Marshall Cavendish Education

Cambridge Assessment International Education

Endorsed for teacher support

Cambridge Primary Science

Teacher's Guide

2nd Edition

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How to Use This Book

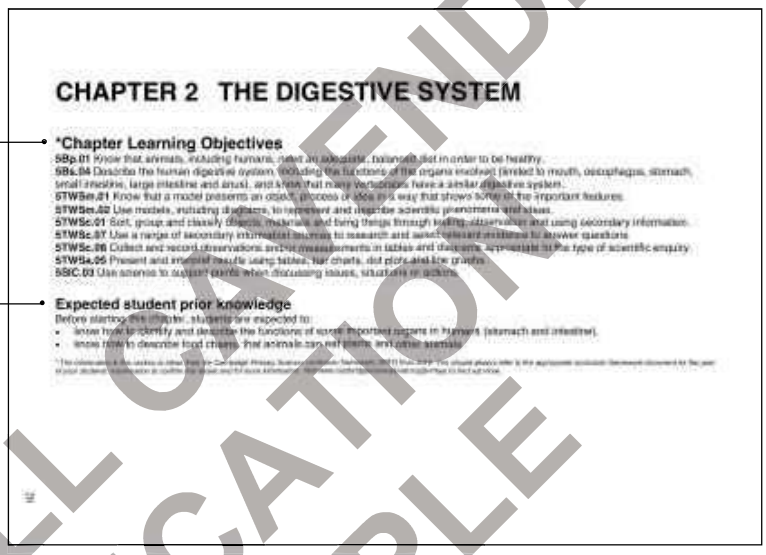
This **Teacher's Guide** is part of the Marshall Cavendish Education (MCE) suite of Cambridge Primary Science resources, designed and created to support you as you teach the **Primary Science (0097)** syllabus.

The Teacher's Guide provides convenience for teachers with great lesson and activity ideas. It contains step-by-step lesson plans to help teachers prepare lessons with ease. The language is simple and concise for all teachers, including non-native speakers, to comprehend. The intent is to ensure that teachers are well-supported to deliver an enhanced learning experience.

The Teacher's Guide has the following features:

Chapter Learning Objectives provide an overview of what students are expected to achieve at the end of a chapter. The relevant learning objective codes are included to help you match the content to the Cambridge Primary Science curriculum framework.

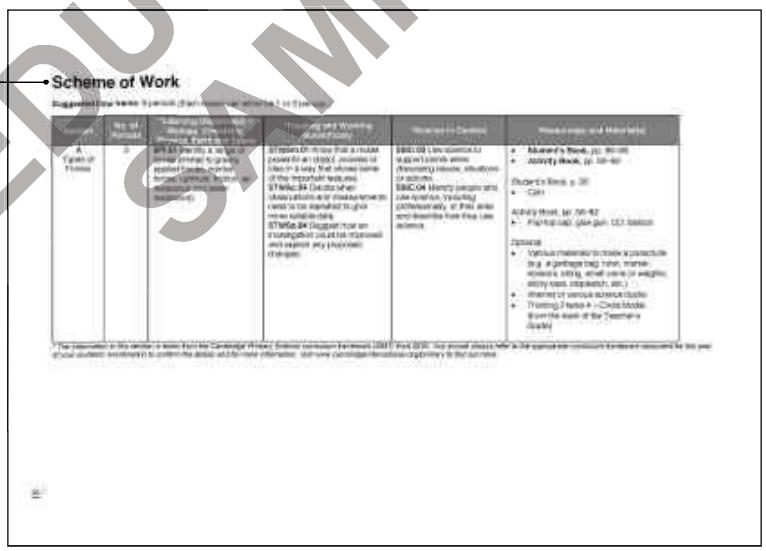
Expected student prior knowledge helps you evaluate what students already know and pitch the teaching of the lesson at the right level.


CHAPTER 2 THE DIGESTIVE SYSTEM

*Chapter Learning Objectives

Expected student prior knowledge

Scheme of Work provides an overview of the chapter to help you manage your lesson planning and prepare what you need for the chapter.


Scheme of Work

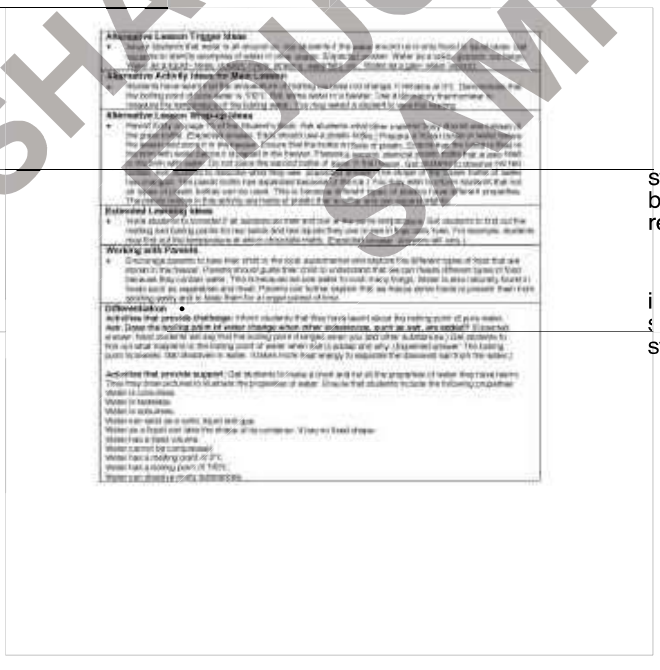
Section Learning Objectives are listed at the start of every section.

Science Words to Highlight include the new scientific terms in the Student's Book chapter.

Lesson Plan outlines teaching ideas to help you conduct an engaging lesson step-by-step.
If you are an experienced teacher, the editable Lesson Plan allows you to customise your lesson, making use of selected parts of the Teacher's Guide to support your teaching flow and include your own teaching ideas.

Common misconceptions highlight incorrect concepts that are misunderstood.

Alternative Lesson Trigger Ideas, Activity Ideas for Main Lesson and **Lesson Wrap-Up Ideas** further creative ways to engage students.

