

Chapter 9

Habitat and Adaptation

We learnt that animals and plants grow together in their environment.



Can you find any animal in the picture? The shape and colour of the animal is very similar to the coral.



Photo of the Pygmy Seahorse hiding in the environment

9.1

Habitats

Lesson 1 Habitats

The environment is everything around us. Plants and animals live in the environment.



What kinds of environment do living things live in?



Activity : Place where plants and animals live

What to Do:

1. Draw a table like the one shown below.

Name of living thing	Place where it lives	Conditions of the place where it lives

2. Study the pictures of plants and animals below. Think about where they live and the conditions of the place. Complete the table.

3. Share your ideas with your classmates. Discuss the place where plants and animals live.



Bird of Paradise



Sea turtle



Water lily



Beetle



Seaweed



Frog



Cuscus



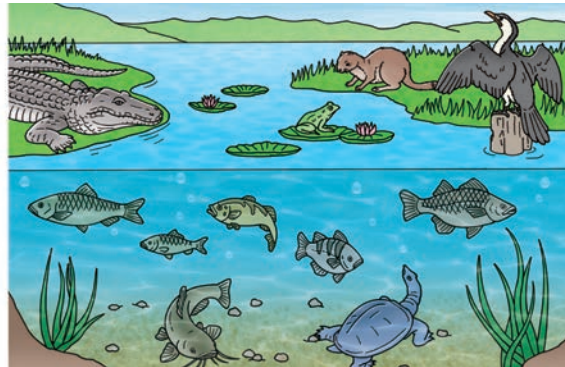
Crab



Crocodile

Summary

Different living things live in different environments. The part of an environment where a plant or an animal lives is called its **habitat**. The habitat provides plants and animals with food, water, shelter and space to live. Rainforests, grasslands, rivers and oceans are different kinds of habitats. Each habitat has different conditions such as temperature, light and moisture. Some habitats are hot and dry. Other habitats are cold and wet. Plants and animals live in the conditions that best meet their needs.



Different living things live in different habitats.



Grassland habitat



Freshwater habitat



Rainforest habitat



Ocean habitat

Lesson 2 Freshwater Habitat

Even though freshwater covers only 3 percent of the Earth's surface, it is also a habitat for many kinds of plants and animals.



What is a freshwater habitat?



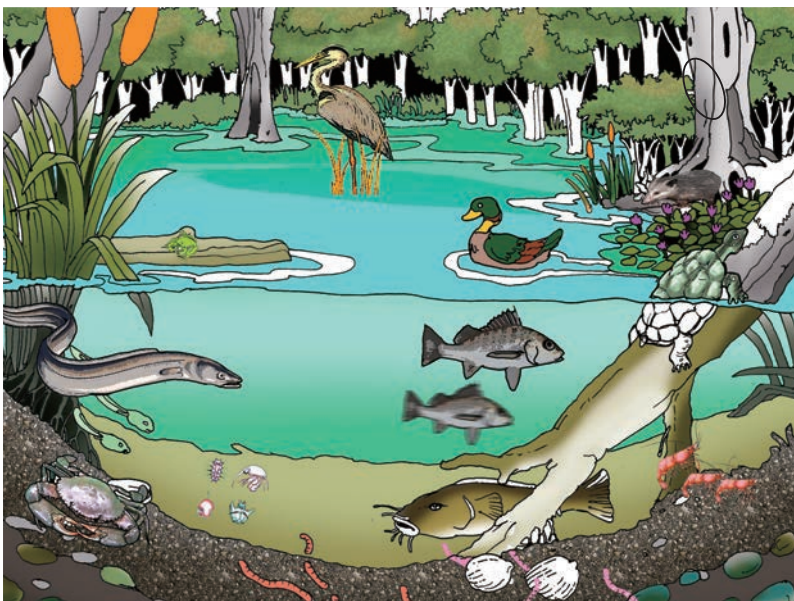
Activity : Living things in freshwater habitats

What to Do:

1. Go out of the classroom and find a freshwater habitat such as; a river, a pond, a wetland or a lake around you.
2. Observe the freshwater habitat and find the living things that live in or around it.
3. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss what kinds of living things that live in and around the freshwater habitat.



I found different kinds of living things in different places.



Living things in freshwater habitat

Date: _____

Place: pond

Frog
Bird
Grass
Small fish
Water lilies

List of living things

1. frog
2.

Summary

Freshwater habitats are natural water sources that do not contain salt. They include streams, rivers, ponds, lakes, wetlands and the area around them. Streams and rivers are flowing water. Ponds and lakes are still water. A wetland is a place where the land is covered by shallow water.



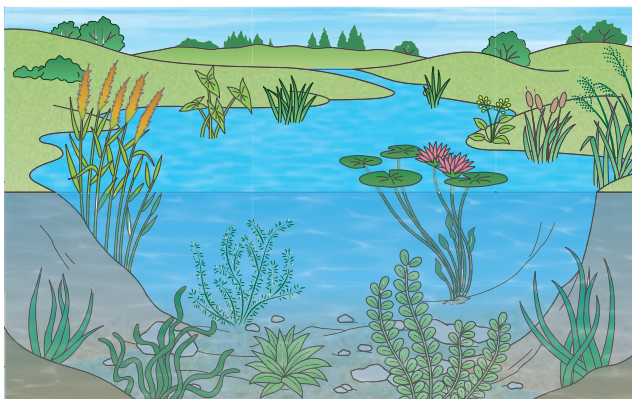
River



Lake



Wetland



Many kinds of plants live in freshwater habitats.

Many kinds of animals and plants live in or near freshwater habitats. They rely on the habitats to provide food, water and shelter. Freshwater habitats contain different kinds of plants such as grass, algae, reed and water lily but very few trees.

Some animals like frogs and dragonflies rely on water to complete

their life cycles. Others such as fish and shrimps spend their entire life in the water. Many birds, reptiles and mammals visit freshwater habitats to feed.



Different kinds of animals rely on freshwater habitats.

Lesson 3 Ocean Habitat

An ocean is one of the habitats. Oceans cover about 70 percent of the Earth's surface.

? What is an ocean habitat?

Activity : Living things in ocean habitats

What to Do:

1. Draw a table like the one shown below.

Area	Name of living things
Coast	
Top layer of open ocean	
Deep ocean	

Do you know other living things that live on the coast, top layer of open ocean and deep ocean?



2. Study the pictures of plants and animals below and think about the area of the ocean which they live in. Make a list of the living things in the table.

3. Share your ideas with your classmates. Discuss the types of living things and the area where they live in the ocean habitat.



Tuna



Sea turtle



Coral



Mangrove



Frill Shark



Lobster



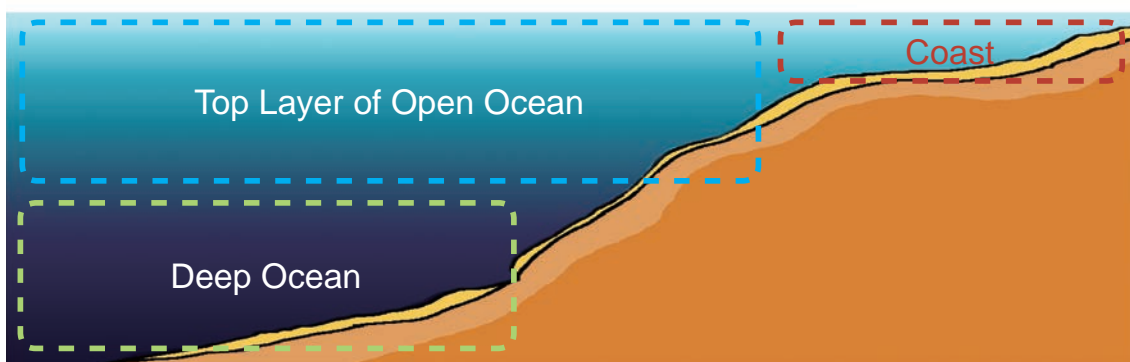
Starfish



Angler fish



Whale



Summary

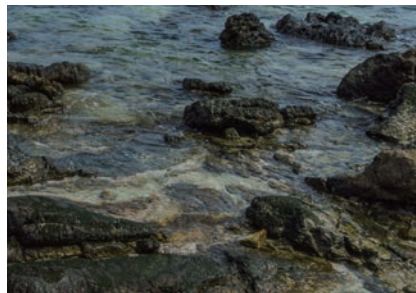
An **ocean habitat** is a place with salty water. Each plant and animal lives in a certain ocean habitat depending on how much sunlight they receive. Ocean habitats can be divided into two: coastal and open ocean habitats.

Coastal Habitats

A coast is a place where the land meets the sea. Coastal habitats are shallow, sunny and warm. Coastal habitats include beaches, rock pools, coral reefs, estuaries and mangrove forests. Animals such as shore birds, fish, crabs, corals and starfishes can be found in the coastal habitats. Mangroves, algae and kelp are examples of plants found in the coastal habitats.



Coral reefs



Rock pools

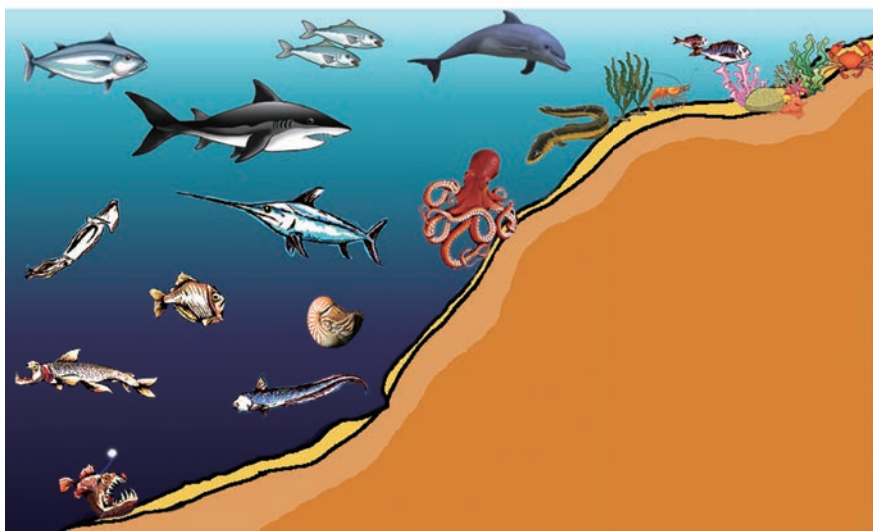


Estuaries

Open Ocean Habitats

The open ocean is the area of the ocean outside of coastal areas. The top layer of the open ocean gets the most sunlight. Tiny algae floats near the surface. Dolphins can be found near the surface in the open ocean.

