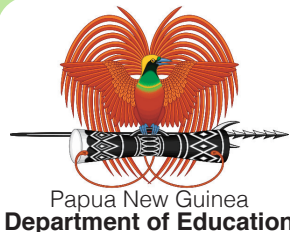


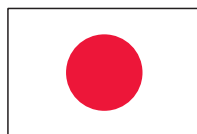
National **SCIENCE** Textbook



Grade 6



Papua New Guinea
Department of Education



From
the People of Japan



'FREE ISSUE
NOT FOR SALE'

Issued free to schools by the Department of Education

First Edition

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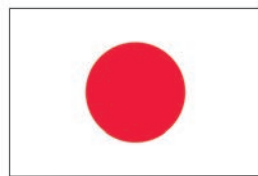
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National Science Textbook

Grade 6



Papua New Guinea
Department of Education



**From
the People of Japan**



Minister's Message

Dear Grade 6 Students,

I am honoured to give you my message in this National Science Textbook. The Government of Papua New Guinea through the National Department of Education has been giving priority to improve standards of learning in the area of Science for many years. A big thank you to the Government and the people of Japan for the continuous support in improving the quality of education in Papua New Guinea.

Students, this Science Textbook was developed by our very own Textbook Writers, Pilot teachers and Curriculum officers who have worked together with the Japanese specialists for three years to complete this Textbook. This is the first of its kind and also the best National Textbook for Grade 6 students in PNG. Do you know why? Because what you will learn from this textbook is comparable with international standards.

This textbook is exciting because it contains a lot of interesting student-centred topics and activities recommended for Grade 6 Science. The photographs, illustrations, charts and diagrams are based on PNG contexts and are interesting and exciting for learning. I am confident that this textbook will motivate you to explore more about Science.

Students, Science is a very important subject because it allows you to explore the things around you by using all your senses. You will have the opportunity to investigate scientific problems by yourself using the Science process skills; make predictions, test predictions and find solutions to the scientific problems.

I encourage you to be committed and to enjoy and love Science, because one day in future you will be a very resourceful person, participating in developing and looking after this very beautiful and resourceful country of ours and improving the quality of living.

I wish you a happy and fun learning experience with this Grade 6 Science Textbook.

Joseph Yopyyopy, MP
Minister of Education





Message from the Ambassador of Japan

Greetings to Grade 6 Students of Papua New Guinea!

It is a great pleasure that the Department of Education of Papua New Guinea and the Government of Japan have worked together to publish the national textbooks on science for the first time.

The officers of the Curriculum Development Division of the Department of Education made full efforts to publish this textbook with Japanese science experts. To be good at science, you need to keep studying with this textbook. In this textbook, you will learn many things about science with a lot of fun and interest, and you will find it useful in your daily life. This textbook is made not only for you but also for the future students.

You will be able to think much better and smarter if you gain more knowledge on numbers and diagrams through learning science. I hope that this textbook will enable you to enjoy learning science and enrich your life from now on. Papua New Guinea has a big land mass with plenty of natural resources, and a great chance for a better life and progress. I hope that each of you will make full use of the knowledge you obtained and play an important role in realising such potential.

I am honoured that, through the publication of this textbook, Japan helped your country develop science education to improve your ability, which is essential for the future of Papua New Guinea. I sincerely hope that, through the teamwork between your country and Japan, our friendship will last forever.

Satoshi Nakajima

Ambassador of Japan to Papua New Guinea

SCIENCE...

It's exciting...

It's amazing...

It's fun...



It's Science

Secretary's Message

Dear students,

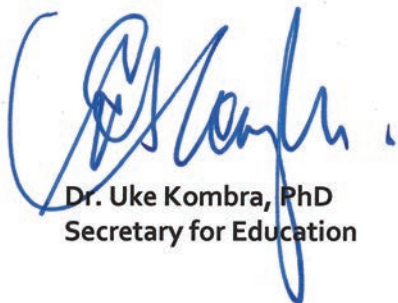
This is your Science Textbook that you will use in Grade 6. It contains a lot of very interesting and enjoyable activities that you will be learning in your daily Science lessons.

In our everyday lives, we come across many situations such as food chains in different environments, things falling down and breaking, the moon changing its shape and the list goes on. These situations are real and they are part of the way we live. By learning Science using this textbook, you will be able to find out why these things occur.

This Textbook provides a variety of enjoyable and interesting science activities and ideas. It provides the opportunity for the learner to learn together with the class or as an independent learner. The activities are designed in a way that a scientific problem is identified and the learner will have to solve the problem using the different scientific skills like making predictions, measuring, recording data and communicating the results. These are the important skills needed in order to understand the concepts of the lessons. The use of science process skills will help you to make decisions that will benefit you, your family, your community, your province and the country to improve the standard of living in the 21st Century and beyond.

I encourage you to enjoy learning Science and use the scientific knowledge learned to solve problems and issues that are encountered in the community and country today.

I wish you all the best in studying Science using this Textbook.



Dr. Uke Kombra, PhD
Secretary for Education

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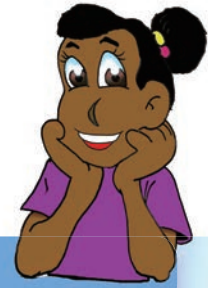
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Strand

-  Life
-  Physical Science
-  Earth and Space



How to learn SCIENCE

1 Wonder or Question

- Look carefully at things in nature around you and things in your daily life.
- Realise things that you wonder about.
- Identify the **key question** of the lesson.



2 Research

- Guess what will happen at the end of the activity.
- Understand the steps of the activity.
- Observe or conduct experiments in the activity.
- Record the result in your exercise book.
- Check if the result is the same with your guess.
- What do you find from the observation or experiment?



Symbols in this textbook

Each symbol gives you an attention about:

 : Key question of the lesson.

  : Activity that you will try.

 : Discussion question with your classmates.

 : Caution and warning.

 : Try it!

with this Textbook

Learn about nature, learn from nature

3 Findings

- Present and share your findings with your classmates.
- Discuss with your classmates to make sure if your findings are correct.
- Make conclusion to the key question.



4 Summary

- Read the textbook and confirm what you learnt in the lesson.
- Summarise what you did in the lesson.
- Let's try to use things you learnt in your daily life.



Friends learning together with you

Friends learning together in this textbook



Mero



Naiko



Sare



Gawi



Kekeni



Ambai



Vavi



Yamo

Enjoy SCIENCE with us!!



Chapter 1

Paths of Energy

We learnt that energy is transferred through living things in food chains.



We can find fungi on the fallen tree. Where do they get their energy?



1.1

Food Chain and Food Web

Lesson 1

Living Things in a Food Chain

A **food chain** is the path of food energy from plants to animals. Plants are eaten by some animals, and some animals are eaten by other animals. What are the roles of living things in a food chain?



How do living things play a role in a food chain?



Activity : Roles of living things in a food chain

What to Do:

1. Study the picture of the food chain below.
2. Think about the following questions:
 - (1) How do plants and animals get energy?
How are they different?

How can we differentiate living things in a food chain?



- (2) What types of food do the two animals eat? How are they different?
 - (3) Which animal eats another animal and which animal is eaten by another? What is the relationship between the two animals?

