Let's Do SCIENCE

Primary 3

Textbook B

The 5E Model – Guided Inquiry

The Let's Do Science series is based on the Biological Sciences Curriculum Study (BSCS) 5E teaching and learning instructional model. The 5E model is centered on the idea that students understand science concepts best by using prior knowledge to pose questions and find answers through guided inquiry.

This hands-on approach, integrated with engineering and design skills, has students learn science by doing science. Teachers guide the learning process and are able to assess student performance by evaluating student explanations and the application of newly acquired knowledge and skills.

Engage

The Engage phase of the 5E model provides students with the opportunity to demonstrate their prior knowledge and understanding of the topic or concept. Students are presented with an activity or question which serves to motivate and engage students as they begin the lesson. Teachers identify and correct any misconceptions and gather data from students which will guide informed teaching and learning.

Essential to stimulating and engaging students is the use of mixed media such as colorful photos, illustrations and diagrams found throughout the textbooks and activity books. Let's Do Science also includes extensive digital resources such as narrated videos, interactive lessons, virtual labs, slideshows and more.

Explore

This phase encourages exploration of concepts and skills through hands-on activities and investigations. Students are encouraged to work together and apply various process skills while gaining concrete, shared learning experiences. These experiences provide a foundation for which students can refer to while building their knowledge of new concepts. This student-centered phase comes before formal explanations and definitions of the concept are presented by the teacher.

Explain

This phase follows the exploration phase and is more teacher-directed. Students are initially encouraged to draw on their learning experiences and demonstrate their understanding of the concept through explanations and discussion. After the students have had the opportunity to demonstrate their understanding of the concept, the teacher then introduces formal definitions and scientific explanations. The teacher also clarifies any misconceptions that may have emerged during the Explore phase.

Elaborate

In the Elaborate phase, students refine and consolidate their acquired knowledge and skills. Opportunities are provided for students to further apply their knowledge and skills to new situations in order to broaden and deepen their understanding of the concept. Students may conduct additional investigations, share information and ideas, or apply their knowledge and skills to other disciplines.

Evaluate

This final phase includes both formal and informal assessments. These can include concept maps, physical models, journals as well as more traditional forms of summative assessment such as quizzes or writing assessments. Students are encouraged to review and reflect on their own learning, and on their newly acquired knowledge, understanding and skills.

Let's Do Science

Let's Do Science is based on the United States Next Generation Science Standards (NGSS). The series consists of full-color textbooks and full-color activity books for Grades K to 6.

Let's Do Science engages students with a highly visual presentation of the disciplinary core ideas in the textbooks and places an emphasis on applying scientific knowledge using NGSS practices through numerous scientific investigations. Let's Do Science sees engineering as an essential element of science education and as such is tightly integrated into both the textbooks and activity books.

The Let's Do Science textbooks include the following features:

Think Deeply

Topic-related questions for group discussion aimed at deepening students' understanding of the topic.

Engineer It!

Goes beyond inquiry by encouraging students to design, model and build to engineer solutions to defined problems.

In the Field

Inspirational science-related professions to stir interest in science-related careers.

A Closer Look

Invokes enthusiasm in science by presenting interesting topics beyond the syllabus.

Amazing Fact!

Interesting facts to build interest and enthusiasm.

Did You Know?

Extra information to build students' knowledge base of the current topic.

Try This!

Optional hands-on activities to be conducted in groups or at home.

AB Activity

Links students to the Let's Do Science Activity Book at the appropriate juncture.

Discussion

Topic-related questions and situations for class discussion to build a deeper understanding of topics.

Review

Topical questions at the end of each chapter for formative assessment.

Science Words

Lists the essential science vocabulary covered in each chapter.

Let's Do Science – Contents

Unit 10 – States of Matter 82

Unit 11 – Interactions and Forces 96

Unit 12 – Forms of Energy 132

7 Earth and Space

In this chapter you will ...

- explain how the rotation of the Earth causes us to experience day and night.
- explain how the revolution of the Earth around the Sun causes parts of the Earth to experience seasons.
- describe the movement of the Earth's moon.
- describe how the Sun affects the Earth.
- list the planets and other objects in our solar system.

What objects can be found in space?
How do the objects move?

What objects make up our solar system?

Go Online!

Access interactive content relating to this topic on the NGScience website.
ngscience.com

What is space exploration? What data do scientists collect when they explore space?

Movement of the Earth

Rotation – Day and Night

Why do we experience day and night on Earth?

In space, the Earth moves in different ways. One way the Earth moves is by spinning on its axis. An **axis** is an imaginary line that runs through the Earth's center. This spinning movement on its axis is called a **rotation**.

As it rotates, part of the Earth is facing the Sun. This part of the Earth is lit up and experiences daytime. At the same time, the opposite side of the Earth is facing away from the Sun. This part of the Earth is in darkness and it is night-time.

It takes the Earth 24 hours to complete one rotation. The repeating rotation of the Earth is why we experience the daily pattern of day and night.

▼ *The part of the Earth facing the Sun is in daytime. The part of the Earth facing away from the Sun is in night-time.*

Amazing Fact!

The planets in the solar system rotate about their axis at different speeds. This means the length of a day on each planet is different. One day on Jupiter takes just 10 Earth hours. One day on Venus takes 243 Earth days!

Go Online!

Observe how the Earth rotates on its axis and the daily pattern of day and night on the NGScience website.
QuickCode: **B7M9**

In what other way does the Earth move in space?

