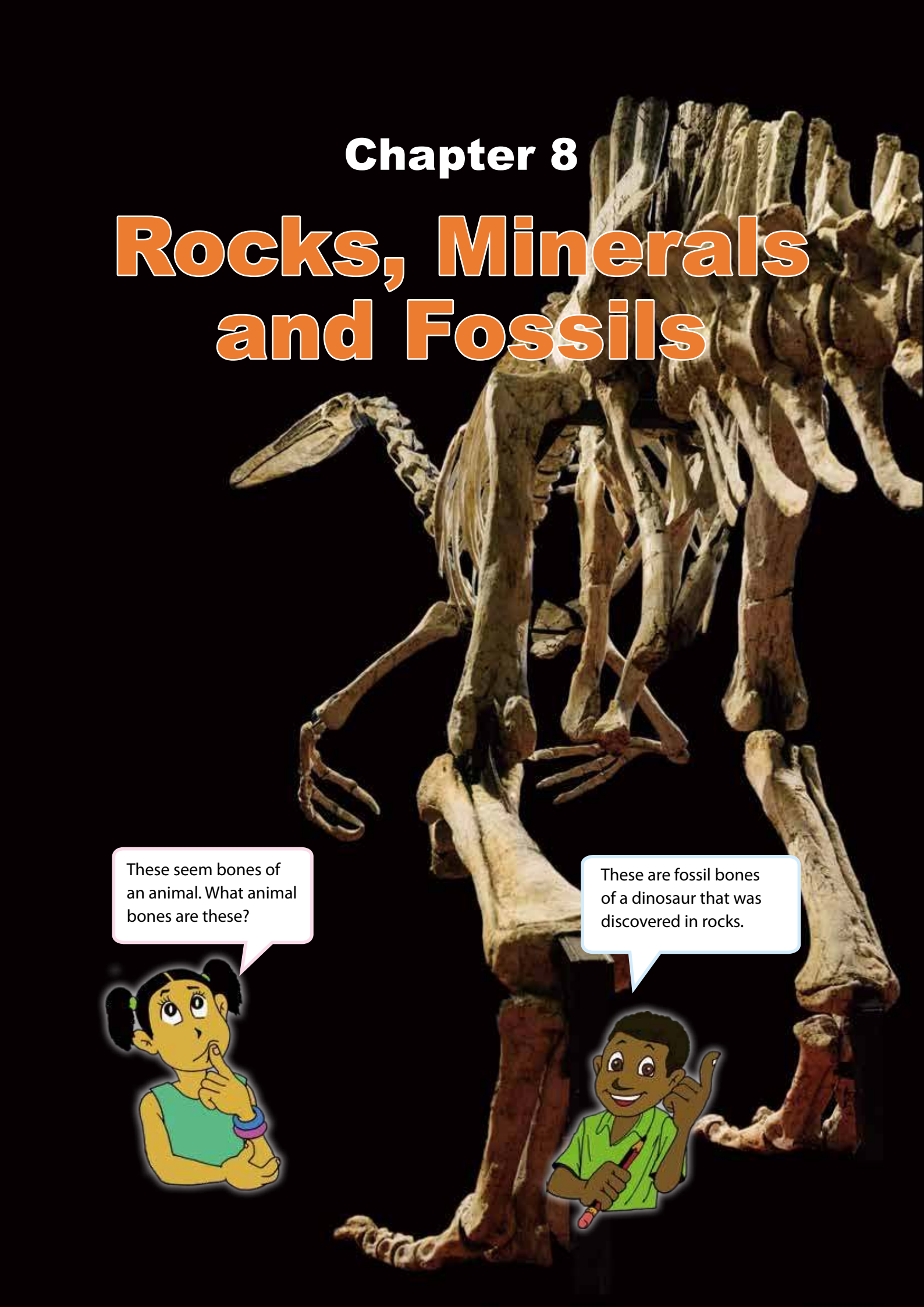
Chapter 8

Rocks, Minerals and Fossils



8.1 Rocks and Minerals

Lesson 1 Rocks

We can find different kinds of rocks around us. Why do rocks look different? What are rocks made up of?

What is a rock?