3. Share your ideas with your classmates. Discuss how living things play their roles in the food chain.

The arrow in the food chain shows 'is eaten by'. Which animal is eaten by which animal?



Plants



Caterpillar



Bird

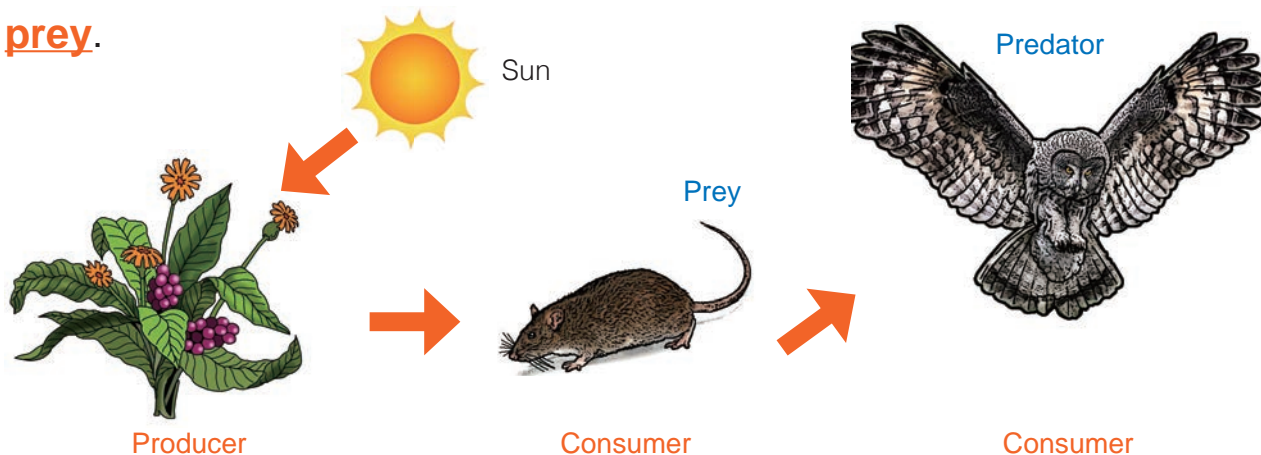
Summary

Living things are parts of a food chain. Plants are called **producers** because they produce their own food by using light energy from the Sun. Animals in a food chain are called **consumers** because they consume other plants and animals.

Consumers can be classified into three groups by their food source. An animal that eats only plants is called a **herbivore**. Deers and kangaroos are herbivores. An animal that eats only animals is called a **carnivore**. Snakes and owls are carnivores. An animal that eats both plants and animals is called an **omnivore**. Humans are omnivores.



Among consumers, some animals eat other animals and some animals are eaten by other animals. An animal that hunts and eats other animals is called a **predator**. An animal that is hunted and eaten by predators is called a **prey**.



Animals can be both predators and preys. For example, a frog eats other animals such as grasshoppers or butterflies, but it is also eaten by a snake or an owl. A frog can be both predator and prey.

Lesson 2

Food Chain in Different Environments

Living things live in different environments such as deserts, rainforests, grasslands, rivers, lakes and oceans.



What food chains are found in different environments?



Activity : Food chains around you

What to Do:

1. Study the pictures of the environments below and the environment around you. Write the names of different environments in your exercise books.
2. Make a list of living things that live in the different environments you found.
3. Draw the food chains in these environments using arrows.
4. Share your ideas with your classmates. Discuss the food chains in the different environments.

Do you remember what habitats are? What kinds of habitats do you live in?



Environment around us	Food chain in River
River	shrimp → fish → bird
Ocean
.....	Food chain in Ocean

Summary

Food chains exist wherever living things are found. Food chains are different in different environments. The following are examples of some food chains in different environments.

What types of food chains can you find in a forest and pond habitat?



Food Chains in Forests

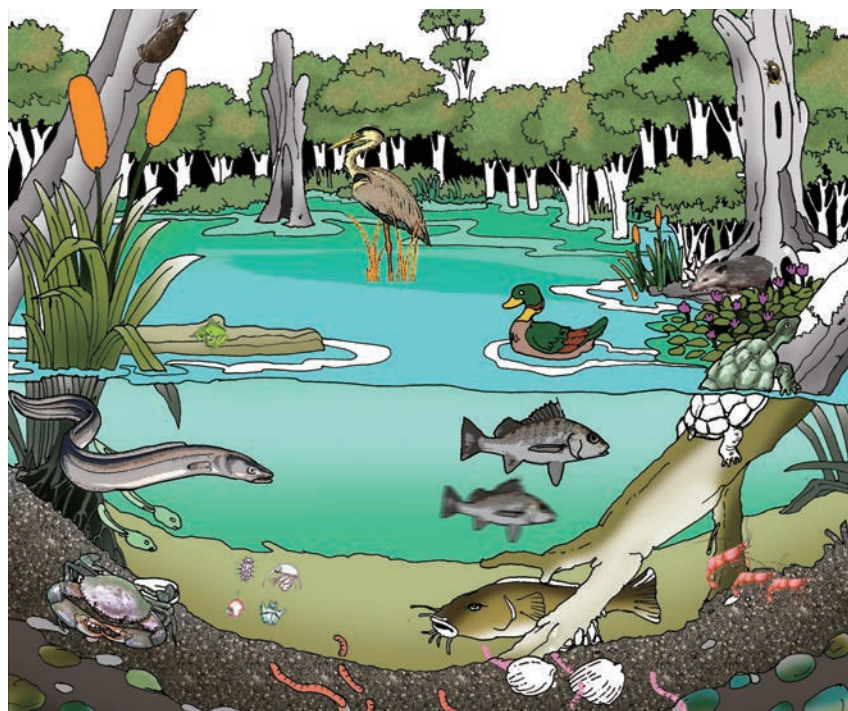
Different types of food chains exist in forests because many types of plants and animals can be found in forests. For example, some insects eat plants to get energy. Mice eat the insects and then snakes eat the mice. The snakes are then eaten by owls.



Plants and animals in a forest

Food Chains in Ponds

Different types of food chains can be found in ponds. For example, algae get their energy from the sun. Freshwater shrimps often eat algae to get energy. Small fish eat the shrimps. Then the small fish are eaten by big fish.



Plants and animals in a pond

Lesson 3

Food Web in Different Environments

Food chains are different in different environments. How about food webs?



What food webs are found in different environments?



Activity : Food webs around you

What to Do:

1. Study the picture below. Write the names of the animals in your exercise book.
2. Draw arrows to show how one living thing is eaten by other living things.
3. Share your ideas with your classmates. Discuss:
 - (1) How many food chains can you find?
 - (2) How is one living thing interconnected with other living things?
 - (3) How is the interconnection different from food chains?

Do you remember what a food web is?



A food chain shows only a path of food energy but we can find many different paths in this diagram.