The deeper the water, the less the sunlight reaches. So, the deepest parts of the ocean are very dark and cold. Many types of living things including fish, shrimps, worms, crabs and clams live in this habitat.



Living things in ocean habitats.

Lesson 4 Rainforest Habitat

A rainforest is one of the habitats. Rainforests are found closer to the equator.



What is a rainforest habitat?



Activity : Living things in rainforest habitats

What to Do:

1. Study the picture of plants and animals below.
2. Think about the following questions:
 - (1) What kinds of animals live in a rainforest?
 - (2) How do different kinds of plants grow in a rainforest?
 - (3) Where do different kinds of animals live in a rainforest?
 - (4) Why do many kinds of animals live in a rainforest?
3. Share your ideas with your classmates.

Do you know other living things that live in a rainforest?

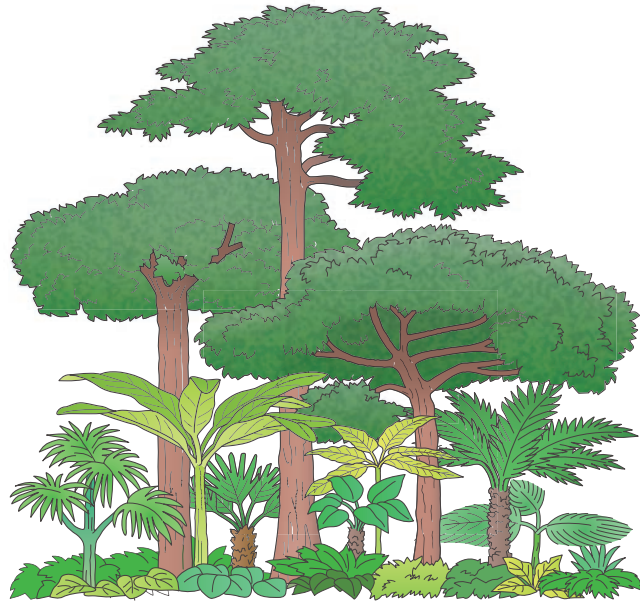


Summary

A **rainforest habitat** is a place with a lot of rain, warm climates and tall trees. Though a rainforest covers less than 2 percent of the Earth's surface, about 50 percent of the Earth's plants and animals live in rainforests. It also produces 20 percent of the oxygen on the Earth.

Different kinds of plants in a rainforest tend to grow close together. Some plants grow taller than other plants. This dense forest has the different heights of branches and leaves and provide shelter and food for many kinds of animals to live.

A lot of animals get energy by eating plants or by eating other animals in a rainforest. Tree kangaroos, cuscus and many kinds of birds find their shelter among the branches of trees in the rainforest. Different kinds of insects also find their shelter in the rainforest.



Plants in rainforests grow densely and in different sizes.



A bird builds its nest among the branches of trees.



Bees make hives on trees.



Cuscus find shelter in trees.

Lesson 5 Grassland Habitat

Living things live in grassland. Grassland is an area mostly covered by grasses.



What is a grassland habitat?



Activity : Living things in grassland habitats

What to Do:

1. Study the pictures below and think about the following questions:

- (1) What kinds of plants grow in grassland habitat?
- (2) What kinds of animals live in grassland habitat?
- (3) How do plants in rainforest and grassland look different?
- (4) Which habitat is easier for animals to hide themselves?

Explain why.

- (5) Where can animals find their shelter in a grassland habitat? Explain why.

2. Share your ideas with your classmates.



Let's compare the types and heights of plants in a rainforest and a grassland.



Rainforest



Grassland

Summary

A **grassland habitat** is a place with few or no trees. The grassland receives more rain than deserts but less than forests. Grasslands are too dry for many trees to grow. Most of the plants there are grasses.



Most of the plants in grasslands are grasses.

Grasslands are sometimes called prairies, savannahs or steppes. Most animals that live in a grassland feed on grasses and their seeds. Some animals feed on other animals to get energy. Grassland animals include wallabies, lizards, snakes, rats, a variety of birds and insects.



A wallaby lives in grassland.



A grasshopper feeds on grasses.

A grassland is a big open space, therefore provides limited places for animals to hide. Grassland animals find different ways to shelter and protect themselves from danger. For example, many grassland animals find shelter and make their homes underground.

Why do many grassland animals make their homes underground?



A rat appearing from its home underground.

Lesson 6 Habitat Changes

Different plants and animals live in different habitats. Fish live in freshwater or ocean habitats. Tree kangaroos and cuscus live in rainforest habitats.



What happens to living things when habitats change?



Activity : Effects of habitat change

What to Do:

1. Draw a table like the one shown below.

Do you have any idea about the causes of habitat change?



Causes of habitat change	What will happen to the habitats and living things?
People cut down trees in a forest.	
It rains heavily and rivers flood.	
It does not rain for a long time and a pond dries up.	
A forest fire occurs and burns a large portion of a forest.	
People drain oil or harmful materials into rivers or land.	

2. Think about the relationship between the causes of habitat change and its effects on the habitats and the living things that live there.
3. Describe your ideas in the table.
4. Share your ideas with your classmates. Discuss the causes and effects of habitat change.



Summary

The habitat is the place where an organism lives. An **organism** is any living thing. Plants, animals and other living things are organisms. Organisms are affected in many ways when their habitats change. Habitats can be changed by natural events and people.

Natural Events

Natural events such as droughts, fire and floods can cause habitats to change. For example, the ponds or streams will dry up when a drought happens. Most plants that live in ponds will die. Many pond animals would not get the food and shelter they need. They would have to find other places to live or they will die, but new plants and animals may make the dried-up pond as their habitat.

What are the causes of habitat change?



Drought



Bush fire



Plants growing on ground after drought.

People

Habitats can also be changed by human activities. People cut down trees to build houses and roads, and change streams or rivers to build dams. In the process, people destroy the habitats of organisms. Pollution is also caused by human activities. People pollute the habitats by throwing away trash, emitting smoke in the air and allowing harmful materials to leak into the soil. Pollution kills plants and causes animals to get sick or die.



Human activities destroy the habitats.



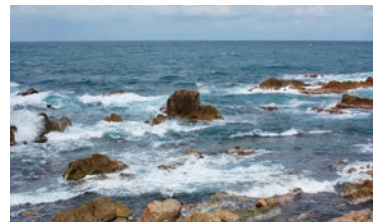
Pollution causes organisms to get sick or die.

Habitat

- Habitat is the part of an environment where a plant and an animal live.
- The habitat provides plants and animals with food, water, shelter and space to live.
- Different kinds of habitats have different conditions such as temperature, light and moisture.

Different Kinds of Habitats

- Freshwater habitats are any natural water sources that do not contain salt including rivers, ponds, lakes, wetlands.
- Ocean habitat is a place with salty water. There are two main types of habitats; the coastal habitat and the open ocean habitat.
- A rainforest habitat is a place with a lot of rain, warm climate, and tall trees. The rainforest is always moist and warm, more kinds of plants and animals live in the rainforest than in any other habitats.
- A grassland habitat is a place with few or no trees. Grasslands are too dry for many trees to grow and most of the plants here are grasses.



Habitat Changes

- Habitats can be changed by natural events and people. The habitat changes have good and bad effects on organisms that live there.
- Natural events such as droughts, fires and floods can cause habitats to change.
- Human activities such as cutting down trees, building dams, throwing away trash, emitting smoke in the air and leaking harmful materials into the soil can cause habitats to change.

Q1. Complete each sentence with the correct word.

- (1) The part of an environment where a plant and animal live is called _____.
- (2) Coastal and open ocean habitats make up the _____ habitat.
- (3) A _____ habitat is a place with a lot of rain, warm climates and tall trees.
- (4) Most animals in the _____ habitat feed on grasses and their seeds.
- (5) Rivers, lakes and streams are examples of _____ habitat.

Q2. Choose the letter with the correct answer.

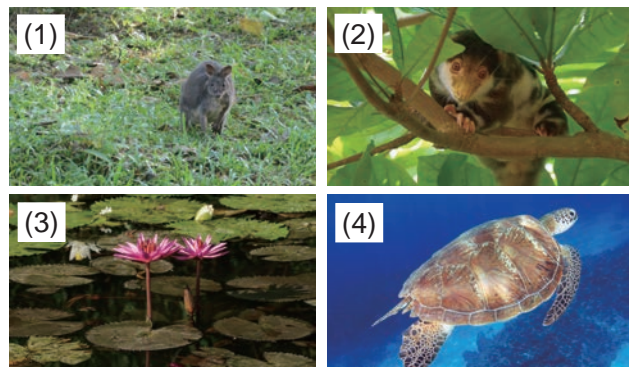
- (1) What is the cause of habitat change shown in the picture on the right?
 - A. Drought
 - B. Earthquake
 - C. Flood
 - D. Bush fire



- (2) Which of the living things are found in the coastal habitat?
 - A. Coral and Mangrove
 - B. Turtle and Tuna fish
 - C. Seaweed and Angler fish
 - D. Whale and Nautilus

Q3. Answer the question below.

What is the name of the habitats for the living things labelled (1), (2), (3) and (4) in the pictures on the right?



Q4. Explain what will happen to the living things in the rainforest habitat if there is a bush fire.

9.2

Adaptations

Lesson 1 What is Adaptation?

Different organisms live in different habitats. Organisms can survive in their habitats only if their needs are met.

? How do adaptations help organisms?