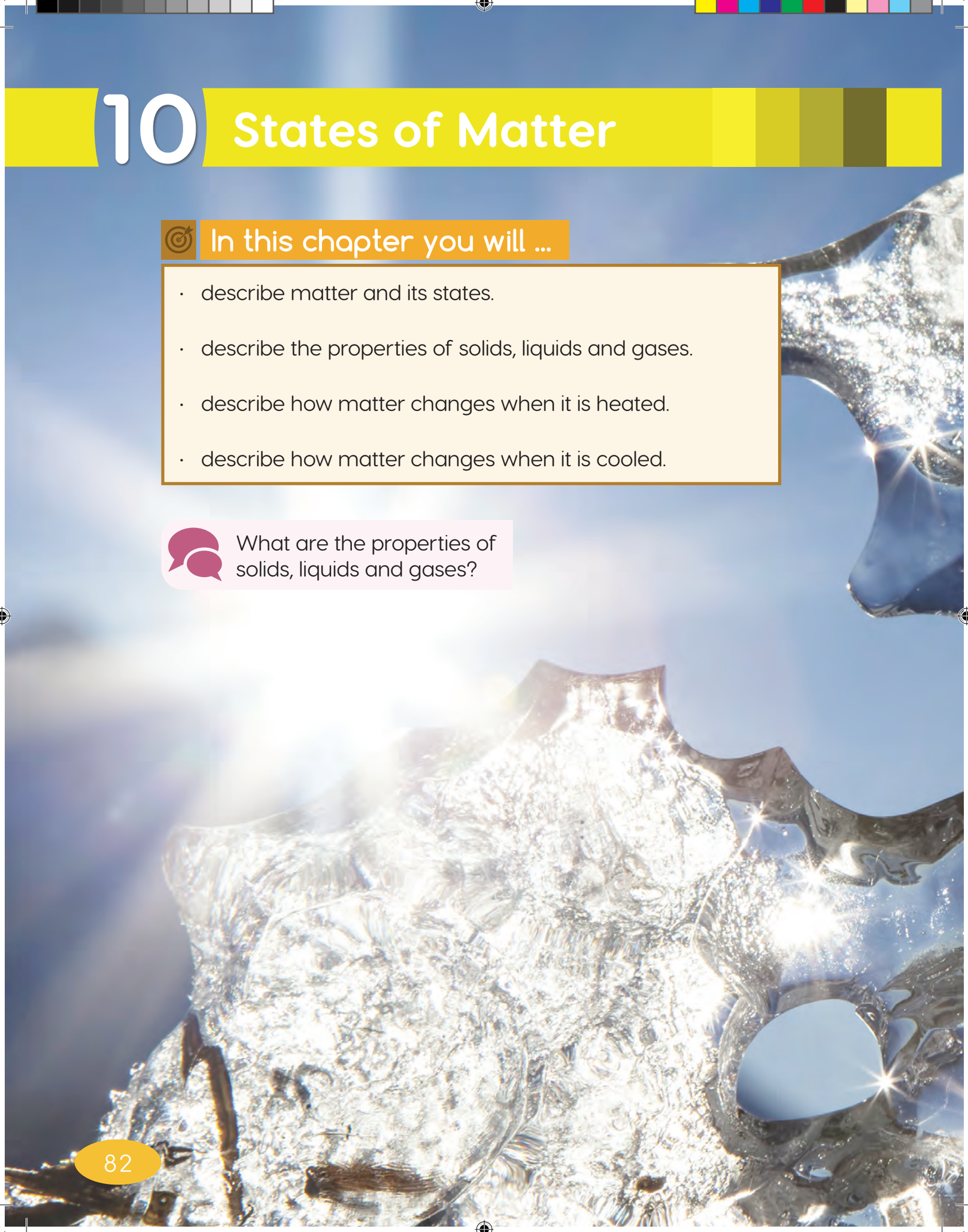
AB Activity 7.1

10 States of Matter

In this chapter you will ...

- describe matter and its states.
- describe the properties of solids, liquids and gases.
- describe how matter changes when it is heated.
- describe how matter changes when it is cooled.

What are the properties of solids, liquids and gases?



Go Online!

Access interactive content relating to this topic on the NGScience website.
ngscience.com

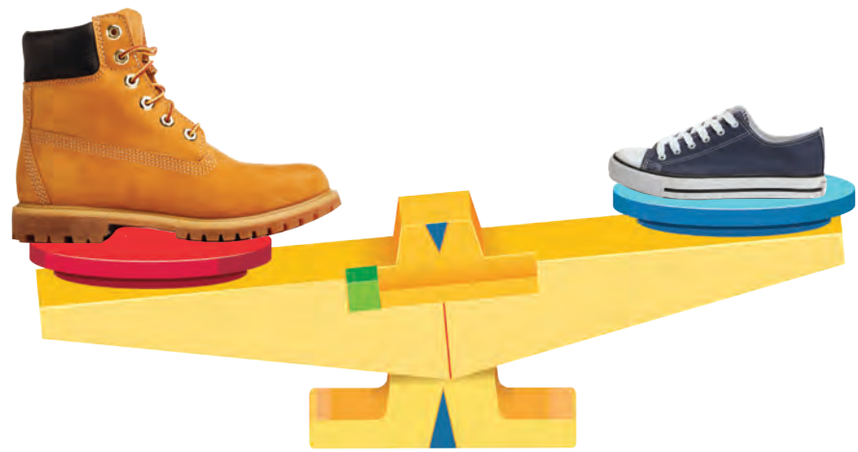
How does matter change when it is heated and cooled?

