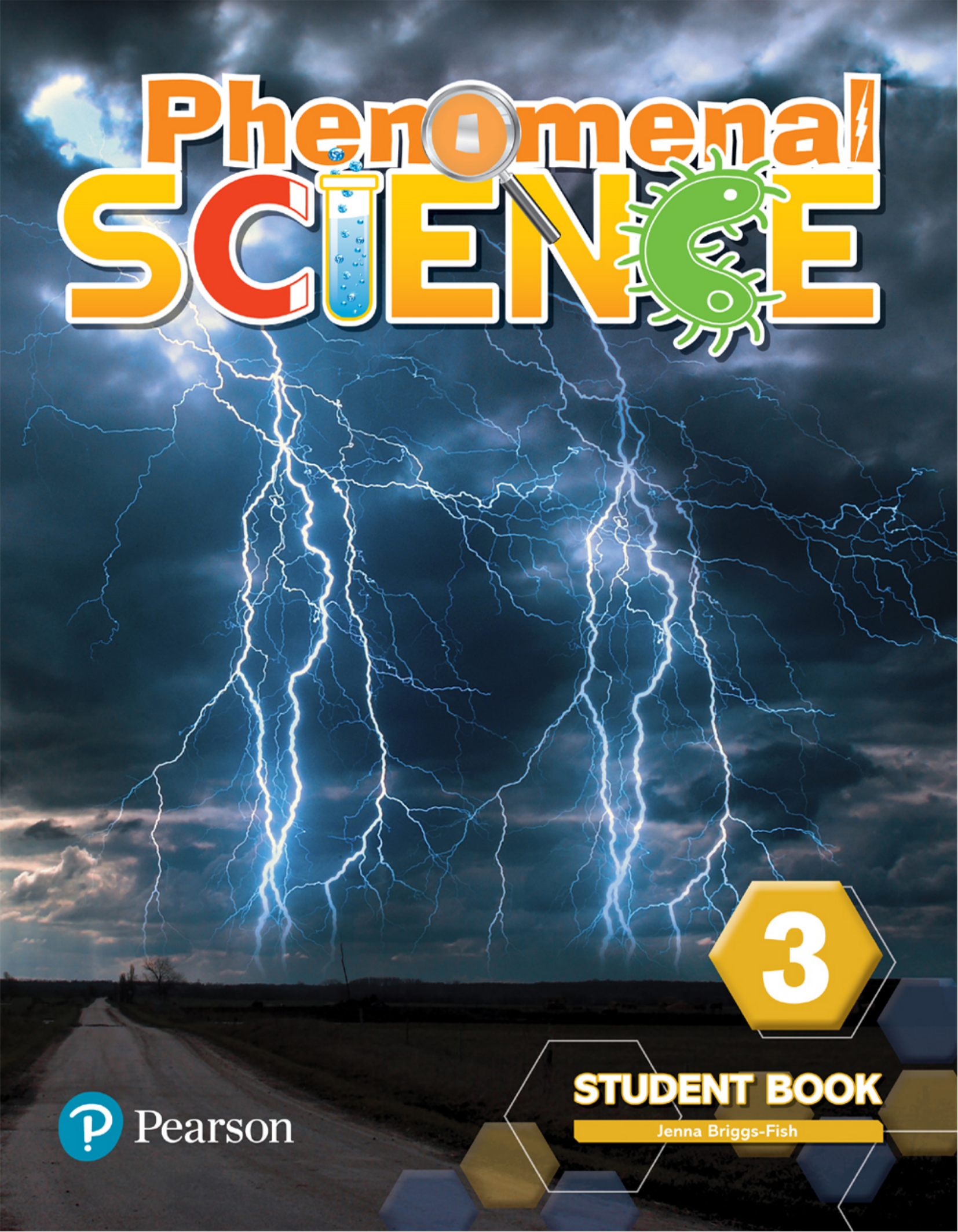
Phenomenal
SCIENCE
3
STUDENT BOOK
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Content Table

Unit 1

How do things work?

Machines and Technology

Since the earliest days of mankind, people have found ways to design and **create** things to make their lives better and easier. The world we live in today is full of **machines** and technology. We use them for nearly everything. Big machines, like cars, trains, and airplanes, can take us to different places around the globe. Modern technology has given us smartphones, video games, and computers. Even our homes are full of modern machines and technology.

Engineers develop and create different machines. With their ideas, our world is a changing place.

Word Box
create
machines
engineers

1. **Look at the picture. What machines can you see?**

2. **Think about all the machines you use in your daily life. How do they make your life easier? Make a list in your notebook and discuss with a classmate.**

Phenomenal Video: Simple Machines: The Pulley

Lesson 1

How do we design new things?

Problems and Solutions

Word Box
problem
solve
goal

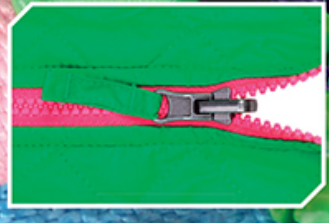
A **problem** is a thing or situation that needs to be solved. Engineers see problems in the world and think of different ways to **solve** them. An engineer's **goal** is to find the best solution to a problem.

