

# Rocks and Minerals

## BEFORE WE START, LET'S CHECK

### What you already know

Tick (✓) the material associated with each of the following.



iron ☐  
wood ☐



paper ☐  
gold ☐



coal ☐  
cloth ☐



coal ☐  
petrol ☐

### What you will know

How many kinds of rocks are there?



What are rocks made up of?



What are the uses of different rocks?



What are minerals and what are their uses?



**Rocks** are found everywhere on the earth. Rocks are found on the surface of the earth as well as under the soil. Rocks exist underwater also.

Rocks are naturally occurring solids made up of **minerals**.

Rocks come in many different colours, shapes and sizes. They have about one hundred varieties.

All rocks are made up of 2 or more minerals. Minerals are naturally occurring substances. There are about 3,000 different minerals in the world.

To understand rocks and minerals, think of a chocolate biscuit as a rock. The biscuit is made of flour, butter, sugar and chocolate. The biscuit is like a rock and the flour, butter, sugar and chocolate are like minerals.

Rocks are formed in different ways. On the basis of how they are formed, rocks are divided into three main types:

1. **Igneous rocks:** These rocks are formed by solidification of lava.
2. **Sedimentary rocks:** These rocks are formed by deposition of sediments.
3. **Metamorphic rocks:** These rocks are formed by changes in other kinds of rocks due to great heat and pressure.

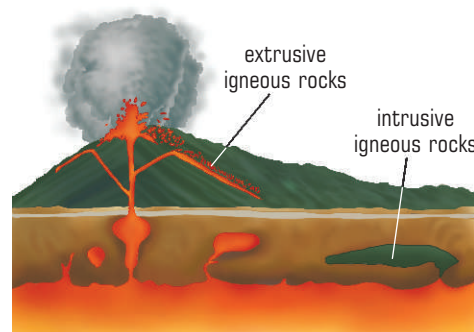


## IGNEOUS ROCKS

The word 'igneous' comes from the Latin word 'ignis', which means *fire*.

We have studied that the inside of the earth is very hot. It is so hot that the rocks deep inside the earth are in molten state. Molten rock is called **magma**.

Magma is pushed upwards by the pressure of other rocks. Here the heat is not so much. So the magma cools slowly over millions of years and forms hard rocks. Such hard rocks are known as **intrusive igneous rocks** because they form beneath the ground.



formation of igneous rocks

Sometimes, magma reaches the surface of the earth. It is then called **lava**. At times, lava just flows to the surface through large cracks on the earth's surface. Sometimes, it escapes with great force as volcanic eruption.

As lava cools on the surface of the earth, it solidifies and forms rocks. These rocks are called **extrusive igneous rocks**.

### Some igneous rocks

#### Granite



The word 'granite' comes from the Latin word 'granum', which means a *grain*. Granite is a very hard rock with fine grains. It is an intrusive rock formed by the slow cooling of magma.

**Uses:** for building monuments, statues, kitchen slabs, flooring, etc.

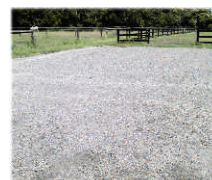


#### Basalt



Basalt is an extrusive rock. It is formed when lava cools fast and becomes hard quickly. It is dense and dark and has fine grains.

**Uses:** as choppers and grinding stones, as road bases



#### Obsidian



It is an extrusive rock that forms when lava cools very rapidly. The result is it is glossy and smooth. It breaks easily, forming sharp edges. It is black or dark in colour.

**Uses:** in jewellery, surgical tools, masks, small sculptures, etc.



#### Pumice



Sometimes, lava cools down so rapidly that gases are trapped inside as bubbles. Then it forms rocks having a lot of pores. Pumice is one such rock. Pumice rocks are very light. Some of them are light enough to float.

**Uses:** in foot scrubbers, furniture polish, erasers, etc.

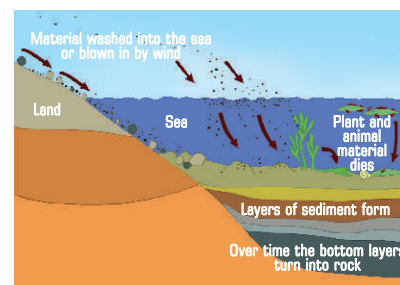


## SEDIMENTARY ROCKS

When mountains were first formed, they were tall and jagged. As they grew older, they became rounded and shorter.