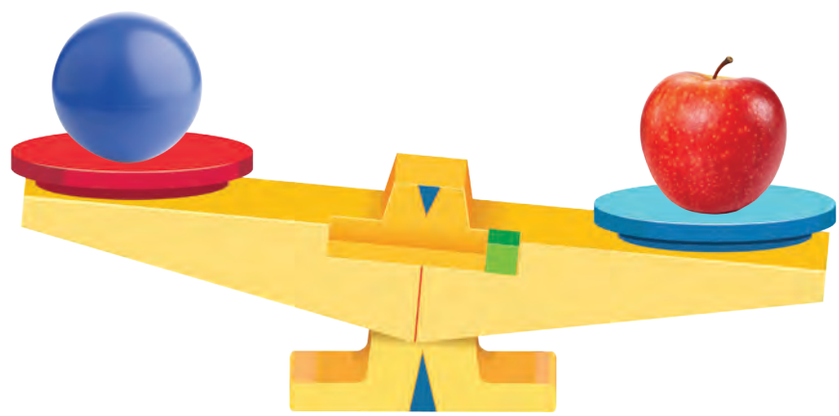
What Is Matter?

Everything around you is made of matter. The air you breathe, the water you drink and even this book is made of matter. **Matter** is anything that has mass and volume.

Mass is how much matter an object has. Mass is measured using a scale or balance and is commonly measured in kilograms, grams, ounces or pounds.

We can compare the mass of different matter using a balance. The balance below shows that the boot has more mass than the shoe. The plastic ball and the apple are of similar size. Using a balance we can see that the apple has a greater mass.





Try This!

Find five objects in your classroom. Pick up each object and order them from the least to the most mass. Use a balance to check if you were correct.

Think Deeply

Chelsea placed two boxes of different sizes on each side of a balance. She noticed that the balance remained level. What can she infer about the mass of the boxes?

▲ *Order the balls from the smallest volume to the greatest volume.*

Volume is how much space the matter takes up. The basketball, beach ball and tennis ball all contain matter – air. The amount of space the air takes up in each ball is different.

Volume can be measured using measuring cups, measuring cylinders or measuring spoons. Volume is commonly measured in milliliters, liters, gallons and ounces.

Think Deeply

Using a measuring cup and water, how could you measure the volume of the air inside a ping pong ball?

Which beaker contains the greatest volume of water? How can you tell?

AB Activity 10.1

States of Matter

There are three states or forms of matter – solids, liquids and gases. The properties of each state of matter is different.

What are the properties of solids, liquids and gases?

Properties of Solids

The objects around you, such as your desk, books and pens are solids. **Solids** are matter that have a fixed shape and volume. This means the shape and volume of a solid does not change when it is placed in different containers. If you take a book and move it between different containers, its shape and volume does not change.

A rock is an example of a solid. Take a small rock and place it on a hard surface. Use you foot to press down on the rock. Notice that pressing down on the rock does not change its shape or volume. Solid matter cannot be compressed and does not change shape easily.

AB Activities 10.2 – 10.3

Try This!

Find a solid object in your classroom. Use your senses of sight and touch to describe the object to a classmate.

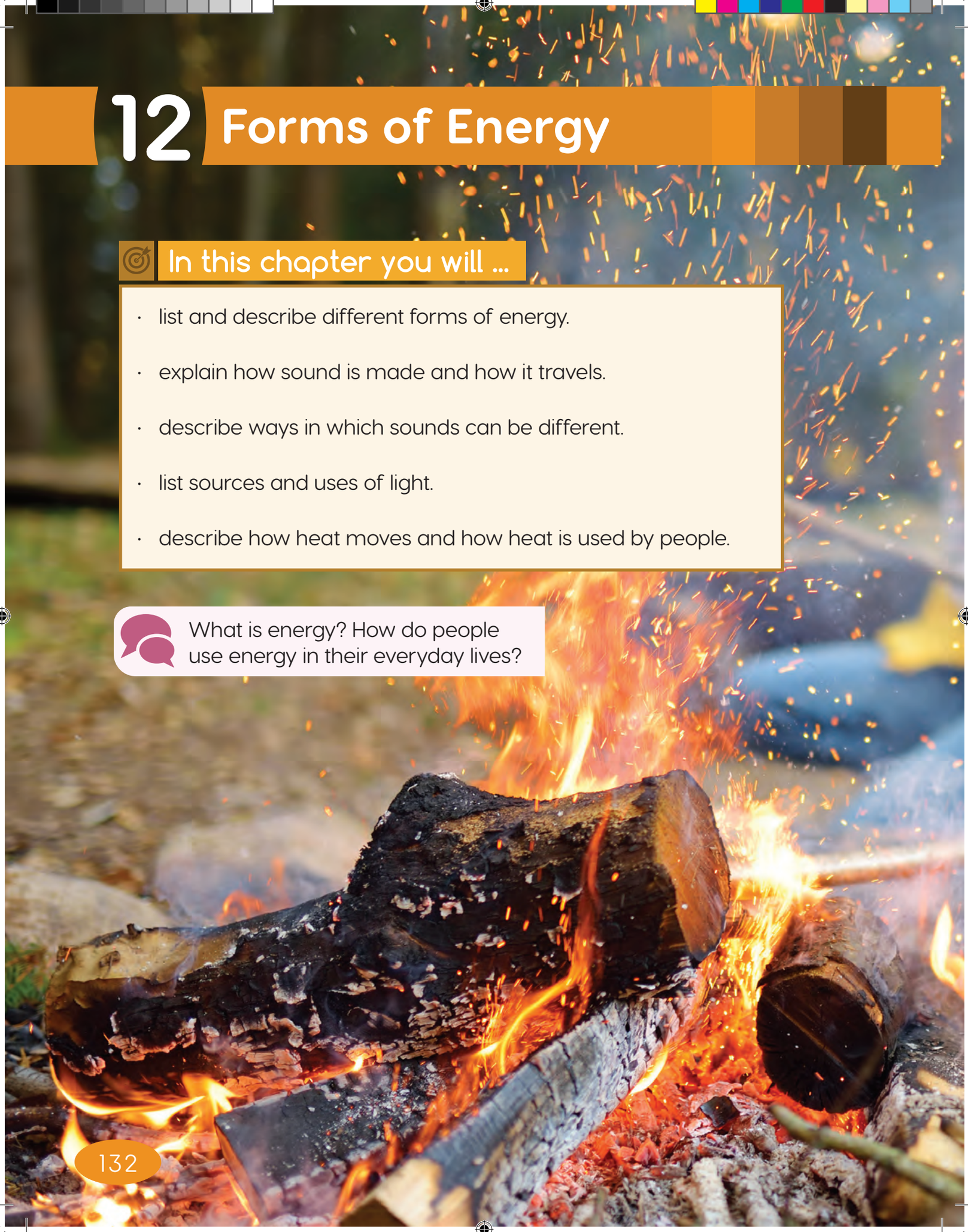
▼ *The pencils stay the same shape whether they are in the cup or the pencil case.*

