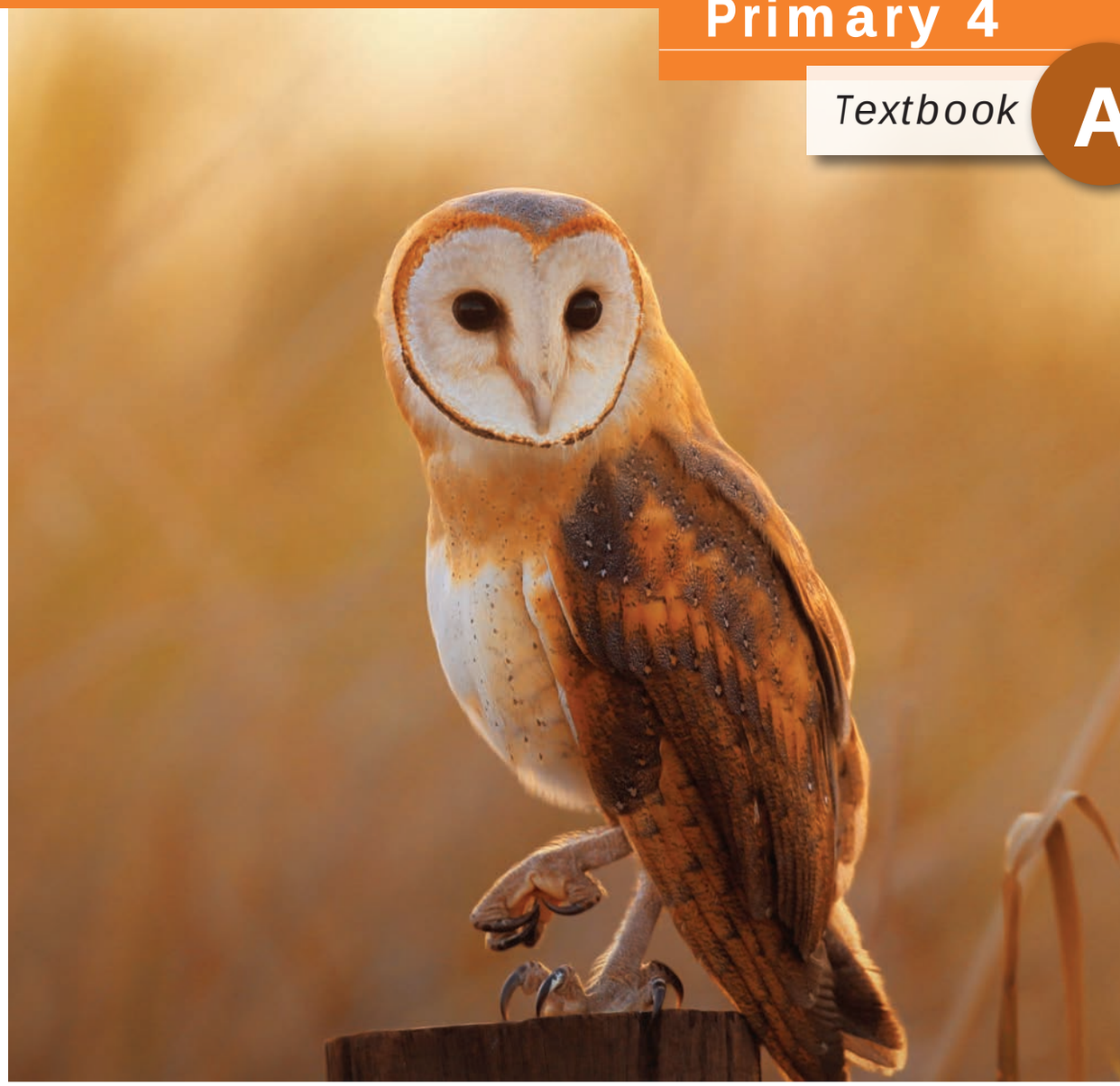
Let's Do SCIENCE

Primary 4

Textbook A



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 which 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

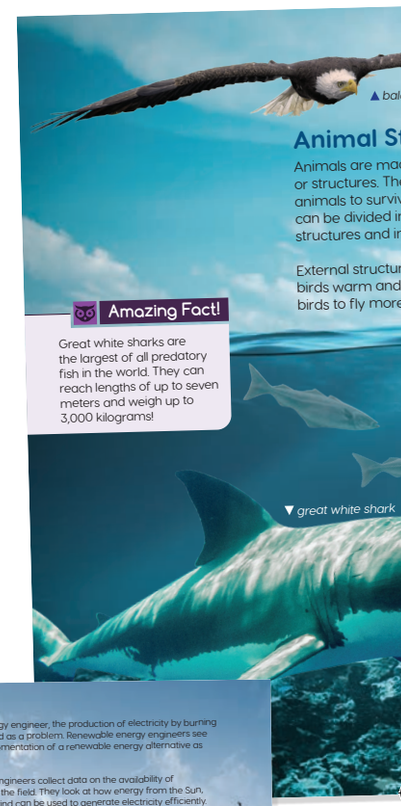
This final phase includes both formal and informal assessments. These can include concept maps, physical models, journals as well as more traditional forms of summative assessment such as quizzes or writing assessments. Students are encouraged to review and reflect on their own learning, and on their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

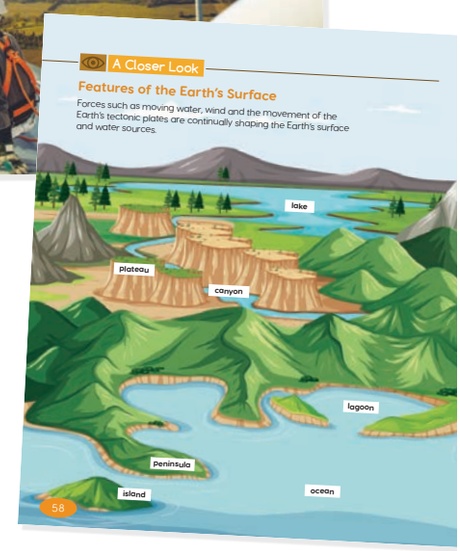


Think Deeply

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.

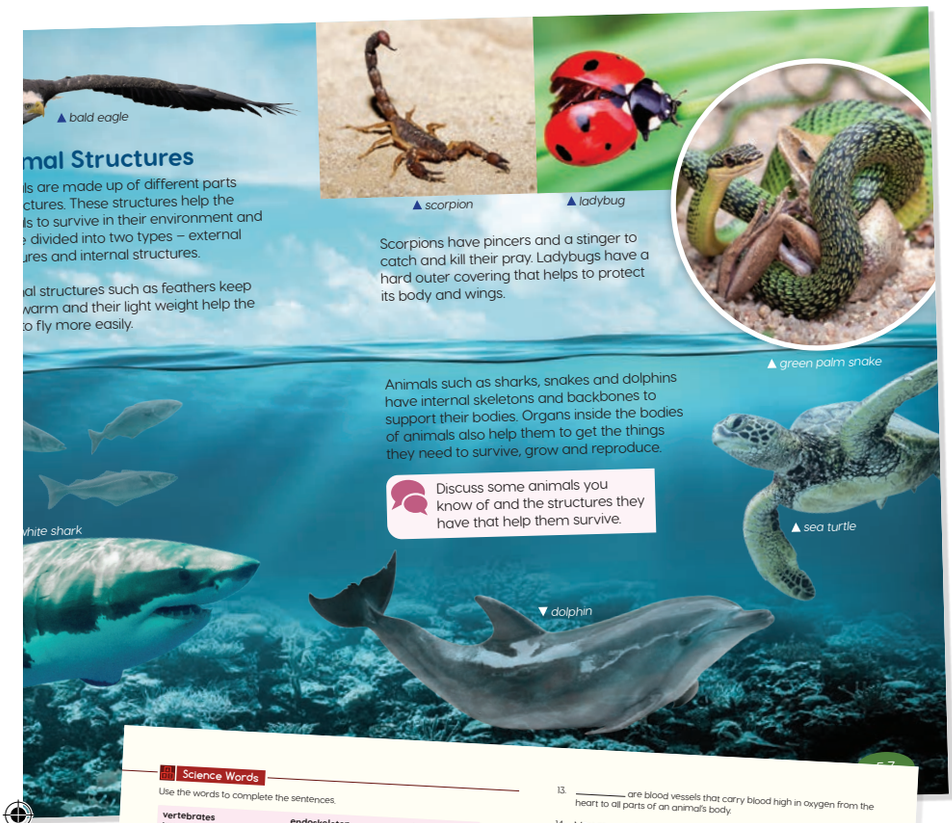


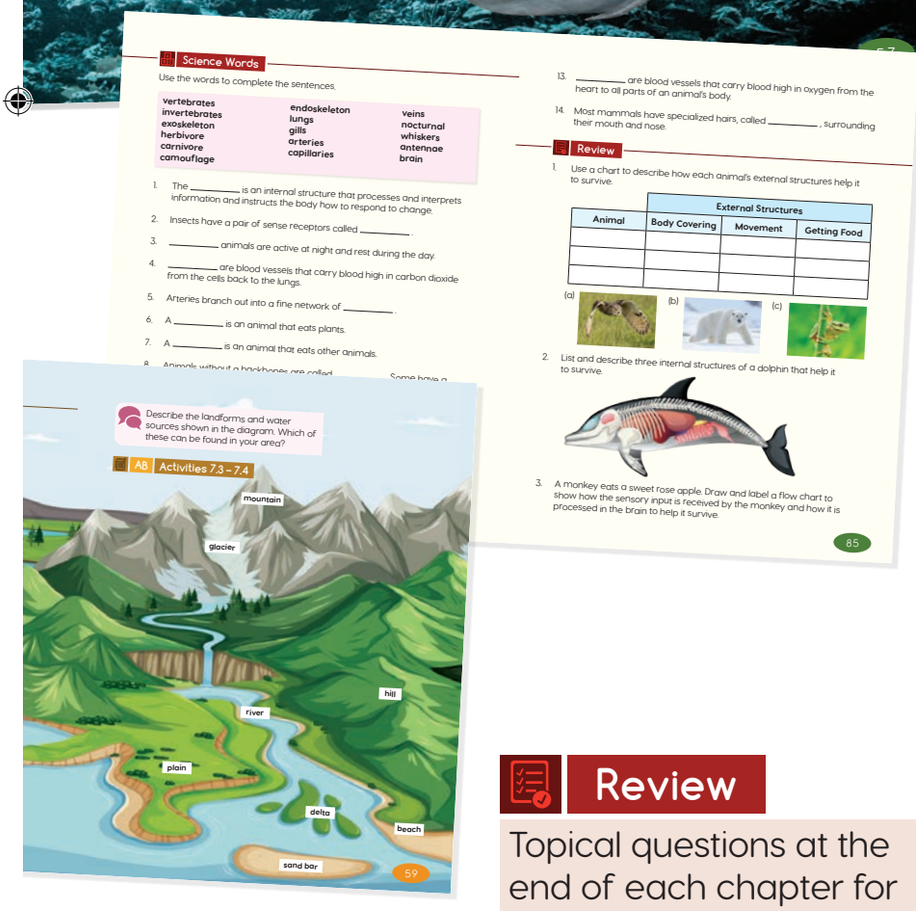
In the Field

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

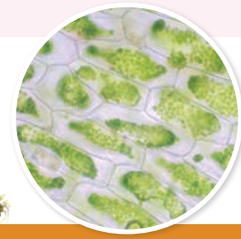
Topical questions at the end of each chapter for formative assessment.

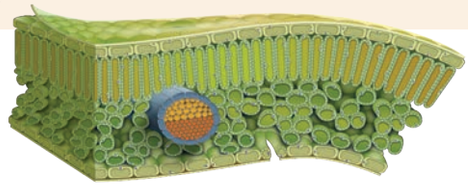
Science Words

Lists the essential science vocabulary covered in each chapter.

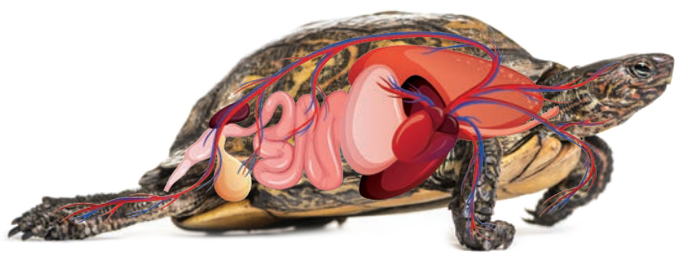
Contents

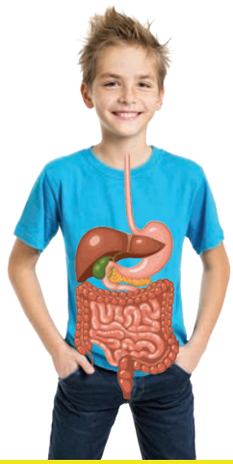








Science Skills

Scientists ask questions about the world around them. To find the answer to these questions, scientists use special skills to collect, analyze and interpret data. They communicate the things they find out.