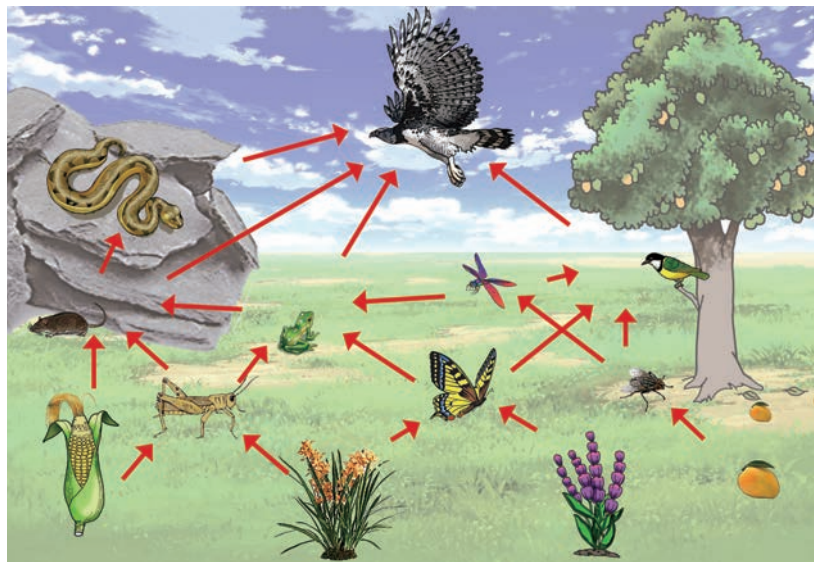


Summary

A food web is made up of several food chains connected together in an ecosystem. It shows how consumers and producers are interconnected in many ways to help them survive. An **ecosystem** is made up of all the living and non-living things in a given area interacting with one another. Different food webs can be found in different ecosystem.

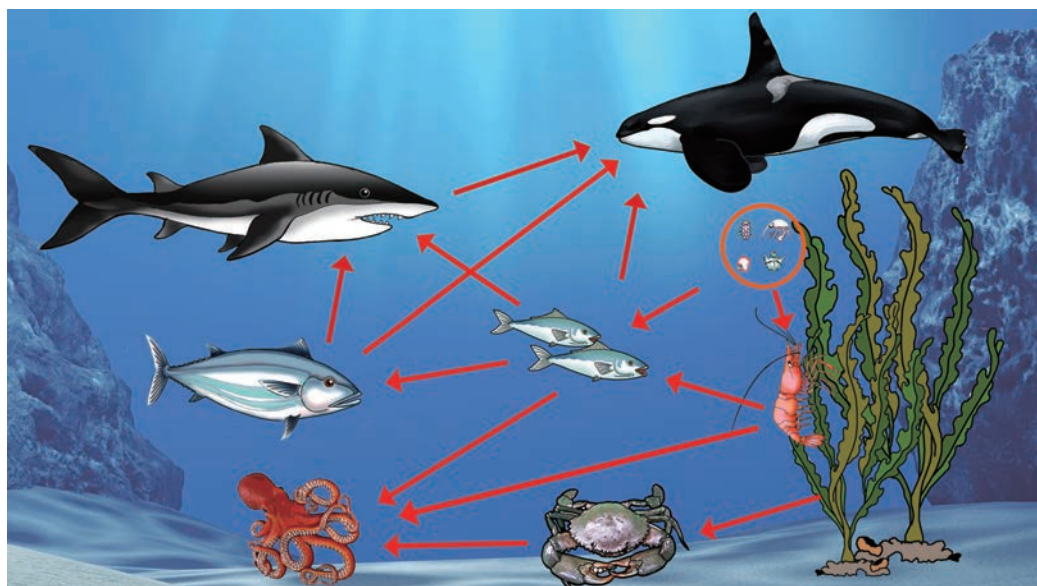
Food Webs in Forests

The diagram shows an example of a food web in a forest. Plants are producers in a forest. Plants are eaten by insects. Insects may be eaten by mice, frogs or small birds. Snakes eat the insects too but they also eat frogs or mice.



Food Webs in Oceans

Different food webs can also be found in oceans. The picture below shows an example of a food web in the ocean. Sea weed is a producer. It is eaten by crabs or shrimps. The shrimps are not only eaten by small fish but also the octopus. The small fish are eaten by big fish or sharks.



Lesson 4 End of Food Chains

Energy from food is transferred from producers to consumers through food chains. What happens to the energy after living things die?



What happens to the energy in food chains after living things die?



Activity : Food chains on and in soil

What to Do:

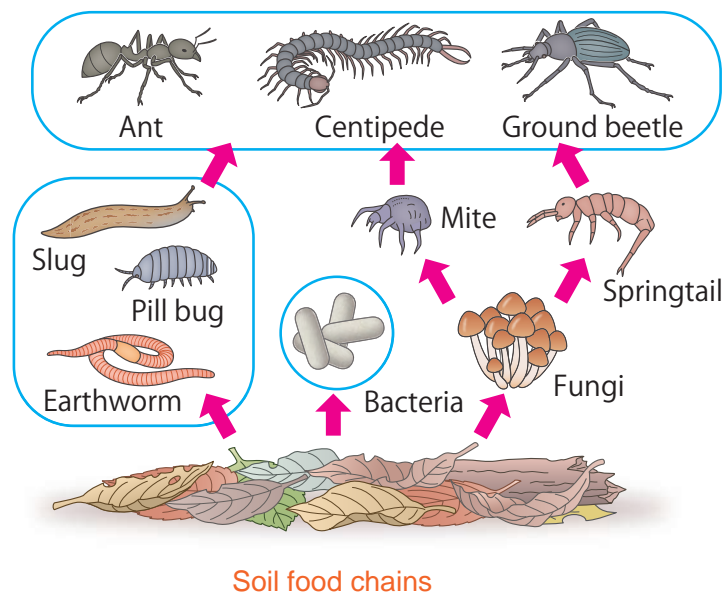
1. Go to a place where fallen leaves are piled up over a period of time.
2. Remove the leaves and record what you observe under the fallen leaves.
3. Dig out the top soil and record the types of living things and the things you observed.
4. Share your ideas with your classmates. Discuss:
 - (1) What types of living things you found?
 - (2) How the fallen leaves and the soils look like?
 - (3) Why the Earth is not covered with dead plants and animals?

Can you guess what will happen to the bodies of living things after they die?



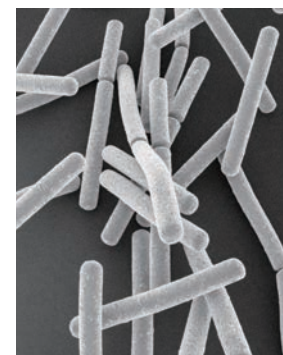
Summary

Many small living things feed on dead plants or animals to get energy. Some examples of these living things are fungi, earthworms, pill bugs and slug. All of them form food chains on and in the soil.



