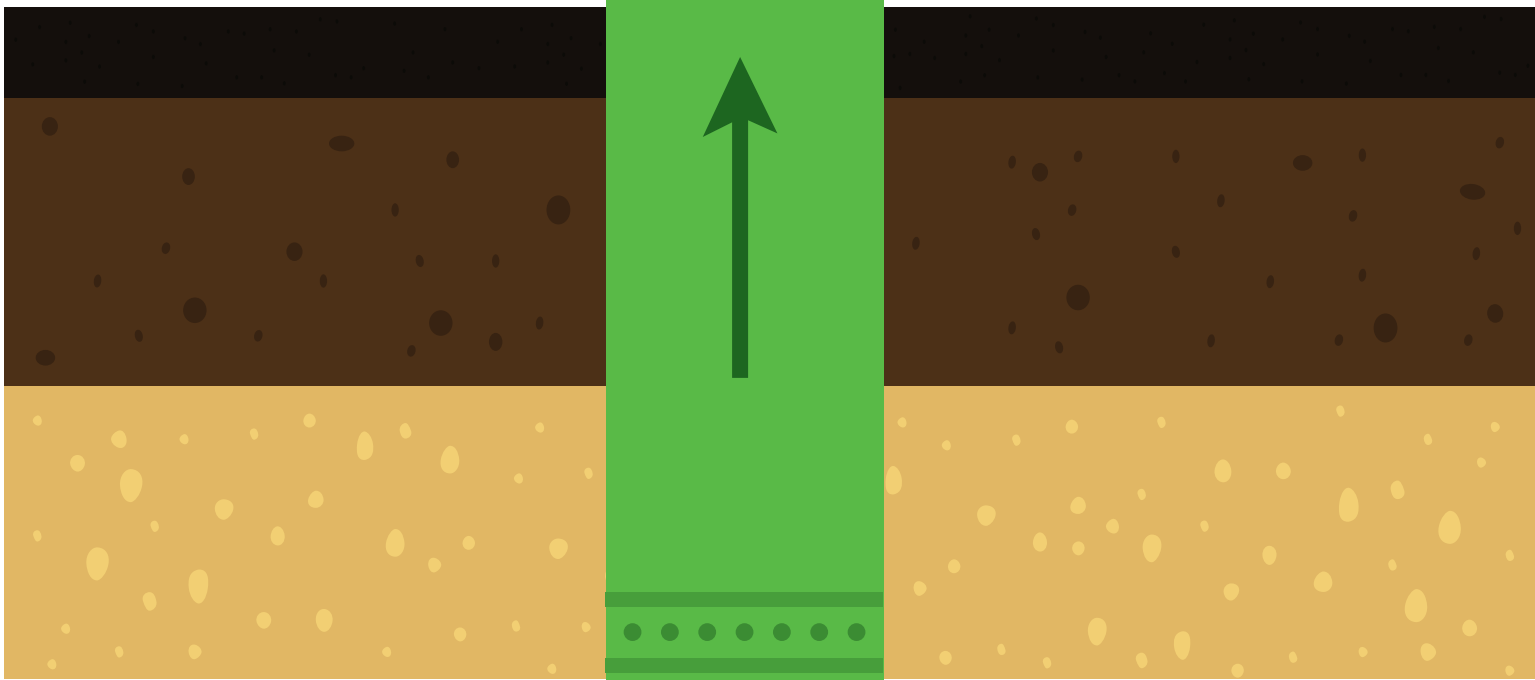
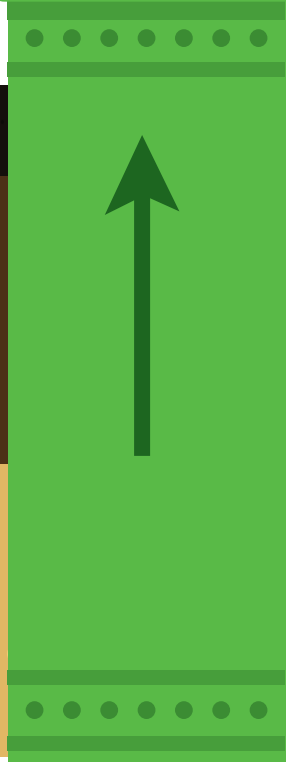
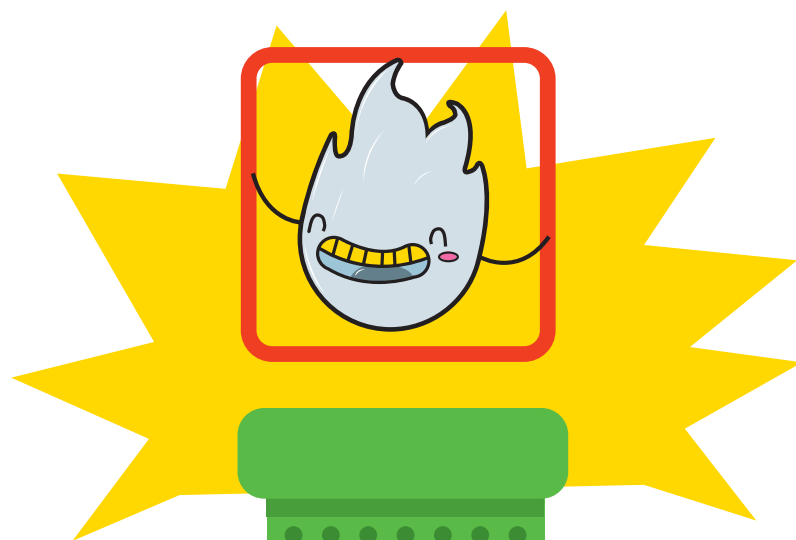