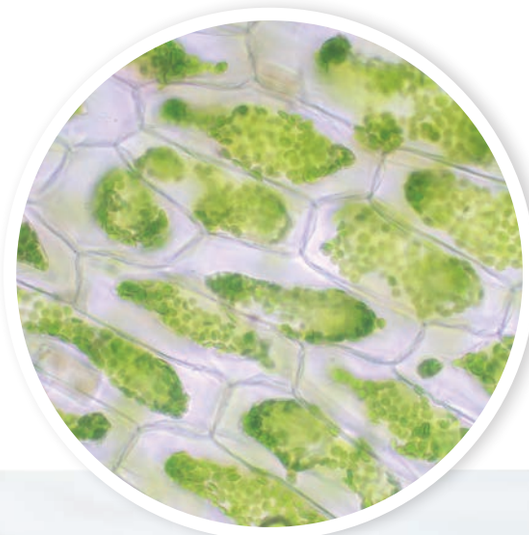
Let's look at how you can use these skills so you can be a scientist too.

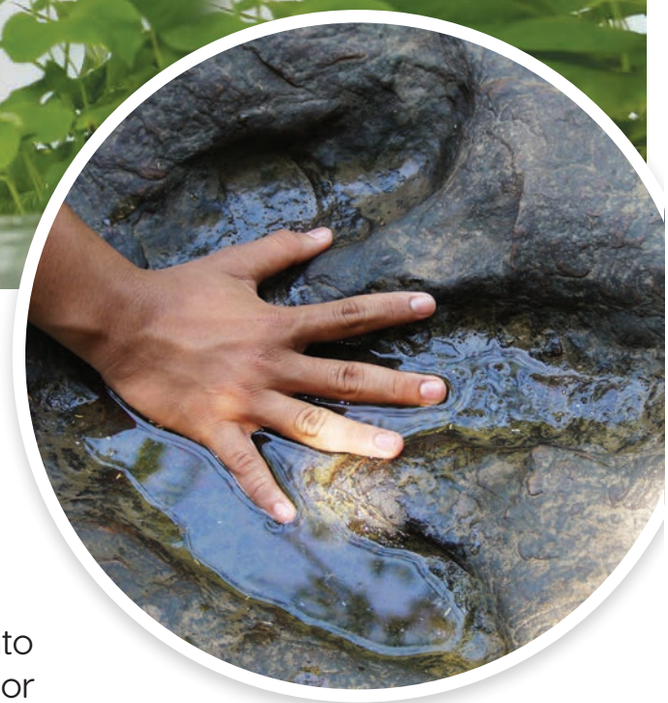
Observing

You make observations when you gather information about something using your senses. You can observe how something looks, feels, sounds, smells or tastes.

Scientists often use tools and instruments that allow them to observe things closely. Such tools include hand lenses, microscopes and telescopes.

It is important to accurately record your observations in a way that can be easily understood by others. You can make notes, and create charts and tables. You can also draw and label diagrams.

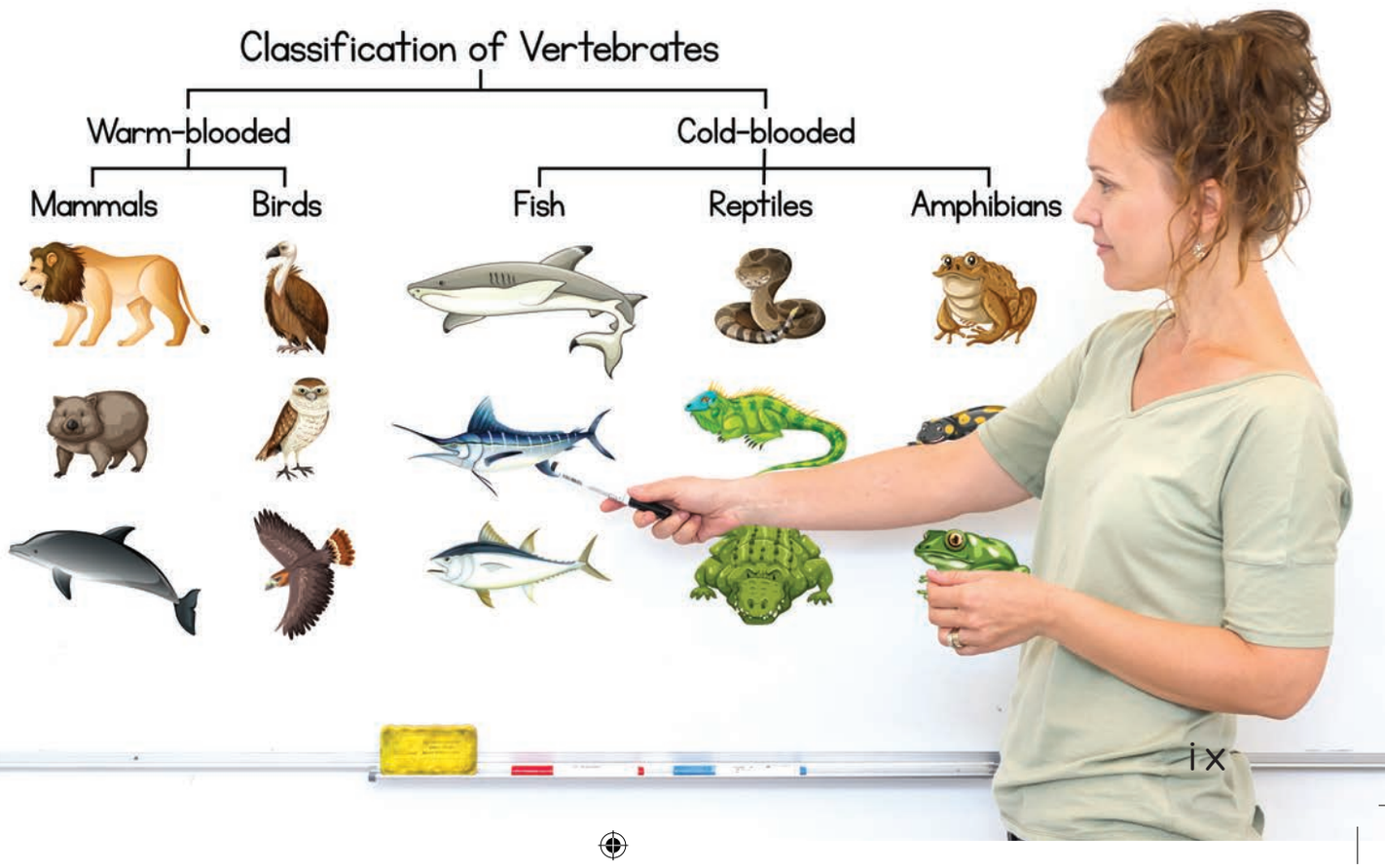




Comparing and Classifying

Scientists compare the things they observe. To compare means to observe the properties or characteristics of two or more things and identify their similarities and differences.

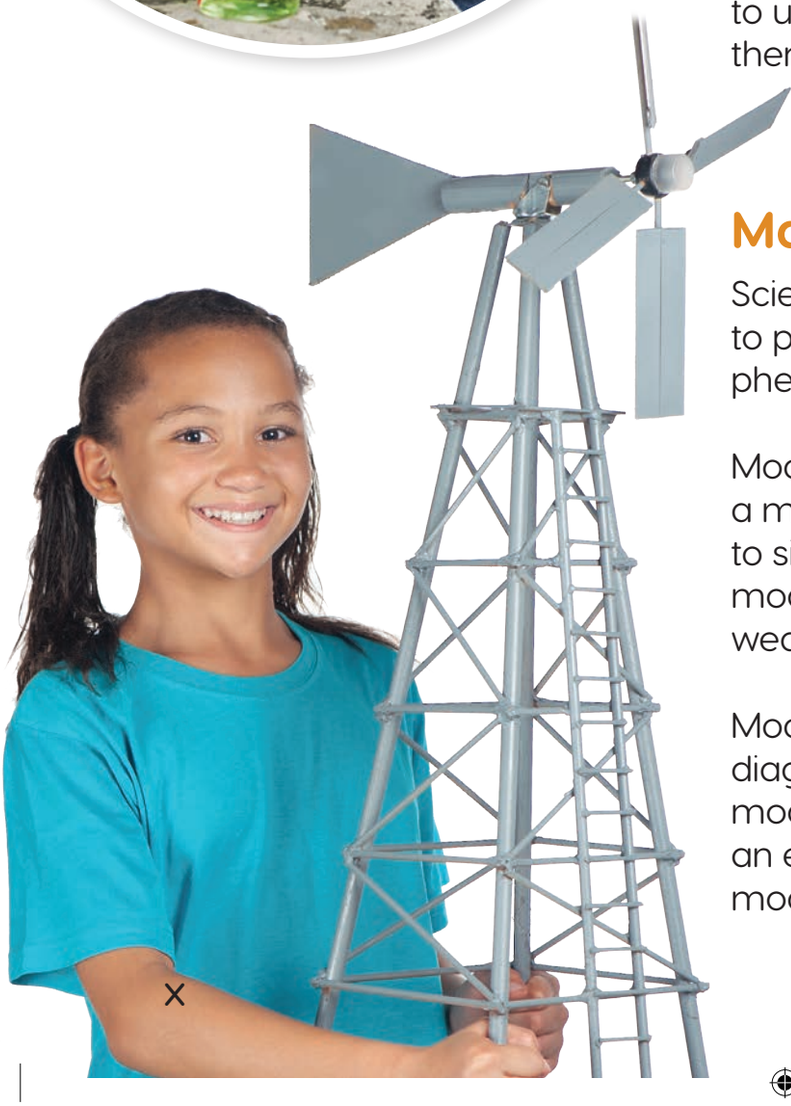
Classification is the process of placing things into groups based on similarities in their properties or characteristics. Objects around us can be classified by the properties of the materials they are made of. Organisms can be classified by their features, such as the presence or absence of a backbone.



Measure

Measuring is an important science skill. It allows you to quantify your observations. Distance, time, volume, mass and temperature are some quantities that can be measured.

To measure accurately, you often need to use tools such as rulers, beakers, thermometers and stopwatches.



Make a Model

Scientists often construct models to predict, test and observe real-life phenomena.

Models can be physical objects, such a model of a miniature wind turbine to simulate electricity generation or a model of the Earth's surface to simulate weathering and erosion.

Models can also be in the form of diagrams. A food web diagram is a model that shows the flow of energy in an ecosystem. A map is a diagrammatic model of an area of land or water.

Infer

You infer when you make a guess about something based on what you know or what you observe.

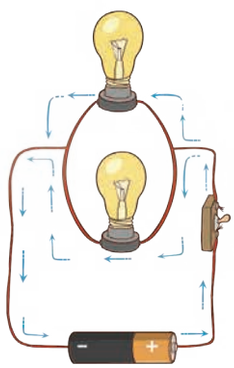
If you see footprints in the snow, you can infer that an animal has passed by after the last snowfall.

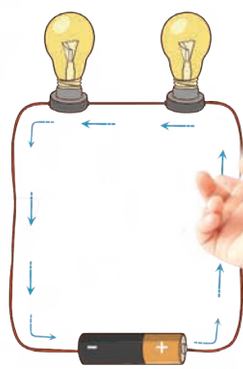
If you discover an animal jaw bone with large canine teeth, you can infer that the animal likely ate other animals.