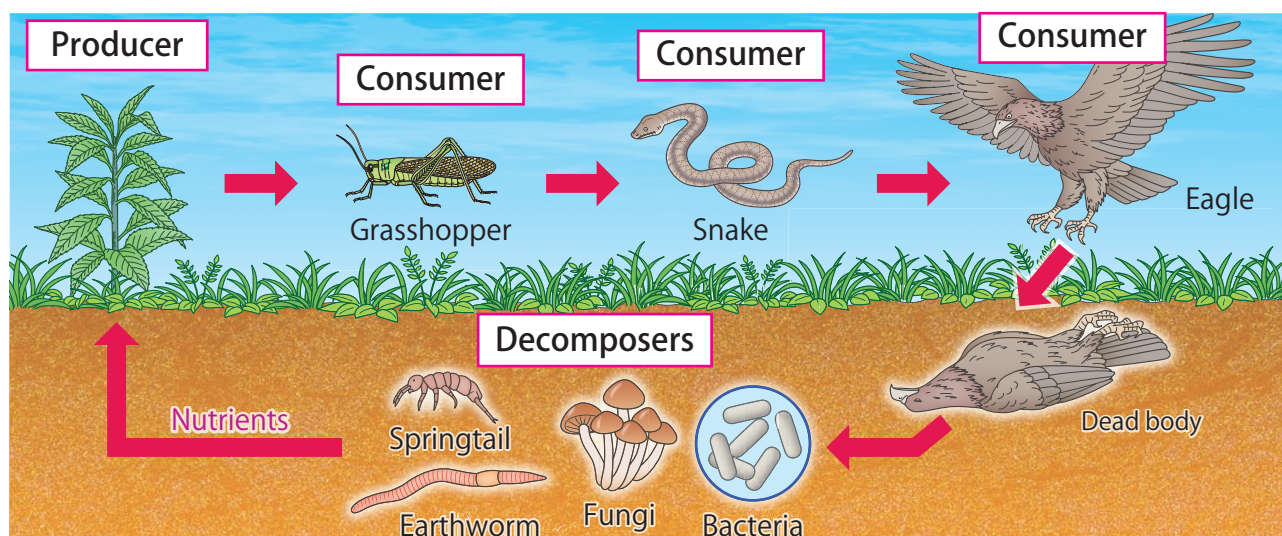
Soil food chains

Organisms that break down dead animals and plants are called **decomposers**. Worm, fungi, bacteria and some insects are examples of decomposers. **Bacteria** are tiny little organisms that are everywhere around us. We cannot see them without a microscope.



Bacteria

Decomposers are part of a food chain. They are the last link in the food chain. Plants get energy from the Sun and animals eat plants or other animals to get energy. When a plant or an animal dies, decomposers break down the dead plants or animals into smaller pieces. They then turn them into nutrients in the soil. Plants use the nutrients to grow again. Thus the food chain becomes a complete cycle. Without decomposers, dead plants or animals would pile up on the Earth.



Living Things in a Food Chain

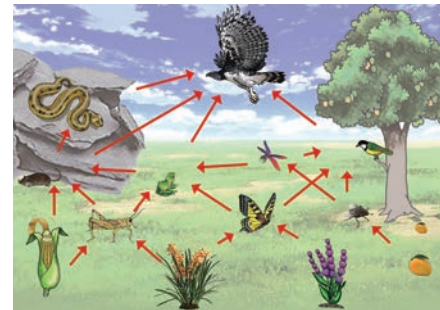
- Plants are producers that produce their own food.
- Animals are consumers that consume plants and other animals to get energy.
- Herbivores are animals that eat only plants.
- Carnivores are animals that eat only animals.
- Omnivores are animals that eat both plants and animals.
- A predator is an animal that hunts and eats other animals.
- A prey is an animal that is hunted and eaten by predator.

Food Chain in Different Environments

- Food chains exist wherever living things are found.
- Food chains are different in different environments because different types of plants and animals live there.

Food Web in Different Environments

- A food web is made up of several food chains connected together in an ecosystem. It shows how consumers and producers are interconnected in many ways to help them survive.
- An ecosystem is made up of all the living and non-living things in a given area interacting with one another.
- Different food webs can be found in different ecosystems.



Example of food web

End of Food Chains

- Decomposers are organisms that break down dead plants and animals to get energy.
- Bacteria are tiny little organisms that are everywhere around us. We cannot see them without a microscope.



Example of decomposers

Q1. Complete each sentence with the correct word.

- (1) An animal that eats both plants and other animals is called an _____.
- (2) An animal that is hunted and eaten by other animals is called a _____.
- (3) An _____ is made up of all the living things and non-living things in a given area interacting with one another.
- (4) Organisms that break down the remains of dead animals and plants are called _____.

Q2. Choose the letter with the correct answer.

- (1) Which of the following eats other animals only?
 - A. Carnivore
 - B. Prey
 - C. Herbivore
 - D. Omnivore
- (2) What do decomposers provide for soil and plants?
 - A. Bacteria
 - B. Nutrients
 - C. Water
 - D. Sunlight

Q3. Answer the following questions.

- (1) Place each living thing below under the correct heading.

tomato, frog, seaweed, butterfly, snake, hibiscus

Producer	Consumer

- (2) What makes a food web different in different environments?

Q4. Why is the Earth not piled up with dead plants and animals?

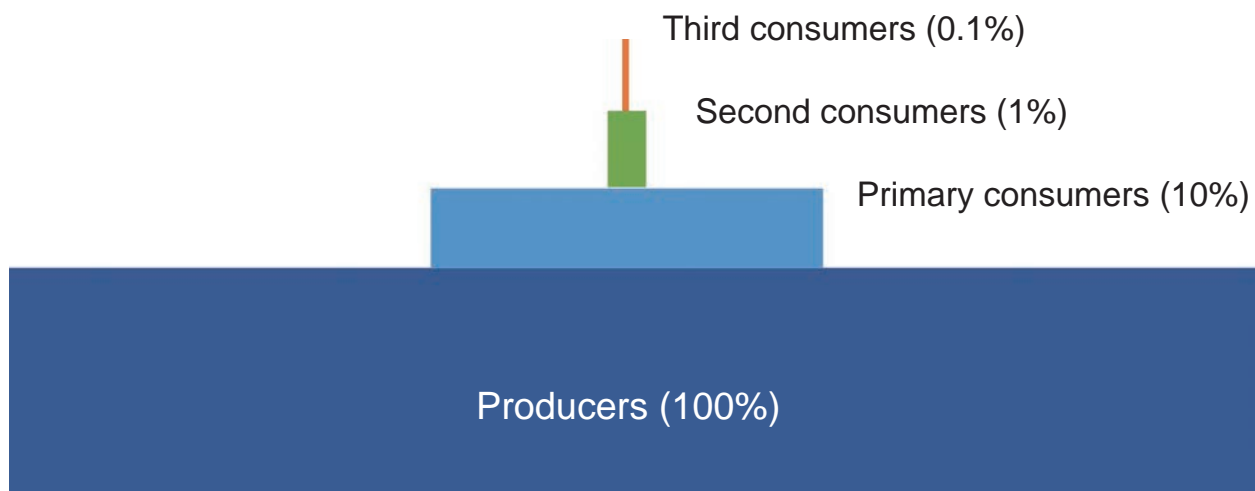
Chapter 1

•Science Extras•

How much energy is transferred in a food chain?

When a plant is eaten by a primary consumer, only 10% of the energy is passed on. The low percentage of transferred energy can be recognised for different reasons like some of the organism not being eaten, incomplete digestion of the eaten organism, energy lost in removal of waste processes or energy lost as heat.

Consumers pass 10% of their energy onto other consumers that feed on them. Because they are far more able than plants when passing on the energy. A lot of the energy is lost in the removal of waste and some is lost in trying to maintain a constant body temperature.



Energy pyramid

The pyramid shows the total energy stored in organisms at each feeding level in an ecosystem. Starting with the primary consumers at the base feeding level of the pyramid. The pyramid makes it clear why there can be only a limited number of feeding levels in a food chain or web. Because there is less energy at higher feeding levels, there are usually fewer organisms as well. Organisms tend to be larger in size at higher feeding levels.