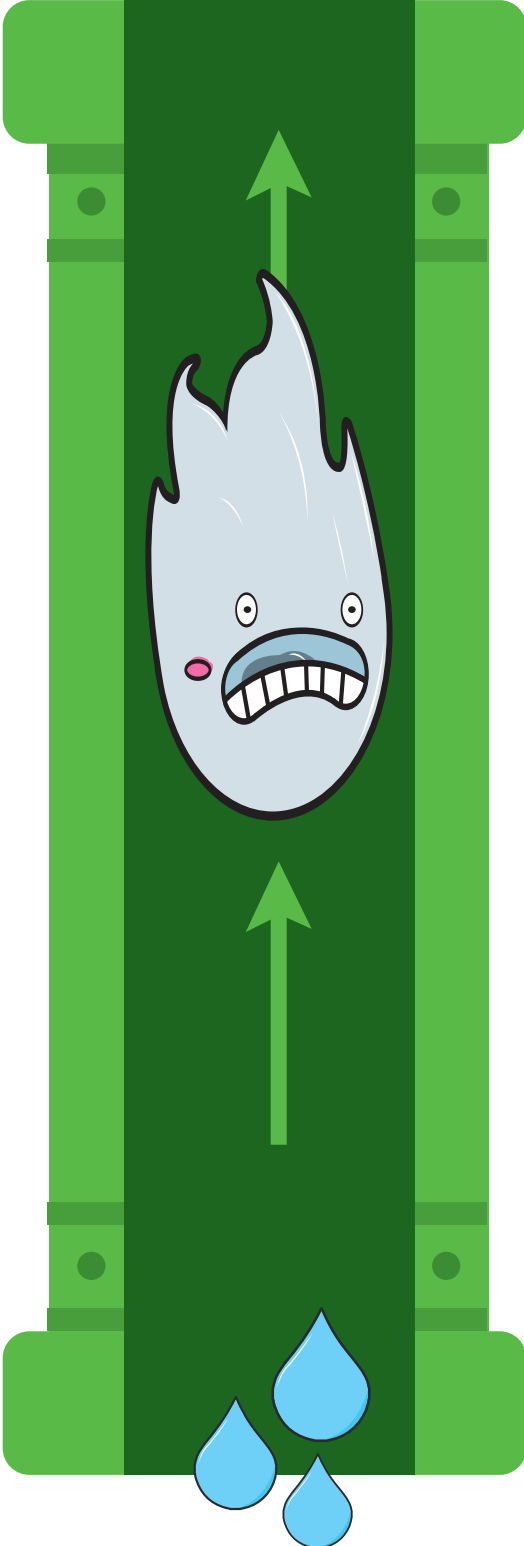


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