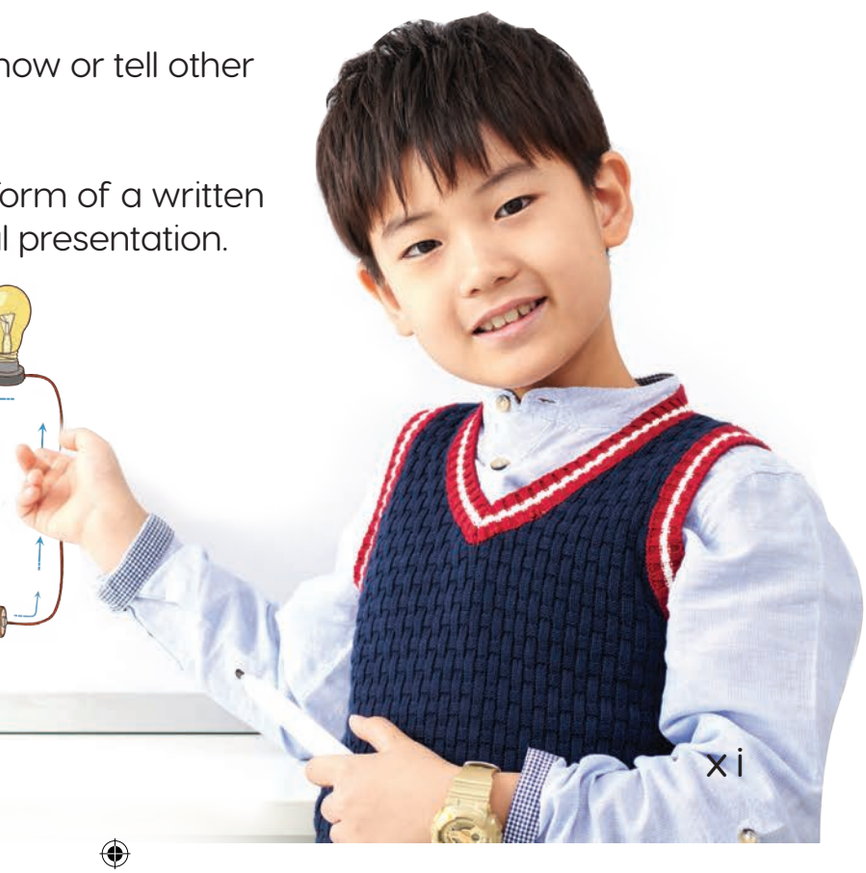
Communicate

You communicate when you show or tell other people what you find out.

Communication can be in the form of a written report, visual displays or an oral presentation.







Scientific Method

Scientists ask questions based on observations of the world around them. To find the answers to their questions, they carry out tests and investigations following the scientific method.

Why is it useful for scientists to follow the same scientific method?

The scientific method is a logical set of steps that is followed to help guide an investigation. It also helps to ensure the investigation is carried out fairly and in a manner that can be understood and repeated by other scientists.

Make Observations

The scientific method begins by making observations about the world around you. You may observe that plants in one area grow faster and taller than plants in other areas. You may notice that you feel hotter in a darker-colored shirt than a lighter-colored shirt. You may observe that ice melts faster in a cup made of one material than a cup made of another material.

Such observations lead you to ask questions about why these things occur.

Ask Questions

Before a science investigation begins, it's important to ask questions about what you would like to find out.

Asking questions helps you to define the investigation. Your investigation should be designed to find the answer to your questions.

You can also used prior knowledge and experiences to provide possible answers to your questions.

Make a Prediction

Once you have asked questions based on your observations, it's time to make a prediction and form a hypothesis. A **hypothesis** is a statement about what you think your investigation will show.

A hypothesis is more than just a guess. It is a statement based on knowledge you already have or things you have observed in the past.

Based on past gardening experience, you may predict that plants will grow faster and taller in humus-rich potting soil than in sandy soil.

Based on a previous investigation, you may already know that metal is a better conductor of heat compared to wood or plastic. These past experiences can help you predict the results of an investigation.

Why is it important to write a procedure that can be easily followed by others?

Plan and Carry Out an Investigation

Once you have stated your hypothesis, it's time to plan and conduct an investigation that will test your prediction. In planning your investigation, you should include all the materials you will need and a procedure that clearly shows the steps you will take to conduct the investigation.

Your materials and procedure should be written in a way that allows the investigation to be easily followed and repeated by others. In your procedure, include the data you will collect and the way it will be recorded.

Variables

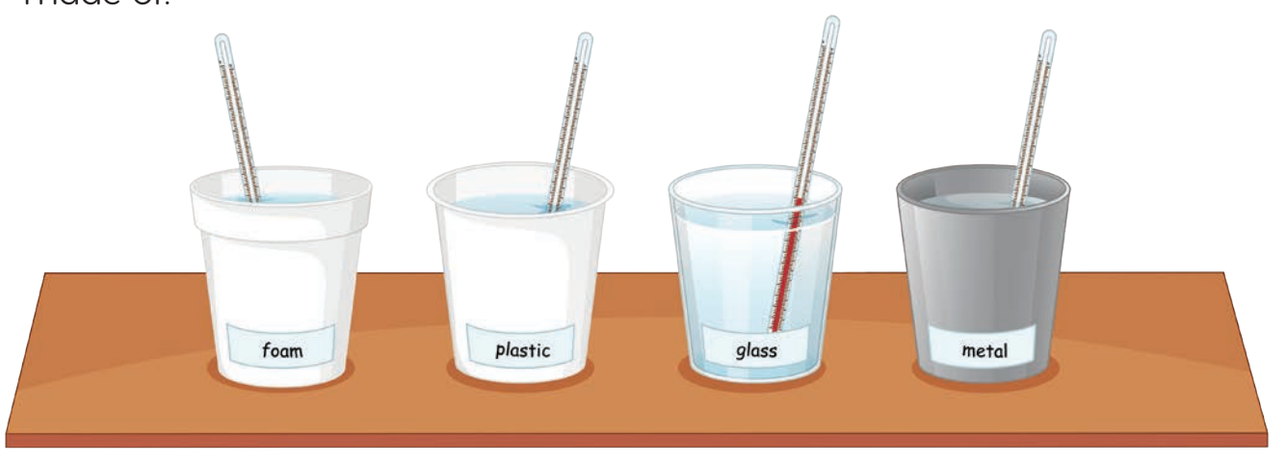
An important part in a science investigation are variables. A **variable** is any factor that can be controlled or changed during the investigation. There are three main variables – the independent variable, the dependent variables and the controlled variables.

The **independent variable** is the one condition in the investigation that you can change. Usually it is the thing that is being tested. If you were investigating which materials are good conductors of heat, the independent variable would be the type of material.

The **dependent variable** is the factor that you measure or observe. The dependent variable should change due to changes in the independent variable.

In an investigation on materials that are good conductors of heat, the dependent variable could be temperature of water in a cup. You would expect the temperature of the water to change as you change the independent variable – the type of material the cup is made of.

Imagine conducting an investigation about the growth rates of different seedlings. What would be the independent variable? What would be the dependent variable?



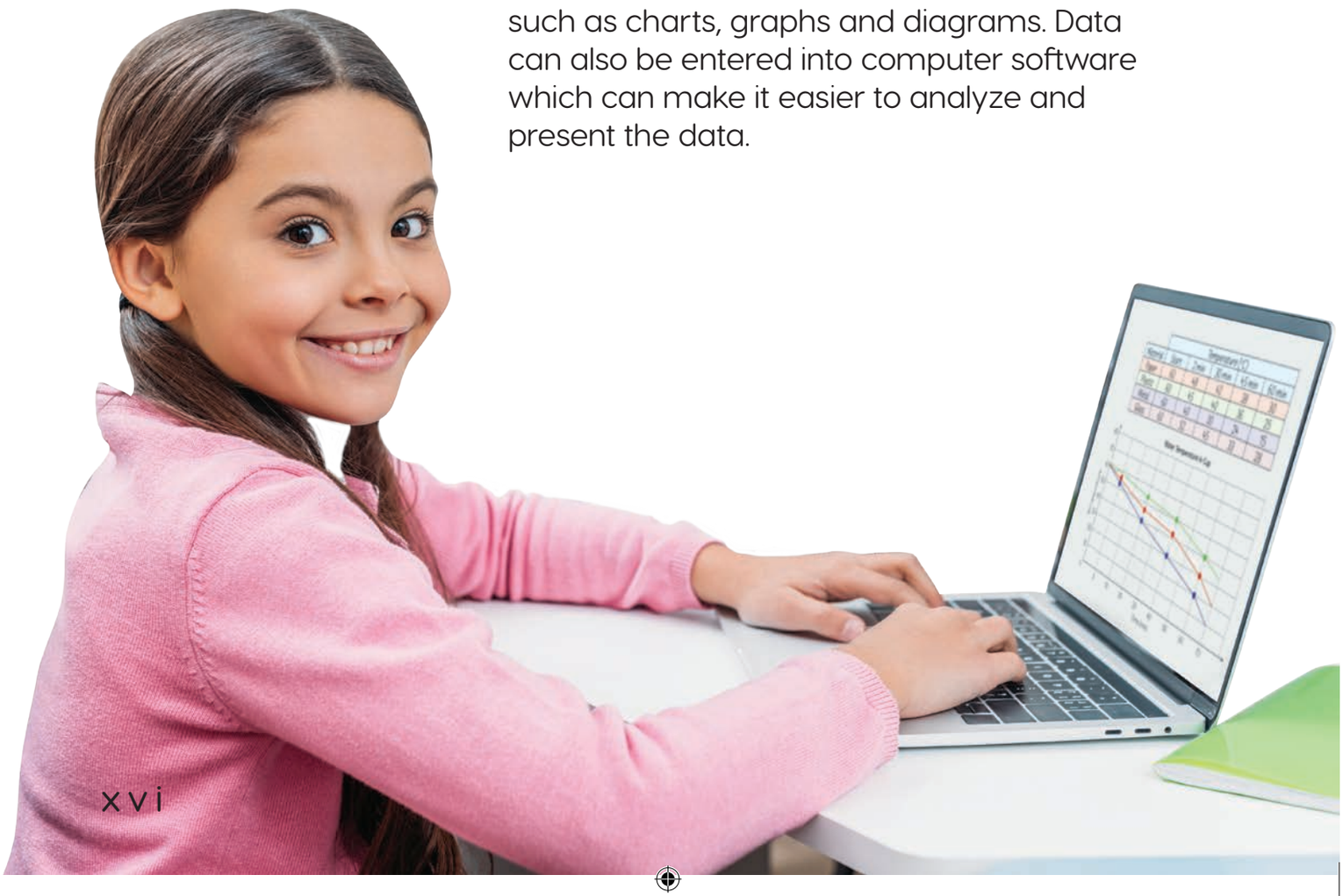
The **controlled variables** are variables that do not change during the investigation. Controlled variables could include the type and size of a container, the source and temperature of water and the types of instruments used to take measurements. The purpose of the controlled variables is to ensure that the only influence on changes in your observations is due to the independent variable.

Imagine you were carrying out an investigation into the effect of temperature on plant growth. What would be your controlled variables?

Collecting and Recording Data

Make observations and collect data as stated in your procedure. The data should be recorded in an organized way that can be read and understood by others.

Often, data is recorded in a visual manner, such as charts, graphs and diagrams. Data can also be entered into computer software which can make it easier to analyze and present the data.



Analyze and Interpret Data

Once your observations have been accurately recorded, it's time to analyze and interpret the data to see if your hypothesis is supported.

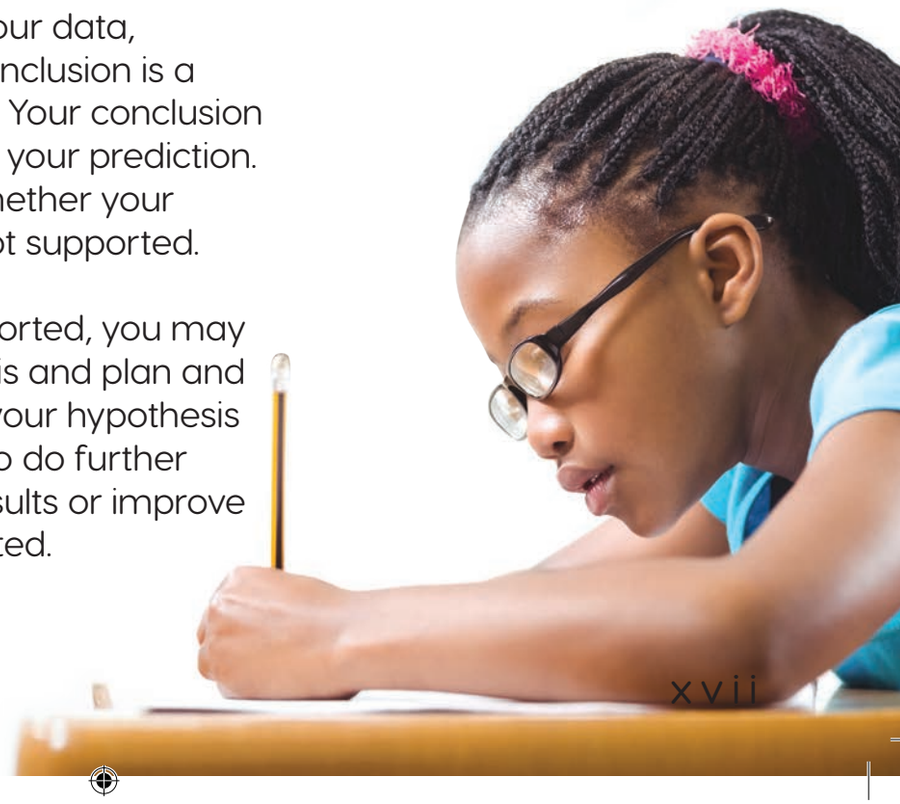
You **analyze** when you look closely at recorded data. You look for patterns to help explain your results. A pattern is when data repeats in a predictable way.