Activity : Grouping rocks

What We Need:

- hand lens, different types of rocks, markers

What to Do:

1. Draw a table like the one shown below.

Properties	Rock 1	Rock 2	Rock 3	Rock 4	Rock 5
Colour					
Texture					
Pattern (regular or irregular)					
Property of grains					
Others					

2. Go out of the classroom and collect 5 different rocks. Number the rocks using the marker.
3. Observe the properties of each rock with your eyes first. Record your observations in the table.
4. Observe the properties of grains in the rocks again using the hand lens. Record your observations in the table.
5. Classify the rocks into some kinds of groups based on their properties.
6. Share your findings with your classmates. Discuss the properties of rocks and how you can tell rocks apart.

Summary

A **rock** is a naturally formed, non-living material of the Earth. A rock is made up of one or more minerals. A **mineral** is a material that is found in nature such as gold and copper. Some rocks may be made of one mineral type. Other rocks may be made of a mixture of different mineral types.

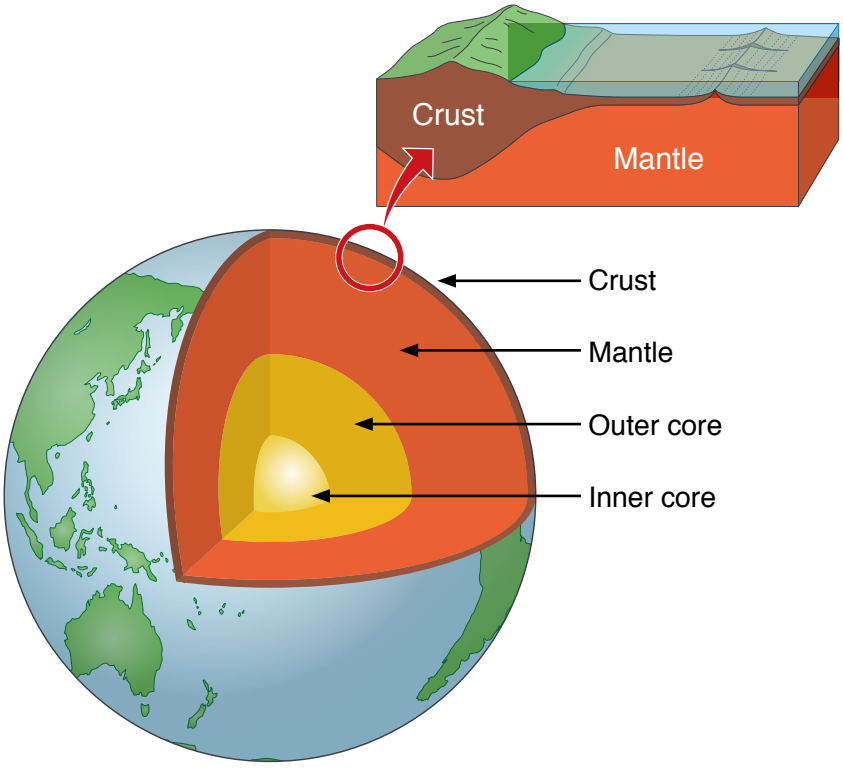
There are many kinds of rocks. Limestone and sandstone are examples of rocks. Rocks can be identified by the types, size and colour of mineral grains they contain. The mineral grains in a rock may be white and tiny or they may be red and as big as your fingernail.

Rocks form within the Earth and make up a large part of our Earth. Earth is made of three layers; crust, mantle and core. The **crust** is the thinnest outer layer of the Earth. The **mantle** is the thick, hot layer of the Earth. The **core** is the hottest, innermost layer of the Earth. The crust is made of rocks.

Quartz is made of one mineral.

This rock contains several different colours and textures of minerals.

Inside the Earth



Lesson 2 Minerals

Rocks are made up of one or more types of minerals. What types of minerals are there? What properties do minerals have?

How can we classify minerals?

Activity : Properties of minerals

What We Need:

- rock that includes different types of minerals, hand lens, steel nail

What to Do:

1. Draw a table like the one shown below.

Properties	Mineral 1	Mineral 2	Mineral 3	…
Colour				
Glitter				
Texture				
Hardness				

2. Observe the rock with the hand lens and find different types of minerals.
3. Record the colour, glitter and texture of each mineral in the table.
4. Test each mineral to see if you can scratch it with a steel nail. Record the results in the table.
5. Share your findings with your classmates. Discuss how you can tell minerals apart.

Summary

A **mineral** is a solid non-living material that is found in nature. Minerals make up rocks.

