

+ Explore your book!

Richmond Solution BE Primary Science includes ten units in four different areas of science: **Biology**, **Chemistry**, **Physics** and **Earth and Space**.

Each unit teaches a different topic.

Engage!

Start your adventure here! Think about what you already know about the topic. How does it relate to your life?

Explore!

Carry out an experiment or observation! This is a chance to explore the topic and your ideas. Make observations and draw conclusions.

UNIT 1 Plants

Engage!

Find out about fruit!

Fruit can be sweet, juicy, colorful, big or small. But how does fruit grow? As a class, discuss how bananas, oranges and melons grow. Write your ideas on the board. Try to answer these questions:

- Where does each fruit come from?
- On which part of the plant does the fruit grow?
- How are these fruits similar and different?

Next, in groups, choose a fruit and use the internet or books to find out how it grows. Tell the class what you found out about your fruit. Work as a class to make a poster that explains how fruit grows.

Explore!

How can I change the color of a flower?

Objective: Change the color of a flower without touching the plant.

Method

- In groups, fill a cup halfway with water.
- Add 10-15 drops of food coloring into the water and stir.
- Cut the end of the flower stem at an angle and put it in the cup.
- Describe the flowers in the first column of the table below.
- Observe the flowers the next day. Describe them in the second column of the table.

Observations

The flowers on day 1	The flowers on day 2

Conclusions

- What color was your flower at the beginning of the experiment?
- What color did you add to the water?
- Did the flower change color overnight?
- Imagine you are going to repeat the experiment. How can you get a darker color?

You will need

- two white flowers
- a tall cup
- water
- food coloring
- a spoon
- scissors

Explain!

Read explanations of new ideas.

Lesson 1.1

What are vascular and nonvascular plants?

There are many different kinds of plants. But scientists can classify all plants into two groups: **vascular** and **nonvascular**.

Vascular plants have roots, a stem and leaves. They use a system of tubes to transport water and food. Some tubes transport water and **minerals** from the roots to the stems and leaves. Other tubes transport food from the leaves to the rest of the plant. Vascular plants are stronger and grow taller than nonvascular plants.

We can put vascular plants into two main categories: **flowering** and **nonflowering**. Most plants that produce seeds are flowering.

Practice

- Choose the true sentences.
 - There is a small variety of plants in the world.
 - Vascular plants transport food and water through a system of tubes.
 - Some plants have no roots, no stem and no real leaves.
 - Most nonvascular plants are big.
- Complete the Venn diagram.

have roots live in or near water moss need water produce own food trees use a system of tubes

vascular plants

both

nonvascular plants
- Look at the photos and write vascular or nonvascular.

a.

b.

c.

Lesson 1.3

How do plants reproduce?

Plants need male and female parts to reproduce. Together, the male and female parts make seeds that will become new plants. Some flowers have both male and female parts. Other flowers have either male or female parts.

The stamen is the male part of the flower. The stamen consists of the **anther** and the **filament**. The anther makes **pollen**.

The carpel is the female part of the flower. The carpel consists of the **stigma**, the **style** and the **ovary**.

Pollination is when the pollen moves from the male part of a flower to the female part. In **self-pollination**, a flower pollinates itself. **Cross-pollination** is when one flower pollinates another. Pollinators, such as the wind, birds and insects, transport pollen from one flower to another.

Fertilization is the next step in the process of reproduction. A pollen grain lands on the stigma. The pollen grain grows a pollen tube down through the style to the ovary. Part of the male cell in the pollen grain passes down the tube to fuse with a female cell, or ovule, in the ovary. Fertilized ovules develop into seeds. The rest of the ovary develops into a fruit that contains one or more seeds. The seeds can then grow into new plants.

stamen (male part)

anther

filament

pollen

stigma

style

ovary

ovule

carpel (female part)

Practice

- List three pollinators.
- Label the pictures.

anther cross-pollination filament self-pollination stigma style

a.

b.

c.

d.

e.

f.
- Order the stages of self-pollination 1-5.
 - The fertilized ovule develops into a seed, and the ovary becomes a fruit.
 - Pollen goes from the anther to the stigma.
 - The pollen grain fertilizes an ovule.
 - Seeds in the fruit germinate and make new plants.
 - The pollen grain grows a tube down the stigma to the ovary.

Extend!

Check your understanding and find out more!

Evaluate!