You **interpret** when you understand and explain what the data means. In interpreting data, you use your prior knowledge, experience, and skills to explain patterns and trends identified in the analysis of the data.

An important part of analyzing and interpreting is to check the accuracy of the data collected. If there are inaccuracies or inconsistencies in the data, you may need to adjust your procedure and repeat the investigation.

Draw a Conclusion

By analyzing and interpreting your data, you reach a conclusion. Your conclusion is a summary of the data collected. Your conclusion should indicate the accuracy of your prediction. Your conclusion should state whether your hypothesis was supported or not supported.



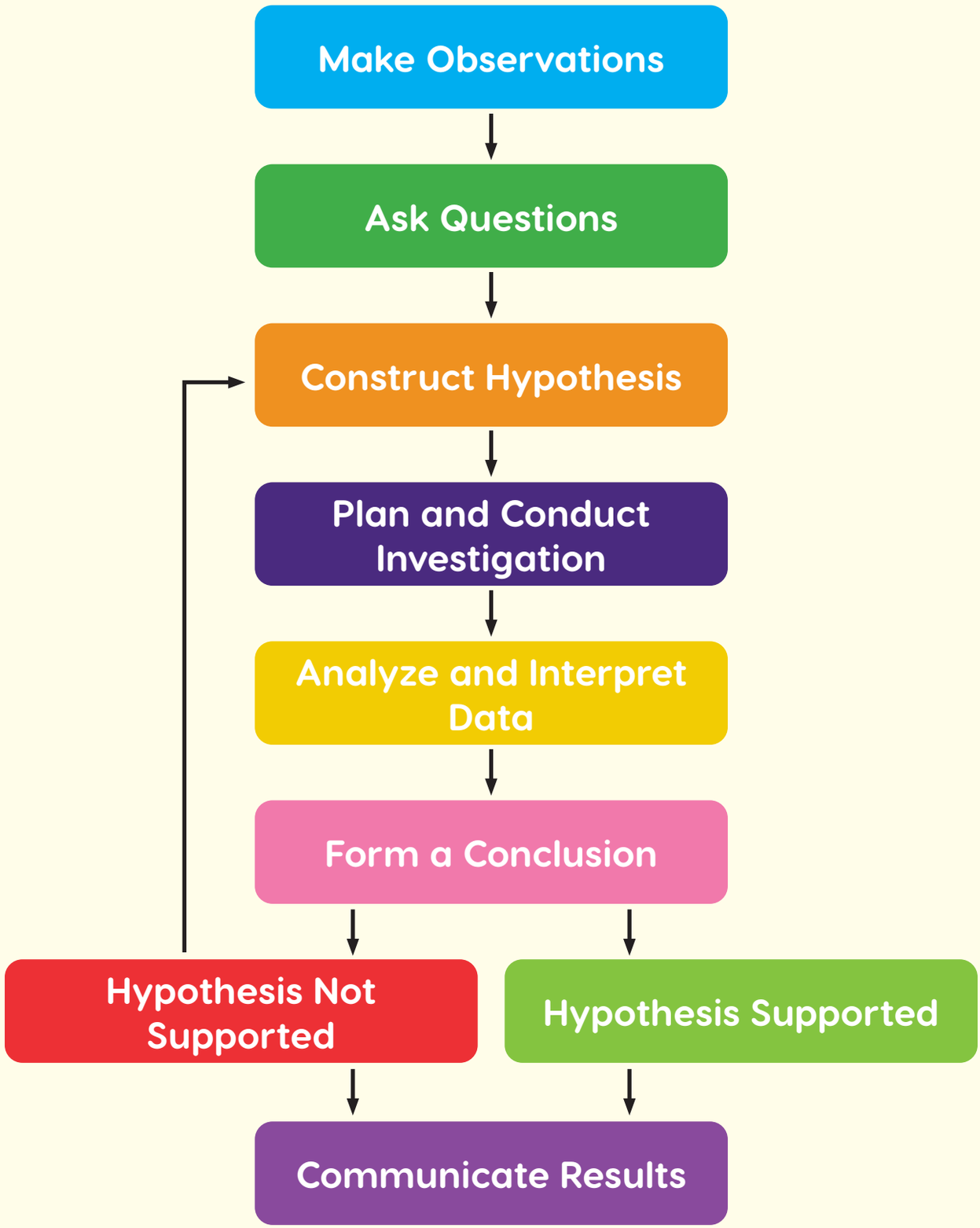
If your hypothesis was not supported, you may decide to form a new hypothesis and plan and conduct a new investigation. If your hypothesis was supported, you may wish to do further investigations to confirm the results or improve the accuracy of the data collected.

Communicate

The final step in a science investigation is to communicate your findings to others. This allows you to share what you have discovered and also allows others to assess the accuracy of your investigation.

The people you communicate your results with may wish to conduct a similar investigation and compare results. They may also wish to conduct further investigations to find out more. If they do, they'll also communicate their results so others can learn from their investigations too.

Scientific Method Flowchart



Science Safety

In the Laboratory

Follow these safety rules when in your science laboratory or when carrying out any science investigation.

- Do not enter the laboratory without a teacher.
- Follow your teacher's instructions. If you have any questions or are unsure of what to do, raise your hand and ask your teacher.
- Do not eat, drink, play or run in the laboratory.
- Wash your hands with soap when entering and before leaving the laboratory. Dry your hands properly, especially if you will be working with electrical equipment. If any chemical or hazardous material gets on your hands, inform your teacher immediately.
- Wear appropriate safety gear when carrying out scientific investigations. Safety gear includes a lab coat, safety googles and gloves. Tie long hair back and do not wear open-toed shoes.
- Be careful when handling sharp tools or working with burners and hot substances.

- Do not panic if an accident occurs. Be aware of eyewash stations, fire extinguishers, exit doors and other safety equipment and procedures in case of an emergency.

- Keep your workspace clean and organized. Report any spills or breakages to your teacher. Clean up any spills straight away and dispose of the cleaning products safely.

- When cleaning up, ensure all materials and substances go into the correct bin or container. Do not pour any liquid down the sink unless your teacher has instructed you to do so.

- Look after the equipment you use and return it to its proper location in the same condition you received it. Wipe your workstation down after use.

In the Field

- Make sure you are accompanied by an adult when on field trips or doing other activities outside of the schoolyard.

- On long trips, make sure you take enough water and food. Bring insect repellent if necessary.

- On sunny days, take Sun protection such as a long-sleeved shirt, hat and sunscreen.

- Do not touch plants, animals or other organisms unless instructed to do so by your teacher.

Try This!

Create a poster of the rules to be followed in your science laboratory or classroom. Display the poster in a place for everyone to see.

1 Classification of Organisms

How can we distinguish living things from non-living things?

In this chapter you will ...

- identify the needs and characteristics of living things.
- understand that all organisms are made up of one or more cells.
- describe how scientists classify organisms into groups.
- list the six kingdoms and provide examples of organisms within each kingdom.

How can we classify the living things around us?

Go Online!

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

▲ *fox with her cubs*

▲ *Some poison dart frogs carry their young to water.*

How can we classify the living things around us?

▼ *squirrel eating*

Characteristics of Life

The plants and animals on these two pages are all living things. A living thing is called an **organism**. We can tell if something is an organism by looking at its needs and characteristics.

Organisms need the same things to live and survive in their environment. Animals need water, food, nutrients and a place to live. They also need the gas oxygen.

Plants are organisms that produce their own food through the process of **photosynthesis**. To do this, plants need sunlight and a gas called carbon dioxide.

▲ *Sunflower seedlings get bigger and taller as they grow.*

All organisms **grow** as they get older. When organisms grow, they usually get taller and heavier. As organisms get older, they look more like their parents.

All organisms can **reproduce**. This means they are able to produce young of the same kind.

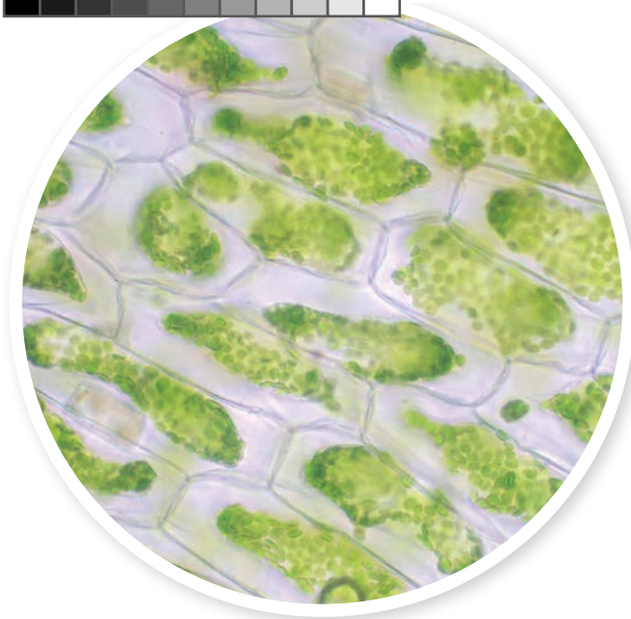
Organisms also **respond** to changes around them. When an animal senses danger, it may respond by running away. Some plants open and close their leaves or flowers in response to the change from day to night. Many plants grow or bend in the direction of sunlight. Responding to changes around them helps all organisms to meet their needs and survive in their environment.

AB **Activities 1.1 – 1.2**

Think Deeply

A plant's response of growing or bending in the direction of sunlight is called phototropism. How does this response help plants to live and grow?

▼ *Sunflower plants turn and bend to follow the position of the Sun throughout the day.*



▲ *leaf cells*

Cells

All organisms are made of structures called cells. **Cells** are the smallest unit within an organism that carries out life processes – including reproduction and growth.

Some organisms are made of only one cell. Many of the organisms around us, such as most plants and animals, are made up of millions of different cells.

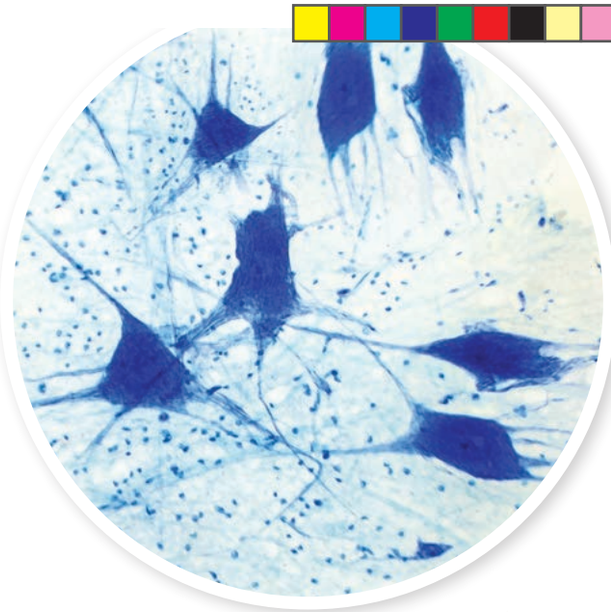
Most plants and animals are made up of many cells. They are called **multicellular organisms**.

▼ *stem cells*

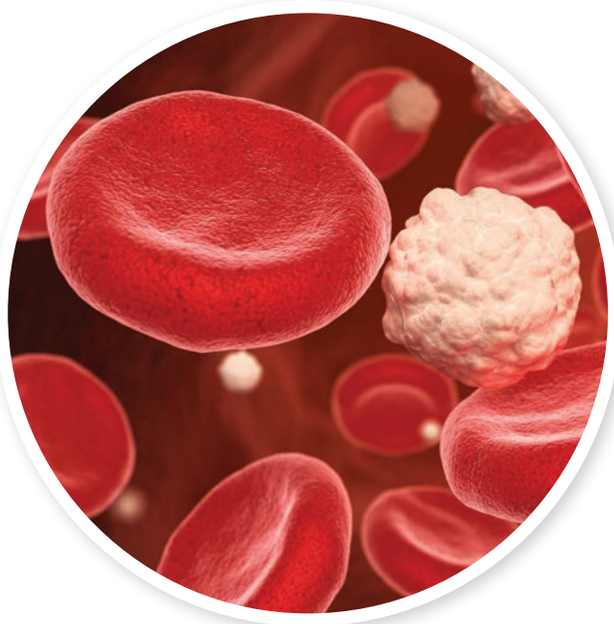
Each type of cell plays a role in helping the organisms to function.