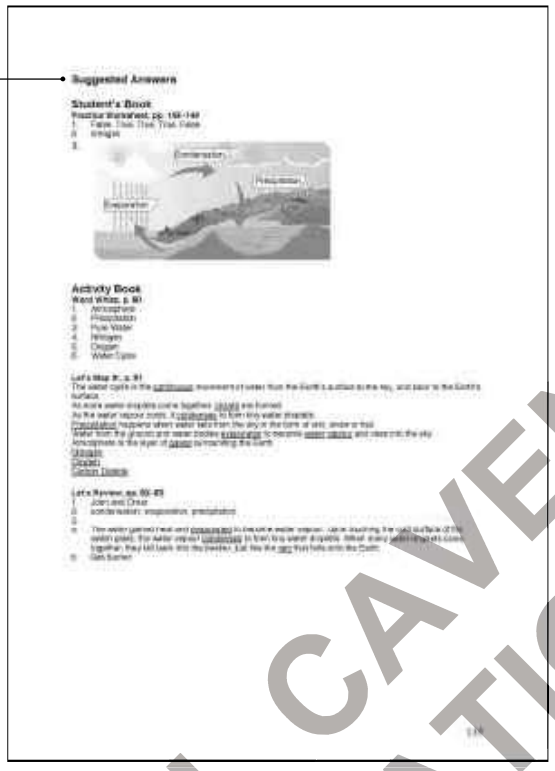


home-

students to extend their learning beyond the classroom by making real-world connections.

students.

Suggested Answers to the questions in the Student's Book and Activity Book are provided to support teaching.

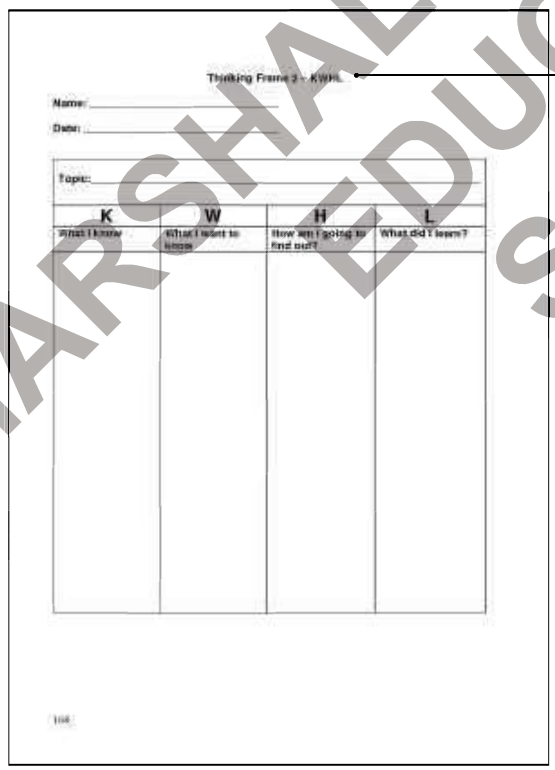


Suggested Answers

Student's Book

Activity Book

Thinking Frames are included at the back of the book. You are encouraged to refer to them or photocopy them for use in class for students to demonstrate their thinking.



Thinking Frame 3 - KWHL

Name: _____

Date: _____

Topic: _____

K	W	H	L
What I know	What I want to know	How am I going to find out?	What did I learn?

Contents

CHAPTER 1 FLOWERING PLANTS

*Chapter Learning Objectives

5Bs.01 Know that not all plants produce flowers.
5Bs.02 Identify the parts of a flower (limited to petals, sepals, anthers, filaments, stamens, stigma, style, carpel, and ovary).
5Bs.03 Describe the functions of the parts of a flower (limited to petals, anthers, stigma and ovary).
5Bp.02 Know the stages in the life cycle of a flowering plant.
5Bp.03 Describe how flowering plants reproduce by pollination, fruit and seed production, and seed dispersal.
5Bp.04 Describe seed germination and know that seeds, in general, require water and an appropriate temperature to germinate.
5TWSm.01 Know that a model presents an object, process or idea in a way that shows some of the important features.
5TWSm.02 Use models, including diagrams, to represent and describe scientific phenomena and ideas.
5TWSp.01 Ask scientific questions and select appropriate scientific enquiries to use.
5TWSp.02 Know the features of the five main types of scientific enquiry.
5TWSp.03 Make predictions, referring to relevant scientific knowledge and understanding within familiar and unfamiliar contexts.
5TWSp.04 Plan fair test investigations, identifying the independent, dependent and control variables.
5TWSp.05 Describe risks when planning practical work and consider how to minimise them.
5TWSc.01 Sort, group and classify objects, materials and living things through testing, observation and using secondary information.
5TWSc.02 Complete a key based on easily observed differences.
5TWSc.03 Choose equipment to carry out an investigation and use it appropriately.
5TWSc.08 Collect and record observations and/or measurements in tables and diagrams appropriate to the type of scientific enquiry.
5TWSa.01 Describe the accuracy of predictions, based on results.
5TWSa.03 Make a conclusion from results informed by scientific understanding.
5TWSa.04 Suggest how an investigation could be improved and explain any proposed changes.
5SIC.04 Identify people who use science, including professionally, in their area and describe how they use science.

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Expected student prior knowledge

Before starting this chapter, students are expected to:

- know the function of roots, leaves, stems and flowers.
- know what conditions plants need to be healthy.

Scheme of Work

Suggested time frame: 10 periods (Each lesson can either be 1 or 2 periods.)

Section	No. of Periods	*Learning Objective(s) – Biology, Chemistry, Physics, Earth and Space	*Thinking and Working Scientifically	*Science in Context	Resource(s) and Material(s)
A Flowers	2	**5Bs.01** Know that not all plants produce flowers. **5Bs.02** Identify the parts of a flower (limited to petals, sepals, anthers, filaments, stamens, stigma, style, carpel, and ovary). **5Bs.03** Describe the functions of the parts of a flower (limited to petals, anthers, stigma and ovary).	**5TWSm.01** Know that a model presents an object, process or idea in a way that shows some of the important features. **5TWSp.05** Describe risks when planning practical work and consider how to minimise them. **5TWSc.01** Sort, group and classify objects, materials and living things through testing, observation and using secondary information. **5TWSc.02** Complete a key based on easily observed differences. **5TWSc.08** Collect and record observations and/or measurements in tables and diagrams appropriate to the type of scientific enquiry.		• **Student's Book,** pp. 3–7 • **Activity Book,** pp. 1–2 Activity Book, pp. 1–2 • Two flowers from two different plants, one piece of cardboard, magnifying glass (optional), one pair of tweezers, two paper plates