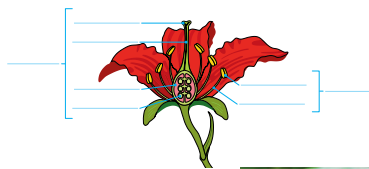
Check your progress!
At the end of each unit,
there are plenty of
activities to see how
much you have learned.

Evaluate!

Check my progress

- 1 Choose the words that relate to vascular plants.
- | | | |
|--------------------------------|-----------------------------|------------------------------------|
| ☐ no roots | ☐ stem | ☐ nonflowering |
| ☐ leaves | ☐ moss | ☐ fern |
| ☐ spores | ☐ seeds | ☐ flowers |

- 2 Label the flower. Write the labels for the female parts in red and the male parts in blue.
- anther carpel filament ovary ovule stamen stigma style



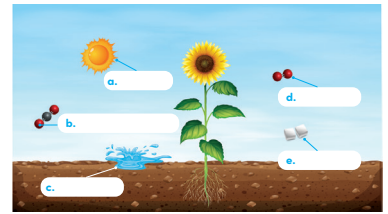
- 3 Circle the correct words to complete the sentences.

Cross-pollination / self-pollination is when pollinators transport **nectar / pollen** between flowers. Pollinators carry pollen from the **anther / sepal** to the **petal / stigma**. Then the pollen grows a tube down the **anther / style** to the **ovary / filament**. It **fertilizes / germinates** an ovule. This makes a **stem / seed**. The ovary becomes a **fruit / flower**.



Evaluate!

- 1 Label the picture.



- 2 Complete the summary.

carbon dioxide energy glucose photosynthesis roots water

_____ is the process plants use to make food. Chlorophyll captures light from the Sun. Stomata take in _____ from the air. _____ absorb water. Photosynthesis uses the sunlight, carbon dioxide and _____ to make _____.

- 3 Describe briefly the four stages in the life cycle of a flowering plant.

- a. germination: _____
b. growth: _____
c. reproduction: _____
d. death: _____

21

Glossary

- A** **absorb** Take in (e.g., light or water).
adapted (Of a living thing) with suitable features to survive in its environment.
adequate diet Enough food to survive.
air resistance Friction caused by air.
anther The part of the stamen of a flower that produces pollen.
anus The final organ of the digestive system through which waste leaves the body.
aquatic Growing or living in, on or near water.
asteroid A large rock that orbits the Sun.
atmosphere The gases surrounding a planet.
atom The smallest particle of an element.
attract Pull toward.
axis An imaginary line between the North Pole and the South Pole around which Earth rotates.
- B** **balanced diet** A variety of food from food groups that maintains health and growth.
balanced forces Forces of the same strength acting in opposite directions, resulting in no change in movement.
behavioral adaptation Something an animal does in order to survive in its environment.
biodiversity The variety of species of animals and plants in an area.
- C** **boiling point** The temperature at which a liquid changes to a gas.
camouflage A physical adaptation that allows living things to hide from other living things.
carbohydrate A nutrient in food that the body uses for heat and energy.
carbon dioxide A gas that plants use in photosynthesis to make food and all living things produce during respiration.
carnivore An animal that eats only other animals.
carpel The female part of a flower, comprising the stigma, style and ovary.
chlorophyll A green substance in plants that absorbs light energy to make glucose from carbon dioxide and water.
condensation The change of state from a gas to a liquid.
contaminate Make something impure by introducing a germ or harmful substance.
cross-pollination The transfer of pollen from the anther of one flower to the stigma of another flower.
- D** **dairy product** Milk or any of the foods made from milk, such as cheese, yogurt or butter.
decibel (dB) A unit of measurement of the volume of sound.
decompose Break down dead matter into more simple parts.

130

Glossary

- E** **digestion** The process of breaking down food into nutrients and waste.
digestive system The system in the body that breaks down food, absorbs nutrients and expels waste.
disinfection The process of killing or removing germs from food or water.
dissolve (Of a solid) mix with a liquid and form a solution.
droppings The feces of animals such as rodents and birds.
- F** **eco-friendly** Of a product or service that causes no harm to the environment.
element A pure substance made of only one of the 118 types of atoms, such as gold or oxygen.
ellipse An oval shape.
equator An imaginary circle around the middle of Earth that separates the Northern and Southern Hemispheres.
esophagus A tube that connects the throat to the stomach in the digestive system.
evaporate Change from a liquid state to a gas state.
evaporation The change of state from a liquid to a gas.
- G** **gas** A state of matter in which the particles do not have a fixed volume or shape.
gaseous Having the characteristics of a gas.
germination The initial growth of a seed or spore.
- H** **fertilization** The joining of a male cell (such as in pollen) and a female cell (such as an ovule) that leads to new life.
fertilizer Something added to soil to help plants grow.
fiber Something in fruit and vegetables that is not digested but helps the body move food through the digestive system.
filament The long thin part of the stamen of a flower that supports the anther.
filtration The process of separating solids from a liquid or gas.
flowering (Of a plant) reproducing by flowers, fruit and seeds.
force A push or a pull.
freezing The change of state from a liquid to a solid.
freezing point The temperature at which a liquid changes to a solid.
frequency The number of vibrations of the source of a sound per second, which determines the pitch of its sound.
fresh water Water from a river, lake, snow or ice with no salt in it.
friction A force that causes an object to slow down when it rubs against another object.