In a plant, cells in the roots take in water for the plant. Cells in the stem move water and food to different parts of the plant. In the leaves, many cells contain chloroplasts. **Chloroplasts** are the part of a cell that make food for the plant.

Animal cells can be different in shape, size and their function. Cells in the brain of a kitten help it to send messages about its surroundings. Cells in the blood help to move oxygen to where it is needed.



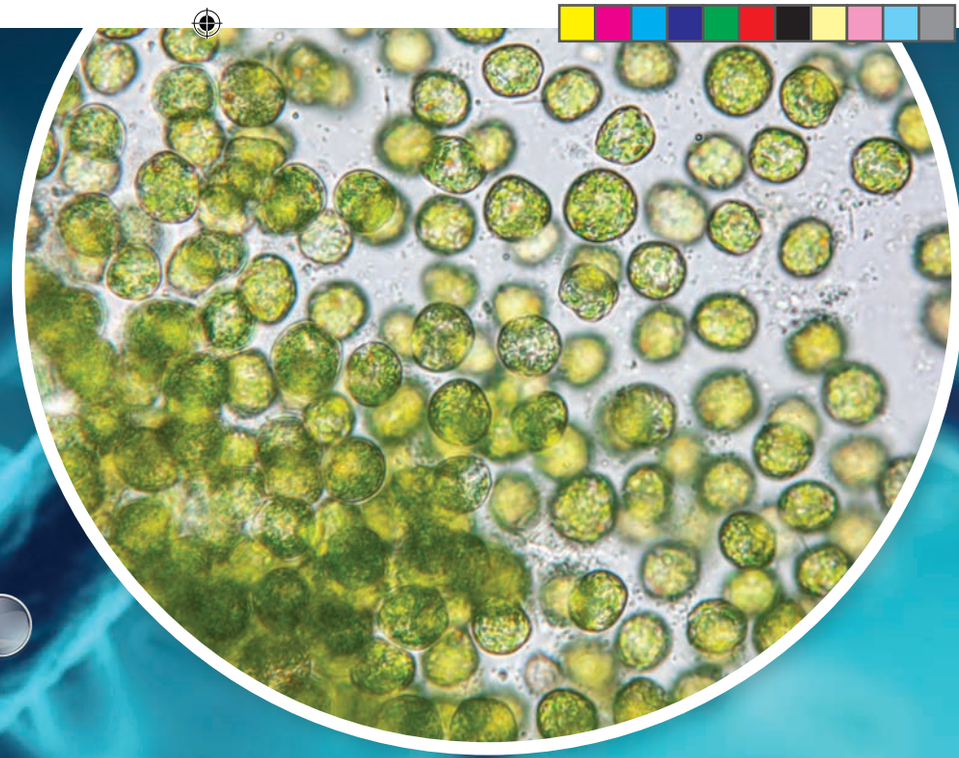
▲ *brain cells*



▲ *blood cells*

Why do cells come in a variety of different shapes and sizes?

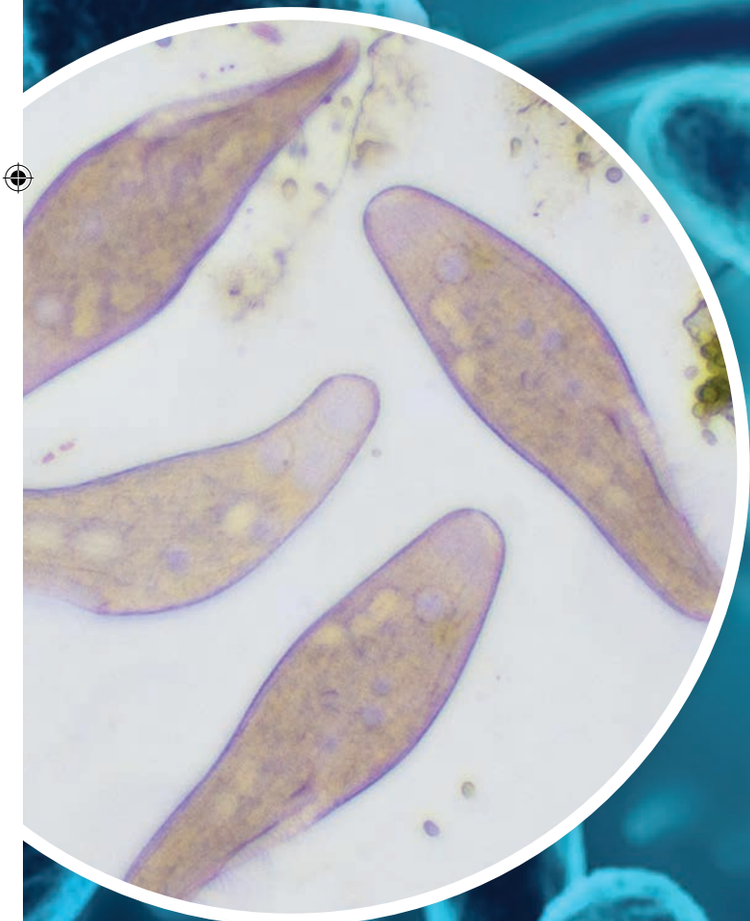
AB Activities 1. 3 – 1.4



▲ *microscopic chlorellas*

Try This!

Draw a Venn diagram to show the similarities and differences between a hand lens and a microscope.



▲ *microscopic parameciums*

Unicellular Organisms

Most cells are very small and can only be seen using powerful microscopes. Many organisms, from tiny seedlings to giant blue whales, are made up of millions of cells. Some organisms are made of only one cell. They are called **unicellular organisms** or one-celled organisms.

Chlorellas are unicellular green algae that are able to photosynthesize.

Parameciums are unicellular organisms that, when observed under a microscope, are shaped like a shoe.

Bacteria are simple unicellular organisms found all over the world. Some bacteria can be harmful to plants and animals. Other bacteria can be helpful. Rhizobium is a bacterium found in soil that helps a plant to get the nutrients it needs.

People often use unicellular organisms in preparing food. Lactobacillus is a bacteria used to make yogurt. Yeast is a unicellular fungus used to make bread and other food and drink products.

AB **Activity 1.5**

Amazing Fact!

A bacterium reproduces by dividing into two cells. Each of the two cells can then divide again to form four cells. By reproducing in this way, billions of bacteria can be produced in just one day!

Go Online!

Discover more about microorganisms in a video on the NGScience website.
QuickCode: **T9L6**

▼ *yeast*

▲ *muscle cells*

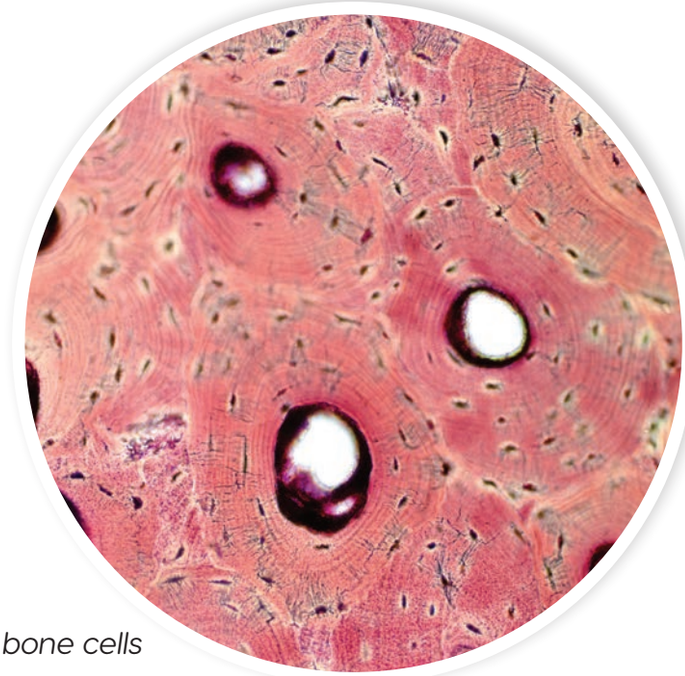
Multicellular Organisms

Most organisms are multicellular – they are made up of many different cells.

The cells that make up multicellular organisms come in a great variety of shapes and sizes. The shape, size and location of the cells within an organism are suited to their function.

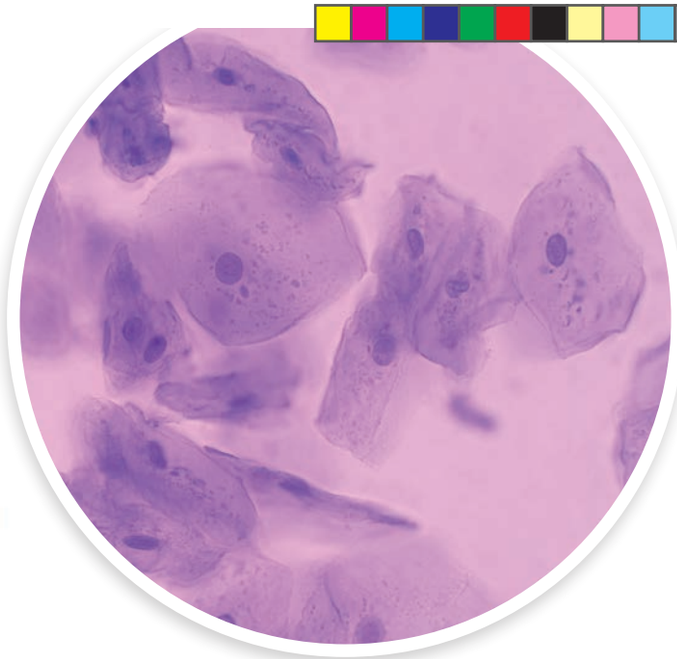
Humans are multicellular organisms with many different types of cells.

The shape, size and location of muscle cells help you to move different parts of your body. Bone cells give your bones strength and structure.

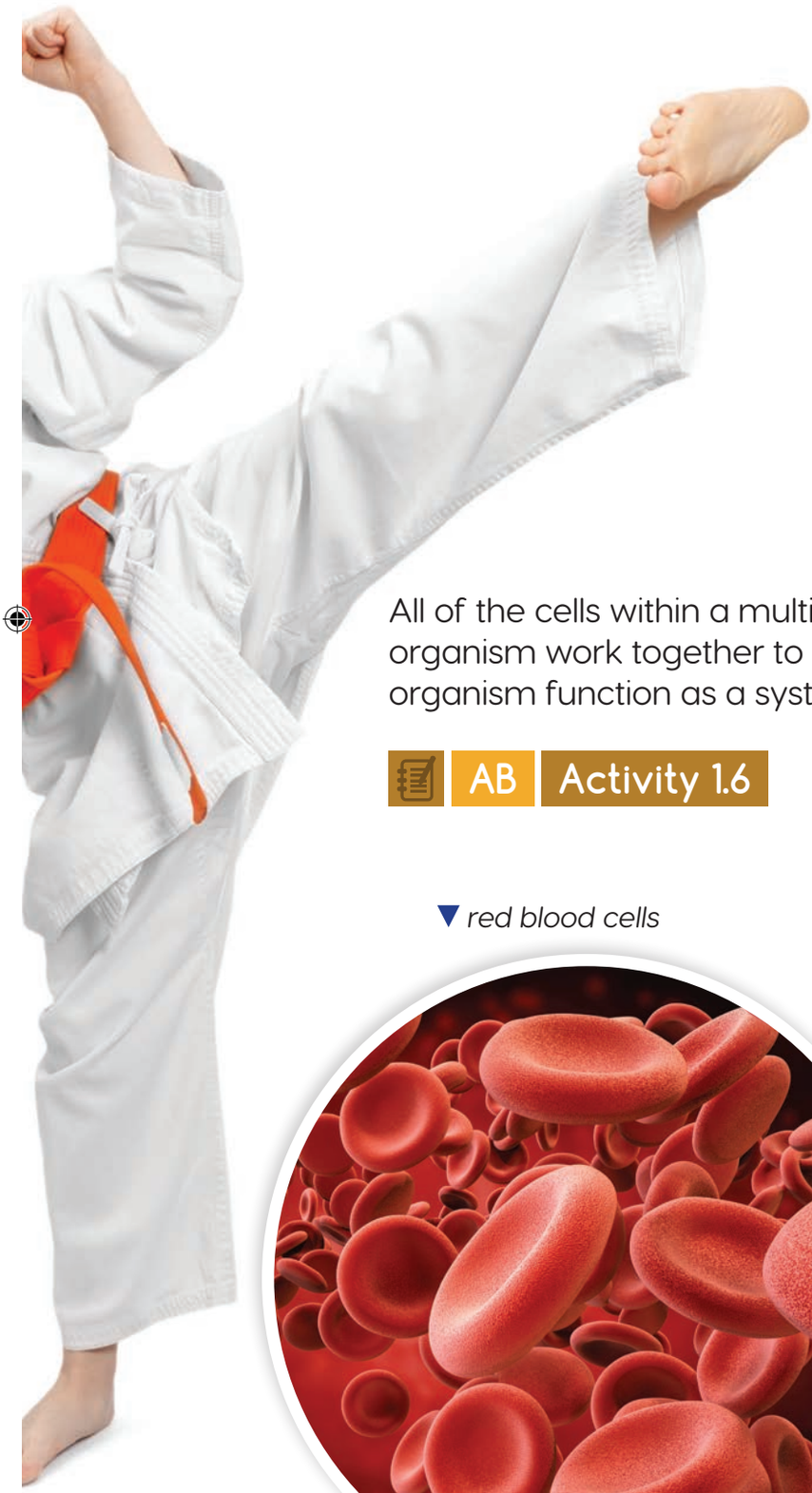


▶ *bone cells*

Your skin cells form a protective layer around your body. Blood cells help to transport gases to and from other types of cells.