Chapter Test

1. Paths of Energy

Q1

Complete each sentence with the correct word.

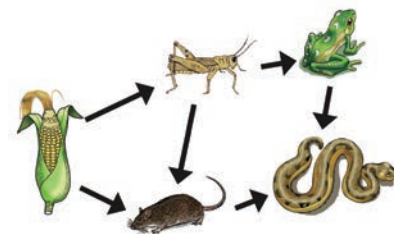
- (1) Organisms that break down the bodies of dead animals and plants to get energy are called _____.
- (2) Animals in a food chain are called _____ because they eat other plants and animals.
- (3) Humans are called _____ because they eat both plants and animals.
- (4) Tiny decomposers that cannot be seen without a microscope are called _____.

Q2

Choose the letter with the correct answer.

- (1) What do all food chains end with?
 - A. Producers
 - B. Herbivores
 - C. Carnivores
 - D. Decomposers
- (2) Which is a food chain that is found in a pond?
 - A. Seaweed → Grasshopper → Fish → Shark
 - B. Shrimp → Seaweed → Small fish → Large fish
 - C. Grass → Grasshopper → Frog → Snake
 - D. Seaweed → Shrimp → Fish → Shark
- (3) Study the food web shown in the picture on the right and identify the omnivore.

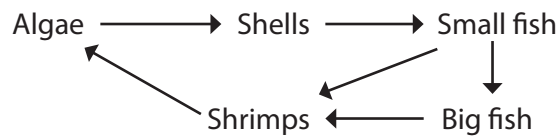
- A. Corn plant
- B. Grasshopper
- C. Rat
- D. Snake



- (4) Why do food chains differ from others in different environments?
 - A. Because same animals eat the same food.
 - B. Because same living things live in different environment
 - C. Because different living things live in different environment.
 - D. Because same plants live in different environments.

Q3

(1) A student observed living things in an environment and drew a food web as shown below, however there was something wrong with his food web. Explain why.



(2) How do algae get their energy?

Q4

(1) A bird died and laid on the soil. After some days the bird looked as though it had disappeared into the ground. What had happened? Explain your answer.



(2) What would happen to the energy that was in the bird?

Chapter 2

Change and Formation of Land

What happens to the sediments when a river flows?

We learnt that sediments are sand particles of rocks and small bits of soil piled up over time.



Photo of Mt. Kare, Enga Province

2.1

The Changes of the Earth's Surface

Lesson 1

Breaking Apart of Rocks

Study the picture on the right. The rock looks like a giant mushroom! How was it formed?



How does the surface of the Earth change?



Activity : Shaking a mixture of chalk and salt

What We Need:

- ➔ jar, some pieces of the same coloured chalk, salt



Salt represents sand and chalk represents rock



What to Do:

1. Record the size and shape of the chalk.
2. Put the chalk into the jar and pour salt until it covers the chalk. Close the lid tightly and shake it over 100 times.
3. Pour the mixture of chalk and salt on a paper. Observe the colour of salt, and the size and shape of the chalk.
4. Think about the following questions:
 - (1) Why did the colour of the salt and the size and shape of the chalk change?
 - (2) Salt represents sand. What makes sand move in nature?
 - (3) Chalk represents rocks. What changes the size and shape of rocks in nature?
5. Share your ideas with your classmates. Talk about what causes rocks to change in nature.



Summary

The surface of the Earth is slowly changing. The change of the Earth's surface is caused by weathering. **Weathering** is a process where rock is broken down into smaller pieces over time. The smaller pieces of rock are called **sediments**.

Weathering can shape rocks into unusual formations. Wind, water, ice, chemicals and living things are causes of weathering.

Sand blown by wind and rain hits large rocks over and over. The rocks are weakened and broken down into smaller pieces of rocks.

Most rocks have tiny cracks in them. Rainwater gets into the cracks. In cold climates, the water freezes and expands. The expanding ice makes the cracks bigger and breaks rocks over time.

Gases such as carbon dioxide in the air react with rainwater to form acid rain. Acid rain weakens rocks such as limestone, causing it to break. Plants also cause weathering. They slowly grow into cracks in the rocks and widen the cracks and the rock breaks.



An arch of rock is a result of weathering.



A rock wall is damaged by acid rain.



A plant is growing out of the cracks in the rocks.

Lesson 2

Carrying Away of Sediments

Wind, water, ice, chemicals and living things cause rocks to break down into sediments.



What happens to sediments after weathering?



Activity : How do waves change the beach?

What We Need:

➔ tray, sand, ruler, water

What to Do:

1. Place some sand on one side of the tray to make a beach model and then add enough water to cover the bottom of it.
2. Place the ruler at the opposite end of the tray to the beach. Slowly move the ruler back and forth to create waves against the sand for 3 minutes.
3. Observe the beach and record your observations in your exercise book.
4. Based on your observations, think about the following questions:
 - (1) What happened to the shape of the beach when waves hit it?
 - (2) What happened to the sand after the waves hit the beach?
 - (3) How did the waves change the beach?
5. Share your ideas with your classmates. Discuss how flowing water changes the Earth's surface.



Sand represents beach and water represents ocean.



Summary

Once rocks are broken up by weathering, the small pieces of rocks called sediments are carried away. The movement of sediments from one place to another is called **erosion**. Erosion is caused by water, wind and ice.

Water is the main cause of erosion. Rain, rivers, floods and the ocean carry away sediments. For example, rivers erode the riverbed and pick up sediments. The flowing water carries them away downstream. Ocean waves also erode the Earth's surface. Waves hit the coastline over time, causing the rocks to break down and are washed away.

In dry areas, wind picks up and carries away sand and soil to different places.

A glacier is a large mass of moving ice. As the glacier moves slowly, it digs out huge areas of rocks and soil and carries them away.



Flowing water break down rocks and carries sediments downstream.



Waves cause the rock to break down and be carried away.



Glaciers dig out huge areas of rock and soil and carries them away.

Lesson 3 Works of Rivers

Water is the main cause of erosion. Rivers or flowing water carry away sediments. What happens to sediments? Where do they go?



What happens to sediments after they are carried away by rivers?



Activity : Making a river model

What to Do:

1. Make a heap of soil and dig a winding waterway in the soil as shown in the picture below.
2. Start pouring water slowly into the waterway from the top of the mound and observe the following points:
 - (1) At which part of the waterway is water running faster or slower?
 - (2) At which parts of the waterway is soil most eroded?
 - (3) At which parts of the waterway does soil accumulate most?
3. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss how rivers work to change the Earth's surface.

Where can water run fast or slow? What happens to the soil when water runs fast or slow?



Result

We found out that at the steep slope, water runs faster. Soil is eroded deeply and is carried away by flowing water. At the gentle slope, water runs slowly and soil accumulates most. At the outside of the curve in the waterway, soil is eroded. At the same time, soil also accumulates at the inside of the curve in the waterway.



At the steep slope, water runs faster. Soil is eroded and carried away.



At the gentle slope, water runs slowly and soil accumulates most.



At the outside of the curve, soil is eroded. At the inside of the curve, soil accumulates.

