

Phenomenal SCIENCE



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STUDENT BOOK

Jenna Briggs-Fish

 Pearson

Phenomenal SCIENCE



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Phenomena SCIENCE



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Content Table



ENGINEERING AND TECHNOLOGY

Unit 1	How do things work?	3
Lesson 1	How do we design new things?	4
Lesson 2	How do we use tools and machines?	7
Lesson 3	How do everyday machines work?	10
Makerspace Project	How can we make a bridge using spaghetti?	12
Review	Unit 1 Review	13



LIFE SCIENCE

Unit 2	How does the human body work?	15
Lesson 1	How do we move?	16
Lesson 2	What makes our body react?	19
Lesson 3	What happens to the food we eat?	22
Makerspace Project	How can you study the human stomach?	24
Review	Unit 2 Review	25



LIFE SCIENCE

Unit 3	What is nutrition?	27
Lesson 1	What are the different types of food?	28
Lesson 2	What do different animals eat?	31
Lesson 3	What is a balanced diet?	34
Makerspace Project	How do you make compost?	36
Review	Unit 3 Review	37



EARTH SCIENCE

Unit 4	What are rocks and soil?	39
Lesson 1	What are the properties of rocks?	40
Lesson 2	How are rocks formed?	43
Lesson 3	Where does soil come from?	46
Makerspace Project	What are the properties of chalk?	48
Review	Unit 4 Review	49



PHYSICAL SCIENCE

Unit 5	What is matter?	51
Lesson 1	What are solids, liquids, and gases?	52
Lesson 2	What is a solution?	55
Lesson 3	What is a mixture?	58
Makerspace Project	How do you make a gas?	60
Review	Unit 5 Review	61



PHYSICAL SCIENCE

Unit 6	What is force?	63
Lesson 1	What happens when we push and pull?	64
Lesson 2	What are magnets?	67
Lesson 3	What is a magnetic force?	70
Makerspace Project	How can a magnet move a car?	72
Review	Unit 6 Review	73



EARTH SCIENCE

Unit 7	How does the weather change?	75
Lesson 1	What kinds of weather are there?	76
Lesson 2	How can we measure weather?	79
Lesson 3	How can we stay safe in severe weather?	82
Makerspace Project	How can I make a weather station?	84
Review	Unit 7 Review	85



PHYSICAL SCIENCE

Unit 8	What is sound?	87
Lesson 1	How can we classify different sounds?	88
Lesson 2	How do we hear sounds?	91
Lesson 3	How do we measure pitch and volume?	94
Makerspace Project	How can we see sound?	96
Review	Unit 8 Review	97



EARTH SCIENCE

Unit 9	What is Earth like?	99
Lesson 1	What do we know about the Sun, Moon, and stars?	100
Lesson 2	What is in our Solar System?	103
Lesson 3	How do we have day and night?	106
Makerspace Project	Why are there so many craters on the Moon?	108
Review	Unit 9 Review	109

Mind maps	111
------------------	-----

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.



How do we design new things?

Problems and Solutions

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.

Word Box

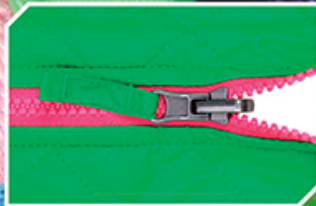
problem
solve
goal



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



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

How do we use tools and machines?

Tools and Machines

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.

Word Box

tools
effort

1. Read the text again and complete the sentences.

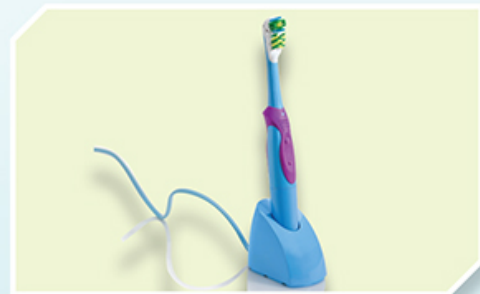
- 1 _____ are things we use to do specific things.
- 2 _____ reduce the effort we need to do things.

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

1



2



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.