There are many kinds of minerals on the Earth. Salt that we put on food is a mineral. Metals such as gold and copper are also minerals. The graphite in our pencil is a mineral too. Each mineral has its own properties such as colour, lustre and hardness. We can use the properties to identify minerals.

Colour - Minerals come in many colours. Most minerals come in just one colour. Some minerals such as quartz come in many colours.

Lustre - Lustre describes how light reflects off the surface of a mineral. Some minerals are shiny like silver. Some are dull.

Hardness - The hardness of a mineral describes how easy it is to scratch the surface of a mineral. Some minerals are soft and others are much harder. Diamond is the hardest mineral on the Earth.

Gold

Rock salt

Copper

Graphite

There are many kinds of minerals.

Different colours of quartz

Some minerals are shiny and others are dull.

Diamond is the hardest mineral on the Earth.

Lesson 3 Types of Rock

Look around us. We can find many different types of rocks. What types of rocks are there on the Earth? How can we tell them apart?

What types of rock are there?

Activity : How rocks are formed

What We Need:

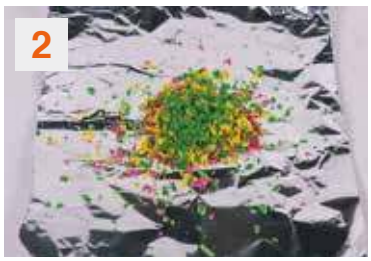
- three different colours of crayons, cutter, aluminium foil, mug, boiling water

What to Do:

1. Make crayon shavings with the cutter.

To shave the crayons with the cutter, be careful with its sharp blade.

2. Sprinkle a layer of each colour crayon on the aluminium foil. Fold up the foil and press down on it very hard. Unfold the foil and observe the crayon to represent a rock.



3. Wrap the crayon that you made in Step 2 with the aluminium foil. Put it in very hot water for 15 to 20 seconds until the crayon starts to melt. Remove it from the hot water and squeeze it. Let it cool and observe the crayon to represent a rock.
4. Wrap the crayon that you made in Step 3 with aluminium foil. This time put it in the very hot water for the crayon to melt completely. Remove it and let the crayon cool. Observe the crayon that represent a rock.

5. Share your findings with your classmates. Discuss how they are formed and their appearance.

Be careful when using hot water

Summary

A rock can be grouped according to how it is formed. There are three kinds of rocks on the Earth; Sedimentary, Metamorphic and Igneous rocks.

Sedimentary Rock

A **Sedimentary rock** is formed when sediments are glued together and become hard. **Sediment** is sand particles of rock and small bits of soil. It is piled up over time, usually as layers at the bottom of lakes and oceans. Sandstone, limestone and conglomerate are examples of sedimentary rocks.

Sediment piled up as layers.

Limestone

Metamorphic Rock

A **Metamorphic rock** is formed when a rock inside the Earth has been changed by heat and pressure. Metamorphic rocks are often made from other types of rocks. For example, limestone can be changed into marble. Slate and soapstone are examples of metamorphic rocks.

Marble

Igneous Rock

An **Igneous rock** is formed when melted rock from inside the Earth cools and hardens. Melted rock is called **magma**. This can happen in many different places on the Earth but one of the most common places is at a volcano. Granite and basalt are examples of igneous rocks.

Granite

Lesson 4 Uses of Rocks and Minerals

We have learnt about the properties of rocks and minerals. Each rock and mineral has its own properties. How are rocks and minerals useful for our lives?

How do we use rocks and minerals in daily life?

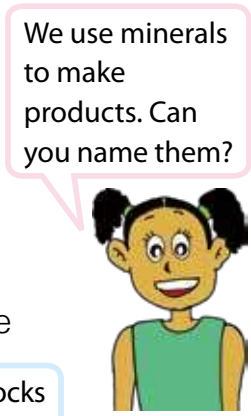
Activity : Finding uses of rocks and minerals

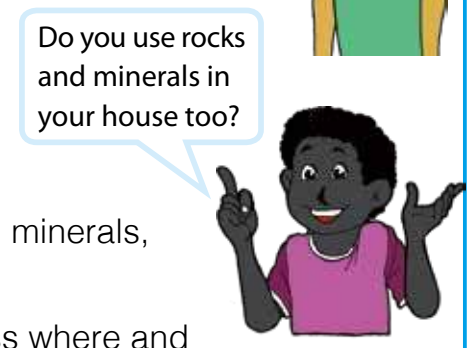
What to Do:

1. Draw a table like the one shown below.

Location	How are rocks and minerals used?
In classroom	
Outside classroom	
Others	

2. Look at your classroom and find how rocks and minerals are used in the classroom.
3. Go out of the classroom and find how rocks and minerals are used.
4. Record your findings in the table.
5. If you have any ideas on the uses of rocks and minerals, write your ideas in the table.
6. Share your ideas with your classmates. Discuss where and how we use rocks and minerals.