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Section	No. of Periods	*Learning Objective(s) – Biology, Chemistry, Physics, Earth and Space	*Thinking and Working Scientifically	*Science in Context	Resource(s) and Material(s)
B Reproduction in Flowering Plants	3	**5Bp.02** Know the stages in the life cycle of a flowering plant. **5Bp.03** Describe how flowering plants reproduce by pollination, fruit and seed production, and seed dispersal.	**5TWSm.01** Know that a model presents an object, process or idea in a way that shows some of the important features. **5TWSm.02** Use models, including diagrams, to represent and describe scientific phenomena and ideas. **5TWSc.01** Sort, group and classify objects, materials and living things through testing, observation and using secondary information.		• **Student's Book,** pp. 8–14 • **Activity Book,** p. 3 Student's Book, p. 8 • Stickers from the back of the Student's Book Activity Book p. 3 • Ruler, pen, paper plate, crayons or colour pencils Optional • Photographs of a real tree and a real seed
C Germination of Seeds	5	**5Bp.04** Describe seed germination and know that seeds, in general, require water and an appropriate temperature to germinate.	**5TWSp.01** Ask scientific questions and select appropriate scientific enquiries to use. **5TWSp.02** Know the features of the five main types of scientific enquiry. **5TWSp.03** Make predictions, referring to relevant scientific knowledge and understanding within familiar and unfamiliar contexts. **5TWSp.04** Plan fair test investigations, identifying the independent, dependent and control variables. **5TWSc.03** Choose equipment to carry out an investigation and use it appropriately.	**5SIC.04** Identify people who use science, including professionally, in their area and describe how they use science.	• **Student's Book,** pp 15–21 • **Activity Book,** pp. 4–10 Student's Book, p. 15 • Various materials to investigate if water is needed for seeds to germinate Activity Book, pp. 4-5 • Two plastic cups, soil, marker, four mung beans, water Optional • Thinking Frame 2 – KWHL (from the back of the Teacher's Guide)

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Section	No. of Periods	*Learning Objective(s) – Biology, Chemistry, Physics, Earth and Space	*Thinking and Working Scientifically	*Science in Context	Resource(s) and Material(s)
			5TWSc.08 Collect and record observations and/or measurements in tables and diagrams appropriate to the type of scientific enquiry. **5TWSa.01** Describe the accuracy of predictions, based on results. **5TWSa.03** Make a conclusion from results informed by scientific understanding. **5TWSa.04** Suggest how an investigation could be improved and explain any proposed changes.		

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Section A Flowers

Number of Periods: 2

***Section Learning Objectives**

5Bs.01 Know that not all plants produce flowers.
5Bs.02 Identify the parts of a flower (limited to petals, sepals, anthers, filaments, stamens, stigma, style, carpel, and ovary).
5Bs.03 Describe the functions of the parts of a flower (limited to petals, anthers, stigma and ovary).
5TWSm.01 Know that a model presents an object, process or idea in a way that shows some of the important features.
5TWSp.05 Describe risks when planning practical work and consider how to minimise them.
5TWSc.01 Sort, group and classify objects, materials and living things through testing, observation and using secondary information.
5TWSc.02 Complete a key based on easily observed differences.
5TWSc.08 Collect and record observations and/or measurements in tables and diagrams appropriate to the type of scientific enquiry.

Science Words to Highlight

- anther, carpel, filament, flowering plants, flowers, non-flowering plants, ovary, petals, stamen, stigma

Common Misconceptions

Misconception 1: All plants produce flowers.
Correct concept: Plants are classified into flowering and non-flowering plants.
How to address:
Ask: Have you seen a plant with only leaves and no flowers, regardless at which time of the year?
Explain to students that not all plants bear flowers. There are some plants like ferns, that do not have flowers, regardless which time of the year or at which stage of their life cycle. This is because they are non-flowering plants.

Misconception 2: Plants are either male or female like animals or have no gender.
Correct concept: Plants have both male and female reproductive organs that help them reproduce.
How to address:
Ask: What are the male structures of a plant that you know of? What are the female structures of a plant that you know of? Have you seen both the male and female structure on the same plant?
Explain to students that the male and female structures are found in flowers. Although there are some flowers with only male or female structures, most flowers have both male and female structures within the same flower. There are also some plants which have only male or female structures in the entire plant.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 1 (40 min)	
Lesson Trigger **(5 min)**	• You may wish to give an overview of the chapter to the students by referring to the list of the learning aims for this chapter in the table of contents of the Student's Book. • Start the lesson by showing students the pictures on page 3 of the Student's Book. • **Ask: What are the differences between the two flowers?** (Expected answer: Colour, shape, number of flowers. Answers may vary.) • **Ask: Which flower would be more attractive to insects and why?** (Expected answer: The yellow flower would be more attractive to insects as it is brightly coloured.) • Get students to complete the short writing activity. (Expected answer: Answers may vary. Students should name a bright colour, such as orange, red or yellow, instead of the colour black or white.)

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Pre-evaluation **(5 min)**	• Refer to 'Thinking Cap' on page 4 of the Student's Book. (Expected answer: Answer may vary. Some students may be aware that there male and female reproductive parts.) • Guide students to recall what they know about flowers and what flowers contain. Students should recall that flowers help some plants reproduce and that the flowers contain the reproductive structures of these plants.
Activity **(15 min)**	• Refer to 'Let's Explore!' on page 4 of the Student's Book. • **Health and Safety Warning:** Before beginning 'Let's Explore!', ensure that students who have plant or pollen allergies do not come in contact with the flowers and are kept a safe distance away. It is important that the health and safety measures stated by your country, city and/or school are strictly followed. • Students are going to walk around the school or nearby garden in groups and make observations on the plants they see. • **SEL:** Emphasise that it is very important to be respectful of all living things. Explain that the plants should be inspected carefully and not be picked or damaged. • **Ask: What do you look out for to tell if something is a plant?** (Expected answer: It should have roots, a stem and leaves. Note that some students may say that plants should have flowers too.) • **Ask: What are some common parts of plants?** (Expected answer: Answers may vary. Roots, stem and leaves.) • **Ask: Do all plants have flowers?** (Expected answer: Yes or no, depending on student's prior knowledge) • Students' answers will help you identify Misconception 1 (refer to 'Common Misconceptions' at the beginning of the section). Go through the explanations to ensure that students are aware of the correct concept. • In preparation it would be good to have walked previously so that you will be able to research and name some of the plants. Students will need these names to complete the task next. • To link with the Thinking and Working Scientifically strand of the curriculum, inform students that they are required to sort the flowers through observation. They will also be creating a key based on these easily observed differences. • Let students formulate a question to ask based on the observed features of the plants they have gathered so far. They can then sort the plants into the respective groups according to the question they have come up with. • For students who need additional support, you could give an example after a few minutes if students are struggling. (Expected answer: Answers may vary. Does it have white flowers? Do the flowers grow in a single stalk?)
Explanation **(10 min)**	• **Ask: Do all plants have flowers?** • Get students to use the features they observed in the beginning of the lesson. They should arrive at the answer 'no'. • Refer to 'Let's Learn' on page 5 of the Student's Book. Get students to look at the examples of flowering and non-flowering plants on the page. • Get students to list out the major parts of a plant. They can peer assess each other using the pictures in the Student's Book. • Refer to the content on parts of a flower on page 6 of the Student's Book. • **Ask: Do flowering plants have the same parts?** (Expected answer: Yes or no, depending on student's prior knowledge) • The question posed above can lead you into introducing what a model is and why we use it — to identify and understand the common features of flowers since not all flowers look the same to us. • **Ask: Do you think plants have male and female gender just like animals do?** (Expected answer: Answers may vary. Most students might say 'yes'.) • Students' answers will help you identify Misconception 2 (refer to 'Common Misconceptions' at the beginning of the section). Go through the explanations to ensure that students are aware of the correct concept. • Take students through the parts of the flower and their functions on pages 6 and 7 of the Student's Book. • To check students' understanding, you could run a match-up task, where students have to match each part of a flower with its corresponding function. • **Ask: Does a flowering plant bear flowers all the time?** (Expected answer: Answers may vary. Some students may say 'no' as they have observed that the plants in the garden go through periods of time without flowers on them.)