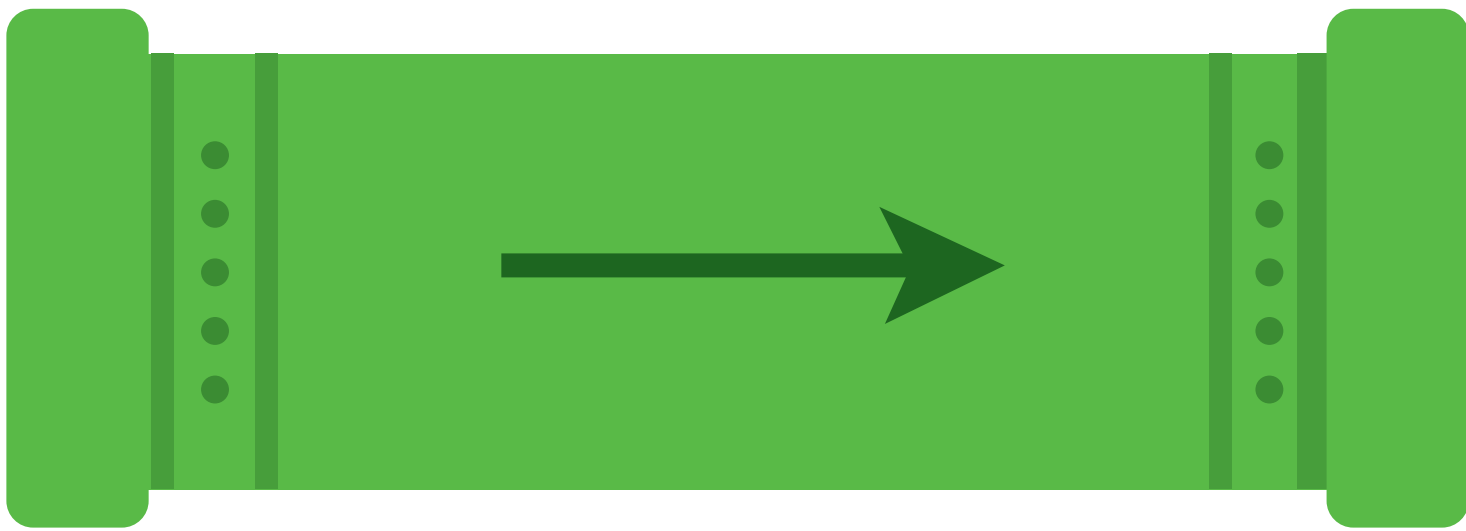
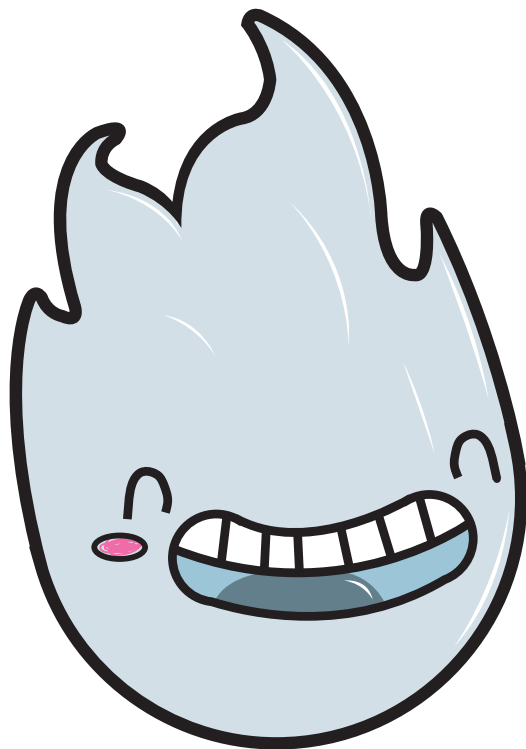


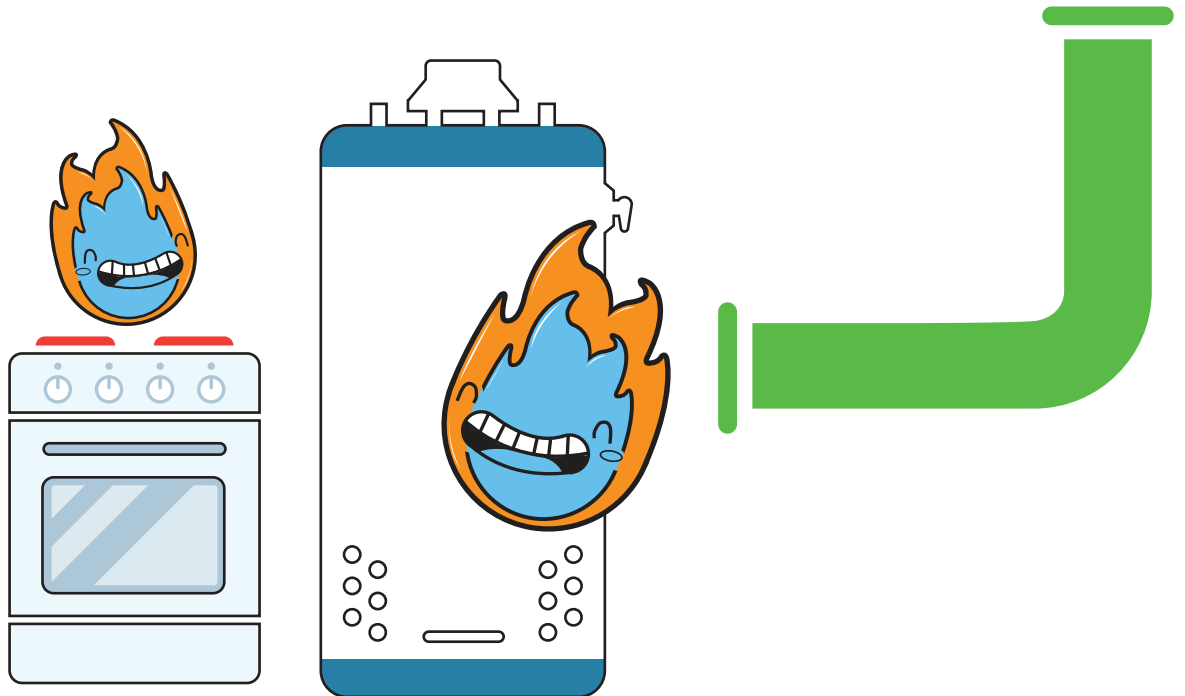