Summary

As water in a river flows fast, the rushing water erodes the ground, picks up sediments from the riverbed and carries them downstream. This process makes the river channel deeper and wider over time. The river tends to slow down as it flows into the ocean or lake. When the river slows, sediments are dropped and deposited at mouths of the river or in the oceans. Slowly sediments build up into a landform such as a delta or beach. The dropping of sediments moved by water, wind and ice is called **deposition**. Erosion and deposition occur in the river.



Lesson 4

Other Causes that Change the Earth's Surface

Weathering and erosion cause the changes on the surface of the Earth. Are there any other causes that change the Earth's surface?



What else changes the surface of the Earth?



Activity : Changes of mountain

What to Do:

1. Draw a table like the one shown below.

How does the mountain change?

What causes the change to the mountain? Wind? Water? Glacier? mmm....



2. Study the pictures below. Both are the pictures of the same mountain taken over time.
3. Compare the two pictures and record how the mountain has changed in your exercise book.
4. Share your ideas with your classmates. Discuss what causes the change to the surface of the Earth.

The mountains in the pictures are the same mountain but they look different!



Photo taken in 1973



Photo taken in 1982

Summary

The surface of the Earth rapidly changes. Some of these changes are caused by earthquakes, volcanoes and landslides.

Earthquakes

An **earthquake** is the shaking of the Earth's surface. When earthquakes occur, they can change the shape of mountains. The land is lowered in certain areas. Cracks appear on the ground. Earthquakes may create mountains and valleys.



Earthquakes cause cracks on the ground.

Volcanoes

A **volcano** is an opening (usually in a mountain) on the Earth's surface which allows hot magma, volcanic gas and ash to escape. After a volcano erupts, the shape of the mountain will change. A new mountain, a large bowl-shaped hole in the ground or lakes may be formed.



A lake is formed after a volcanic eruption.

Landslides




A **landslide** is the rapid downhill movement of large amount of rock and soil. Heavy rains, earthquakes and volcanic activities often cause landslides. Parts of mountains and hills are destroyed by landslides.



Parts of a mountain and a town destroyed by landslide.

Breaking Apart of Rocks

- Weathering is a process where rock is broken down into smaller pieces overtime.
- Wind, water, ice, chemicals and living things are causes of weathering.

		
An arch of rock is the result of rock being weathered by wind.	A rock wall is damaged by acid rain.	A plant slowly grows into cracks in rocks.

Carrying Away of Sediments

- Erosion is the movement of sediments from one place to another caused by water, wind and ice.
- The dropping of sediments moved by water, wind and ice is called deposition.
- Erosion and deposition occur in the river.



Erosion and deposition in the river

Other Causes that Change the Earth's Surface

- Rapid changes to the surface of the Earth are caused by earthquakes, volcanoes and landslides.
- An earthquake is the shaking of the ground caused by the sudden movement of the Earth's surface.
- A volcano is an opening in the Earth's surface which allows hot magma, volcanic gas or ash to escape.
- A landslide is the rapid downhill movement of a large amount of rocks and soil.

Q1. Complete each sentence with the correct word.

- (1) The process where a rock is broken down into smaller pieces over time is called _____.
- (2) Erosion is mainly caused by water, _____ and ice.
- (3) The rapid downhill movement of a large amount of rocks and soil is called a _____.
- (4) The shaking of the ground caused by the sudden movement of the Earth's surface is called an _____.

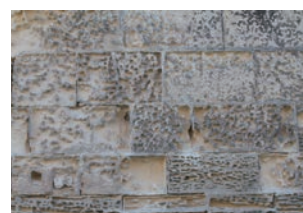
Q2. Choose the letter with the correct answer.

- (1) Which of the following is the best explanation of erosion?
 - A. Erosion is the process of dropping rocks.
 - B. Erosion is the movement of sediments from one place to another.
 - C. Erosion is the process of breaking down rock.
 - D. None of the above.

- (2) What are the small pieces of rocks that are broken down by weathering called?
 - A. Glacier
 - B. Carbon dioxide
 - C. Acid rain
 - D. Sediments

Q3. Answer the following questions.

- (1) What are the causes of weathering? List at least three.
- (2) Study the picture on the right and explain how acid rain affects the rock wall.



Q4. What changes would be observed when a volcano erupts?

2.2

Formation of Rock Layers and Rocks

Lesson 1 Cross Section of a Cliff

When we look at a cross section of a cliff, we find the striped patterns.



Why does a cross section of a cliff have the stripe pattern?



Activity : Observing a cross section of a cliff

What We Need:

➔ tape measure, hand lens, shovel



What to Do:

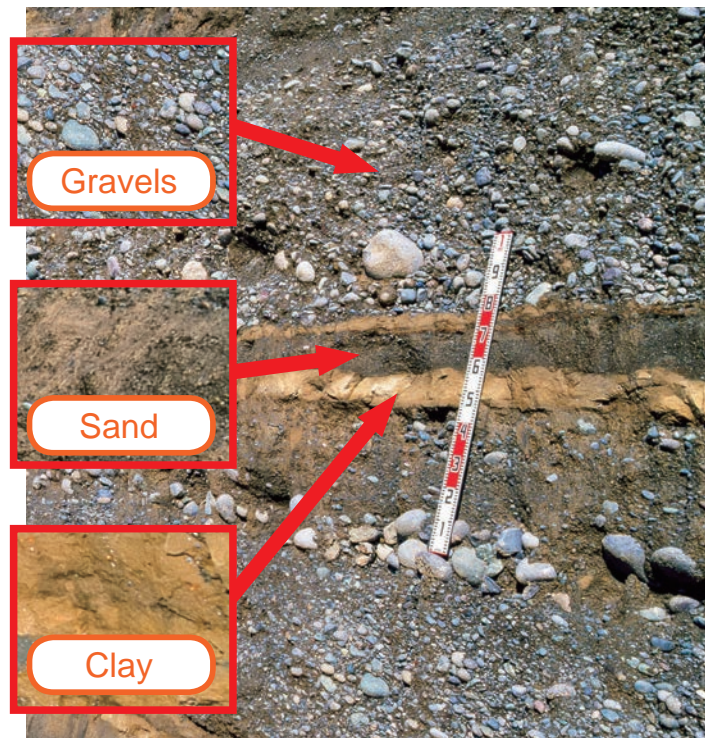
1. Go to a cliff, road cuts or river banks near your school.
2. Observe the cross section based on the following points:
 - (1) Colour of each layer
 - (2) Components and properties of each layer
3. Sketch the cross section and record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss why a cross section of a cliff has striped patterns.

Don't climb the cliff! Be careful of falling rocks!



Result

We found out that there are many different layers on the cross section of a cliff. Each layer had different colours. Some are pale or dark grey and some are khaki (dull brownish yellow). Each layer has different size and types of materials. Some layers consist of clay and sand. Others consist of sand and small rocks.



Each layer has different size and colour of materials.

Summary

The striped patterns of the cross section are formed with many layers that consist of materials such as gravels, sand, volcanic ash, or silt known as **sediment**. Each of the sediment has a different colour. This makes the cross section appear in different colours, forming striped patterns. The horizontal layers of sediment are called **strata**. In nature, strata come in many layers.



These are different types of strata. Why do they look different?