	• This will be a good chance to move into the topic of the life cycle of flowering plants. You may wish to ask students if plants do not always bear flowers, at which stage they start producing flowers. This can serve as a lead-in to the next section. • **ESL:** Highlight and explain the meanings of the words in 'Word Boost'. surround – to be all around something function – the purpose or role of a structure of an object
Lesson Wrap-up **(5 min)**	• Get students to answer the question in 'Check Your Learning' on page 7 of the Student's Book. (Expected answer: Answer may vary. The anther contains a powdery substance called pollen, which is made of pollen grains. / The petals of some flowers are brightly coloured. They attract insects that transfer pollen from the male part to the female part. This helps the plant to reproduce. / The stigma is the part that pollen grains land on. / The ovary contains one or more ovules. Ovules may develop into seeds.) • Ask students to tick the 'I can' boxes on page 7 of the Student's Book to assess their progress at the end of the section. Ensure that all misconceptions are rectified by the end of this lesson.

Alternative Lesson Trigger Ideas

- Divide students into groups. Invite students to imagine there is a bee looking for a flower. Ask each group to design a flower that the bee would be most attracted to and present their design to the class. Encourage students to discuss and vote for the type of flower that would most likely attract the bee.
- Show pictures of a rose and a black bat flower. Encourage students to imagine and role play that they are a bee. Invite students to discuss which flower they would prefer and why.

Alternative Activity Ideas for Main Lesson

- Provide students with different parts of a flower that they need to piece together, like a jigsaw puzzle, to form a whole flower. Get students to name the parts of the flower and their functions when the puzzle is complete.
- Get students to make flash cards for each part of the flower. Each card should include a drawing of either a whole flower with a label for the flower part being referenced, or the flower part on its own and a description of its function. Students can then assess each other using their cards.

Alternative Lesson Wrap-up Ideas

- Present students with various pictures of different flowers. Select students to identify and describe the function of the parts of a flower in the various pictures.
- Invite students to share some examples of the different types of flowering and non-flowering plants they often see around their home. Encourage students to describe and discuss whether the flowering plants have similar or different flowers and flower parts.

Extended Learning Ideas

- Flowers grow in many regions in the world. Show students different types of flowers growing in different regions. **Ask: Why are flowers growing in different regions different?** (Expected answer: To suit the environment/conditions they live in)
- Ask students how we can or have been able to change some of the characteristics of flowers to benefit us. Students may conduct research using the Internet or science books to find out how scientists have changed certain characteristics of flowers to benefit people.

Working with Parents

- Encourage parents to take the family out on a trip to a garden or park with various types of plants. Parents can guide their child to observe and compare different flowers and their various parts.

Differentiation

Activities that provide challenge: Get students to use the Internet or science books to find out about the largest flower in the world. Challenge students to try and label the parts of the flower that they can see.

Activities that provide support: Show students a diagram of a flower similar to the diagram on page 6 of the Student's Book. Make sure that there are lines pointing to the following parts of the flower: petal, sepal, anther, filament, stamen, stigma, style, ovary, ovules. Provide students with labels of the flower parts and ask students to match the labels to the label lines pointing to the correct parts.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 2 (40 min)	
Lesson Start **(5 min)**	• Prepare two different flowers for each student before this lesson. Alternatively, students may bring two different flowers of their choice. • **Health and Safety Warning:** Ensure that students who have plant or pollen allergies do not come in contact with the flowers and are kept a safe distance away. It is important that the health and safety measures stated by your country, city and/or school are strictly followed.
Activity **(30 min)**	• Refer to Activity 1A on pages 1 and 2 of the Activity Book. • Go through steps 1 to 4 briefly. • Draw students' attention to the speech bubble of the robot mascot. • To link with the Thinking and Working Scientifically strand of the curriculum, get them to think in pairs, about the possible risks in this activity. In their discussion, they should also think of ways to reduce the risks they have identified and talk about how they would handle the materials safely to prevent any accidents. • Have some students share about their discussion before the start of the activity to ensure that the class proceeds with the activity safely. • Get students to complete Activity 1A on pages 1 and 2 of the Activity Book. • Get students to record their observations by pasting the flower parts in the tables provided. They should be able to separate the parts by gently using their hands. • Inform students that the parts of a flower are fragile. Students should work slowly and gently to avoid damaging the various parts of the flower. • Wherever possible, encourage students to use the same parts from each flower for this activity. This enables students to compare how these parts are similar or different. • Encourage students to use the parts of the flowers they have learnt on pages 6 and 7 of the Student's Book. (Expected answers: 5a. Students should label these parts of their flowers – petals, sepals, anthers, filaments, stamens, stigma, style, carpel, and ovary. They should list the functions of these parts – petals, anthers, stigma and ovary. b. Answers may vary. c. Answers may vary. 6. Ferns, conifers)
Lesson Wrap-up **(5 min)**	• Get students to compare and discuss their answers to question 5 of Activity 1A on page 2 of the Activity Book. • **Ask: Why do you think some of these flower parts are the same/different?** (Expected answer: Answers may vary. The flowers are taken from the same/different areas with the same/different living conditions.) • This can be extended by asking students if they would be able to recognise these differing parts of flowers if we do not have models to refer to. Students' answers may vary but this will help to reinforce the importance of models in the learning of science.