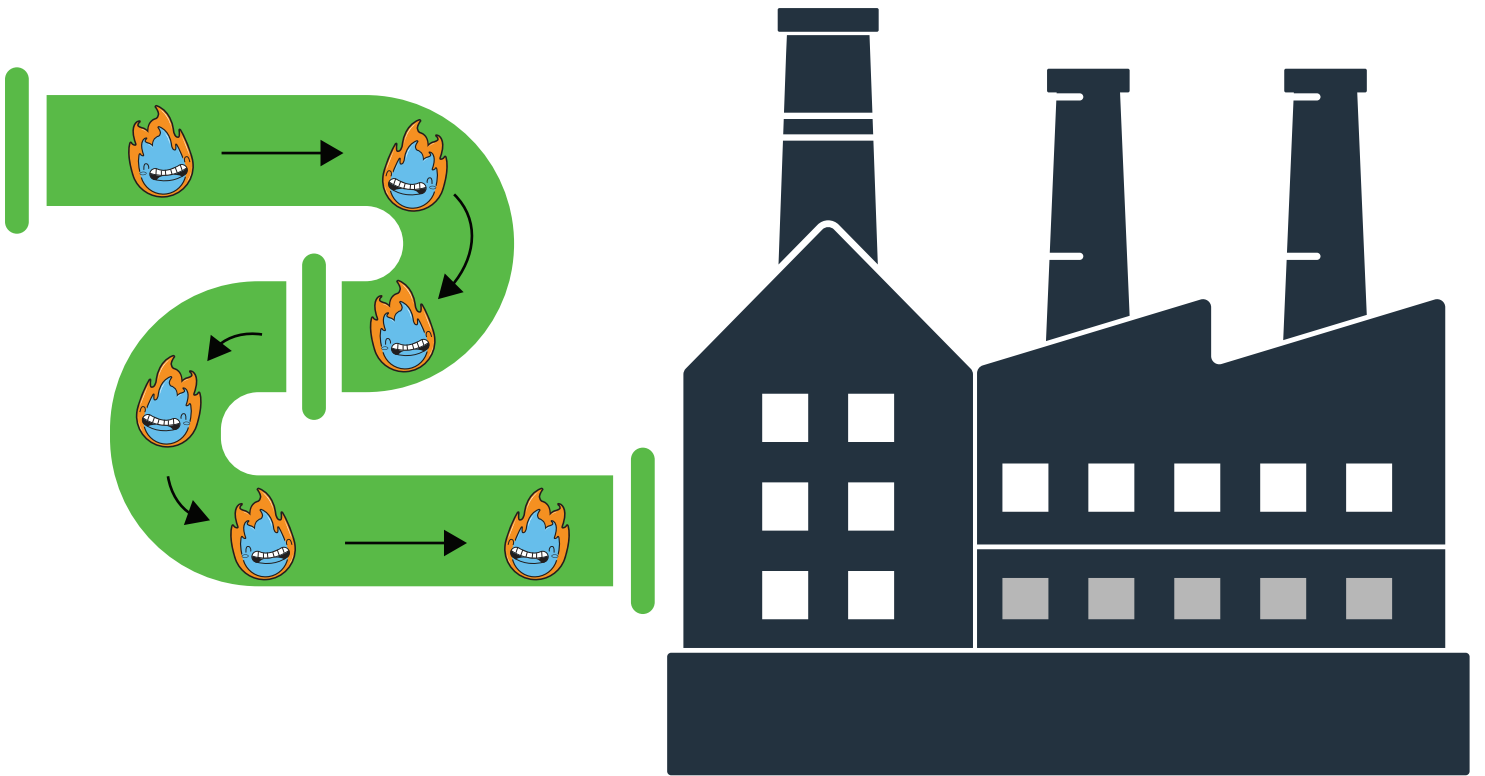














# NIFTY NATURAL GAS STORY

## ANSWER KEY