▲ *skin cells*



All of the cells within a multicellular organism work together to help the organism function as a system.

AB **Activity 1.6**

▼ *red blood cells*

Amazing Fact!

The human body is an amazing and complex system. There are about 200 different types of cells and about 30 trillion cells in all!

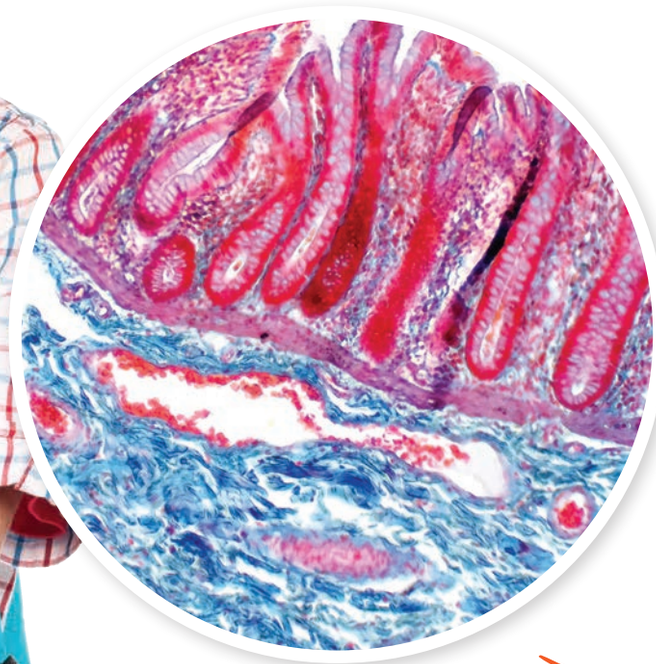
Try This!

Observe some prepared slides of human cells under a light microscope. Draw and describe the cells you observe under low power and high power.

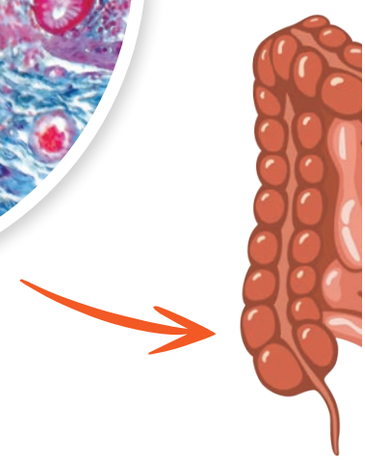
Cell Organization

Humans and many of the animals you are familiar with are complex, multicellular organisms. The variety of cells that make up multicellular organisms are organized in a way that helps the organisms function as a whole system.

Cells that are of the same kind and have the same function are often grouped together as **tissue**. Intestinal cells in your body, for example, make up your different kinds of intestinal tissues.



▲ *intestinal tissue*



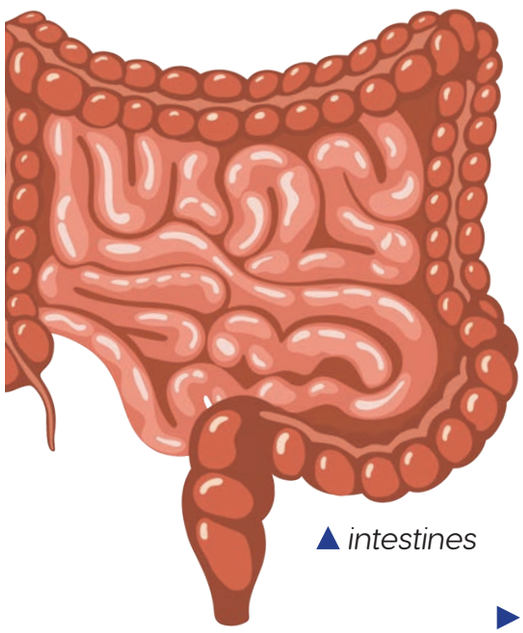
Two or more types of tissue that are grouped together make up an **organ**. Each organ has a primary function. Your small intestine is an organ that helps your body to absorb nutrients from food.

A group of organs that perform a central task is called an **organ system**. Your esophagus, stomach and intestines are organs that work together as your digestive system. The primary function of the digestive system is to break down food to enable your body to get the energy and nutrients it needs to carry out life processes like moving about, growing and repairing itself.

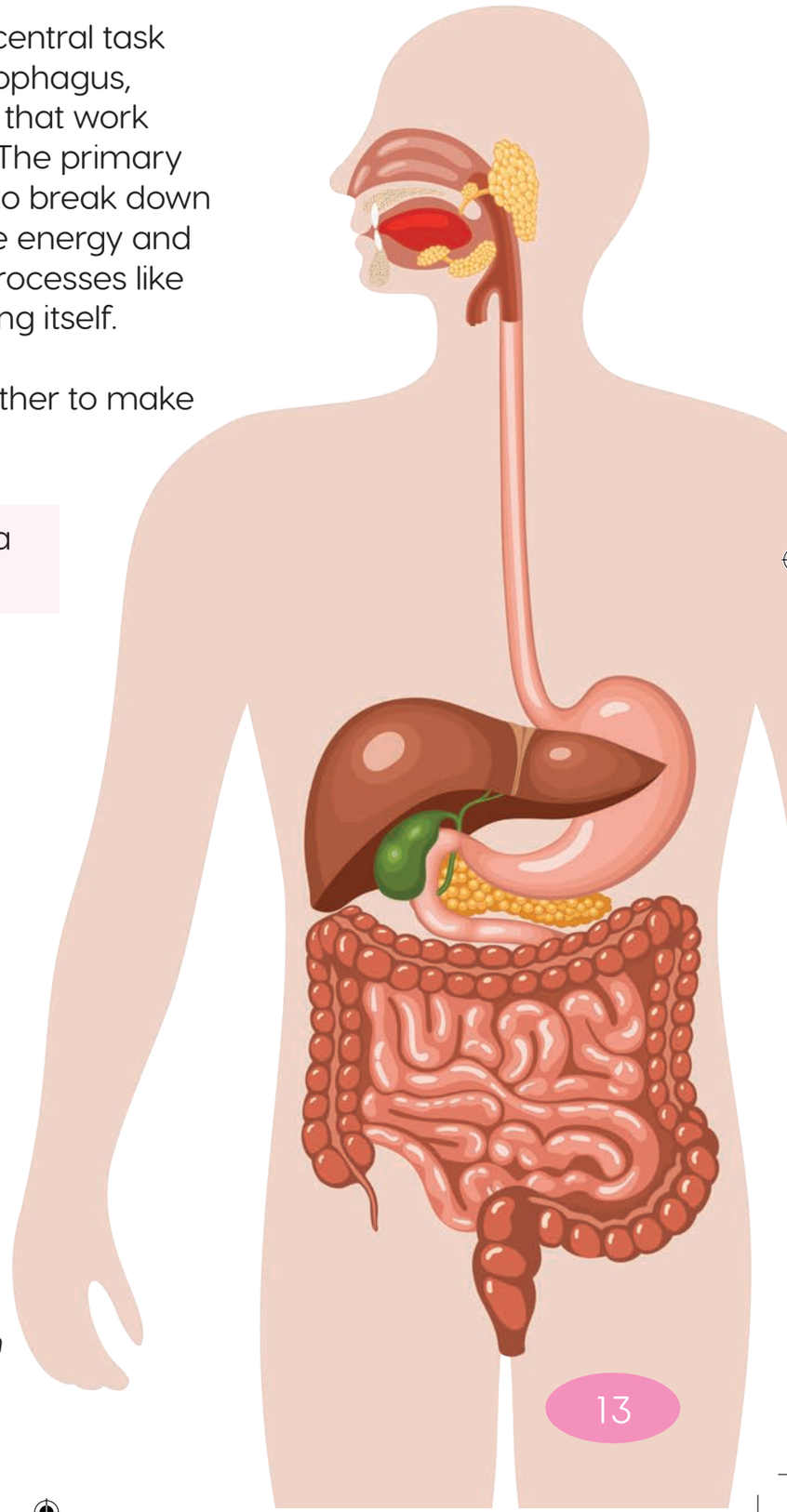
All of the organ systems work together to make up an organism.

How are cells organized in a multicellular organism?

AB Activity 1.7



▲ *intestines*



▶ *digestive system*

Think Deeply

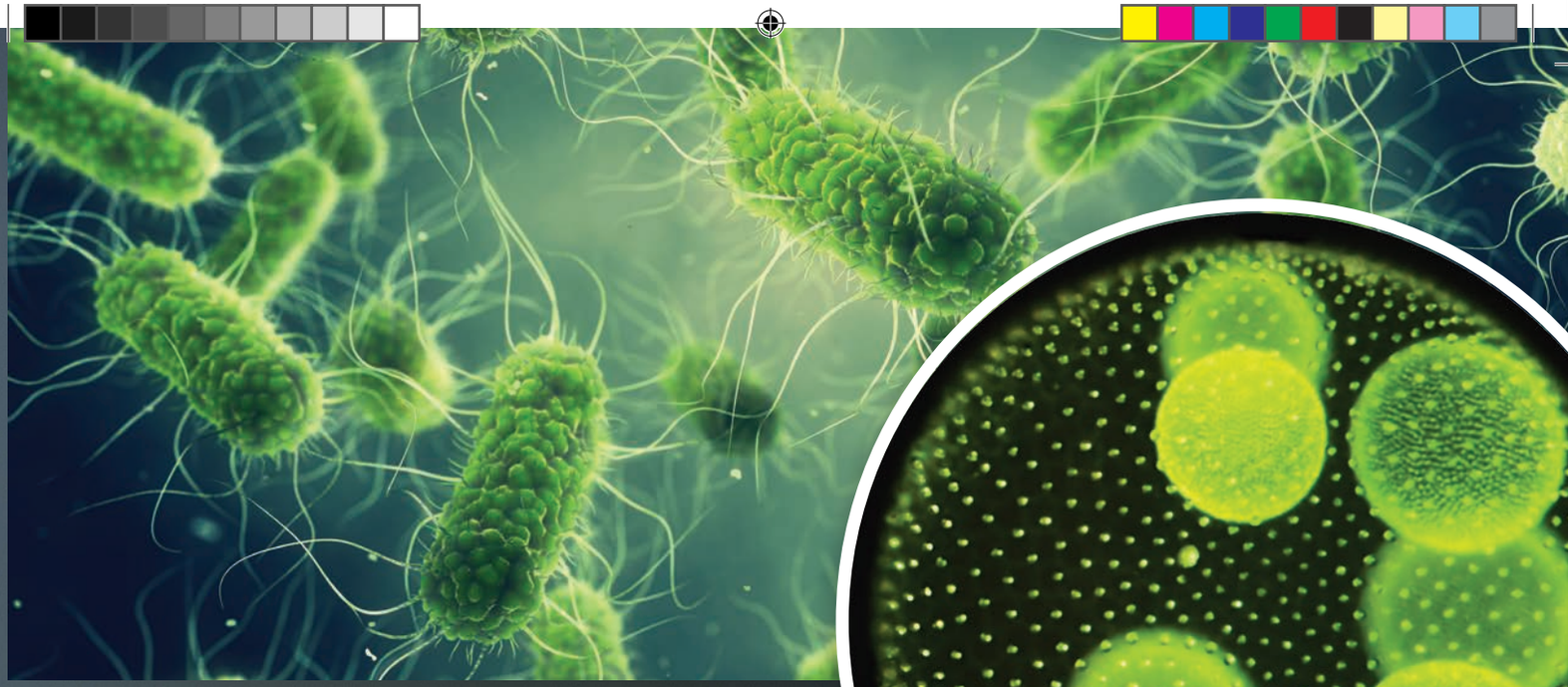
Why do multicellular organisms have different types of organs?