Section B Reproduction in Flowering Plants

Number of Periods: 3

***Section Learning Objectives**
5Bp.02 Know the stages in the life cycle of a flowering plant.
5Bp.03 Describe how flowering plants reproduce by pollination, fruit and seed production, and seed dispersal.
5TWSm.01 Know that a model presents an object, process or idea in a way that shows some of the important features.
5TWSm.02 Use models, including diagrams, to represent and describe scientific phenomena and ideas.
5TWSc.01 Sort, group and classify objects, materials and living things through testing, observation and using secondary information.

Science Words to Highlight

- fertilisation, life cycle, pollination, seed dispersal

Common Misconceptions

Misconception 1: Plants produce seeds on their own (pollination or fertilisation is not needed).
Correct concept: Pollination and fertilisation need to take place before seed formation can happen.
How to address:
Ask: Have you heard of pollination and fertilisation? What is pollination and what is fertilisation?
Explain to students that pollination is the transfer of the pollen from the male part to the female part of a flower, while fertilisation happens when the pollen and egg join. Some students may think that pollination and fertilisation refer to the same process. Point out that these are different processes, and both are necessary before seeds are formed.

Misconception 2: All seeds from the same plant have the same size and shape.
Correct concept: Seeds from the same plant may come in a variety of sizes and shapes.
How to address:
Ask: Have you paid attention to the seeds from the apple that you eat? Do they all have the same size and shape?
Explain to students that many factors come into play during fertilisation, which can affect the size or even shape of every single seed produced. Point out that this is why we can sometimes notice that seeds may be of various sizes and shapes, even if the seeds come from the same fruit.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 3 (80 min)	
Lesson Trigger and Pre-evaluation **(10 min)**	• Refer to 'Thinking Cap' on page 8 of the Student's Book. Display pictures of a real tree and a real seed on the board. Get students to observe the pictures on the board. • Ask students to discuss how a large tree could grow from a tiny seed. (Expected answer: Students may refer to one or more stages in the process of germination. For example, roots will help absorb water and nutrients to help the seed grow into a small plant. Over time, the small plant grows into a tree as the stem of the plant grows and thickens.)
Activity **(15 min)**	• Refer to 'Let's Explore!' on page 8 of the Student's Book. • Get students to use the stickers at the back of the Student's Book, to show how a plant grows. (Expected answer: Picture of a seed → picture of a seedling → picture of a young plant → picture of an adult plant) • **Ask: How do you think plants change as they grow?** (Expected answer: As the seed grows into a seedling, the roots and stem(s) also develop and grow. The plant produces leaves that make food for the plant. Over time, the plant grows into an adult plant. Some adult plants produce flowers that can help them reproduce.) • To support students in their sharing of ideas, you could write some of the science words you want them to use on the board, for example, 'seed', 'seedling', 'young plant' and 'tree'.

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	• **Ask: What would happen to plants if their leaves were damaged**? (Expected answer: They would not be able to make food, and this would affect their growth and development. Without leaves, the plants would also die.)
Explanation **(50 min)**	• Refer to the life cycle of a flowering plant on pages 9 to 13 of the Student's Book. • Go through the diagram of the life cycle of a flowering plant on page 9 of the Student's Book briefly. • To link with the Thinking and Working Scientifically strand of the curriculum, take the opportunity to reinforce what a model is and why we use it. In this case, a diagram is also a form of model. Explain that the life cycle diagram helps us to understand the scientific ideas and processes involved in the various stages of a plant's growth. • Ask students to describe to a partner what they notice happening at each stage of the life cycle. The partner could generate questions based on observations. For example: Why does the plant grow taller? Why do plants need roots? Would plants be able to grow well without sunlight? Students could carry out research to find answers to these questions as homework. • Guide students through each stage of the life cycle, beginning with pollination on page 10 of the Student's Book. • **Ask: Have you heard of pollination and fertilisation?** (Expected answer: Yes or no depending on student's prior knowledge) • Students' answers will help you identify Misconception 1 (refer to 'Common Misconceptions' at the beginning of the section). Go through the explanations to ensure that students are aware of the correct concept. • **Ask: How does pollination happen?** (Expected answer: Pollination takes place when the pollen from the anther lands on the stigma of the same or a different flower.) • Prompt students to use the appropriate science words when they refer to the parts of the plant involved in pollination. • **ESL:** Highlight and explain the meanings of the words in 'Word Boost'. develop – grow and mature repeat – do something again or more than once cycle – events or actions that are repeated in the same order • **Ask: Why is pollination important?** (Expected answer: Pollination allows the pollen to join with the egg. Once fertilisation is successful, new seeds can be formed. Without pollination, fertilisation cannot happen.) • Refer to the production of fruits and seeds on page 11 of the Student's Book. • **Ask: Why do plants need to be fertilised?** (Expected answer: To produce seeds and fruits so that new plants can grow, and the life cycle of a flowering plant can continue.) • Guide students through the process of fertilisation on page 11 of the Student's Book. • **ESL:** Highlight and explain the meaning of the word in 'Word Boost' tube – long hollow space used for transporting something • Guide students through the process of how fruits and seeds develop after fertilisation on page 12 of the Student's Book. • **ESL**: Highlight and explain the meanings of the words in 'Word Boost' wither – parts of a plant becoming dry swells – becomes bigger ripens – ready to be eaten • Refer to the content on seed dispersal on page 13 of the Student's Book. • Highlight to students the meaning of seed dispersal and why it is such an important stage in the life cycle of a flowering plant. • **Ask: Do all seeds have the same shape and size?** (Expected answer: Yes or no depending on the student's prior knowledge) • Students' answers will help you identify Misconception 2 (refer to 'Common Misconceptions' at the beginning of the section). Go through the explanations to ensure that students are aware of the correct concept. • Get students to look at the different methods of seed dispersal on pages 13 and 14 of the Student's Book. Inform them that they will be learning about the characteristics of the seeds in Chapter 3, Adaptations. • **ESL:** Highlight and explain the meanings of the words in 'Word Boost' overcrowding – having too many things in a space compete – try and win something by beating others scattering – going in various directions

	• Use the MCE Cambridge app to launch the video* on page 14 of the Student's Book about the life cycle of a flowering plant. Project the video on a screen via the MCE Cambridge app.
Lesson Wrap-up **(5 min)**	• Get students to answer the question in 'Check Your Learning' on page 14 of the Student's Book. (Expected answer: Seeds can be dispersed by animals, the wind, explosion and water). • Ask students to tick the 'I can' boxes on page 14 of the Student's Book to assess their progress at the end of the section. Ensure that all misconceptions are rectified by the end of this lesson.
Homework	• Assign the activity on page 14 of the Student's Book as homework. • To link with the Thinking and Working Scientifically stand of the curriculum, inform students that they are to sort the seeds according to the correct method of seed dispersal.