12 Forms of Energy

In this chapter you will ...

- list and describe different forms of energy.
- explain how sound is made and how it travels.
- describe ways in which sounds can be different.
- list sources and uses of light.
- describe how heat moves and how heat is used by people.

What is energy? How do people use energy in their everyday lives?



What are some different forms of energy?

Go Online!

Access interactive content relating to this topic on the NGScience website.
ngscience.com

What Is Energy?

Everything that happens around you happens because of energy. You need energy to carry out daily activities like breathing, sleeping and playing sports.

Energy makes cars, buses and trains move. Energy makes things feel hot, makes sounds and produces light.

Did You Know?

Energy cannot be created or destroyed. It can be transferred or changed from one form to another.

All living things need energy to live and grow. Most of the energy on Earth comes from our Sun. Plants use the energy from sunlight to make food. The energy in the food made by plants is passed on to animals and people when they eat plants.

There are different forms of energy. Some forms include sound, light and heat. People use these forms of energy and others in many different ways.

Sound

What Causes Sounds?

Engineer It!

Musical instruments make sound when a part of the instrument vibrates. Design and build your own musical instrument using art and craft supplies. Form a 'band' with your classmates. Play a song!

What are some sounds you hear from day to day? What causes the sounds?

We hear and make sounds all the time. We make sounds when we talk, clap or play a musical instrument. Objects like cars, sirens, phones and televisions make sound too.

Sound is a form of energy we can hear. All sounds are made when something vibrates. **Vibrations** are rapid back and forth movements.

When a bow is pulled across the strings of a violin, the strings vibrate and make sound. The vibrating strings cause the air around them to vibrate too. This creates sound waves. You hear the sound when the sound waves travel through the air to your ears.

Try This!

A sound is made when something vibrates. Plan and conduct an investigation to show that sound can also cause an object to vibrate.

Did You Know?

When you throw a ball against a wall, it bounces back towards you. Sound waves travel in a similar way. When sound waves hit a surface, they bounce off the surface and move out in different directions. You hear the sound that bounces back towards you as an echo. The echo is similar to the original sound.

AB Activity 12.1

Describing Sounds

Go outside, close your eyes and listen to the sounds around you. How can you describe the sounds your hear?

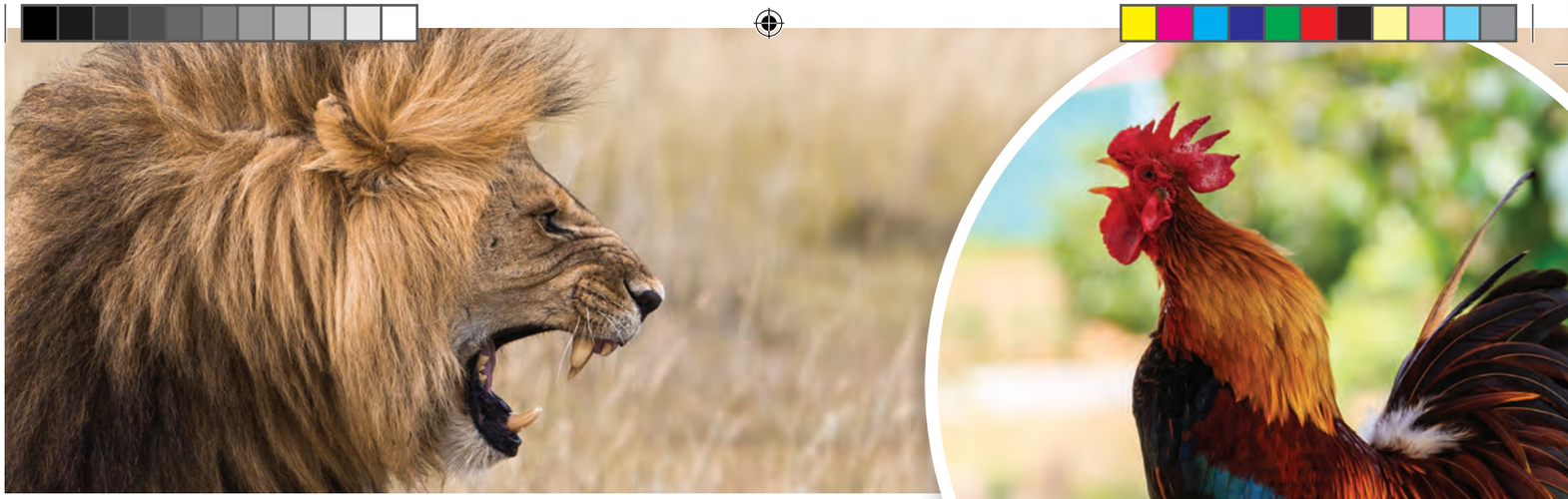
We can describe the sounds we hear in different ways. One way to describe a sound is by its volume. **Volume** is how loud or soft a sound is.