Lesson 2 Formation of Strata

Strata come in many layers. Each layer of strata consists of different materials such as gravels, sand and silt.

? How are strata formed?



Activity : Making a model of strata

What We Need:

- ➔ soil with gravels, sand and clay, clear plastic bottle, water,



Can you guess how strata are formed?

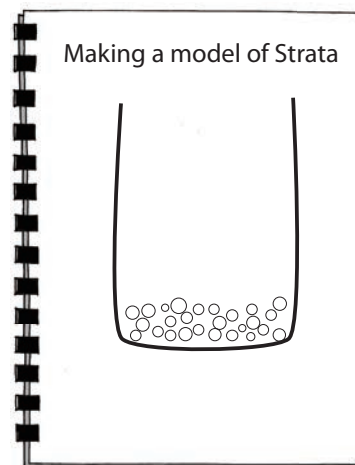


What to Do:

1. Pour soil and water into a plastic bottle. Fasten the bottle cap and shake it well.
2. After shaking, leave it for a while until the water becomes clear.
3. Observe the soil in the bottle and sketch your observations in your exercise book.
4. Share your ideas with your classmates. Discuss how layers of soil are formed.



Do you remember how a river works?



Result

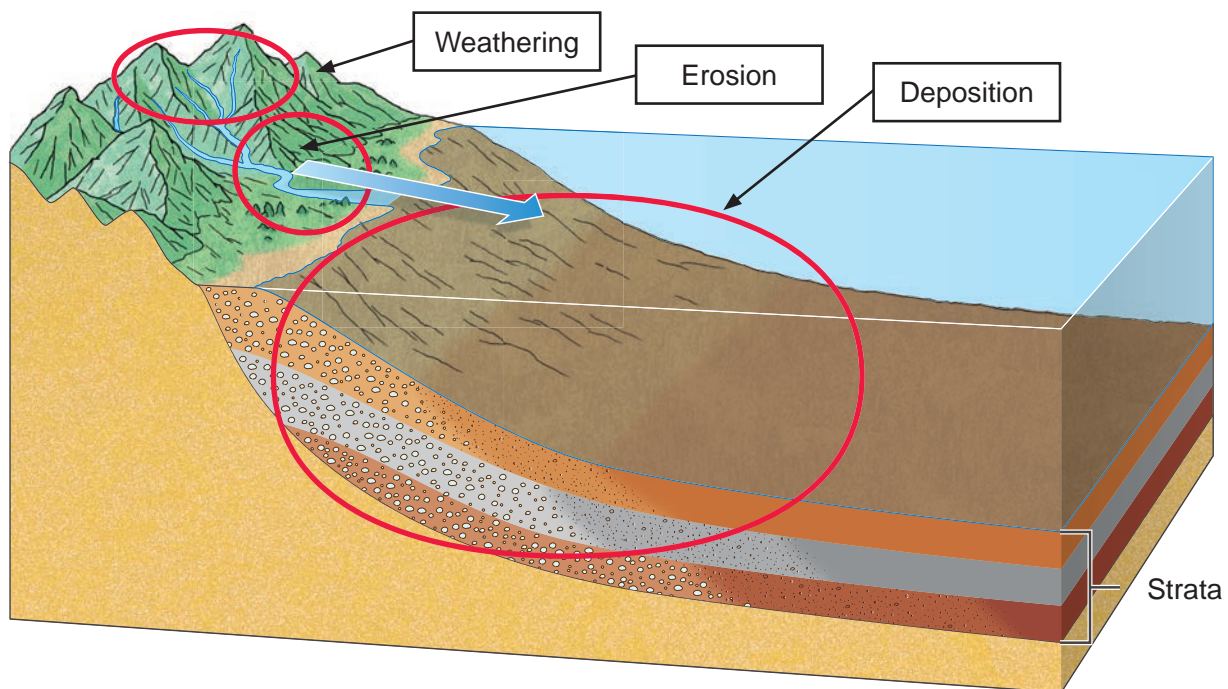
We found out that some layers can be observed. The different sizes and colours of sediments are deposited and divided into layers of gravels, sand and clay.



Layers of soil

Summary

Strata are formed by works of flowing water or rivers. Sediments such as gravels, sand and soil are carried by rivers to the ocean or lakes. As rivers slow down, sediments are deposited at the bottom of the oceans and lakes as layers, and are divided into different sizes. When weathering, erosion and deposition processes are repeated over time, strata are formed.



Formation of strata with works of water

Lesson 3

Formation of Sedimentary Rock

A **sedimentary rock** is formed by sediments such as minerals, sand, mud and even fossils.



How are sedimentary rocks formed?



Activity : Making a model of sedimentary rock

What We Need:

- ➔ syringe with the end cut off,
- two paper cups, sugar,
- sand, water, spoon, tissue



What to Do:

1. Pour a spoonful of sand into the paper cup.
2. Add 5 spoonfuls of sugar and a spoonful of water in another paper cup and stir it until it is dissolved.
3. Pour the sugar water mixture slowly into the cup of sand until it is moistened. Pour off any excess water.
4. Fill the syringe with the sand and compress it with your finger or the palm of your hand to squeeze out any air.
5. Carefully push the sand out onto the piece of paper and observe what happens to the sand.
6. Share your ideas with your classmates. Discuss how a rock is formed.



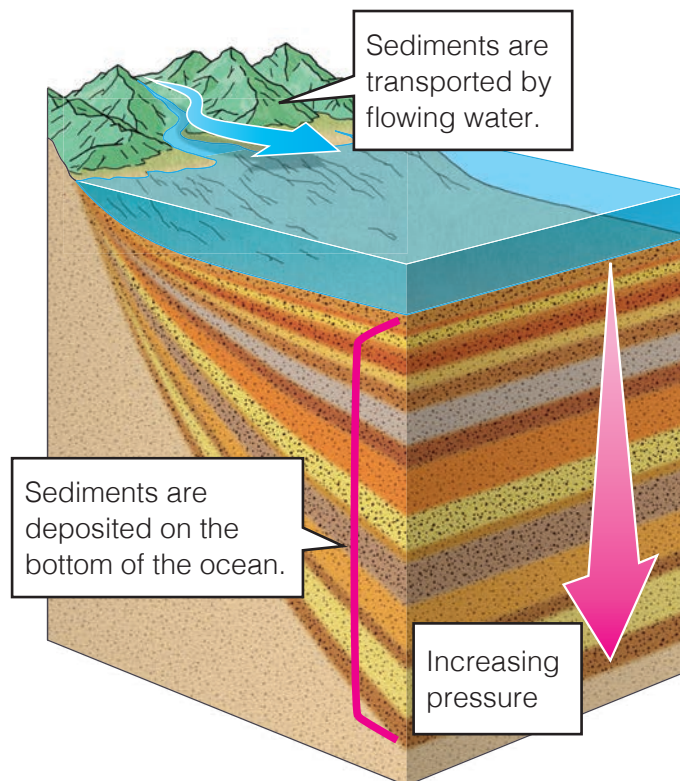
Summary

A sedimentary rock is formed from layers of sediments called strata, usually at the bottom of rivers, lakes and oceans.





As thick layers of sediments build up over millions of years, the weight of the upper layers press the sediments at the bottom.

The pressure forces out the water and slowly turns the sediments into sedimentary rocks. Sedimentary rocks may contain fossils of animals and plants.