Alternative Lesson Trigger Ideas

- Prepare a range of fruits for students to explore. For fruits that have seeds on the inside, prepare cut sections of the fruit before the lesson. Get students to observe the fruits and identify their seeds. Invite students to discuss why fruits have seeds. Students may also be asked to discuss the similarities or differences between the seeds of the different fruits.

Alternative Activity Ideas for Main Lesson

- Divide students into groups. Engage each group to role play the life cycle of a flowering plant. Students can use actions to represent structures such as the pollen and anthers. Encourage students to explain each stage of the life cycle in their role play.

Alternative Lesson Wrap-up Ideas

- Get students to design and describe their perfect seed. Students should consider how the design of their seed can help it be dispersed successfully.

Extended Learning Ideas

- Students can find out how familiar flowering plants around them grow. Get students to compare the growth process of these flowering plants to see that the life cycle is the same for all. Have them present the life cycle of their flowering plants using pictures and arrows.

Working with Parents

- Encourage parents to collect the seeds of the fruits eaten at home. Parents can ask their child to compare and discuss the similarities and differences between the different types of seeds. Parents can also inform their child of how the seeds of the different fruits are dispersed.
- Parents and their child can work together to make a poster of the life cycle of a flowering plant. The poster can then be displayed on a wall in their home for the child to review.

Differentiation

Activities that provide challenge: Inform students that not all plants have seeds. Get students to find out how these plants can reproduce without seed dispersal. Encourage students to find out characteristics of the plant that help it reproduce, for example spores are light and can easily detach and float to another location.

Activities that provide support: Provide students with pictures of different types of seeds and pictures showing the different methods of dispersal (wind, water, animal, explosion). Get students to match the type of seed with the dispersal method and encourage them to give reasons for their answers.

**This material has not been through the Cambridge International endorsement process.*

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 4 (40 min)	
Lesson Start **(5 min)**	• Get students to share their findings from their homework task in the previous lesson. (Expected answer: Wind – Maple seed; Water – cattail seeds; Animals – Spanish needle seeds; Explosive action – violet) • Review the life cycle of a flowering plant to ensure that students have the correct understanding.
Activity **(30 min)**	• Refer to Activity 1B on page 3 of the Activity Book. • Explain to students that they are creating a model that shows the life cycle of a flowering plant. • To link with the Thinking and Working Scientifically strand of the curriculum, reinforce that a model can help us see the important features of an object, a process or an idea. It can help us to understand how the object, process or idea works. • Get students to complete steps 1 to 4 the activity and share their responses for step 4. (Expected answer: Answers may vary, depending on which section they begin the life cycle in.) • **Ask: Why is the plate divided into four sections?** (Expected answer: The life cycle of a flowering plant has four stages: seed, seedling, young plant and adult plant.) • **SEL:** This is a good opportunity for students to use positive communication skills. Invite students to collaborate with others by sharing ideas and to encourage and compliment each other's work.
Lesson Wrap-up **(5 min)**	• Get students to share any further questions they have about the life cycle of a flowering plant using the five W's and one H. • Encourage students to continue their learning at home by researching on any further questions they have.

Section C Germination of Seeds

Number of Periods: 5

***Section Learning Objectives**

5Bp.04 Describe seed germination and know that seeds, in general, require water and an appropriate temperature to germinate.
5TWSp.01 Ask scientific questions and select appropriate scientific enquiries to use.
5TWSp.02 Know the features of the five main types of scientific enquiry.
5TWSp.03 Make predictions, referring to relevant scientific knowledge and understanding within familiar and unfamiliar contexts.
5TWSp.04 Plan fair test investigations, identifying the independent, dependent and control variables.
5TWSc.03 Choose equipment to carry out an investigation and use it appropriately.
5TWSc.08 Collect and record observations and/or measurements in tables and diagrams appropriate to the type of scientific enquiry.
5TWSa.01 Describe the accuracy of predictions, based on results.
5TWSa.03 Make a conclusion from results informed by scientific understanding.
5TWSa.04 Suggest how an investigation could be improved and explain any proposed changes.
5SIC.04 Identify people who use science, including professionally, in their area and describe how they use science.

Science Words to Highlight

- germination, temperature

Common Misconceptions

Misconception 1: Seeds can germinate at any temperature.
Correct concept: Seeds can germinate only when the right conditions are available. This includes the presence of enough air, water and a suitable temperature.

Misconception 2: Just like plants, seeds require sunlight to germinate.
Correct concept: Light is not necessary for the germination of seeds.

How to address:
You could address both misconceptions by having students carry out scientific enquiry. Get students to make a prediction about whether a suitable temperature or sunlight is required for seeds to germinate. Students can research using the Internet or other secondary sources of information to find out the answer – seeds require a suitable temperature to germinate, and seeds do not need sunlight to germinate. Alternatively, throughout the lesson whenever appropriate, allow students to carry out experiments to address the misconceptions above.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 5 (80 min)	
Lesson Trigger and Pre-evaluation **(5 min)**	• Refer to 'Thinking Cap' on page 15 of the Student's Book. • **Ask: Do all dispersed seeds grow into new plants?** (Expected answer: Not all dispersed seeds grow into new plants.) • Encourage students to think deeper as to why this may not be so and what seeds need to germinate. • **Ask: When will seeds start to germinate?** (Expected answer: Answers may vary. Seeds start to germinate when they receive some water.) • Students' answers will help you identify Misconception 1 and 2 (refer to 'Common Misconceptions' at the beginning of the section).Go through the explanations to ensure that students are aware of the correct concept.