The sound of an airplane jet engine and the sound of thunder are examples of loud sounds. The rustle of leaves and a whisper are examples of soft sounds.

A loud sound has more energy than a soft sound. Hitting a drum with a large force creates larger vibrations and a louder sound than if it were hit with a smaller force.

Try This!

Use a microphone and computer to record loud and soft sounds. Observe the size of the waves produced. What do you notice? What happens to the waves when you move further from the microphone?



Compare the sound of a rooster crowing to that of a lion's roar. The volume of the sounds are similar – they are both loud sounds. However, they are different in pitch. **Pitch** is how high or low a sound is.

The crow of a rooster is a high-pitched sound. The roar of a lion is a low-pitched sound.

The faster an object vibrates, the higher the pitch of the sound. The length and thickness of the vibrating object also affects its pitch. You can see this by making different sounds on a guitar. A thin, short string produces a much higher-pitched sound than a longer, thicker string.

AB Activity 12.2

Go Online!

Did you know doctors can use sound waves to see inside your body? Learn all about ultrasound on the NGScience website.
QuickCode: **M6U2**

Engineer It!

Design a device that uses the volume and pitch of different sounds to send a message to another person. How will you change the volume of the sounds? How will you change the pitch?

▲ *The Sun is our main source of light.*

Light

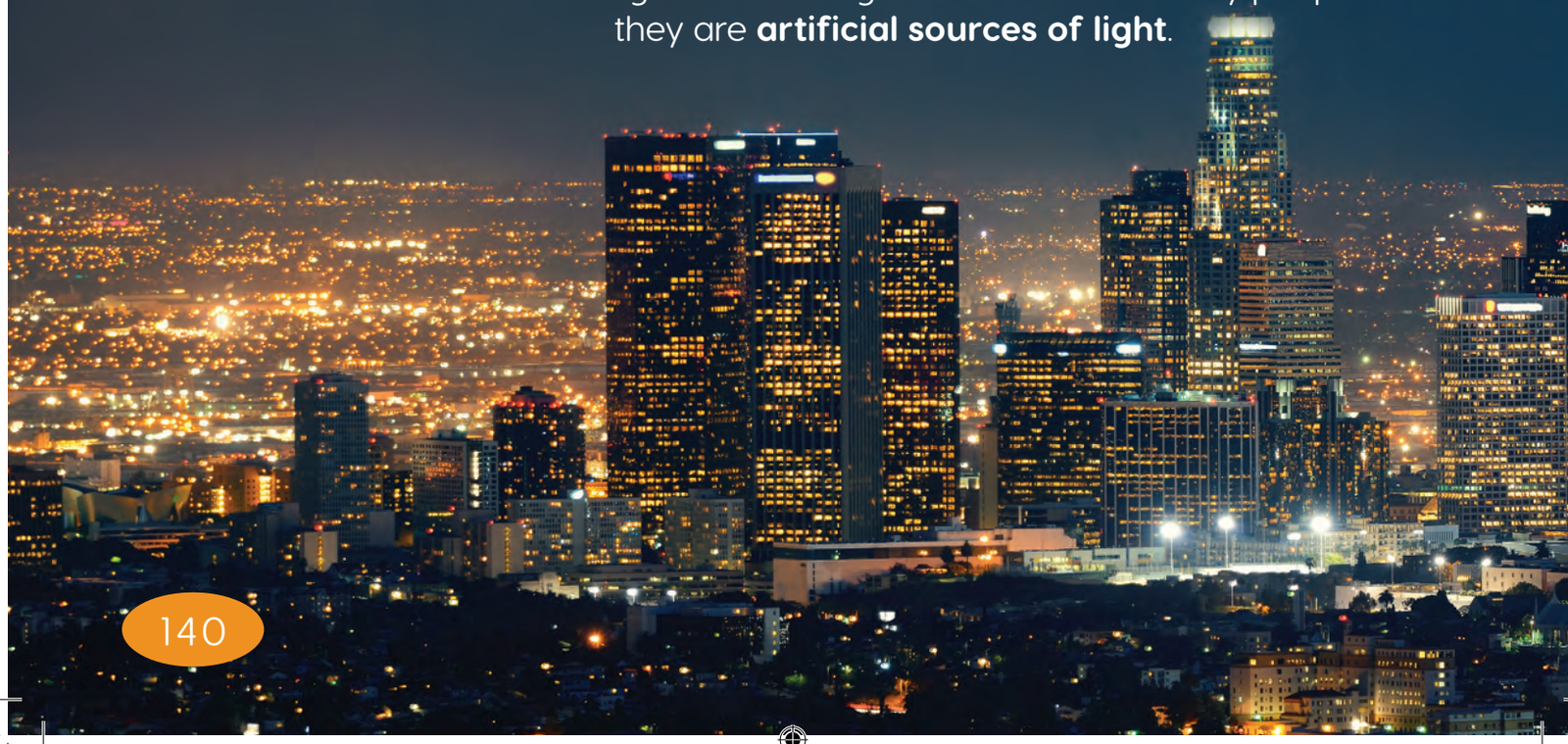
Sources and Uses of Light

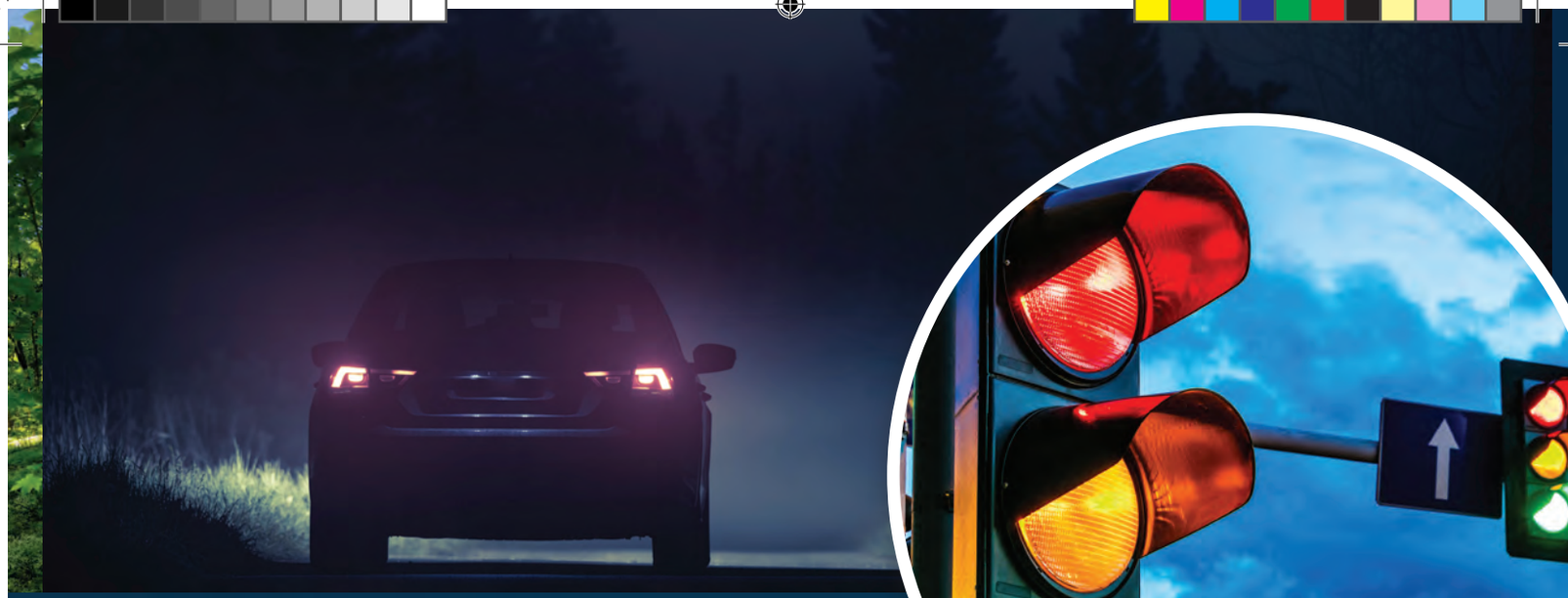
What are some sources of light? How are sources of light used by people?

Amazing Fact!

The Sun is about 150 million kilometers from Earth. The light from the Sun takes about eight minutes to reach the Earth.

Light is a form of energy that allows us to see the things around us. Any object that gives out light of its own is called a source of light. Some sources of light, such as the Sun, lightning and fire are **natural sources of light**. Others, such as light bulbs and glow sticks are made by people – they are **artificial sources of light**.





During the day, the Sun is our main source of light. Plants use the Sun's light energy to produce food. This provides energy to people and animals when they eat the plants.

Sunlight also helps us to see the things around us. At night, we often use lights to see. Lights are also used to send messages, such as telling cars when to stop and start at traffic lights.

Light is also used by people in devices such as telephones, televisions and computer monitors.

AB Activity 12.3

Think Deeply

Light plays a very important role in boat navigation and safety. Lights of different colors tell people which direction to travel and warn them of danger. Boats are often required to display a raised, round, white light that can be seen from all directions. How is this useful?