In the 1800s, people used buttons or a hook and eye to fasten their shoes and clothes. Sometimes boots would have up to 50 buttons! This means it took a long time to put them on and take them off.

Engineers then began asking themselves: *Is there a faster, easier way to do this?* They began to invent new ways to fasten things. Today, we have zippers and Velcro on our footwear.


hook and eye


buttons


zipper


Velcro

1. **Complete the sentences.**
   1 When something is wrong or not working well, I have a _____.
   2 My goal is to find a way to fix it. I need a _____.

2. **What kinds of things need fasteners? In groups, make a list. Consider what problems they solve.**

3. **Imagine you're designing a pair of new sports shoes. In pairs, decide which type of fastener works best. Why?**

4. **What problems do these inventions solve? In pairs, discuss your ideas.**

light bulb | clock | refrigerator

The Design Stage

When engineers have an idea, they do lots of **drawings**. Then they choose the best one and develop it. They **plan** how to build it and think about what **materials** to use.

It's important to choose the right materials to make an idea work. Different materials have different **properties**. For example, paper is light, but wood is heavy. Textiles, like cotton, are soft, but plastic can be hard or soft.

The first zippers were made of metal. This is good for heavy materials, like jeans, but not for everything. Later, zippers were made of plastic. These were softer and better for more lightweight materials.

Word Box

drawings
plan
materials
properties

wood

textile

5. **In pairs, discuss why it is important to choose the right materials.**

6. **In groups, put your ideas together and sketch a design for a school bag in your notebook. Label the features and materials. Present your idea to the rest of the class.**

7. **Some objects use recycled materials. Research a material that is commonly recycled. What is it used for? Write your findings in your notebook.**

The Finished Product

When an idea has been developed and built, it's not the end of the process. Engineers need to **test** their inventions to see how well they work. After testing, engineers often make changes to their inventions to **improve** them and make them better.

In the late 1800s, Whitcomb L. Judson developed an idea for a sliding fastener. When he tested it, he found it wasn't fast or easy to use. So, he made some changes. His next idea was better, but it sometimes popped open. About twenty years later, Gideon Sundback improved on these early ideas and created the zipper as we know it today. Today, the zipper is used not only in purses, bags, and boots, but also in clothes.

Word Box
test
improve

8. Who created the zipper?

_____

9. Complete the design process with words from the box.

brainstorm ideas | identify a problem | build | improve | draw and plan | test

1 _____ 3 _____ 5 _____

2 _____ 4 _____ 6 _____

10. In pairs, talk about what happens at each stage of the design process. Make notes in your notebook.

Lesson 2

How do we use tools and machines?

Tools and Machines

Word Box
tools
effort

Early humans made and used **tools** to hunt, eat, and build. Today, we use many different tools. Tools help us do a specific job. For example, we can paint a wall with a paintbrush. With a measuring tape, we can measure how long something is.

Machines have different parts that work together to make our work easier. A bike is an example of a machine. When you push down on the pedals, you make the wheels move. If you want to travel a long distance, riding a bicycle is easier than walking. It takes less **effort**. Machines make our life easier because they do the work for us.

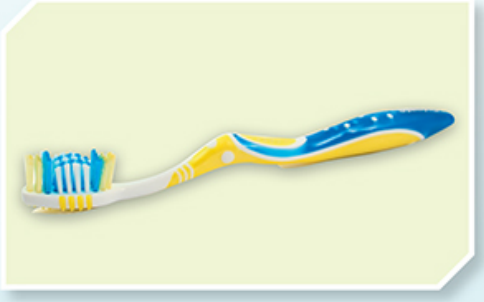
1. Read the text again and complete the sentences.

1 _____ are things we use to do specific things.

2 _____ reduce the effort we need to do things.

2. Look at the pictures. In pairs, discuss which one is a tool and which one is a machine.

1



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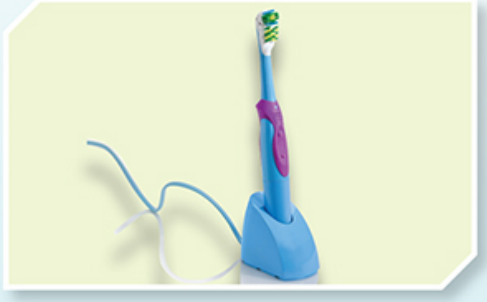

3. In groups, discuss if machines can be tools.

4. Which of these machines do you think has changed our world the most?

airplane | printing press | telephone | textile machinery

Simple Machines

Simple machines have few or no moving parts. A **lever**, **wedge**, **pulley**, and **inclined plane** are all examples of simple machines. An inclined plane is a sloping surface. A **ramp** is an example of an inclined plane. It helps us move something or someone to a higher or lower place.

A **screw** is also an example of an inclined plane wrapped around a pole. A screw makes it much easier to make a hole in a material like wood or cement.

A wedge is an inclined plane used as a tool. A wedge is used to split an object in two. Cutting machines, such as **saws** and pencil sharpeners, are wedges.

Word Box

lever
wedge
pulley
inclined plane
ramp
screw
saws

5. Look at the picture. Name the simple machine used.

6. Are there ramps in your town or city? Who are they for? In groups, list all the places where there could be more ramps to help people.