Activity : Body parts of animals

What to Do:

1. Draw a table like the one shown below.

Body parts	How the body part helps the animal?
Long neck of a giraffe	
Thick fur of a polar bear	
Long and sharp spines of a echidna	

Do you have any ideas on body parts that help organisms?



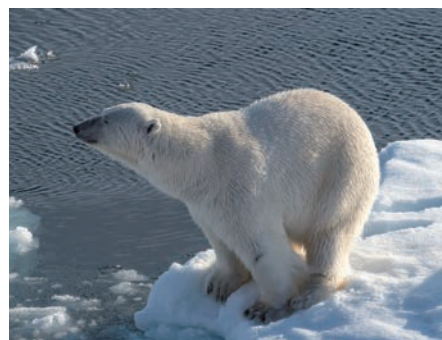
2. Study the pictures of the animals below.

Think about how each of the body parts help animals to survive and write your ideas in the table.

3. Share your ideas with your classmates. Discuss how the body parts help the animals.



Giraffe



Polar bear



Echidna

Summary

Adaptation is the use of body parts or a behaviour that helps an organism survive in its environment. **Behaviour** is the way organisms act in a certain situation. Adaptations help organisms survive in many ways.

Getting Food

Adaptations help organisms get food to survive. For example, giraffes have long necks. The long neck helps giraffes to eat leaves of trees that other animals cannot reach.



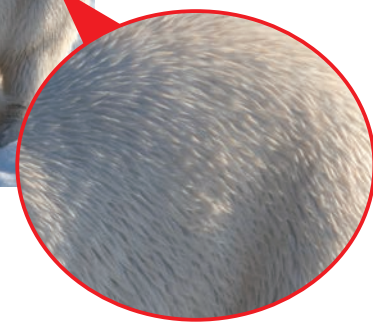
A long neck helps a giraffe to eat the leaves of a tree.

Surviving Severe Conditions

Some habitats have severe conditions. Some are very cold and snowy. Some are very hot and dry. Organisms living in severe conditions have adaptations that help them to survive. For example, some animals such as polar bears have thick fur. The thick fur helps keep them warm to survive in cold habitats.



The thick fur helps keep polar bear warm.



Self-Defence

Most organisms have adaptations for self-defence. For example, some organisms such as echidnas and cactus plant are covered with long sharp spines. The spines help keep organisms from being eaten by enemies. Some animals such as octopus change colour as their environment changes. Some adaptations help organisms hide in their surroundings.



Spines help keep echidna from being eaten.

Lesson 2 Adaptations to Habitats

Adaptations help organisms get food, hide from other animals and survive in conditions of their habitats.



How do organisms adapt to their habitats?



Activity : Turtles adaptation

What to Do:

1. Draw a table like the one shown below.

How are they similar?	How are they different?

2. Study the pictures of the two turtles below.

3. Compare and describe how they are similar or different in the table.

4. Based on your results, think about the following questions.

- (1) Where do they live?
- (2) How do their body parts adapt to their habitats?

5. Share your ideas with your classmates.

Both of them are turtles but what are the differences between them?



Think about what body parts they use to move in their habitat. Explain why.



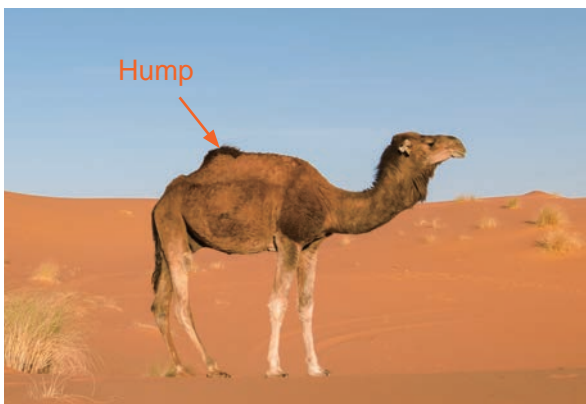
Sea turtle



Freshwater turtle

Summary

Organisms need to adapt to their habitats to survive. Habitats are different, so organisms living in different habitats need different adaptations to survive. A **desert** is one of the habitats. The desert is a place with very little water. It can be hot and dry. It is hard for organisms to get food and water in a desert. Desert organisms have adaptations to desert habitats. A camel stores fat in its hump(s) that helps it to survive long periods without food and water. A cactus plant has thick stems and waxy skin that holds water for survival in a dry habitat.



A camel stores fat in its hump.



A cactus has thick stems and waxy skin that holds water.

Organisms living in water also have adaptations that help them to meet their needs. Some animals such as fish and dolphins have fins or flippers that help them swim through water. Animals living on land have different adaptations. They have legs that help them to walk easily on land. Some animals such as birds have wings that help them fly in the air.



Fins are adapted for swimming.



A pig has legs for walking.



Wings help birds to fly.

Lesson 3 Camouflage

Organisms need to adapt to their habitats to survive. What other kinds of adaptations do organisms have?



What is camouflage?



Activity : Can you find animals?

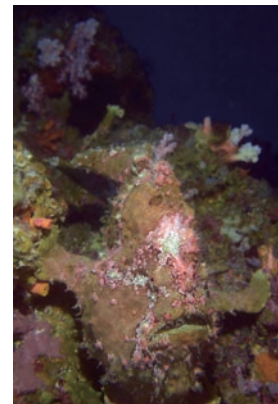
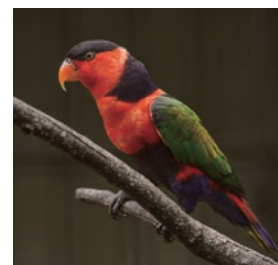
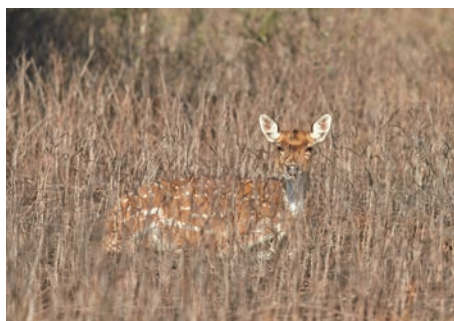
What to Do:

1. Study the pictures below carefully and find the animals.
2. Make a list of the animals you find.
3. Think about the following questions.
 - (1) Which animals were easy or hard to find? Explain why.
 - (2) How are the colours and patterns of the animal body parts helpful to them?
4. Share your ideas with your classmates.

How many animals can you find?



Why are some animals difficult to find?



Summary

Camouflage is a type of animal adaptation. It is the colours, patterns or shape of body parts of an animal that allows it to blend in with its surroundings. Camouflage helps animals to hide from enemies and to find their food.

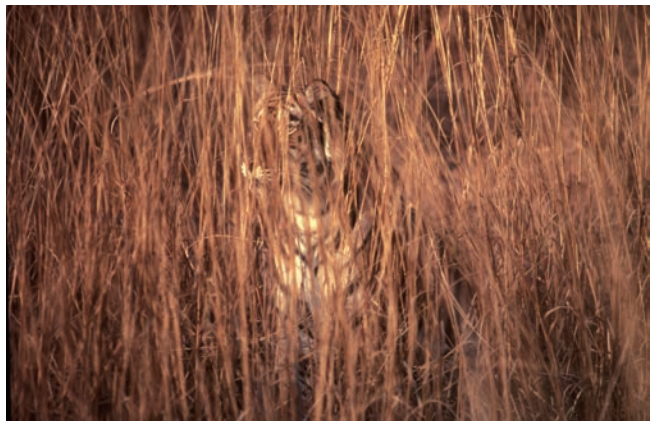
The colour and pattern of an owl's feathers helps it to blend in with trees, making it easier to stay hidden from other animals in the daytime. A tiger also uses camouflage. Its striped fur helps it to blend in with the tall grasses. The tiger can hunt without being seen.

Some insects use their body parts to camouflage. A stick insect uses camouflage to look like the branches or leaves of the trees where it lives. Its physical appearance helps the stick insect to blend in with its surroundings and hide from its enemies.

The following pictures show examples of animals camouflaging.



An owl blends in with a tree.



Striped fur helps tigers blend in with the tall grasses.



A stick insect looks like twigs.



Examples of animals camouflaging to blend in with their surroundings.

Lesson 4 Mimicry

Organisms use their body parts to camouflage themselves. Do organisms use their body parts in different ways?



What is mimicry?

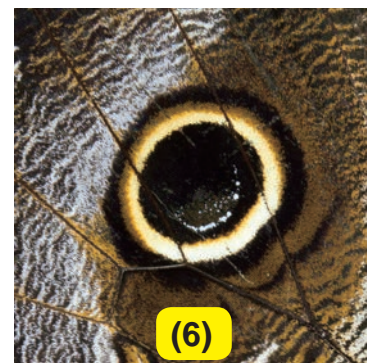
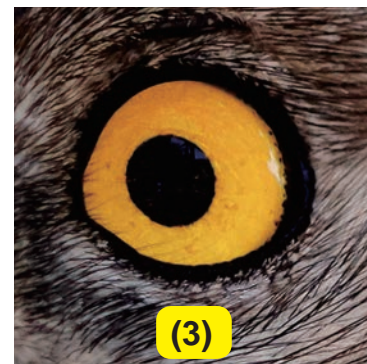
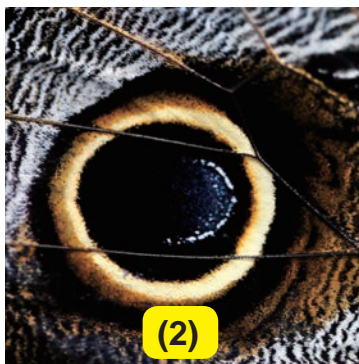
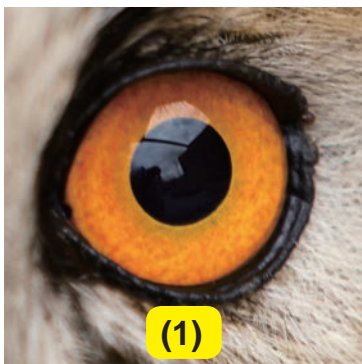


Activity : Which one is an owl's eye?