Organism Classification

There is a great variety of different organisms on Earth. From deep in the ocean to the top of the coldest mountains. More than one and a half million different kinds of organisms have been named by scientists and millions more are yet to be discovered.

Amazing Fact!

So far, about 1.6 million different kinds of organisms have been named, described and classified. Scientists estimate there are more than 10 million different kinds of organisms yet to be discovered.



▲ *bacteria*

▲ *Volvox are unicellular algae.*

In order to better understand each kind of organism and their differences and similarities with other organisms, scientists have classified them into groups called **kingdoms**. The six main kingdoms are ancient bacteria, bacteria, protists, fungi, plants and animals.

To decide which kingdom an organism belongs to, scientists look at the organism's characteristics such as how it gets food, how it reproduces and whether it is unicellular or multicellular.

▼ *fir sapling*

Why is it important to classify organisms into groups?

AB **Activity 1.8**

Did You Know?

Not all bacteria are harmful. Blue cheese, Korean kimchi and soy sauce are just some of the many food made using different kinds of bacteria.

Bacteria

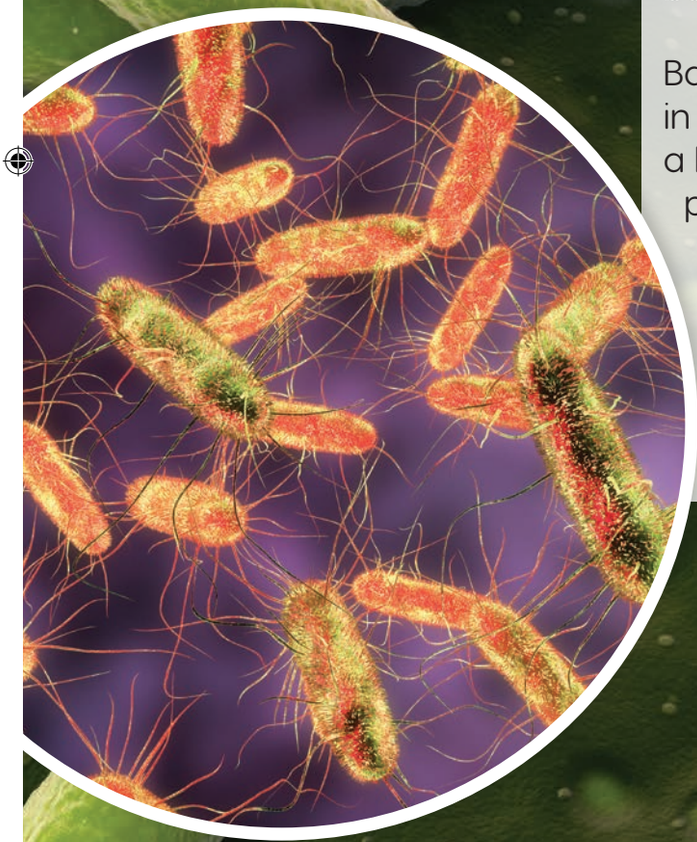
Bacteria are the simplest organisms on Earth. They are unicellular and their cells are simpler than that of other organisms.

Most bacteria break down the remains of plants and animals for food. Some bacteria get the food they need by living in or on other organisms. Other bacteria are able to photosynthesize and make their own food.

Bacteria are able to reproduce rapidly by dividing. During this process, a single bacterium divides into two identical daughter bacteria.

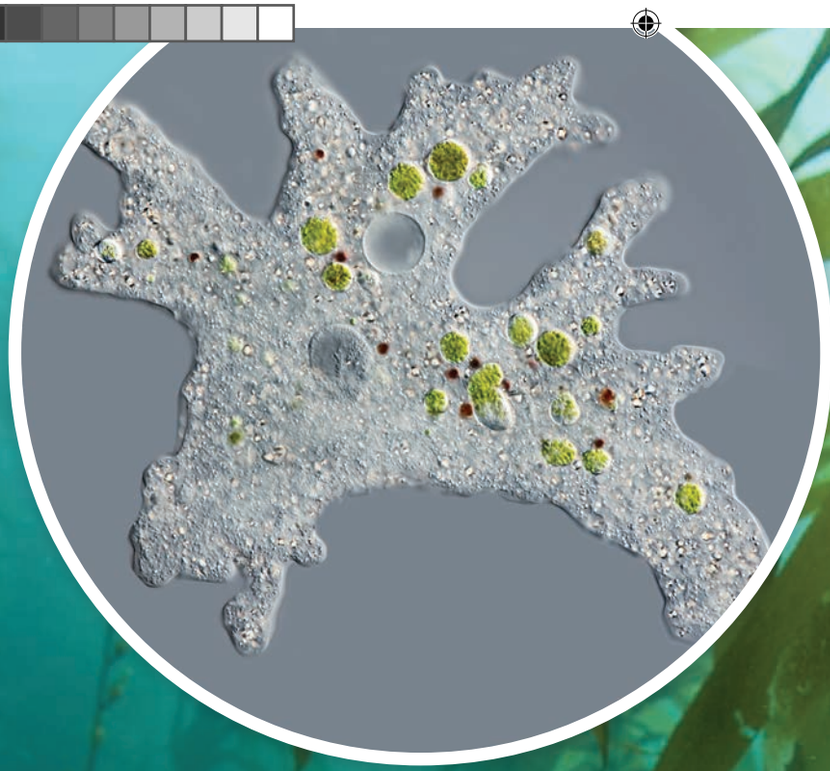
Bacteria can cause diseases and infections in plants, animals and people. Salmonella is a bacteria that can cause food poisoning in people and some animals.

Bacteria can also be helpful. Many organisms need bacteria to help them get the nutrients they need. Bacteria in your stomach help you to get nutrients from the food you eat.



▲ *salmonella*

In what ways can bacteria be harmful? In what ways can they be helpful?



▲ *amoeba*

Protists

Protists are a diverse group of organisms. Some, like amoebas and parameciums, are unicellular and can only be seen under a microscope. Others, like giant kelp, are multicellular and can reach lengths of more than 50 meters.

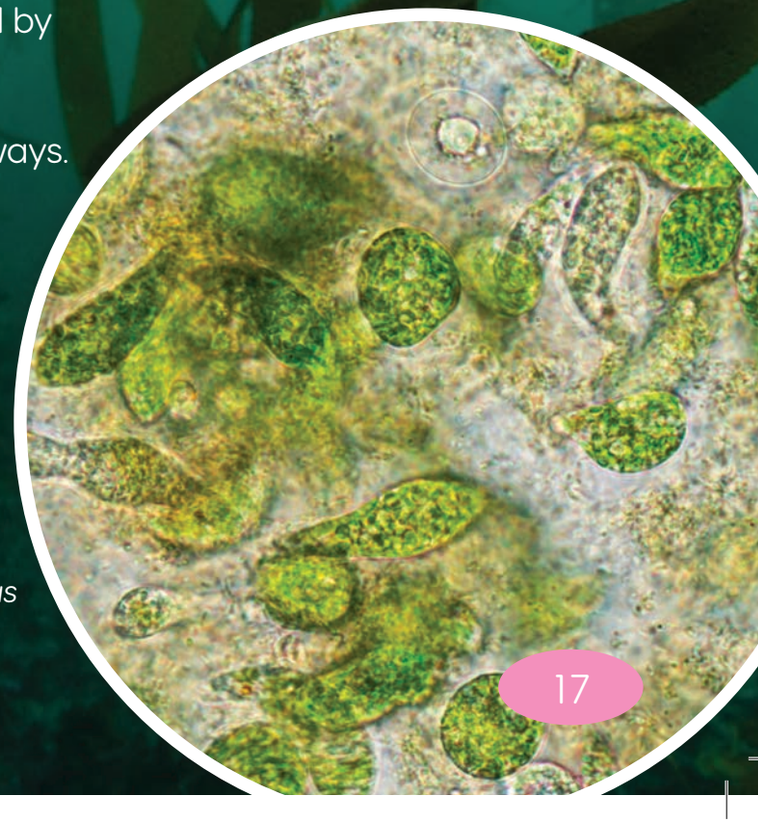
Some protists, like euglenas, make their own food. Others get the food they need by eating other organisms.

Different protists reproduce in different ways. Some are able to reproduce by dividing. Others have more complex life cycles.

AB Activity 1.9

Think Deeply

Why are kelp forests only found in shallow coastal waters and not in the deep ocean?



▶ *euglenas*

Go Online!

Discover more about fungi in a video on the NGScience website.
QuickCode: **Y5S7**

Think Deeply

Many years ago scientists classified fungi as plants. Upon closer observation, they noticed that fungi were different from plants in a number of ways. With a classmate, create a chart to show the similarities and differences between fungi and plants.

Fungi

Fungi have many features in common with plants. They often grow in soil and do not move from place to place. Fungi lack the distinguishing features of plants such as stems, leaves, flowers or fruits.

Fungi are also different from plants in the way they get their food. They do not make their food as plants do, but instead break down the remains of plants and animals. An organism that gets its energy in this way is called a **decomposer**. Decomposers play an important role in an ecosystem by helping to recycle dead organisms into nutrients in the soil.

Unlike plants, fungi do not produce seeds. Most fungi reproduce by releasing microscopic spores into the air. New fungi grow from the spores.

Common types of fungi include mushrooms, bracket fungi, puff balls and molds.

◀ *puff ball*

▲ *mold*

▲ *penicillium fungi*

Like bacteria, some fungi can be harmful to other organisms by causing infections and diseases. Fungi are also important to people. Mushrooms, for example, are an important source of food. Other types of fungi, such as yeast, are used in the production of different food.

Penicillium is a type of mold that is used to make penicillin.

Amazing Fact!

Truffles are edible fungi found underground. They only grow in certain regions of the world and are hard to find. They range in size from the size of a strawberry to the size of an apple. Some truffles can sell for thousands of dollars.

In what ways are fungi similar to plants? In what ways are they different?

AB Activity 1.10

The Zombie Fungus

Found mostly in tropical rainforests are a type of fungi that are truly fascinating. Meet the mind-controlling cordyceps fungus, sometimes called zombie fungus. Cordyceps are parasites, which means they infect and live inside other organisms.

When a cordyceps fungus infects an animal, usually an insect, it begins to take over its mind. The fungus compels the insect to leave the safety of its nest and move to a branch above the ground that is the right temperature for the cordyceps to reproduce.

After about a week, the insect dies and the cordyceps pushes a spore-containing growth through the insect's head. Cordyceps fungi reproduce through spores. The spores are released into the air and land on other insects. The insects become infected and the life cycle repeats!

Did You Know?

Cordyceps fungi are used in traditional Chinese medicine. However, scientists have not found any evidence on their ability to treat human diseases.

▲ *sequoia trees*

Plants

Plants are organisms that can be found almost everywhere on Earth and they come in a diverse range of shapes, sizes and colors. Scientists have named and classified hundreds of thousands of different kinds of plants and more plants are constantly being discovered.

Plants are able to make their own food through the process of photosynthesis. During photosynthesis, plants use light energy from the Sun to transform carbon dioxide, water and minerals into food and oxygen.

Scientists classify plants into smaller groups by looking closely at their external structures. Plants that produce flowers and fruits are called flowering plants. Flowering plants reproduce from seeds. Plants that do not produce flowers and fruits are called non-flowering plants. Many non-flowering plants, such as mosses and ferns, reproduce from spores.

Go Online!

