Name: _____ Date: _____

Why the Bicycle Pump Gets Warm as You Pump

Circle group

Pump up a bicycle tire with a hand pump. Then touch the lower part of the pump. It feels warm. You did not plug it in. You did not heat it. So where did the warmth come from? The answer shows how energy and heat are linked.

Air is a gas. It is made of countless molecules that zoom around and bump into each other. They move faster when air is hotter. They move slower when air is colder. When you push the handle down, you squeeze the air into a smaller space. The plunger meets the molecules as they bounce off it. It is like a bat hitting a ball. It sends them away faster than they came.

Now the squeezed air has molecules with more energy. Its temperature goes up. The work of your arms has turned into heat. Some warmth also comes from the plunger rubbing inside the pump. Friction always makes a little heat.

The effect is small on a bike pump. It matters more in big machines. A diesel engine squeezes air so hard that it gets hot enough to ignite the fuel sprayed into it. No spark is needed. When squeezed air spreads out again, the opposite happens. It cools down.

Questions

1. What happens to the air when you push the handle down?

_____

_____

2. Why do molecules in squeezed air have more energy?

_____

_____

3. Besides squeezing the air, what else makes warmth in the pump?

_____

_____

4. How does a diesel engine use this idea?

_____

_____

5. Where does the energy that warms the air come from?

_____

_____

6. What do you think happens to the temperature of air that spreads out again?

_____

_____

Words to know

molecules: the tiny particles that everything is made of
plunger: a part that slides back and forth inside a tube
friction: the rubbing force between two surfaces that touch
temperature: a measure of how hot or cold something is

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Why the Bicycle Pump Gets Warm as You Pump

Triangle group

After you inflate a bicycle tire with a hand pump, touch the lower part of the pump. It feels warm. You did not plug it in or heat it, so where did the warmth come from? The answer shows how closely energy and heat are connected.

Air is a gas made of countless molecules zooming around and bumping into one another. They move faster when the air is hotter and slower when it is colder. When you push the pump handle down, you squeeze the air into a smaller space. The plunger meets the molecules as they bounce off it, and like a bat hitting a ball, it sends them away faster than they arrived.

As a result, the squeezed air has molecules with more energy, and its temperature goes up. The work your arms did has become heat. Part of the warmth also comes from the plunger rubbing against the inside of the pump, because friction always makes some heat.

The effect is small on a bicycle pump, but it matters in bigger machines. A diesel engine squeezes air so hard that the air becomes hot enough to ignite the fuel sprayed into it, with no spark needed. When squeezed air is allowed to spread out again, the opposite happens, and it cools down.

Questions

1. What happens to the air when you push the pump handle down?

_____

_____

2. Why do the molecules in squeezed air have more energy?

_____

_____

3. Besides squeezing the air, what else makes warmth in the pump?

_____

_____

4. How does a diesel engine use this idea?

_____

_____

5. Where does the energy that warms the air come from?

_____

_____

6. What do you think happens to the temperature of air that is allowed to spread out again?

_____

_____

Words to know

inflate: to fill something up with air
molecules: the tiny particles that everything is made of
plunger: a part that slides back and forth inside a tube
friction: the rubbing force between two surfaces that touch
temperature: a measure of how hot or cold something is

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Why the Bicycle Pump Gets Warm as You Pump

Square group

After you inflate a bicycle tire with a hand pump, touch the lower part of the pump, and you will probably find that it feels distinctly warm. You did not plug the pump into anything or hold it near a flame, so where did that warmth actually come from? The answer reveals just how closely energy and heat are connected to each other.

Air is a gas made of countless molecules that zoom around in every direction, constantly bumping into one another. They move faster when the air is hotter and more slowly when the air is colder. When you push the pump handle downward, you squeeze the air into a much smaller space. The plunger meets the molecules as they bounce off its surface, and, like a bat striking a ball, it sends them away faster than they arrived.

As a result, the squeezed air contains molecules with more energy, and its temperature rises. The work that your arms performed has been transformed into heat. Part of the warmth also comes from the plunger rubbing against the inside of the pump, since friction always produces some heat.

The effect is small on a bicycle pump, but it matters a great deal in larger machines. A diesel engine squeezes air so forcefully that the air becomes hot enough to ignite the fuel sprayed into it, with no spark required. When squeezed air is later allowed to spread out again, the opposite happens, and it cools down.

Questions

1. What happens to the air when you push the pump handle downward?

_____

_____

2. Why do the molecules in squeezed air end up with more energy?

_____

_____

3. Besides squeezing the air, what else produces warmth in the pump?

_____

_____

4. How does a diesel engine take advantage of this idea?

_____

_____

5. Where does the energy that warms the air originally come from?

_____

_____

6. What do you think happens to the temperature of squeezed air that is later allowed to spread out?

_____

_____

Words to know

inflate: to fill something up with air
molecules: the tiny particles that everything is made of
plunger: a part that slides back and forth inside a tube
friction: the rubbing force between two surfaces that touch
temperature: a measure of how hot or cold something is

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Why the Bicycle Pump Gets Warm as You Pump

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Why the Bicycle Pump Gets Warm as You Pump

Easier · 207 words · Flesch-Kincaid grade 2.6

1. It is squeezed into a smaller space.
2. The plunger sends them away faster than they came, like a bat hitting a ball.
3. Friction from the plunger rubbing inside the pump.
4. It squeezes air until it is hot enough to ignite the fuel, so no spark is needed.
5. From the work your arms do pushing the handle.
6. It gets cooler.

Triangle: Why the Bicycle Pump Gets Warm as You Pump

This passage · 215 words · Flesch-Kincaid grade 6.3

1. It is squeezed into a smaller space.
2. The plunger sends them away faster than they arrived, like a bat hitting a ball.
3. Friction from the plunger rubbing against the inside of the pump.
4. It squeezes air until it is hot enough to ignite the fuel, so no spark is needed.
5. From the work your arms do pushing the handle.
6. It gets cooler.

Square: Why the Bicycle Pump Gets Warm as You Pump

Harder · 246 words · Flesch-Kincaid grade 8.5

1. It is squeezed into a much smaller space.
2. The plunger sends them away faster than they arrived, like a bat striking a ball.
3. Friction from the plunger rubbing against the inside of the pump.
4. It squeezes air until it is hot enough to ignite the fuel, so no spark is required.
5. From the work your arms perform pushing the handle.
6. It becomes cooler.