** The information in this section is taken from the Cambridge Primary Science curriculum framework (0097) from 2020. You should always refer to the appropriate curriculum framework document for the year of your students' examination to confirm the details and for more information. Visit www.cambridgeinternational.org/primary to find out more.*

Activity **(45 min)**	• Refer to 'Let's Explore' on page 15 of the Student's Book. • This activity provides students with a chance to plan and carry out a guided investigation. To link with the Thinking and Working Scientifically strand of the curriculum, inform students that they will be practising the skills stated at the top of page 15 during their investigation. • You may wish to provide large sheets of kraft paper and markers for students to plan their investigation on. • Invite students to consider the materials and equipment required in their investigation. These may include the type of seed used, clear plastic cups or jars, cotton wool and water. Remind them to use the materials and equipment appropriately. • Refer to pages 1 and 2 of the Student's Book on where the five main types of scientific enquiries and their respective features are introduced. You may wish to go through the features of each type of scientific enquiry if you have not done so. • To link with the Thinking and Working Scientifically strand of the curriculum, **ask: What types of scientific enquiry would you use in your investigation?** (Expected answers: Answers may vary.) • Get students to justify why they would select a type of scientific enquiry based on the features. • Some students may say that they would use 'Observing Over Time' for this investigation since the investigation would need to happen over some time. Recap that in this type of scientific enquiry, they may observe changes to living things, materials or processes over a period of time. The observations can be made over minutes, hours, days or even years. In this case, the investigation would probably take place over a few days. • Get students to use their prior knowledge to predict the results of the investigation. • Under the correct conditions, the seeds will take two to three days to start germinating. Students should record their daily observations and measurements in a table and derive a conclusion for their investigation. • Get students to share their findings and discuss the accuracy of their prediction based on the results of the investigation after two to three days. • Get students to compare their investigative method with the other groups and think of how they can improve their investigation. Additionally, have students explain why they would like to make those changes.
Explanation **(20 min)**	• Get students to recall the first three stages of the life cycle of a flowering plant. Students should be able to recall that a seed develops into a seedling with roots, a stem followed by leaves. The seedling grows taller, and more leaves develop. The seedling grows into a young plant. • Go through the process of germination on page 16 of the Student's Book. • Go through 'Science at Work' on page 18 of the Student's Book. • To link with the Science in Context strand of the curriculum, highlight to students that agronomists are people who use science, including professionally, in their area. Describe to them briefly what agronomists do. • **Ask: Why is it important for agronomists to study how plants grow in changing conditions? How can plants that live longer benefit us?** (Expected answer: Answers may vary. The availability of some plant crops would be more stable. / To improve the reproduction rate of plants so that more seeds and crops can be produced in a shorter time / To enable plants that were sensitive to changing weather conditions to grow throughout the year / To improve the availability of more types of plant crops for food)
Lesson Wrap-up **(10 min)**	• Get students to answer the question in 'Check Your Learning' on page 18 of the Student's Book. (Expected answer: Air, water and a suitable temperature) • Ask students to tick the 'I can' boxes on page 18 of the Student's Book to assess their progress at the end of the section. Ensure that all misconceptions are rectified by the end of this lesson.

Alternative Lesson Trigger Ideas

- Engage students by asking them to imagine they are an Inuit who has found a seed in the snow. Invite students to discuss if the seed will grow if it was planted in the snow. Then, ask students to imagine they are living in the hottest desert in the world. **Ask: Will the seed grow in this desert?**

Alternative Activity Ideas for Main Lesson

- Get students to observe two pictures. Picture A shows a pot with healthy leaves by a window sill on a sunny day. Picture B shows a pot with only soil and a seed placed in the refrigerator. Invite students to discuss their observations and explain why the seed in picture B did not germinate. Emphasise that a suitable temperature is required for plants to germinate. (Expected answer: The seed in picture B did not germinate because it is placed in a cold place. Seeds require warmth for germination.)

Alternative Lesson Wrap-up Ideas

- List the stages involved in germination on the board, in an incorrect order. Ask students to rearrange the stages of germination in the correct order.

Extended Learning Ideas

- Students can find out about other methods of growing plants, such as hydroponics and vertical crops. **Ask: How do these types of plants obtain suitable conditions they need to grow?** Get students to compare these methods to that of traditional farming and discuss how the methods differ. (Expected answer: Answers may vary. For example, soil is not used in hydroponics, yet the plants are being effectively grown in water. The nutrients required for plant growth are found in the water solution used.)

Working with Parents

- Parents can work with their child to germinate a seed in their own home. Parents can guide their child to discuss what materials are needed and the conditions that are necessary for germination, which includes assessing the best location to place the seed preparation in their home.

Differentiation

Activities that provide challenge: Inform students that seeds have an outer coating. Ask students to think about what characteristics seed coatings should have to cope with different conditions. (Expected answer: Answers may vary. A seed needs a hard coating to protect the seed when it is being transported from location to location, such as by an animal./ A seed needs to be thick or hard enough to prevent other organisms from entering.)