Plants can be different in many ways. Learn about some of Earth's more unusual plants in a video on the NGScience website.
QuickCode: **L1K7**

Think Deeply

Hundreds of millions of years ago, plants only lived in the ocean and other aquatic environments. They eventually developed adaptations suitable for living on land. As more plants adapted to life on land, the amount of oxygen in the Earth's atmosphere increased. Why did this occur?

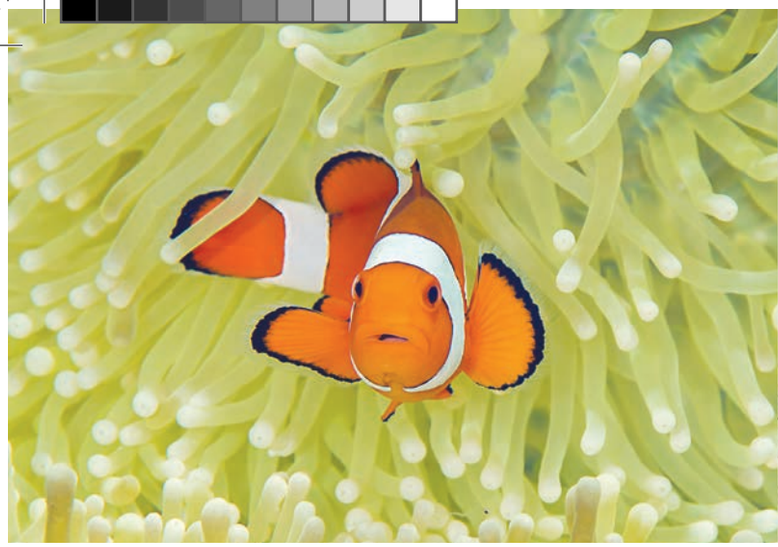
Scientists can also classify plants by looking closely at their internal structures. **Vascular plants** are plants with internal structures, called xylem and phloem, to transport food and water throughout the plant. Plants without these internal structures are called **non-vascular plants**.

What characteristics of plants make them different from fungi and animals?

Amazing Fact!

The oldest living organism on Earth is a type of pine called the methuselah tree. It is found in the California mountains in the United States and is estimated to be 4,853 years old!

◀ *moss*



▲ *anemone fish hiding in a sea anemone*

▲ *Sally Lightfoot crab*

Animals

There is a great diversity of animals on Earth. They can be found in the coldest polar regions to the driest desert. They fill our rainforests and coral reefs and come in all sorts of shapes and sizes. So far, scientists have identified and named over a million different kinds of animals and many new animals are discovered every year. Scientists estimate there may be as many as eight to ten million different kinds of animals yet to be discovered, named and classified.

▼ *leopard*

▼ *king penguins*

▲ *jellyfish*

▲ *bee*

▲ *treefrog*

Like plants, animals are organisms that need food, water and air. Unlike plants, animals are not able to make food. To get the energy and nutrients they need, animals feed on other organisms.

Within the animal kingdom, scientists divide animals into two main groups. Animals that have a backbone are classified as **vertebrates**. Animals without a backbone are classified as **invertebrates**. About 95 percent of the animals on Earth are invertebrates.

Amazing Fact!

Paedophryne amauensis is a type of frog discovered in New Guinea in 2009. At just 7.7 millimeters long, it is the smallest vertebrate on Earth! See if you can find out the largest invertebrate on Earth.

Go Online!

Like plants, animals are a very diverse group of organisms. Discover some strange and outright weird animals in a video on the NGScience website.
QuickCode: **M3H1**

AB **Activity 1.11**

▼ *dwarf crocodile*

Science Words

Use the words to complete the sentences.

organism	**cells**	**tissue**
photosynthesis	**multicellular organisms**	**organ**
grow	**chloroplasts**	**organ system**
reproduce	**unicellular organisms**	**kingdoms**
respond		

1. Organisms made of just one cell are called _____ .
2. Organisms made of more than one cell are called _____ .
3. Organisms _____ to changes around them.
4. _____ are the smallest unit within an organism that carries out life processes.
5. _____ are the part of a cell that make food for the plant.
6. Cells that are of the same kind and have the same function form a _____ .
7. All organisms can _____ which means they are able to produce young of the same kind.
8. Two or more types of tissue that are grouped together make up an _____ .
9. Plants produce their own food through the process of _____ .
10. When organisms _____ , they usually get taller and heavier.
11. A living thing is called an _____ .
12. A group of organs that perform a central task is called an _____ .
13. Organisms can be classified into six main groups called _____ .

Review

1. List the characteristics of all organisms.

2. Provide an example of how an organism responds to changes in its environment.

3. True or false.
   (a) All organisms are made up of at least one cell.
   (b) All cells contain chloroplasts.
   (c) Different cells have different functions.

4. How can bacteria be harmful to people?

5. Draw a flow chart diagram to show how cells are organized in the human body.

6. List the six kingdoms and provide an example of an organism in each.

7. Copy and complete the chart below.

Kingdom	Characteristics	Examples

2 Plant Structures and Functions

What are the external and internal structures of plants?

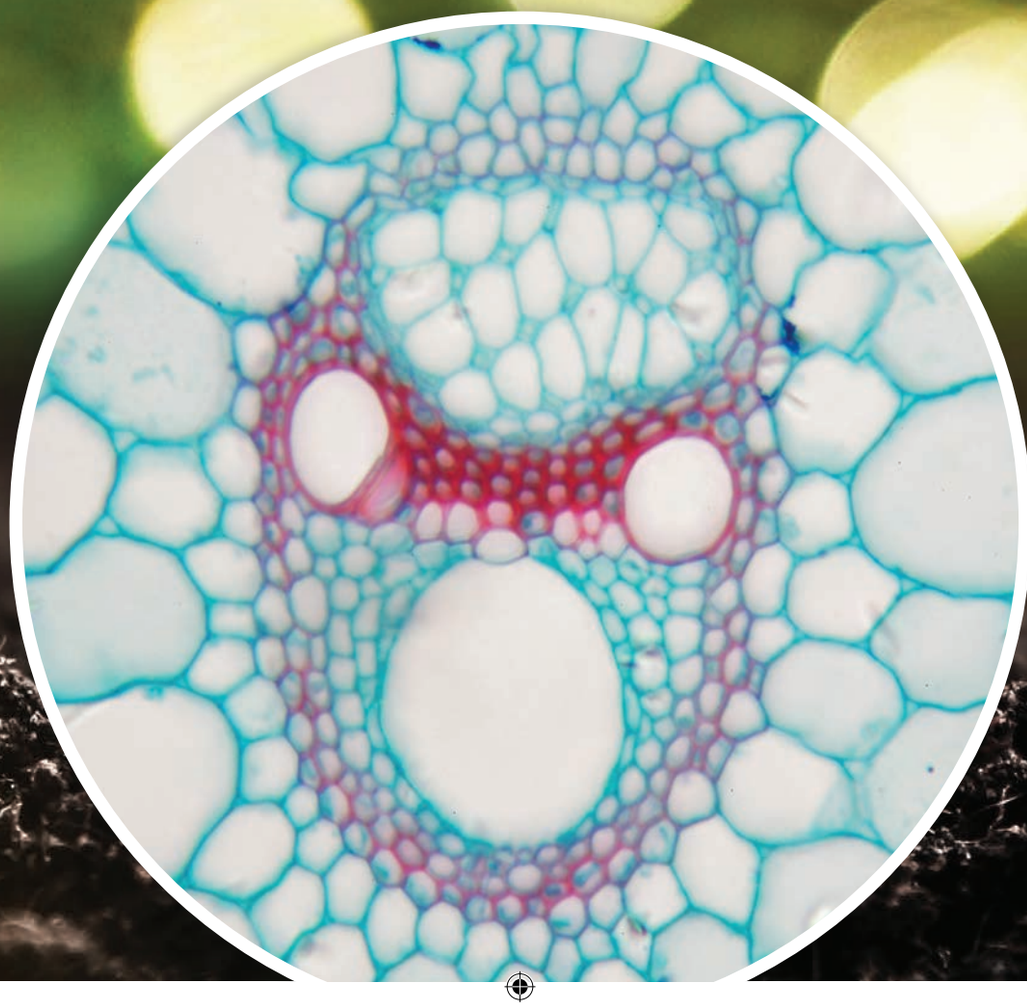
Go Online!

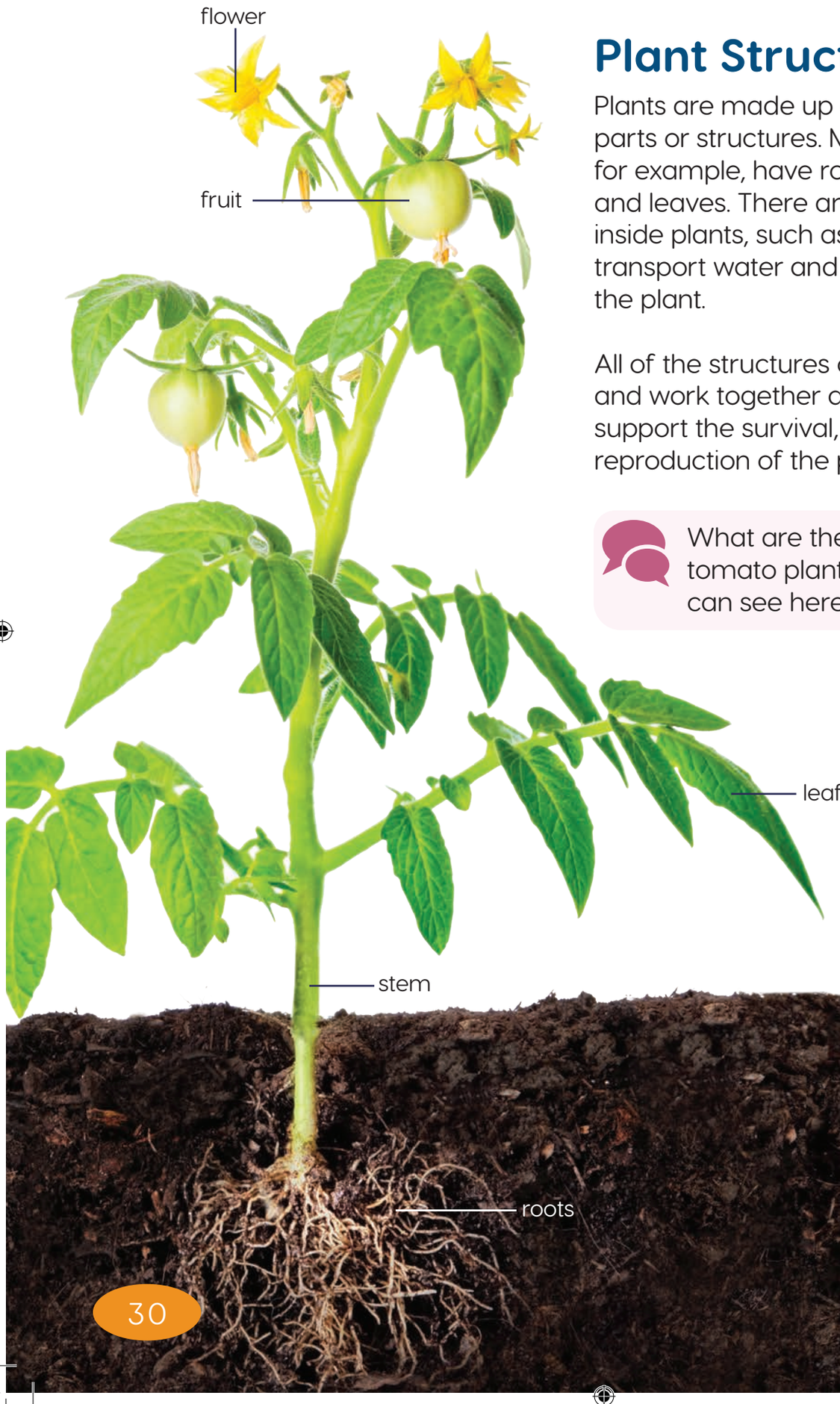
Access interactive content relating to this topic on the NGScience website.
ngscience.com

In this chapter you will ...

- identify and list the external structures of plants.
- identify and list the internal structures of plants.
- describe a plant system in terms of its components and their interactions.
- construct an argument that plants have internal and external structures that function to support survival, growth and reproduction.

How do a plant's structures support its survival, growth and reproduction?





Plant Structures

Plants are made up of different parts or structures. Many plants, for example, have roots, stems and leaves. There are also parts inside plants, such as the tubes that transport water and nutrients around the plant.

All of the structures of a plant interact and work together as a system to support the survival, growth and reproduction of the plant.

What are the functions of the tomato plant structures you can see here?