What to Do:

1. Study the pictures below carefully. Some are owls' eyes and others are the spots on butterflies' wings.
2. Think about the following questions.
 - (1) Which pictures are the owls' eyes or the spots of butterflies?
 - (2) How do the spots help the butterflies?
3. Share your ideas with your classmates.

The spots on the butterflies' wings are similar to the owl's eyes. Explain why.



Summary

Mimicry is a type of animal adaptation that allows an animal to look like another kind of animal. Mimicry can keep them from being eaten or it can help them get food.

Mimicry helps protect some types of butterflies from birds. Some butterflies have large eye-spots on their wings. These spots resemble the eyes of animals such as owls to scare away birds that want to eat the butterfly.



Some butterflies have large eye-spots to scare away birds.

Other animals use mimicry to behave like another animal. Some harmless snakes have colours and patterns that look like dangerous snakes. Birds see these colours and patterns and stay away.

How does mimicry help animals to survive?



A snake with poison (Coral snake)



A snake without poison (Scarlet king snake)



Some animals use mimicry for hunting. Angler fish has a lure that sticks out from its head. The lure looks like small animals such as worms, shrimps or smaller fish to attract a fish's attention. Once a fish gets closer to the lure, the angler fish eats it.



Angler fish has a lure to attract other fish.

Lesson 5 Behavioural Adaptation

Behaviour is also an adaptation. It is the way organisms behave to survive.



How do organisms behave to survive in their environment?



Activity : Animal Behaviour

What to Do:

1. Study the pictures below.
2. Think about the following questions.
 - (1) Why do penguins come together?
 - (2) Why does a rat live in a burrow?
 - (3) How do their behaviour help them?
3. Record your ideas in your exercise book.
4. Share your ideas with your classmates.

What kind of conditions do they live in?



Each habitat has different conditions.



The Antarctic is covered with ice and is the driest and coldest continent on the Earth. It is where penguins come together.



A rat lives in the desert. It stays in its burrow during the daytime. A burrow is a hole or tunnel in the ground made by animals for shelter.

Summary

Behaviour is a type of adaptation. It is the way that animals act or react to their environment. Behaviour helps animals to find food and water, move to safe places and protect themselves.

Some animals move from one habitat to another where the weather is warmer or where they can find food. This is called **migration**. For example, some birds move to another habitat during winter to be in a place where the habitat is warm.



Birds move to another habitat during winter.

Some animals have behavioural adaptations that help them to survive in cold winter. Bears go into a long deep sleep through the winter. This is called **hibernation**. They need little or no food during hibernation. So do frogs, snakes and even some insects. Emperor penguins gather together in the cold to keep warm.



A bear goes into a deep sleep during winter.

Other animals behave in different ways.

Female turtles always return to the same beach where they hatched to lay their eggs. Some animals such as birds and fish travel in a large group that helps to protect the members of the group from enemies.



Sea turtles return to the same beach to lay eggs.



Fish travel in a large group for protection.

What is Adaptation?

- An adaptation is the use of a body part or a behaviour that helps an organism survive in its environment.
- Behaviour is the way organisms act in a certain situation.

Adaptation to Habitats

- Adaptation helps organisms to get food, hide from other animals and survive in conditions of their habitats.
- Organisms living in different habitats need different adaptations to survive.



A camel stores fat in its hump to survive in a desert.

Camouflage

- Camouflage is the colour, pattern or the shape of the body parts of animals that allows them to blend in with their surroundings.
- Camouflage helps animals to hide from enemies and to look for food without being seen.



An owl blends in with a tree.

Mimicry

- Mimicry is a type of animal adaptation that allows an animal to look like another kind of animal.
- Mimicry can keep animals from being eaten or help them to get food.
- Some harmless animals have colours and patterns that look like those of dangerous animals.



A harmless snake taking on the colour and patterns of the poisonous snake.

Behavioural Adaptation

- Behaviour is a type of adaptation. It is a way that animals act or react to their environment. Migration and hibernation are examples of the behaviour.
- Behaviour helps animals find food and water, move to safe place and protect themselves.

Q1. Complete each sentence with the correct word.

- (1) An animal body part or its behaviour helps the organism to survive in its environment is called _____.
- (2) Organisms live in different _____ so they need to adapt in order to survive.
- (3) An adaptation that allows an animal to look like another kind of animal is called _____.
- (4) An adaptation that makes animals to act or react to its environment is called _____.

Q2 Choose the letter with the correct answer.

- (1) What is the adaptation for cactus plant to have thick stems and waxy skin?
 - A. To hold water in dry environment.
 - B. To attract animals for pollination.
 - C. To poke animals that try to eat it.
 - D. To allow water to run out easily.

- (2) Why do some insects blend in with their surroundings?
 - A. To hide from enemies.
 - B. To scare away enemies.
 - C. To be eaten other animals.
 - D. To be easy to be seen.

Q3. Some butterflies have large eye-spots on their wings. Why do the butterflies have such eye-spots?



Q4. How do some animals behave during cold winter to survive?

Chapter 9

•Science Extras•

How does an octopus use camouflage, mimicry and change its colours?

Octopuses are masters in using camouflage to catch animals they want to eat and hide from animals that want to eat them. Octopuses have very good vision and they use it to better camouflage themselves.

An octopus can change the way its skin looks and feels. It controls the muscles under its skin by changing its skin to match the rock's or plant's bumpiness near to blend in it.

It can also change the way it moves. It mimics a rock, by not only folding its eight tentacles (legs) close to the body but changing the way its skin looks. It can also change the way it swims to mimic the way waves might push a rock through the ocean.

The octopus can change the colour of its skin.

It can control the colour of its skin because it has special cells in its skin that are filled with different colours. If the octopus relaxes the muscles connected to its red colour cells, these cells will become really small and we would not be able to see red on the octopus' skin.

However, if the octopus stretches the muscles connected to its red colour cells, these cells will also stretch and get bigger so that we would be able to see lots of red on the octopus' skin.

By changing the sizes of all the different coloured cells, the octopus can very rapidly create complex patterns that allow it to better blend in with its surroundings.



The octopus blends in the rock.



The octopus can change the colour and patterns of its skin.

Chapter Test

9. Habitat and Adaptation

Q1

Complete each sentence with the correct word.

- (1) The part of the environment where plants and animals live to get all their needs is called _____.
- (2) Animals can camouflage themselves by blending in with their surroundings using their _____, patterns or shapes of body parts.
- (3) Some butterflies use _____ by having two large eye-spots on their wings to imitate an owl's eye to scare birds away.

Q2

Choose the letter with the correct answer.

- (1) Which animal lives in a freshwater habitat?
 - A. Whale
 - B. Tuna fish
 - C. Frog
 - D. Lobster
- (2) What is the type of adaptation when geese fly away from winter to summer in other regions?
 - A. Mimicry
 - B. Behaviour
 - C. Acting
 - D. Camouflage
- (3) Which statement best describes the rainforest habitat?
 - A. Trees and other plants tend to grow close together.
 - B. Most plants are grass which animals eat.
 - C. There are a few trees growing with fewer rainfalls.
 - D. Most plants grow in lots of water with areas of grass.
- (4) If the sea turtle was living on the land, which of its body part would adapt to that environment to survive?
 - A. Eyes
 - B. Head
 - C. Flippers
 - D. Nose



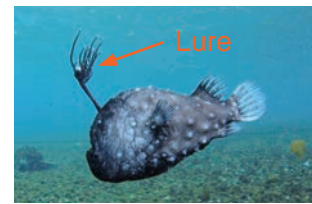
Q3

(1) Observed the dried branches on the picture on the right. There is an insect among the branches. Explain what made the insect difficult to be spotted?



(2) Algae is a kind of plant. Why does it live and float near the top of the open ocean surface?

(3) What is the purpose of the lure on this fish?

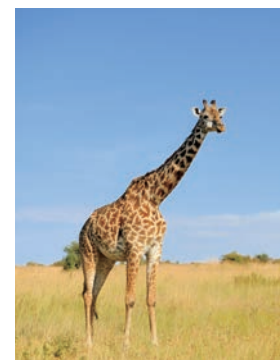


Q4

(1) The picture on the right is the result of drought causing a pond to dry-up. How is the habitat change good for the plants and animals?



(2) The giraffe lives in the savannah grassland of Africa. One of its main food is eating the leaves of a tree. How has the giraffe adapted to eat the leaves at the very top of the tree?



Chapter 10

Plant Growth



We learnt about the life cycle of plants.



When we put a bean seed into the wet soil, the seed germinates. What are the conditions for germination?



10.

Needs for Seed Germination

Lesson 1 Inside of a Seed

Plant life cycle starts from a seed. A young plant comes out from a seed. Is there a part inside a seed that grows into roots or leaves?



What is the structure of a seed?



Activity : Observing the inside of a seed

What We Need:

- ➔ bean seeds soaked in water overnight, cutter knife, hand lens



Be careful when you cut a bean seed with the knife.

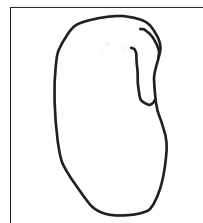


What to Do:

1. Remove the coat of the bean seed and cut it lengthwise with a knife.
2. Observe the inside parts of the bean seed using a hand lens. Sketch its structure.
3. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss which parts of the seed will grow into roots, stem and leaves.