131

Glossary

At the back of the book, there is a Glossary with definitions of all the important scientific words you will need to understand.

This science course helps you develop these global skills, too.
Look out for these symbols next to activities:



Collaborative learning

Work with others to improve your knowledge and develop your interpersonal and social skills.



Critical thinking

Apply what you have learned, analyze information, form new ideas and communicate them to others.



Research

Find out new things about the topic in books or online, select important information and present your findings.



Social and emotional development

Respond to topics as an individual or as a member of society, and discuss your thoughts and feelings about them.

+ Contents

UNIT 1

Plants **Biology**

+ How can I change the color of a flower?	6
+ 1.1 What are vascular and nonvascular plants?	8
+ 1.2 What are the parts of a flower?	10
+ 1.3 How do plants reproduce?	12
+ 1.4 How do plants make food?	14
+ 1.5 What is the life cycle of a flowering plant?	16
+ 1.6 What do plants need to grow?	18
✓ Check my progress	20

UNIT 2

Adaptation **Biology**

+ What do you need to survive?	22
+ 2.1 Why is biodiversity important?	24
+ 2.2 What are plant adaptations?	26
+ 2.3 What adaptations help seed dispersal?	28
+ 2.4 What are animal adaptations?	30
+ 2.5 What is camouflage?	32
+ 2.6 What adaptations do aquatic animals have?	34
✓ Check my progress	36

UNIT 3

The digestive system **Biology**

+ How do we break up food?	38
+ 3.1 How do you digest your food?	40
+ 3.2 What is a balanced diet?	42
+ 3.3 What is food science?	44
✓ Check my progress	46

UNIT 4

States of matter **Chemistry**

+ Is it a solid, a liquid or a gas?	48
+ 4.1 What is matter?	50
+ 4.2 What are the states of matter?	52
+ 4.3 What are some common gases?	54
+ 4.4 What are the properties of water?	56
+ 4.5 What are evaporation and condensation?	58
✓ Check my progress	60

UNIT 5

Mixtures **Chemistry**

+ Which mixtures can you separate?	62
+ 5.1 What are a mixture, a solution and a suspension?	64
+ 5.2 How can you separate solutions?	66
+ 5.3 What is solubility?	68
✓ Check my progress	70

UNIT 6

Forces **Physics**

+ How does it fall?	72
+ 6.1 What is a force?	74
+ 6.2 What is a force diagram?	76
+ 6.3 What is friction?	78
+ 6.4 What is gravity?	80
+ 6.5 What is water resistance?	82
✓ Check my progress	84

UNIT 7

Magnets **Physics**

+ Can you move it?	86
+ 7.1 What is a magnetic material?	88
+ 7.2 Do magnets have different strengths?	90
✓ Check my progress	92

UNIT 8

Sound **Physics**

+ How can you change sounds?	94
+ 8.1 What are vibrations?	96
+ 8.2 What is frequency?	98
+ 8.3 What is volume?	100
✓ Check my progress	102

UNIT 9

Planet Earth **Earth and space**

+ Where does the water go?	104
+ 9.1 What is the atmosphere?	106
+ 9.2 What are the layers of the atmosphere?	108
+ 9.3 Why is water a valuable resource?	110
+ 9.4 What happens in the water cycle?	112
+ 9.5 What is water pollution?	114
+ 9.6 How can we prevent water pollution?	116
✓ Check my progress	118

UNIT 10

Earth in space **Earth and space**

+ How do things move around the Sun?	120
+ 10.1 How does Earth move?	122
+ 10.2 What are the seasons of the year?	124
+ 10.3 What is a satellite?	126
✓ Check my progress	128
✓ Glossary	130