Activities that provide support: Provide a worksheet with sentences on the stages of germination in the correct order. Leave blanks in place of key words. Show students a list of the key words arranged in no particular order. Encourage students to fill in the blanks with the correct key word. Alternatively, students can be asked to describe the stages in sentences rather than just filling in the key words.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 6 (40 min)	
Lesson Start **(5 min)**	• Recall the concepts learnt in the previous lesson on the germination of seeds. • Check that students have the materials required for Activity 1C on pages 4 and 5 of the Activity Book. • **Ask: What do seeds need to germinate?** (Expected answer: The conditions needed such as water, air and a suitable temperature / warmth.) • Have students recall that seeds need water to germinate. Ask them about the investigation they did previously in the Student's book. Get them to briefly mention the steps taken in the investigation.
Activity **(30 min)**	• Refer to Activity 1C on pages 4 to 6 of the Activity Book. • Inform students that they will be conducting another investigation to find out more about the conditions required for seed germination. This investigation will be an open enquiry activity where students decide on the question to investigate. • Go through steps 1 to 10 briefly and allow time for students to plan the investigation. • Remind students that they need to think of the following before planning the investigation: - A question regarding conditions affecting seed germination that can be investigated - Materials and equipment needed to carry out the investigation - Variables to change, measure and to keep the same in the investigation - Possible risks involved in the investigation and how they plan to minimise the risks • If time permits, invite students to share their questions. • **Ask: What makes a good scientific question?** (Expected answer: A good scientific question needs to be one that is testable and where a prediction could be made.) • Should students require guidance to formulate their own questions, get them to start with 'How' or 'What'. • When students' questions have been confirmed, they may begin to complete steps 4 to 7. • Have students write their plan on page 5 of the Activity Book. If space is insufficient, provide large sheets of craft paper and markers for them to plan out their investigation. • This is an opportunity for students to reflect and compare with others to see if their plan is on the right track. They can fine-tune their investigation process. The ownership of this should be on the students to carry out their own inquiry. They may need help with selecting materials and equipment, but otherwise students should be allowed to conduct this activity independently. • You may need to guide students who need additional support on how to make the investigation a fair test. Start by asking them to list all the variables and then thinking about which variables should be changed and which should be kept constant. • Remind students to collect and record their observations in the space on page 6 of the Activity Book.
Lesson Wrap-up **(5 min)**	• As a wrap-up to this activity, get students to share the conclusion to their investigation and discuss the accuracy of their prediction based on the results of the investigation. • Invite students to share about the various conditions required for seed germination, which they have studied through their investigation. • You may get students to complete Thinking Frame 2 – KWHL at the back of the Teacher's Guide to summarise what they know, what they want to know, how they are going to find out and what they have learnt about seed germination.
Homework	• Assign students to brainstorm on ideas for 'Problem-based Learning' on page 17 of the Student's Book as homework. • Explain to students that they will be creating a model to show how pollen can be transferred among flowers. • Inform students that they will have some time to finalise and present their model in the next lesson.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 7 (40 min)	
Lesson Start **(5 min)**	• Students should have carried out a brainstorm on ideas for 'Problem-based Learning' as homework from the previous lesson. • Inform students that they will be given some time to work on steps 1 to 3 of the 'Problem-based Learning'.
Activity **(25 min)**	• To link with the Thinking and Working Scientifically strand of the curriculum, guide students to ask a scientific question that the group wishes to investigate in order for them to understand the pollination process better. • Provide some scaffolding for students to come up with the relevant question to be investigated. For example, you may wish to get students to discuss the pollination concepts which they are unsure of and that they would want to find out more about in order to complete the task. • To link with the Thinking and Working Scientifically strand of the curriculum, ask students to think of the type of scientific enquiry they would use in their investigation. Get them to think of the features of each type of scientific enquiry and make the choice accordingly. • You may wish to refer them to pages 1 and 2 of the Student's Book if necessary. • Most students may choose to use 'Research' in their investigation. Recap that in a research, they find out information about the questions they have. They could speak to people or refer to books or the Internet, which are all considered as sources of information. • Get students to work on their ideas for the machine that their group is going to design. Allow selected groups to present their idea to the class if time permits.
Lesson Wrap-up **(10 min)**	• Get students to evaluate their own ideas. **Ask: What was good about your model? What would you improve?** (Expected answer: Answers may vary.) • Ask students to think of other ways we can help pollinate the flowers.
Homework	• Assign the 'Practice Worksheet' on pages 19 and 20 of the Student's Book as homework. • Assign 'Word Whizz' on page 7 of the Activity Book as homework.

Lesson Plan

The lesson plan below will be available online for teachers to edit and customise according to their requirements.

Lesson 8 (40 min)	
Lesson Start **(10 min)**	• Have students recall what they have learnt across the three sections in this chapter by asking the following questions: - **Ask: What are the parts of a flower and their respective functions?** (Expected answer: Answer may vary. The anther contains a powdery substance called pollen, which is made of pollen grains. The petals of some flowers are brightly coloured. They attract insects that transfer pollen from the male part to the female part. This helps the plant to reproduce. The stigma is the part that pollen grains land on. The ovary contains one or more ovules. Ovules may develop into seeds.) - **Ask: What are the four stages in the life cycle of a flowering plant?** (Expected answer: Seed, seedling, young plant and adult plant) - **Ask: How do flowering plants reproduce?** (Expected answer: Upon pollination, the pollen grain develops the pollen tube downwards into the ovary. The pollen and the egg join. Fertilisation takes place.) - **Ask: What is seed germination and what are the conditions required for it?** (Expected answer: Seed germination happens when a seed develops into a young plant. A seed germinates when there is enough air, water and a suitable temperature.)
Activity **(20 min)**	• Students should have completed the 'Practice Worksheet' on pages 19 and 20 of the Student's Book as homework from the previous lesson. • Go through the questions and answers for the 'Practice Worksheet' in the Student's Book. Use this formative assessment to check students' understanding. • The concepts being tested in the questions are as follows: Q1 – Concepts and misconceptions Q2 – Parts of a flower and functions of flower parts Q3 – Function of a flower part (petals) Q4 – Conditions required for seed germination • Identify the concepts that students had difficulty answering questions on and go through the concepts again if required. Correct any misconceptions that students may still have.
Lesson Wrap-up **(10 min)**	• Go through 'Let's Map It!' on page 8 of the Activity Book to summarise the concepts learnt in Chapter 1.
Homework	• Assign 'Let's Review' on pages 9 to 11 of the Activity Book as homework.

Suggested Answers

Student's Book

Practice Worksheet, pp. 19–20

1. False, True, False, True, False, False
2. anther – contains pollen grains
   ovary – contains ovules that may develop into seeds
   petals – attract insects for pollination
   stigma – the part where pollen lands
3. pollination
4. There is not enough warmth for the seeds to germinate since the temperature in the refrigerator is too cold.

Activity Book

Word Whizz, p. 7

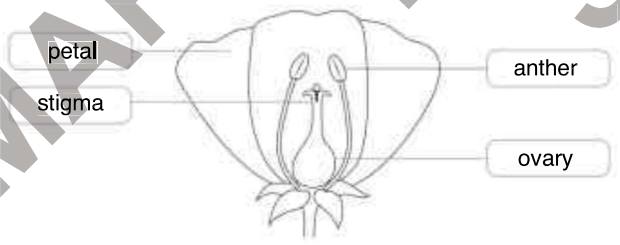
1. Germination
2. Flower
3. Pollination
4. Ovary
5. Seeds
6. Petals
7. Anthers
8. Stigma

Let's Map It!, p. 8

Plants are classified as flowering and non-flowering.
Flowers are the reproductive parts of a plant.
The petals enclose the male and female parts of the flower.
Flowering plants go through various stages of growth and development. This is called a life cycle.
The anther contains pollen.
The stamen contains the male parts of the flower.
Pollen grains are transferred from the anther to the stigma in a process called pollination.
The stigma receives the pollen grains.
The carpel contains the female parts of the flower.
Seeds and fruits start to develop after fertilisation.
The ovary contains ovules that develop into seeds.
Seeds are dispersed by wind, animal, water or explosion.
Seeds need air, water and a suitable temperature for germination.

Let's Review, pp. 9–11

1. petal, anther, stigma
2. a.



   b. During pollination, pollen from the male part called anther is transferred to the female part called stigma.
3. helicopter seeds – wind
   lady fingers – explosion
   berries – animal
   lotus seeds – water
4. Erica wraps some seeds in cotton wool. She sprinkles some water on the cotton wool once a day. She keeps the cotton wool on her table for a week.

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- Activity Book (Stages 1–6)
- Teacher's Guide (Stages 1–6)
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