How does it happen? A lot of rocks get worn away due to erosion. Rain, wind, running water, etc. cause the breakdown of rocks.

Most of these pieces are carried by rivers and streams as they flow along. As they reach the plains, some larger pieces settle down at the bottom of the river. Some of them get carried to lakes and seas and are deposited at the bottom there.



formation of sedimentary rocks

The deposited rocks build up in layers, called **sediments**.

The weight of the sediments at the top squashes the sediments at the bottom. Water is squeezed out from between the pieces of rocks. The minerals in the pieces of rocks help to cement these layers together.

Slowly, these layers turn into a type of rock called **sedimentary rock**. It may take millions of years for sedimentary rocks to form.

### Some sedimentary rocks

#### Sandstone



Sandstone forms when grains of sand are compacted together over a long period of time. It can be yellow, brown or red. Petroleum and natural gas are often found in sandstone.

**Uses:** in building construction, grindstone wheels, garden furniture, fountains, etc.



#### Limestone

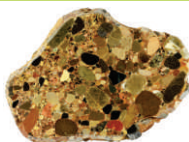


Limestone is made up of the shells of small sea animals. It is a soft rock and contains the mineral calcium. If it is scratched with a sharp object, it becomes a white powder. Chalk is a kind of limestone.

**Uses:** in making cement and glass, treating sewage, fertilisers, etc.



#### Conglomerate



Conglomerate is composed of round pebbles, gravel or boulders cemented together. It is usually grey or orange in colour. It is a rough rock which is not very strong.

**Uses:** as ornamental stones, construction material, etc.



#### Shale



Shale is a clay that has been hardened and turned into rock. It usually forms sheets. Shale is the most abundant rock found on the earth.

**Uses:** in making bricks, tiles and cement





## FOSSILS

Sometimes, during the process of sedimentation, remains of dead animals or plants get buried between the layers of rocks. Some of them get preserved in the sediments while some leave behind an impression. These traces of animals and plants are called **fossils**.

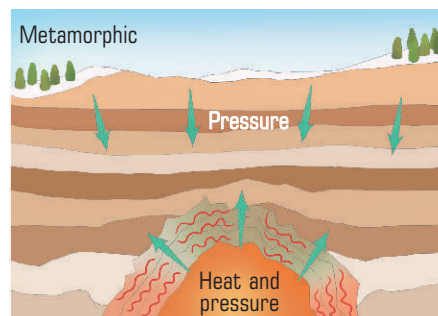


Scientists study fossils to find out about life on earth millions of years ago.

## METAMORPHIC ROCKS

The word 'metamorphic' comes from the Greek words 'meta' and 'morph' which means to *change form*. **Metamorphic** rocks are formed from igneous or sedimentary rocks. These rocks form deep within the earth. When the earth's crust moves, it causes rocks to get squeezed. As a result, rocks are heated and come under great pressure.

Rocks are partially melted and the chemicals within them are rearranged so that the final rock is quite different from the original rock. Sometimes, metamorphic rocks are formed when rocks are close to some molten magma and get heated up.



formation of metamorphic rocks

Uplift and erosion help to bring metamorphic rocks to the earth's surface.

### Some metamorphic rocks

#### Marble



Marble is formed from limestone. Marble is known for its snow-white colour but it can come in other colours too. Marble can be cut and polished easily.

**Uses:** the flooring of houses, statues, monuments, buildings, etc.



#### Slate



Slate is formed from shell. It is normally grey or black in colour. It can be easily broken into neat, thin sheets. It has a wet-like appearance when exposed to the sun.

**Uses:** blackboards, roof and floor tiles, billiard tables, etc.



#### Gneiss



Gneiss is formed from granite. The word 'Gneiss' comes from the German word 'Gneis', which means *sparkling*. It is generally grey or pink in colour. Gneiss is characterised by its alternating light and dark bands of minerals.

**Uses:** as building stone and other structural purposes



#### Quartzite



Quartzite is formed from sandstone. It contains the mineral quartz. It is usually white, light pink or grey. It is smooth with grainy and has a lustrous appearance.