Summary

Rocks and minerals are used to make products in many ways. The properties of rocks and minerals help us decide how they can be used to make products.

Uses of Rocks

We use rocks in many ways. Rocks are used for building roads, houses and statues. Rocks are also used for cooking. Limestone is used to make cement. Coal is burnt for heat. We use marble for building, sculpture and manufacture.

Stone is used for cooking.

Limestone is used for making cement.

Marble is used for building and sculpture.

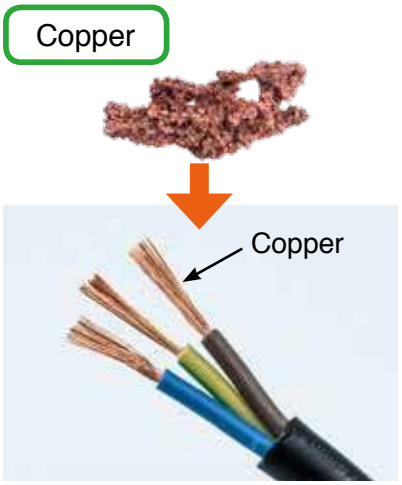
Uses of Minerals

Minerals are also useful for us. Papua New Guinea is rich in gold, silver, copper and nickel. We use gold and silver for jewellery and coins. Copper is used in electric cables and wires. Nickel is mainly used in making alloys such as stainless steel. An **alloy** is a mixture of two or more metals. Quartz is used in making glasses, watches, radios and electrical instruments.

Gold

Gold is used for jewellery and coins.

Copper



Wires made from copper.

Quartz

Quartz is used in the glass that covers the watch.

Summary and Exercise

Summary 8.1 Rocks and Minerals

Minerals

- There are many kinds of minerals on the Earth such as salt, gold and granite.
- Each mineral has its own properties such as colour, lustre and hardness.

Colour	Lustre	Hardness
Different colours of minerals.	Some minerals are shiny others are dull.	Some minerals are hard such as diamond.

Rocks

- A rock is made up of one or more minerals.
- Rocks can be identified by the types, size and colour of mineral grains they contain.
- The Earth is made of three layers; crust, mantle and core. The crust is made of rocks.

Types of Rocks

- Rocks can be grouped according to how they are formed.
- The three types of rocks are sedimentary, metamorphic and igneous.

Sedimentary rock	Metamorphic rock	Igneous rock
		
It is formed when sediments are glued together and become hard.	It is formed when a rock inside the Earth has been changed by heat and pressure.	It is formed when melted rock from inside the Earth cools and hardens.

Uses of Rocks and Minerals

- Rocks are used for building roads, house, statues, for cooking and making cement.
- Minerals are used to make jewellery, coins, electric cables and wires, glasses, watches, radios and electrical instruments.

Summary and Exercise

Exercise 8.1 Rocks and Minerals

Q1. Complete each sentence with the correct word.

(1) The thinnest outer layer of the Earth made of rock is _____.

(2) A melted rock inside the Earth is called _____.

(3) The three types of rocks are; igneous, sedimentary and _____ rock.

(4) A _____ rock is formed when sediments are glued together and become hard.

Q2. Choose the letter with the correct answer.

(1) Which of the following lists contains the correct order of the Earth's layers.

A. Crust, inner core, outer core, mantle

B. Mantle, outer core, inner core, crust

C. Outer core, mantle, inner core , crust

D. Crust, mantle, outer core, inner core

(2) Which of the following is <u>not</u> a correct explanation about minerals?

A. Minerals can be identified by its properties such as colour, lustre and hardness.

B. Salt and gold are examples of minerals.

C. All minerals have the same colour.

D. Minerals make up rocks.

Q3. Study the picture below. What type of mineral was used to make the wires in the electric cables?