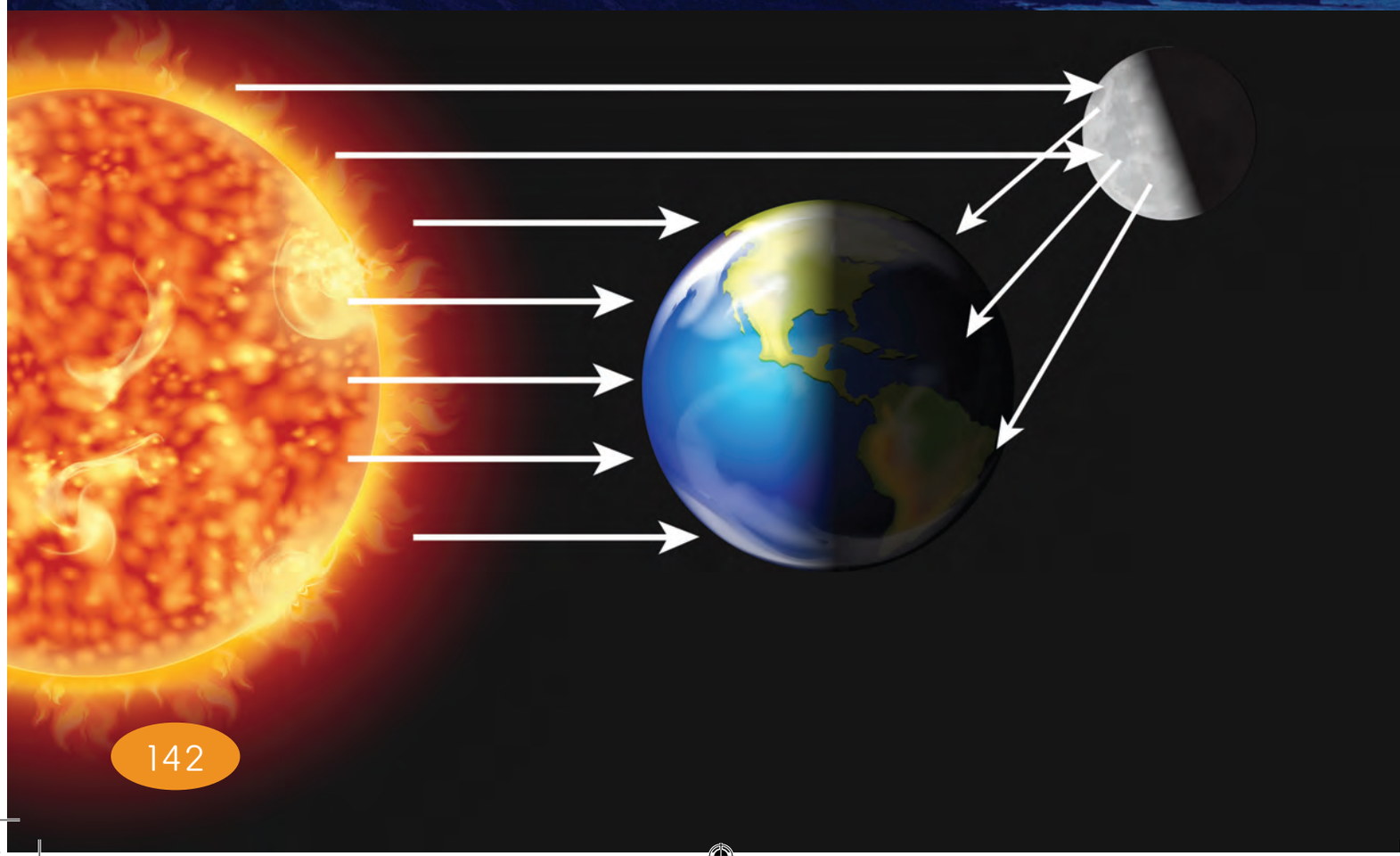
Properties of Light

Light travels out from a source of light in a straight line. It continues to travel in a straight line until it hits an object.

We are able to see sources of light when the light travels from the source to our eyes.

We are also able to see objects that are not sources of light when light **reflects** or bounces off them and into our eyes.

The Earth's moon is not a source of light. We are able to see the moon when it reflects the light from the Sun.



Most objects are not sources of light. We see them when they reflect light.

What things can you see around you? What source of light are they reflecting?

Different surfaces reflect light in different ways. When light hits a dull or rough surface, such as a road, some of the light is absorbed or taken in. The light that is reflected bounces off in different directions. These surfaces appear dull.

Other surfaces reflect a lot of the light that hits them. The light bounces off in the same direction. These surfaces appear shiny.

A mirror reflects almost all of the light that hits it. That's why you are able to see your reflection clearly.