**Uses:** in making glass, ceramic items, railroad ballast, etc.

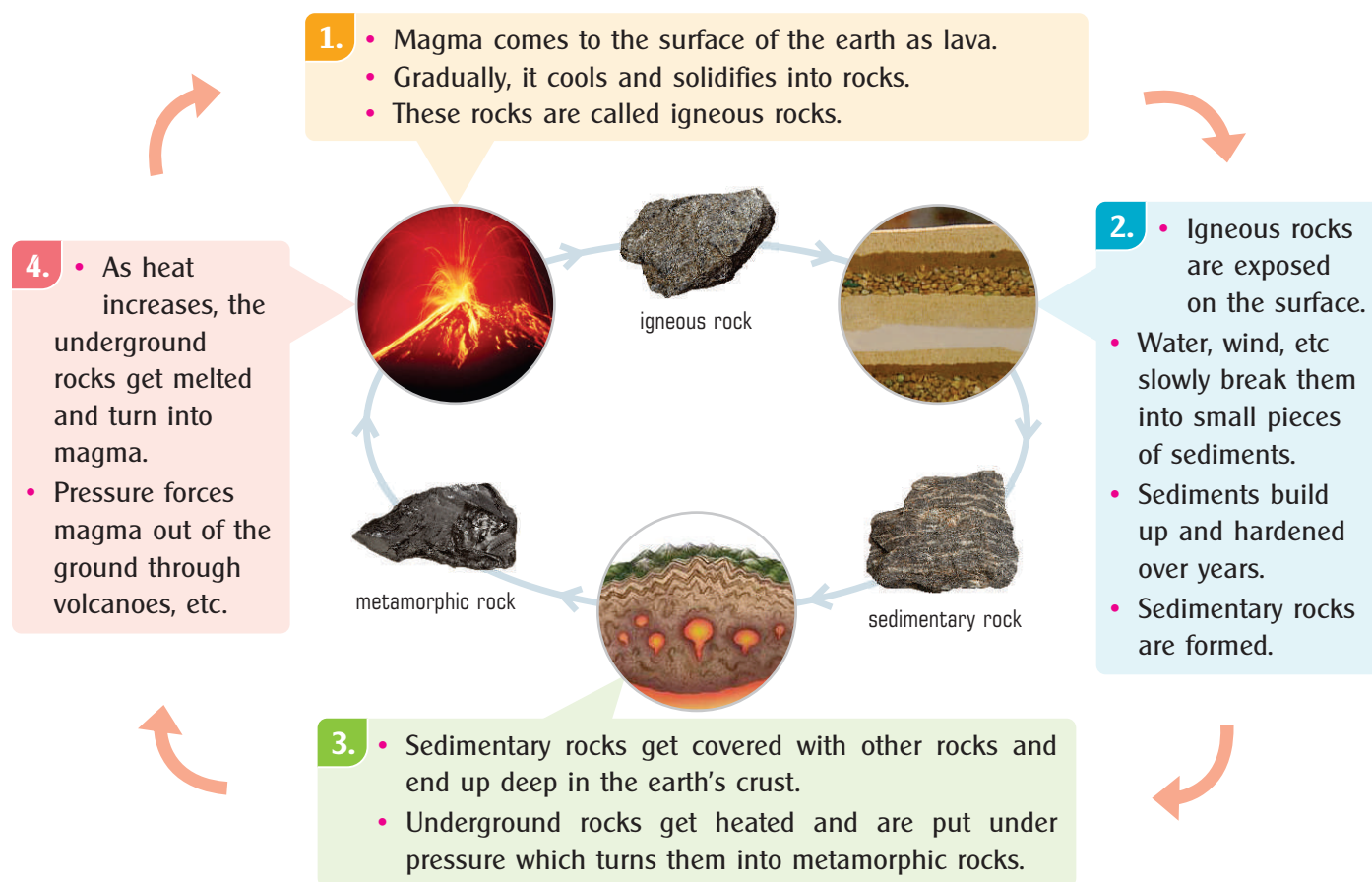


## ROCK CYCLE

We have learnt that there are three main types of rocks: **igneous rocks**, sedimentary rocks and metamorphic rocks. These rocks are constantly formed, worn down and then formed again.

This is known as the **rock cycle**. It takes thousands and millions of years for rocks to change.