Q4. What type of rock is formed when hot magma cools and hardens?

8.2 Fossils

Lesson 1 A Fossil

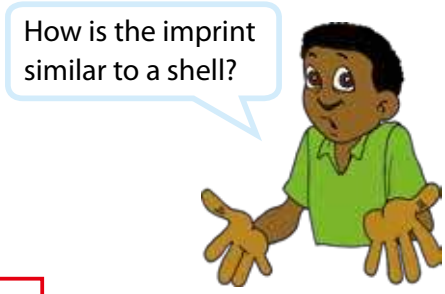
Look at the picture of the fossil on the right.
What does it look like? How was it formed?

What is a fossil?

Activity : Make a fossil

What We Need:

- clay, plate, objects such as shell, candle, tin-can



What to Do:

1. Flatten clay on a plate and press an object into the clay.

Be careful when you pour melted candle onto the clay. It is very hot.

2. Slowly and carefully pull the object out of the clay.
3. Put some candle into the-tin can and heat it until the candle melts completely. Pour the melted candle over the imprint of the object in the clay.

4. Let it cool and dry. Remove the candle from the clay carefully. The candle is your fossil.
5. Observe the imprint in the clay and the fossil and think about how they are similar or different.
6. Share your findings with your classmates. Discuss how fossils are formed.

Summary

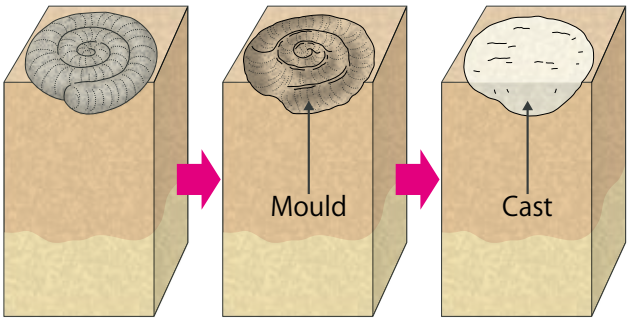
A **fossil** is the remains of a once living thing. Studying fossils helps scientists learn about the past history of life on Earth. Most fossils are found in sedimentary rocks such as shale, limestone and sandstone.

Tyrannosaurus

Trilobite

Plant fossil

Fossils form in different ways. When a living thing dies, it is buried in sediments such as sand and soil. The living thing presses down in sediment and it leaves a shape in the sediment. The sediment turns into a rock. The hard parts of the living thing dissolves completely and the shape is left in the rock. The shape of a living thing found in a rock is called a **mould**. If sediments or minerals fill the mould's empty space, a cast forms. A **cast** is the opposite of its mould.



Formation of fossil

Mould and cast of ammonite

Some fossils are hard parts of living things such as bones, teeth, shells and leaves. After living things die, sediments cover them. The soft parts rot away and the hard parts turn into rocks.

Bone fossil

Shark tooth fossil

Lesson 2 Learning from Fossils

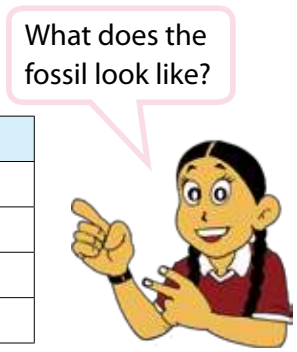
Scientists study about fossils. What do they learn from fossils? What kind of information do fossils give us?

What do fossils tell us?

Activity : Getting information from fossils

What to Do:

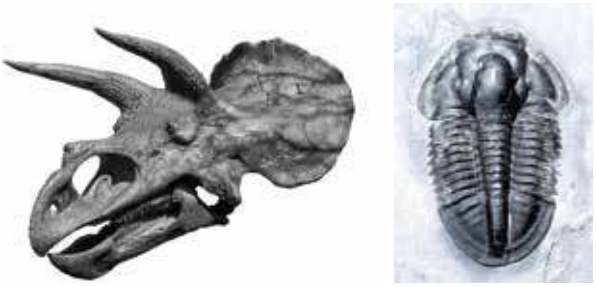
1. Draw a table like the one shown below.