Try This!

Draw an object you can see in your classroom. Use arrows to show how light reflects off the object and into your eyes.

AB Activity 12.4

Thermal Energy

Matter is made up of tiny particles that are always in motion. How much these particles move is called **thermal energy**.

When an object gains thermal energy, the particles that make up the object move faster. Its thermal energy increases and its temperature also increases.

When an object loses thermal energy, the particles that make up the object move slower. Its thermal energy decreases and its temperature decreases.

Go Online!

Watch how heating and cooling matter affect its thermal energy in an animation on the NGScience website.
QuickCode: **Z5J9**

Imagine holding a cup of hot chocolate on a cold day. How would your hands feel?

When you touch a cup of hot chocolate, energy moves from the cup to your hands and your hands warm up. This movement of energy that is caused by a difference in temperature is called **heat**.

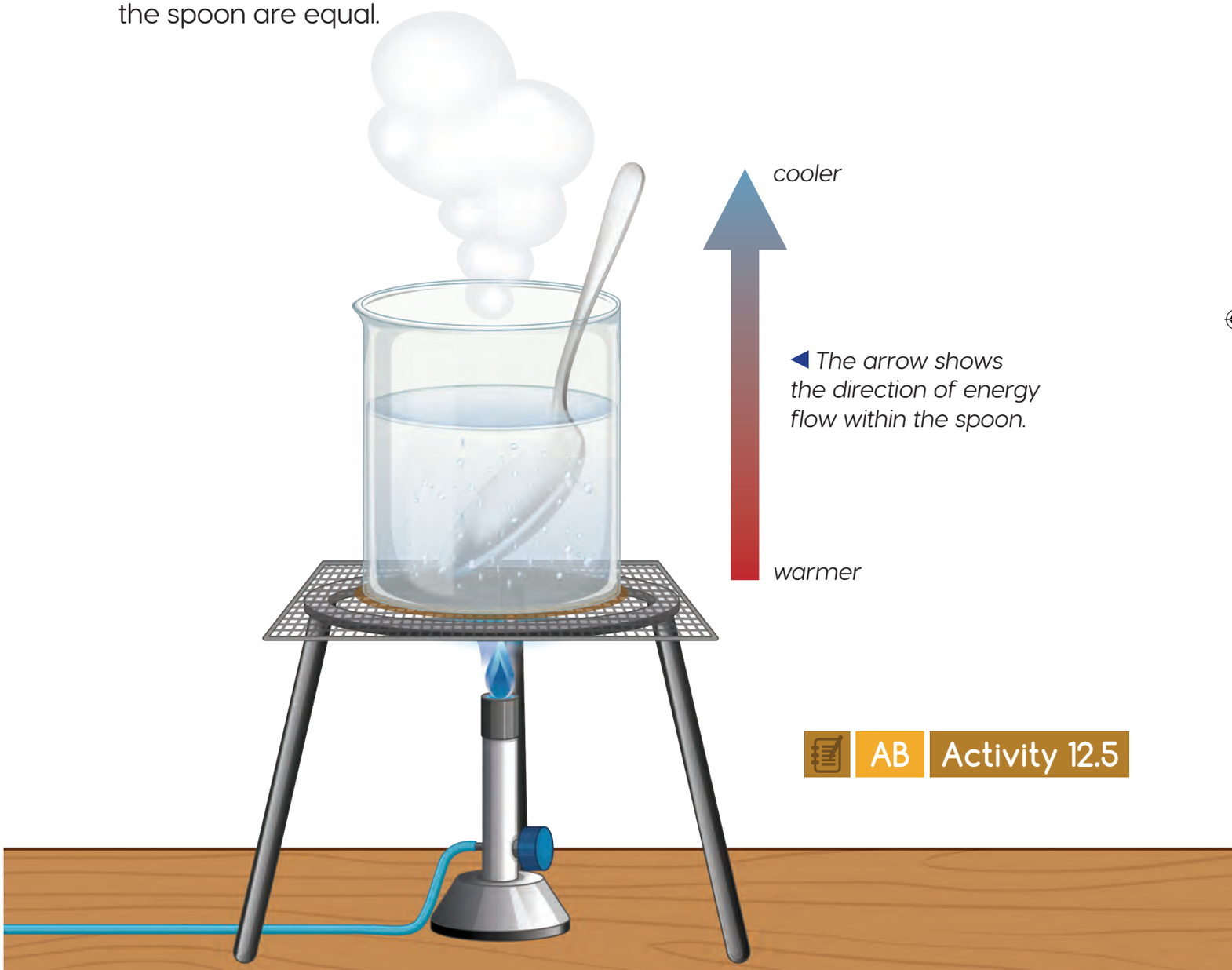
▲ *Thermal energy is the energy of the moving particles that make up matter.*