Inside of a seed



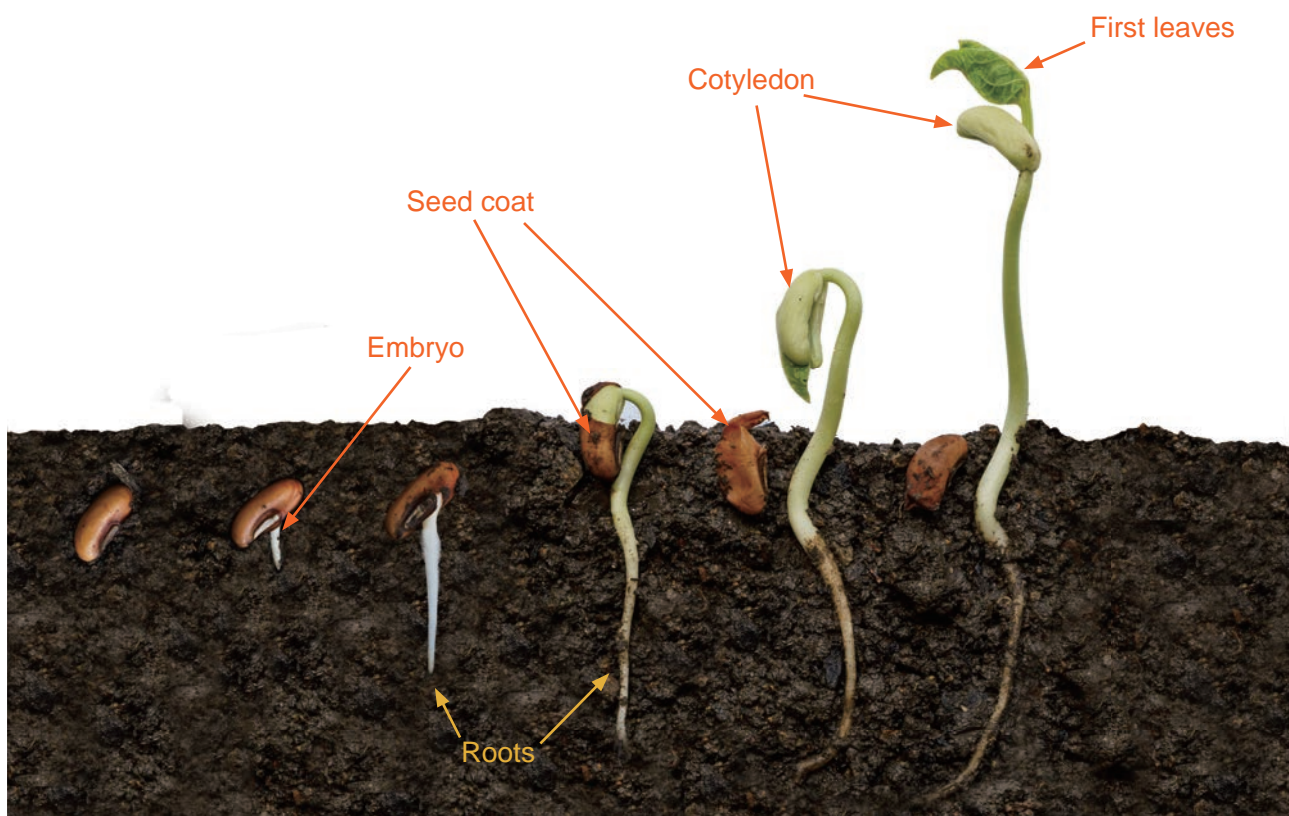
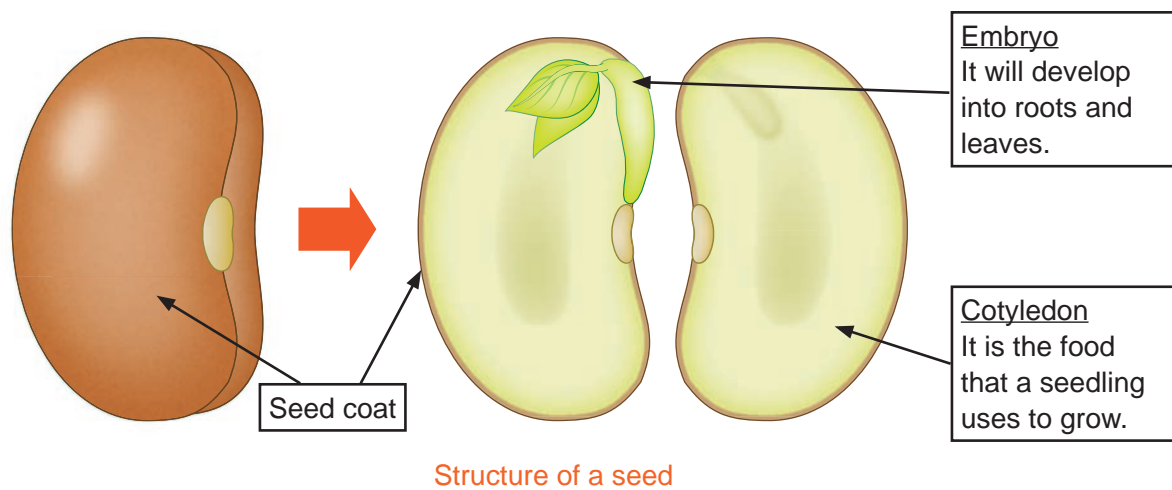
My observation:

Summary

There are three main parts of a seed: seed coat, embryo and cotyledon.

Seed coat is the hard outer layer of the seed covering around the embryo and the cotyledon. It protects the embryo and the cotyledon. **Embryo** is the tiny plant inside the seed. It will develop into roots and leaves. The embryo rests inside the seed until the conditions are right for it to start to grow.

Cotyledon is the part that stores food, known as **starch**. A young plant uses the starch until it is big enough to make its own food.



Stages of seed germination.

Lesson 2

Conditions for Germination 1: Water

Plant life cycle starts from a seed. The seed sprouts and a seedling grows. The process of the seed growing into a seedling is called **germination**. What conditions do seeds need to germinate?



Do seeds need water to germinate?



Activity : With and without water

What We Need:

- ➔ bean seeds, water, tissue paper, two cups



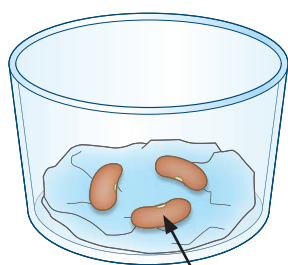
What to Do:

1. Fold the tissue paper so that it will fit inside the cups A and B as shown below.
2. Wet the paper in the cup labelled A until it is completely moist.
3. Place the bean seeds on top of the paper in each cup and put the two cups at the same location. Always keep Cup A moist.
4. Observe the seeds for a week. Record your observations in your exercise book.
5. Share your ideas with your classmates. Discuss which beans germinated and why.

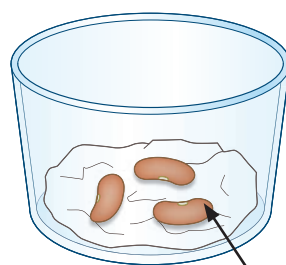
What conditions are the same or different in this activity? Can you identify them?



How can we control the conditions?



A Tissue paper with water



B Tissue paper without water

Result

We found out that the seeds placed on wet tissue paper germinated but the seeds placed on dry tissue paper did not germinate.



With water



Without water

What conditions were same or different?



Different conditions

The seeds were given water or not given water.

Same conditions

The seeds were exposed to air.
The seeds were placed at the same location with the same amount of light and at the same temperature.

Summary

The germination happens inside the seed. Seeds need the right conditions to germinate. Water is one of the important conditions for seed germination. Seeds need water to germinate.

Seeds are usually dry. They might have to wait for years to start growing. When a seed comes into contact with water, water allows the seed to swell up until the seed coat splits apart and the seed embryo absorbs water. Water makes the embryo 'wake up' from its hibernation and starts growing.

From this result, what did you find out? What does a seed need to germinate?



When a seed comes into contact with water, the seed coat will absorb water.

Once the seed coat splits, the embryo starts to grow.

Lesson 3

Conditions for Germination 2: Air

When a seed comes into contact with water, the seed germinates. Are there any other conditions for seed germination?



Do seeds need air to germinate?



Activity : With and without air

What We Need:

- ➔ bean seeds, water, tissue paper, two cups



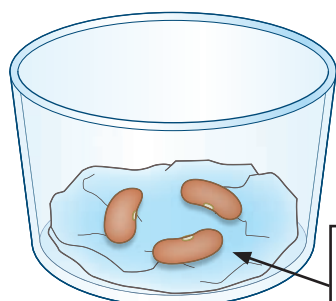
What to Do:

1. Fold the tissue paper so that it will fit inside the cup.
2. Place the paper in each cup and then place bean seeds on top of the paper.
3. Wet the paper in Cup A until it is completely moist. Pour water in Cup B until the bean seeds are submerged.
4. Place both cups at the same location.
5. Observe the seeds for a week.
Record your observations in your exercise book.
6. Share your ideas with your classmates. Discuss which beans germinated and why.

To investigate how seeds grow with and without access to air, what conditions should we control?

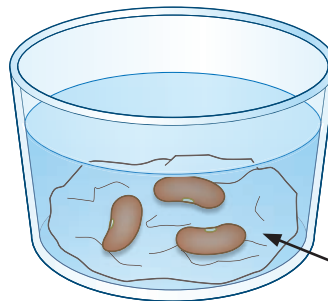


We must place both cups at the same place so that all the conditions should be the same EXCEPT access to air.



Bean seeds placed on the wet paper.

A



Bean seeds submerged.

B

Result

We found out that the bean seeds placed on wet tissue paper germinated but the bean seeds that were submerged did not germinate.



Bean seeds placed on wet tissue paper



Bean seeds submerged

Different conditions

The seeds were exposed to air or not exposed.

Same conditions

The seeds were given water.

The seeds were placed at the same location with the same amount of light and at the same temperature.