Information	Your answer
Types of animal	
Its food	
Its habitat	
Other ideas	

2. Study the picture of the animal fossil below.
3. Think about the following questions.
   (1) What kind of animal is it? Is it a mammal, bird, fish, amphibian or reptile?
   (2) What did it eat?
   (3) Which habitat did it live in?
   (4) What else can you infer from this fossil?
4. Write your answers in the table.
5. Share your ideas with your classmates. Discuss what kinds of information a fossil gives us.

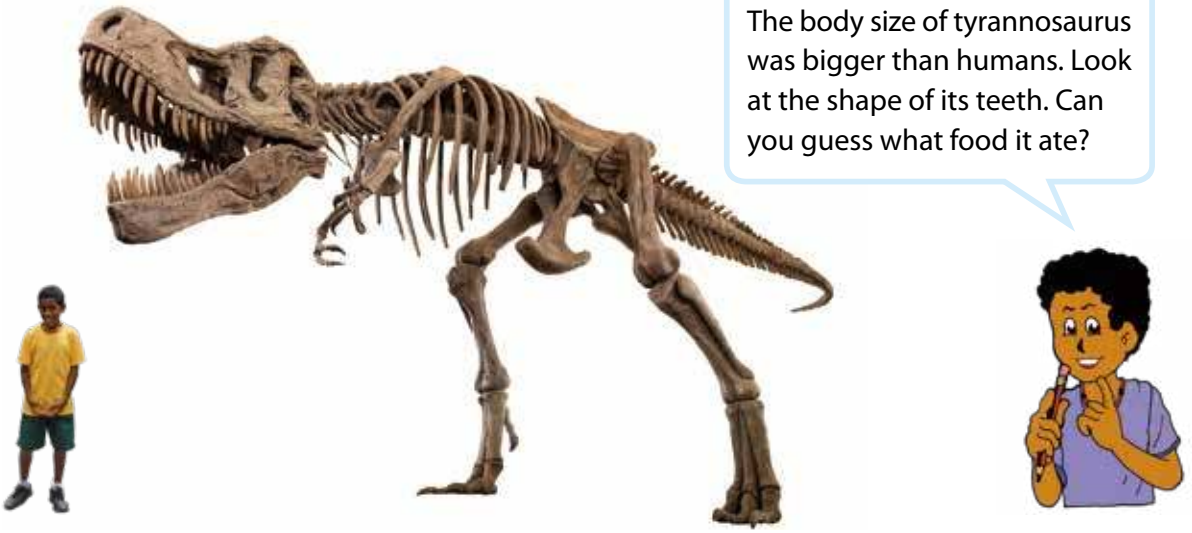
Summary



Some animals no longer live on the Earth.

Fossils give us so many clues. Studying fossils helps us to learn about the past history of life and environments on Earth. Fossils give us information about organisms that lived long ago. Moulds and casts show what kinds of plants and animals might have lived and how they looked. Some fossils look like animals and plants that are living today. Most of them such as dinosaurs no longer live on the Earth. Fossil bones tell us about how large animals were. Fossil teeth show what they ate.

Some fossils are similar to ferns alive today.



Fossils also tell us about the environments in which they lived. For example, an ammonite lived in the sea. When a fossil of an ammonite is found in the mountains, we can infer that the mountains were once covered by the sea.

Long Ago

Ammonite is found in the Himalaya Mountains.

Now

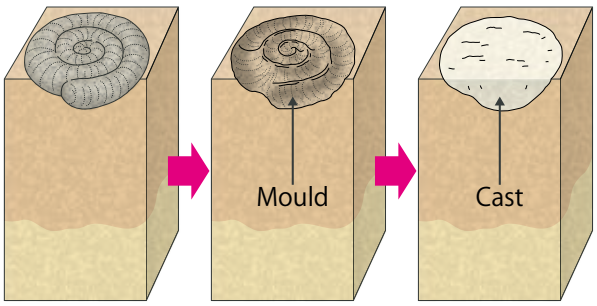
The mountains were once covered by the sea.

Summary and Exercise

Summary 8.2 Fossils

What is a fossil?

- Fossils are the remains of a once living thing.
- Most fossils are found in sedimentary rocks such as shale, limestone and sandstone.
- A mould is an empty shape of a living thing found in rocks.
- A cast is formed when sediments fill the mould's empty space.
- Mould and cast are both fossils.



- Some fossils are the hard part of living things such as bones, teeth, shells and leaves.