Heat always flows from a warmer object to a cooler object. It continues to flow between the objects until the temperature of the objects is the same.

If you place a cool metal spoon into a cup of hot water, heat will flow from the hot water to the cool spoon. The temperature of the spoon will increase. Heat will continue to flow in this direction until the temperature of the water and the spoon are equal.

Think Deeply

How does the heat from the Sun affect the objects on Earth? What changes occur to the objects?



◀ *The arrow shows the direction of energy flow within the spoon.*

AB Activity 12.5

Look at the materials used to make the pan. It has a metal body and a plastic handle. Why were these materials used?

Some materials allow heat to pass through them more easily than others. Materials that allow heat to pass through them easily are called **good conductors of heat**. The metal used to make the pan is a good conductor of heat. It allows heat to flow easily from the hotplate to the food.

Materials that do not allow heat to pass through them easily are called **poor conductors of heat**, or heat insulators. The plastic handle on the pan is a poor conductor of heat. Heat cannot flow through the plastic easily, so it does not get as hot as the metal.

Try This!

In small groups, discuss some daily activities that make use of good conductors of heat and poor conductors of heat. Create a table to show to other groups.

Think Deeply

What makes certain clothes better heat insulators than others? How is this useful?

What are some other examples of objects that are made from good or poor conductors of heat?

AB Activities 12.6 – 12.7

Science Words

Use the words to complete the sentences.

vibrations	**artificial source of light**
volume	**reflect**
pitch	**good conductors of heat**
natural source of light	**poor conductors of heat**

1. An object made by people that gives out light of its own is called an _____ .
2. _____ is how loud or soft a sound is.
3. _____ are rapid back and forth movements.
4. _____ do not allow heat to pass through them easily.
5. We see objects when they _____ light.
6. _____ allow heat to pass through them easily.
7. _____ is how high or low a sound is.
8. An object in nature that gives out light of its own is a _____ .

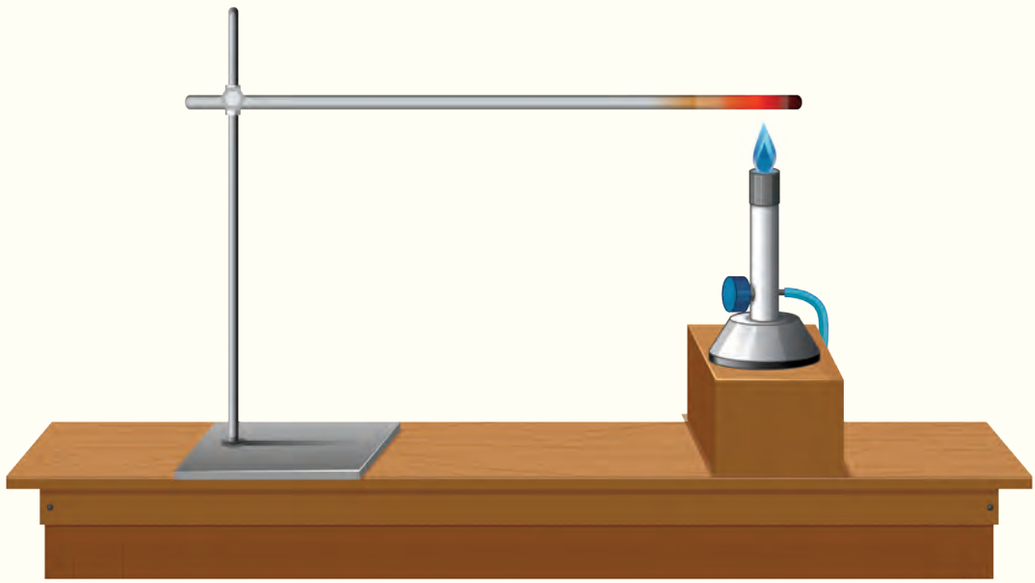
Review

1. What causes sounds?
2. How does sound travel from its source to our ears?
3. How can we describe sounds?
4. Draw a Venn diagram to compare natural and artificial sources of light.

5. List three ways we use light.

6. Describe how we are able to see the moon.

7. Describe how heat moves through the metal rod.



8. Sophie put a plastic spoon and a metal spoon into a hot cup of water.
Which spoon will feel hotter when she touches them?
Explain your answer.