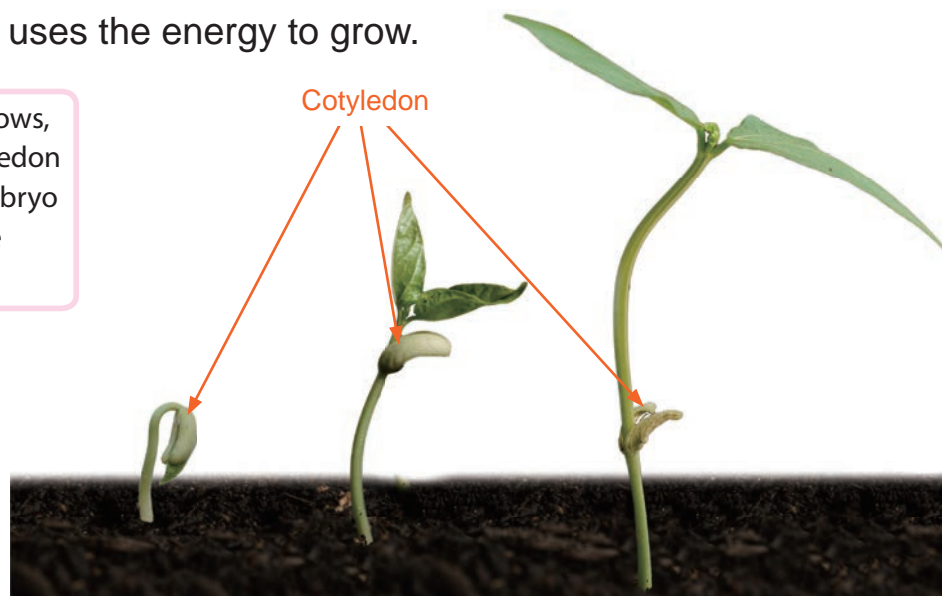
Summary

From this result, what does a seed need to germinate? A bean seed submerged, this means?

A bean seed placed on wet tissue paper is exposed to air. On the other hand, a bean seed submerged is not exposed to air because it is covered with water. From this result, we find that seeds need air to germinate.

Seeds need oxygen in the air for germination. Seeds cannot make food like adult plants do. Instead, they use the oxygen together with starch stored in seeds to make energy. When oxygen gets to the seeds, the oxygen helps the embryo burn the starch stored in the cotyledon. Burning the starch produces energy. The embryo uses the energy to grow.

The more an embryo grows, the more withered cotyledon is. This is because an embryo uses starch stored in the cotyledon to grow.



Stages of seed germination.

Lesson 4

Conditions for Germination 3: Temperature

Seeds need water and air to germinate. How about temperature? Does seed germination have a relationship with temperature?

? Do seeds need proper temperature to germinate?

Activity : Warm or cold temperature

What We Need:

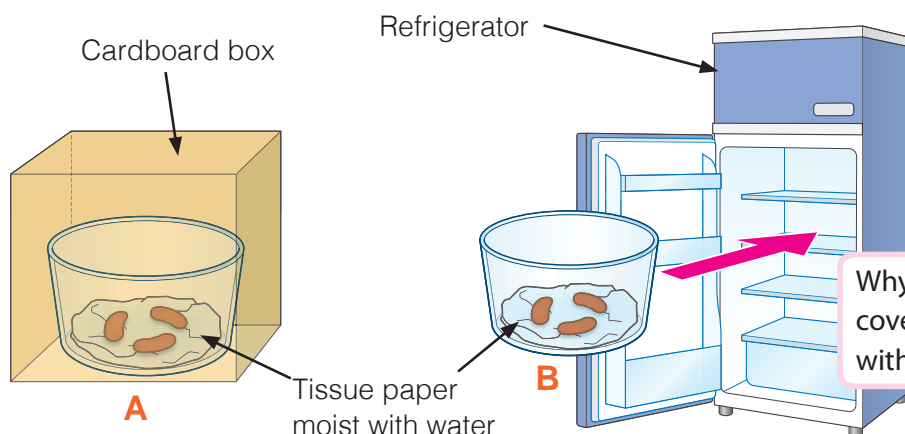
- ➔ bean seeds, water, tissue paper, two cups, cardboard box



What to Do:

1. Fold the tissue paper so that it will fit inside the cup.
2. Place the paper in each cup and wet the paper in both cups until it is completely moist. Put the bean seeds on top of the paper in each cup.
3. Put one of the cups in a refrigerator. Place another cup in a classroom and cover it with the cardboard box.
4. Observe the seeds for a week. Record your observations in your exercise book.
5. Share your findings with your classmates. Discuss how temperature affects seed germination.

All the conditions for seeds should be the same EXCEPT the difference in temperature. What conditions should be the same?



Why do we have to cover one of the cups with the cardboard box?



Result

It is dark inside a refrigerator, so we covered a bean seed placed in a classroom with a box in order to make it dark.



We found out that the bean seeds placed in a refrigerator did not germinate but the bean seeds placed in a classroom germinated.



At room temperature



At cold temperature

Different conditions

The seeds were placed at different temperatures.

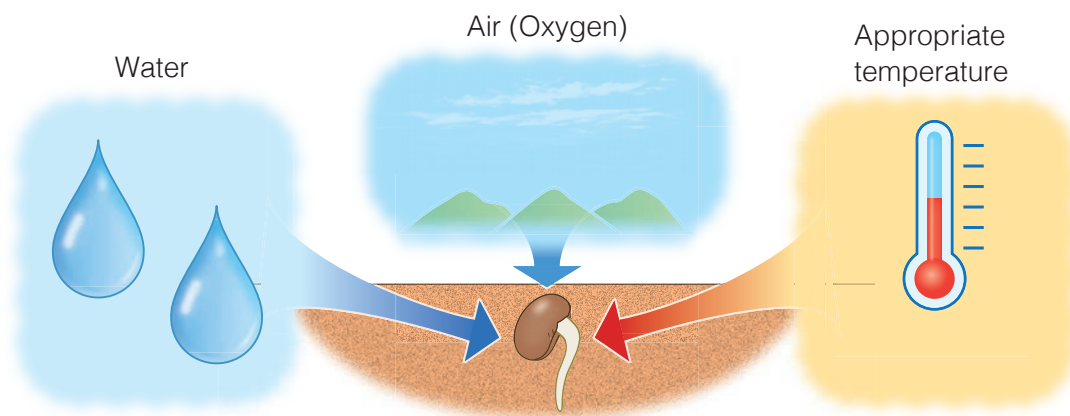
Same conditions

The seeds were given water.
The seeds were exposed to air.
The seeds were not exposed to light (dark place).

Summary

The temperature in a classroom is warmer than that in a refrigerator. This means that seeds need an appropriate temperature for germination. Without the proper temperature, the seeds will not germinate. In general, most seeds will germinate at temperatures between 10°C and 35°C. Warmth speeds up and improves the process of germination. Seeds seem to have a system that makes them wait for warmer temperatures before sprouting. Through the three activities, we find that seeds need three conditions for germination: water, air (oxygen) and appropriate temperature.

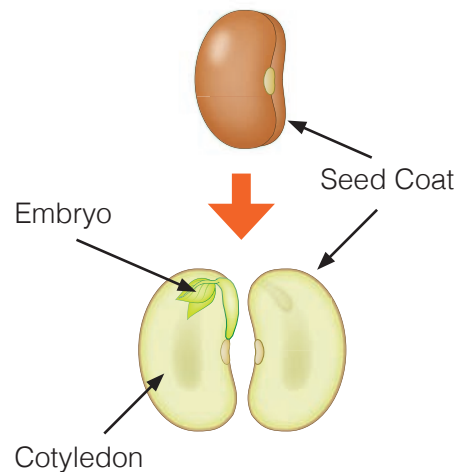
From this result, what does a seed need to germinate?



Seeds need water, air and appropriate temperature to germinate.

Inside of a Seed

- There are three main parts of a seed: seed coat, embryo and cotyledon.
- The seed coat is the hard outer layer of the seed covering around the embryo and the cotyledon. It protects the embryo and the cotyledon.
- The embryo is the tiny plant inside the seed. It will develop into roots and leaves.
- The cotyledon is the part that stores food known as starch for the young plant.



Conditions for Seed Germination 1: Water

- Water is one of the important conditions for seed germination. Seeds need water to germinate.
- When a seed comes into contact with water, it allows the seed to swell up until the seed coat splits apart, and the seed embryo absorbs water.



Germination of bean

Conditions for Seed Germination 2: Air

- Seeds need oxygen in the air for germination.
- When oxygen gets to the seeds, the oxygen helps the embryo to burn the food stored in the cotyledon. Burning the food produces energy to germinate and grow.



Conditions for Seed Germination 3: Temperature

- Seeds need proper temperature for germination.
- Warmth speeds up and improves the process of germination.
- Seeds seem to have a mechanism that makes them wait for warmer temperature before sprouting.

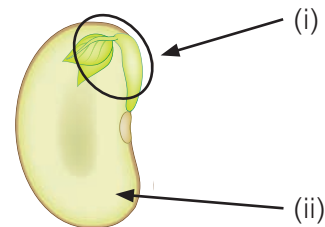
Q1. Complete each sentence with the correct word.

- (1) The cotyledon and embryo are covered by the _____.
- (2) The _____ causes the seed to swell up and split the seed coat apart allowing the embryo to come out.
- (3) The _____ from the air helps embryo burn the food stored in cotyledon.
- (4) Warm _____ speed up the process of germination.

Q2. Choose the letter with the correct answer.

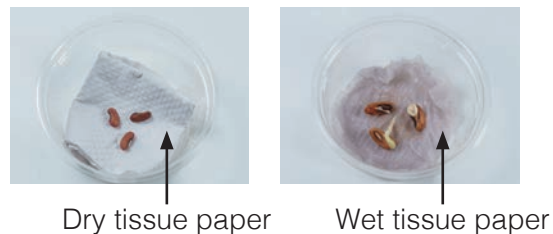
- (1) What is the correct combination of the name of seed parts (i) and (ii)?

- A. (i) is pollen and (ii) is cotyledon.
- B. (i) is cotyledon and (ii) is embryo.
- C. (i) is seed coat and (ii) is embryo.
- D. (i) is embryo and (ii) is cotyledon.