There are different types of sedimentary rocks such as siltstone, shale, sandstone, conglomerate and limestone. Sedimentary rocks can be classified based on what they are made of and how they are formed.



Formation of sedimentary rock

Shale	Sandstone	Conglomerate	Limestone
			
Shale is formed from mud.	Sandstone is formed from grains of quartz in sand.	Conglomerate is formed from different size of pebbles cemented together with sand and dissolved minerals.	Limestone is formed from the remains of shells, corals, planktons and other marine animals.

Cross Section of a Cliff

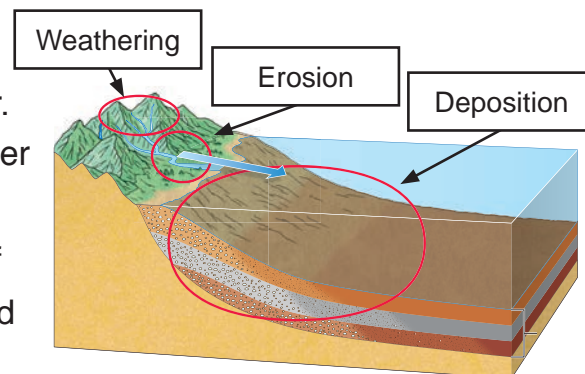
- The strata are the horizontal layers of sediments.
- The striped patterns of the cross section of a cliff are formed with many layers that consist of materials such as gravels, sand, volcanic ash or silt known as sediment.
- Each of the sediment has a different colour. This makes the cross section appear in different colours, forming striped patterns.



Strata

Formation of Strata

- Strata are formed by works of flowing water.
 1. Sediments that are eroded by flowing water are transported to the ocean or lakes.
 2. Sediments are deposited at the bottom of ocean and lakes as layers and are divided into different sizes.
 3. When weathering, erosion and deposition processes are repeated over time, strata are formed.



Formation of strata by works of water

Formation of Sedimentary Rocks

- A sedimentary rock is formed from layers of sediments usually at the bottom of rivers, lakes and oceans.
- The pressure due to the weight of the upper layers forces out the water and slowly turns the sediments into sedimentary rocks.
- There are different types of sedimentary rocks such as siltstone, shale, sandstone, conglomerate and limestone.



Sandstone



Conglomerate

Q1. Complete each sentence with the correct word.

- (1) The horizontal layers of sediments are _____.
- (2) The rock that is formed from layers of sediments is called _____ rock.
- (3) Strata are formed by works of _____ water.

Q2. Choose the letter with the correct answer.

- (1) Study the picture of a cross-section of a cliff. Why does it have striped patterns?

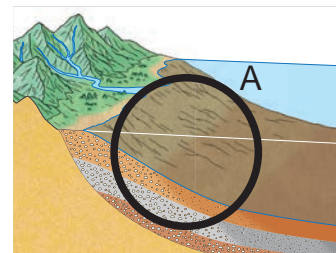


- A. Because different layers have different colour and size of sediments.
- B. Because all layers have same colour of sediments.
- C. Because all layers have same size of sediments.
- D. Because different layers have different smells of sediments.

- (2) What type of sedimentary rock is formed from remains of shells, corals, plankton and other marine animals?

- A. Shale
- B. Conglomerate
- C. Limestone
- D. Sandstone

Q3. Study the diagram on the right that shows formation of strata with works of water. What is the name of the process of dropping sediments moved by flowing water caused at place A?



Q4. Answer the following questions.

- (1) Sedimentary rocks are formed at the bottom part of the thick layers of sediments. Why do sedimentary rocks not formed at the top part of sediments?
- (2) There are several kinds of sedimentary rocks. How are the sedimentary rocks classified?

Chapter 2

•Science Extras•

When electricity is cut off during natural hazards, such as floods, earthquakes and landslides, there is a simple way to produce electricity using another source and that is by using a charcoal.

Let's make a charcoal cell for natural hazard!



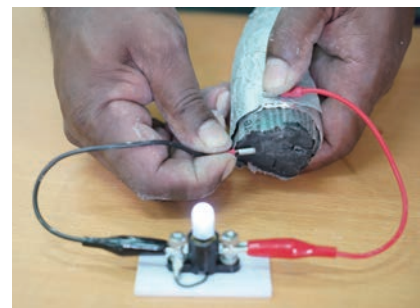
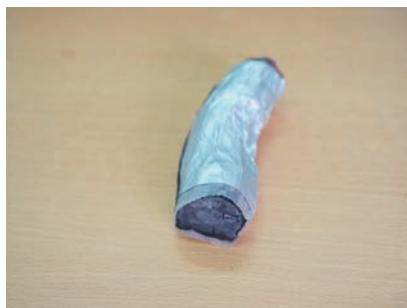
1. Soak newspaper properly in the salt solution.



2. Wrap the newspaper around the charcoal except the two ends.



3. Completely cover the newspaper with a sheet of aluminum foil carefully. (**Make sure the aluminum foil does not touch the charcoal.**)



4. Connect one of the wire from the lamp to the aluminum foil and the other wire to one end of the charcoal.

Chapter Test

2. Change and Formation of Land

Q1

Complete each sentence with the correct word.

- (1) The process by which eroded material drops or settles is called _____.
- (2) A sedimentary rock formed from mud is _____.
- (3) An opening in the Earth's surface which allows hot magma, volcanic gas or ash to escape is a _____.

Q2

Choose the letter with the correct answer.

- (1) What is sediment?
 - A. Decaying plant or animal material.
 - B. The process of rocks being broken down and carried away.
 - C. The top layer of the soil.
 - D. Bits of rock, sand and silt caused by weathering of rocks.
- (2) What happens when glaciers slowly move down a mountain?
 - A. The glaciers cause no change.
 - B. The glaciers melt and form giant lakes.
 - C. The glaciers cause erosion by taking sediments and moving them somewhere else.
 - D. The glaciers melt and freeze.
- (3) Which of the following is a rapid change in the Earth's surface?
 - A. Deposition
 - B. Erosion
 - C. Weathering
 - D. Landslide
- (4) How do plants weather rocks?
 - A. When the leaves dissolve the rocks.
 - B. When roots grow into cracks of rocks and expand the rocks.
 - C. When the plants moves water from the roots to the leaves.
 - D. When water in the leaves evaporates.

Q3

(1) A student took this picture on the right during a holiday trip. What process has made the rock to look the way it is?

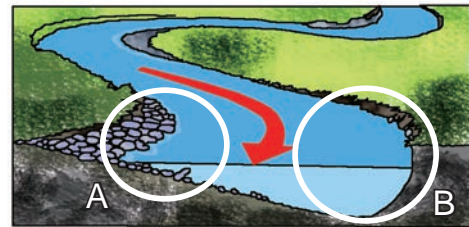


(2) Explain how freezing water can cause the weathering of rocks.

(3) The diagram below shows a river. Points A and B are locations on the banks of the river. What process is occurring at locations A and B?

Position A: _____

Position B: _____



Q4

(1) A group of students studied rocks. They collected different samples of sedimentary rocks. One of the rocks had different size of pebbles that got cemented together with sand and dissolved minerals. What is this rock called? _____



(2) Why do sedimentary rocks appear in strata?