Learning from Fossils

- Studying fossils help scientists learn about the past history of life on Earth.
- Fossil bones tell us about how large animals were.
- Fossil teeth show what they ate.
- Fossils also tell us about the environment which the animal once lived in.

Summary and Exercise

Exercise 8.2 Fossils

Q1. Complete each sentence with the correct word.

(1) The remains of a once living thing is called a _____.

(2) An empty shape of a fossil found in rocks is called a _____.

(3) Fossil _____ tells us about how large animals were.

(4) Fossil _____ show what type of food animals ate.

Q2. Choose the letter with the correct answer.

(1) What type of rocks often contain fossils?

A. Sedimentary

B. Metamorphic

C. Igneous

D. Basalt

(2) Why do scientists study fossils? It helps scientists learn about

A. living things that live on Earth today.

B. the past history of life on the Earth.

C. sedimentary rocks.

D. the environment of today.

Q3. Answer the following questions.

(1) What type of fossil is shown in the picture on the right?

(2) Study the picture showing the fossil bones on the right. What is the name of this type of animal that no longer lives on Earth?

(3) Explain how a mould is formed.

Do rocks float?

We know that heavy objects sink and light objects float. Rocks of course, do not float on water. They sink into water. But there is a special type of igneous rock that floats on water. This rock is called Pumice. It is typically light coloured rock that is formed during volcanic eruptions when lava and water mix, which causes a rapid change in the material's pressure. As it hardens, gases dissolve into the lava and leave behind small air pockets (holes) in the pumice structure. This caused the rock to have a low density due to the air bubbles inside of it. The less dense air offsets the more dense rock, causing it to float. This makes pumice very light. It usually floats for a while but when water gets into it, it starts to sink.

It is ground up and is used today in soaps, polishes, pencil erasers and abrasive cleaners.

The pumice rock from Mount Pago in West New Britian Province.

A Pumice rock with small air pockets

Floating Pumice in the water

A pumice rock has a lighter weigh than other rocks.

Chapter Test

8. Rocks, Minerals and Fossils

Q1

Complete each sentence with the correct word.

(1) A rock that is formed inside the Earth that has been changed by heat and pressure is called _____ rock.

(2) Granite and basalt are examples of _____ rock.

(3) The remains of a once living thing is called a _____.

(4) The rock that is used for building and making sculpture is called _____.

Q2

Choose the letter with the correct answer.

(1) Which type of rocks are formed when sediments are pressed and cemented together?

A. Igneous
B. Metamorphic
C. Sedimentary
D. Fossils

(2) Which of these is <u>not</u> a mineral property?

A. Colour
B. Lustre
C. Temperature
D. Hardness

(3) Which of the following is formed when a fossil mould is filled?

A. Bones
B. Fossil cast
C. Tar pit
D. Plants

(4) Which of the following animal parts would most likely form a fossil?

A. Blood
B. Fur
C. Bones
D. Skin

Q3

Study the diagram on the right.

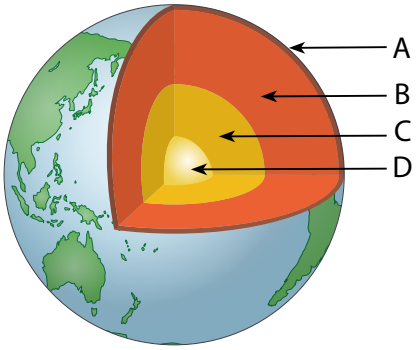
(1) Write the letter A, B, C or D for the correct layer of the Earth in the space provided.

Mantle _____

Inner core _____

Crust _____

Outer core _____



(2) Which part of the Earth layers is made of rocks?

_____

Q4

(1) Scientists found fossils of shellfish in rocks on the land. What can we infer about the place?

_____

_____


Shellfish

(2) A group of students oberved five rocks samples with magnifying hand lens. Study the table below and answer the following questions.

Sample	Lustre	Hardness	Colour	State	Grain
1	Shiny	Hard	White	Solid	Cannot be seen
2	Shiny	Hard	Gold	Soild	Cannot be seen
3	Dull	Hard	Several colours	Solid	Can be seen with different colour
4	Shiny	Hard	Transparent	Solid	Cannot be seen
5	Dull	Hard	White	Solid	Cannot be seen

Which of the above samples would not be classified as minerals? Explain your answer.

_____

_____

_____

_____