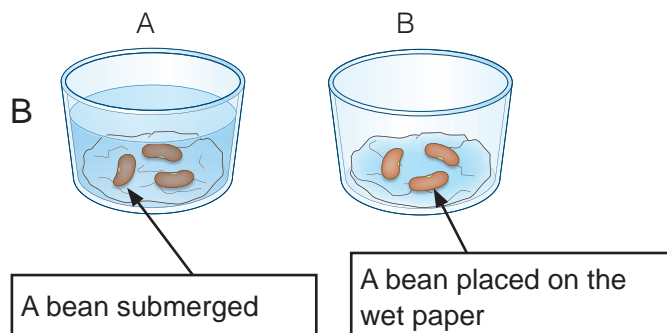
- (2) According to the experiment shown below, what is needed _____ for seed germination?

- A. Water
- B. Water and sunlight
- C. Air
- D. Darkness and air.



Q3. Answer the question below.

What are the conditions in cup A and B that are same and different?



Q4. Greg got some dry corn seeds and planted them in his garden. After five days, he did not see any plants growing from the spot he planted the seeds. What could be the two possible reasons for this?

10.2

Needs for Plant Growth

Lesson 1

Conditions for Plant Growth 1: Water

After germination, a seedling grows and changes into an adult plant. What does a plant need in order to grow well? What types of conditions are necessary for plant growth?

Seeds need water, air and appropriate temperature to germinate. How about young plants? What conditions do they need to grow? Let's predict!



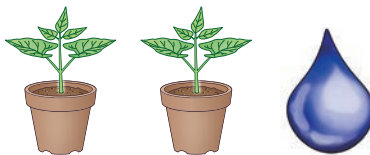
Do plants need water to grow?



Activity : With and without water

What We Need:

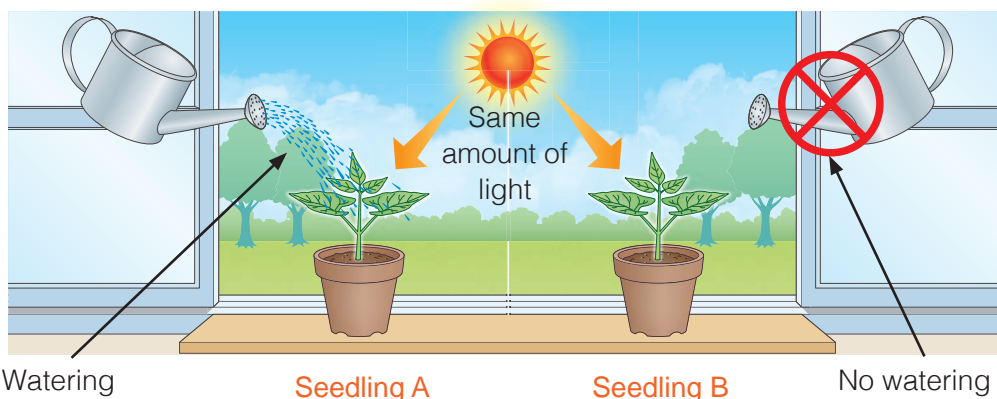
- two same sized seedlings in plant pots, water



What conditions should be the same or different in order to see if plants need water for growth?

What to Do:

- Place seedlings A and B near the classroom window.
- Water seedling A every day, but do not water seedling B.
- Observe the seedlings for a week. Record your observations in your exercise book.
- Share your ideas with your classmates. Discuss what happened to the seedling with or without water added and what it needs to grow.



Result

Why do we have to control conditions?



We found out that the plant that was watered grew well but the plant that was not watered did not grow well.



Without water



With water

Different conditions

With and without water.

Same conditions

The same amount of light.

The same temperature.

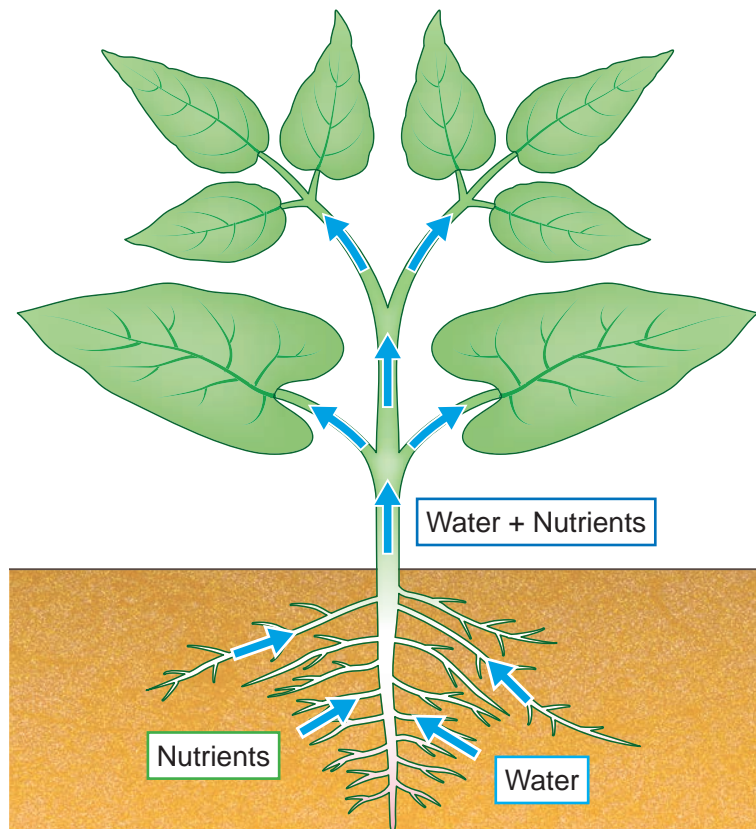
Summary

From this result, what do plants need to grow?



Plants need water to grow. Water is the main component in plants. Without water, plants cannot grow and survive. Water can be absorbed through the roots in the soil.

Water helps the plants to move nutrients from the soil up its stems and leaves. Water keeps the plant moist and flexible. Plants also use water to lower their temperature. Water also helps the plant to make its own food. The moving water inside the plant helps carry food to all parts of the plant.



Lesson 2

Conditions for Plant Growth 2: Light

Plants need water to grow. Are there any other conditions for plants to grow?

? Do plants need light to grow?

Activity : With and without light

What We Need:

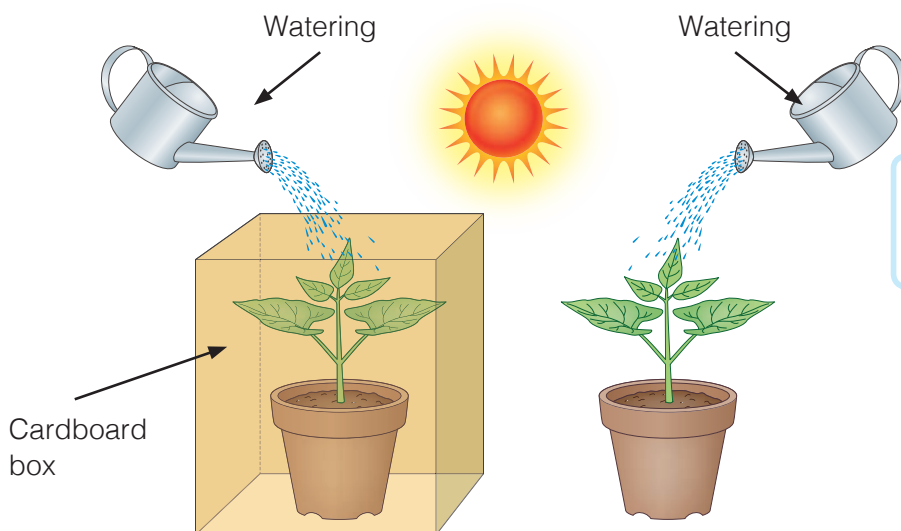
- ➔ two same sized seedlings in plant pots, water, cardboard box



What to Do:

1. Place both seedlings in a sunny place but cover one of the seedlings with a cardboard box.
2. Water both seedlings every day.
3. Observe the seedlings for a week. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss what happened to both seedlings and what plants need to grow.

To investigate whether plants need light for growth, how should we control the conditions? What conditions should be the same?



Why do we have to cover one of the seedlings with a cardboard box?



Result

If the plant is covered with the cardboard box, it is dark inside the box. Why is it dark inside the box?



We found out that the plant covered with the cardboard box did not grow well but the plant that was not covered with the cardboard box grew well.



A plant covered with a box.



A plant without a box.

Different conditions

With and without light.

Same conditions

With water.

The same temperature.

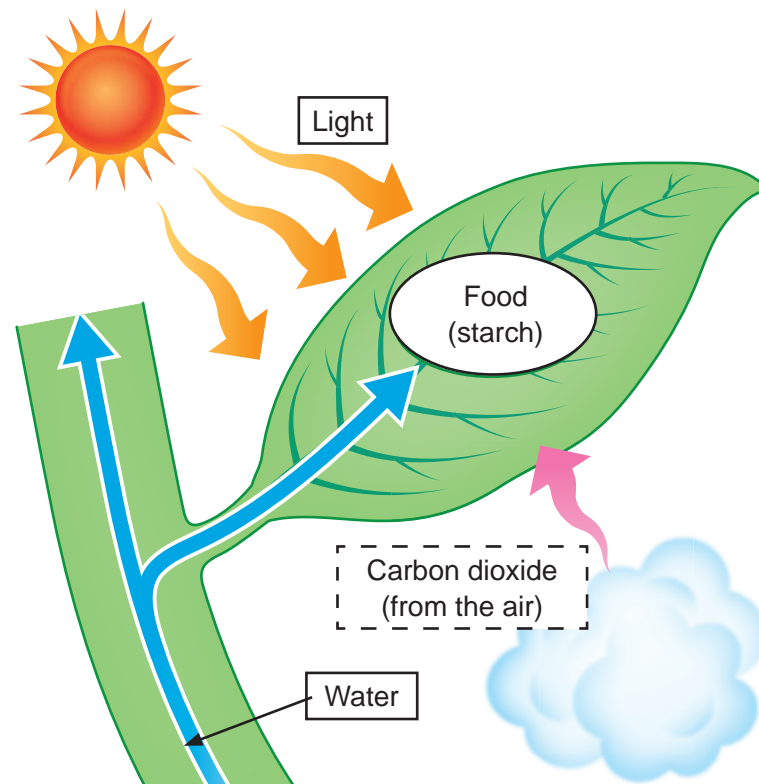
Summary

From this result, what do plants need to grow?



Light is very important for plants to grow. Plants are able to make some of their own food by using light. Plants use the food as the energy for their growth.

Plants need not only water and light but also air (carbon dioxide) to make their own food for their growth. The process by which plants make their own food (starch) from carbon dioxide and water by using light is called **photosynthesis**. Photosynthesis usually takes place in the leaves.



Process of photosynthesis

Lesson 3

Conditions for Plant Growth 3: Fertiliser

Plants need water and light to grow. How can we make plants grow well? Can fertilisers work on plant growth?



Do plants need fertiliser to grow well?



Activity : With and without fertiliser

What We Need:

- two same sized seedlings in plant pots, water, fertiliser



What to Do:

- Form a group with your classmates and predict:
 - What conditions should be different or same in order to see if plants need fertilisers to grow well?
 - How can you investigate whether your predictions are correct or not?
- Based on your predictions, make a plan for your investigation and try it out.
- Observe the seedlings for a week and record your observations in your exercise book.
- Share your ideas with your classmates. Discuss the conditions you controlled, your investigation plan and the results of your investigation.

Where should we place the seedlings? All the conditions should be the same EXCEPT for access to fertilisers.



Result

We found out that both seedlings were put in the same place and had access to water, light and temperature. Seedling A had fertiliser and Seedling B did not. The seedling with fertiliser grew very well. On the other hand the seedling without fertiliser did not grow well.

How did you control the conditions? Is your prediction correct or not?

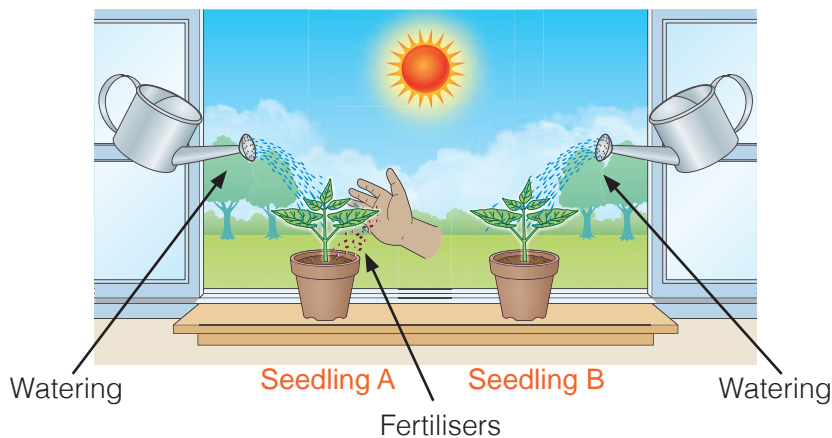


Different conditions

With and without fertilisers.

Same conditions

With water.
Same amount of light.
Same temperature.



With fertiliser



Without fertiliser

If your prediction is not correct, think about what was wrong?



Summary

Fertilisers help plants grow well. They provide nutrients such as nitrogen and potassium to plants to help boost their growth. Plants need nutrients to maintain their growth. The nutrients are necessary for producing green leaves, big flowers and strong roots.

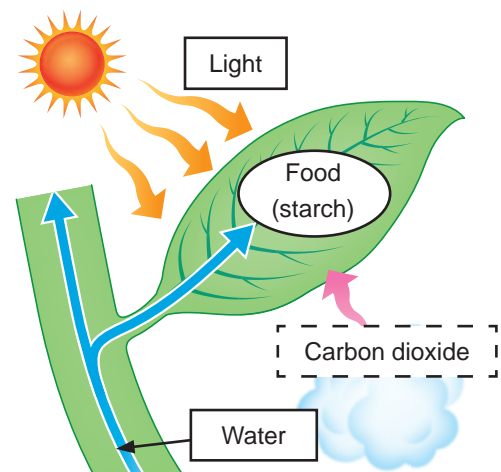
From the three experiments we found out that plants need **water**, **air (carbon dioxide)** and **light** to grow. The **nutrients** also help plants grow well.

Conditions for Plant Growth: Water

- Without water plants cannot grow and survive.
- Water can be absorbed through the roots from the soil and helps to move nutrients from the soil up its stems and leaves.
- Water keeps the plant moist, flexible and lowers its temperature.
- Water also helps the plant make its own food.
- The moving water inside the plant helps carry food to all parts of the plant.

Conditions for Plant Growth: Light

- Light is important for plants to grow.
- Plants are able to make their own food by using light.
- Photosynthesis is the process by which plants make their own food (starch) from carbon dioxide and water by using light.



Conditions for Plant Growth: Fertiliser

- Fertilisers help plants grow well.
- Fertilisers provide nutrients to plants and give plants an additional growth boost.
- Plants need nutrients to maintain their growth. The nutrients are necessary for making green leaves, big flowers and strong roots.



With fertiliser



Without fertiliser

Q1. Complete each sentence with the correct word.

- (1) Water helps the plant move _____ from the soil up its stems and leaves.
- (2) Plants can get nutrients from _____ for growth.
- (3) Plant use _____ to keep itself moist and flexible.
- (4) Plants need water, _____, light and nutrients to grow.
- (5) The process by which plants make their own food from carbon dioxide and water by using light is called _____.

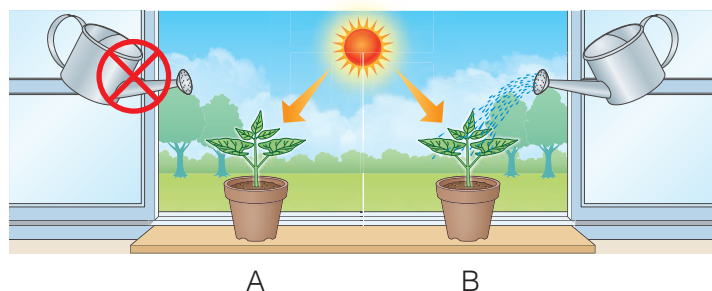
Q2. Choose the letter with the correct answer.

- (1) Which of the following sentences is not correct about the ways that plants use water? Plants use water to
 - A. move nutrients from the soil to its parts.
 - B. make their own food by using sunlight.
 - C. keep them growing big and tall in a short time.
 - D. keep them cool in hot temperature.

- (2) What do plants make as their own food in the process of photosynthesis?
 - A. Water
 - B. Starch
 - C. Carbon dioxide
 - D. Sunlight

Q3. Answer the question below.

What are the conditions in plants A and B that are similar and different?



Q4. Explain what the nutrients from the fertiliser would do to the plant when applied?

Chapter 10

•Science Extras•

How long does it take to germinate and grow Mango from a seed? What are things that affect its growth?

The pulp of the seed of a mature mango fruit must be removed. Store the seed in an open container of water at room temperature and place it in a warm place. The water must be changed every two days during this time.

After 7 to 14 days the seed will start to germinate. Once the seed begins to produce shoots, it must be planted in a pot of compost. If the seed does not sprout within this time, plant the seed in a 10 cm pot of compost and seal the pot in a plastic bag. The plant must be watered frequently and keep it sealed in a warm place for up to 60 days or until shoots appear.

After planting, it takes mango trees about one year to reach 90 to 120 cm tall. It must be transplanted. Between two to four years mango tree will produce fruit. Once the fruit appears, it takes 3 to 6 months to mature.

Mature mango trees can reach heights and spreads of more than 12 m. Temperature is the main factor in a mango tree's growth. Warmth makes them grow faster and mature more quickly. The varieties of mangoes also have certain influences. If the pulp is removed from the mango seed, it may take the seed up to 7 weeks to germinate.



Chapter Test

10. Plant Growth

Q1

Complete each sentence with the correct word.

- (1) The process of the seed growing into a seedling is _____.
- (2) The _____ of the seed will develop into roots and leaves.
- (3) Plants need nutrients to maintain their _____.

Q2

Choose the letter with the correct answer.

- (1) Water and fertiliser were given to both plants shown below. Which condition was not given to the plant on the right?

- A. Salt
- B. Sunlight
- C. Oil
- D. Electricity



- (2) What conditions do seeds need to germinate?

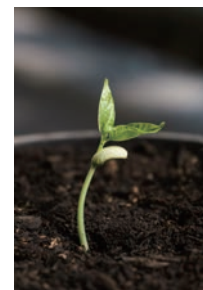
- A. Water, air and appropriate temperature.
- B. Water, light and air.
- C. Water, soil and appropriate temperature.
- D. Air, appropriate temperature and light.

- (3) Which of the following statements does not describe a function of water in plants? Water helps the plant

- A. make its own food.
- B. get rid of the nutrients into soil.
- C. moves the nutrients to all parts of the plant.
- D. keep moist and flexible.

- (4) Which of the following is the correct explanation about cotyledon?

- A. Cotyledons make the plant body cool.
- B. Cotyledons provide light to make food.
- C. Cotyledons develop into the leaves.
- D. Cotyledons store and provide food to the seed.



Q3

(1) After germination, what three conditions do plants need in order to grow well?

1. _____
2. _____
3. _____

(2) What is the process by which plants make their own food from carbon dioxide and water by using sunlight?

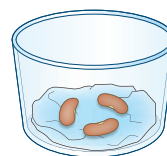
(3) What is the name of the food that the plant makes in the process (2)?

(4) A seed has a hard covering that covers its inside parts. What could be the reason for the seed coat to be hard?

Q4

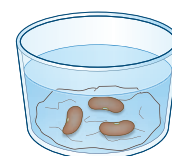
(1) Irene prepared two set-ups as shown on the right in order to investigate the condition of seed germination. Bean seeds are placed on wet paper in setup A while bean seeds in set-up B are submerged in the water. Explain why she prepared the two set-ups in the experiment.

A



Bean seeds placed on the wet paper.

B



Bean seeds submerged.

(2) Ambai observed that the seeds that were moistened and placed in an appropriate temperature and exposed air germinated. If he wants to keep the remaining seeds for the following year, how should he store the seeds? Write two ways to prevent the seeds from germinating.