Let us see how these rocks change cyclically.



## MINERALS

Minerals are naturally occurring substances with a definite chemical composition. They are not usually made by living organisms. All rocks are made of two or more minerals but minerals are not made of rocks.

Minerals are buried deep beneath the earth's surface. We have to dig them out from the earth before we can use them.

Minerals are of two types: metallic minerals and non-metallic minerals.

### Metallic minerals

Metallic minerals contain **metals**. Metals are chemical elements that are usually shiny solids and conduct heat or electricity. Metallic minerals are called **ores**. We extract metals from ores by various processes. Metals are very useful.

### Some minerals, metals and their uses

Mineral	Metal	Uses
haematite	iron	utensils, knives, tools, machines, railway lines, etc.
pyrite	copper	electric wires, currency, jewellery, plumbing
bauxite	aluminium	aircrafts, ladders, drinking cans, cookware, reflectors, etc.
gold ore	gold	jewellery, dentistry, watches, electronics
galena	lead	pencils, paints, batteries, solder, etc.
silver ore	silver	jewellery, currency, photography, medals, etc.
platinum ore	platinum	jewellery, laboratory equipments, electrodes, computers
uraninite	uranium	cancer treatments, x-rays, military weapons, etc.

### Non-metallic minerals

Gypsum, mica and quartz are examples of common non-metallic minerals. Precious stones like diamonds, emeralds, rubies and sapphires are also dug out from rocks. All of them are non-metallic minerals. They are found in the form of crystals.

Coal and petroleum are most valuable non-metallic minerals.

**Coal:** Coal is a kind of sedimentary rock. It is formed from dried parts of trees and plants that got buried under the ground hundreds of years ago.



Coal is a major source of energy. It is used for cooking, heating, in steam engines, in factories and to generate electricity. Thermal energy is generated using coal.

**Petroleum:** Petroleum is formed when plants and animals that live in water die and pile on the ocean floor. Petroleum is also called **crude oil** or 'black gold'.

Petroleum is a dark and thick liquid which is pumped out from under the ground through oil wells. Petroleum cannot be used in its natural state. It is refined in refineries to produce petrol, diesel, kerosene, natural gas (like LPG, CNG), paraffin wax and other things.

Petrol and diesel are used for generating power and running cars, machines, aeroplanes, ships, etc.

LPG and kerosene are used as cooking fuel.

Paraffin wax is used for making candles and polish.



a thermal powerplant



an oil well

## Words to Remember

rocks	– naturally occurring solids made up of minerals
minerals	– naturally occurring solids with a definite chemical composition and usually made up of plant or animal matter
magma	– the molten rock inside the earth's crust
intrusive rocks	– igneous rocks that form beneath the ground
lava	– magma that reaches the earth's surface through volcanoes or cracks in the earth's crust
extrusive rocks	– igneous rocks that form on the surface of the earth
jagged	– with rough, sharp points extending beyond a surface
sediments	– matter that is moved and settles to the bottom of a liquid
sedimentary rock	– rock formed by deposition and composition of sediments
fossil	– the remains or impression of any ancient plant or animal embedded in a rock
metamorphic rock	– rock that was once igneous or sedimentary but has changed into another kind due to extreme heat and pressure
ballast	– gravel or stones used to form the bed of a railway track
igneous rocks	– rocks formed by solidification of lava
metal	– shiny solid chemical elements that conduct heat or electricity
ore	– a metallic mineral
crude oil	– unrefined petroleum

## Points to Recall

- \* Rocks are found on the surface of the earth as well as under the ground.
- \* Rocks are made up of two or more minerals.
- \* Rocks are of three types: igneous rocks, sedimentary rocks and metamorphic rocks.
- \* Igneous rocks are formed by the cooling of lava.
- \* Igneous rocks can be intrusive, that is, formed beneath the ground, or extrusive, that is, formed on the surface of the earth.
- \* Granite, basalt, obsidian and pumice are major igneous rocks.
- \* Sedimentary rocks are formed by deposition and composition of sediments.
- \* Sandstone, limestone, conglomerate and shale are major sedimentary rocks.
- \* Fossils, that is traces of ancient plants and animals, are found on sedimentary rocks.
- \* Some igneous and sedimentary rocks are changed into metamorphic rocks by excessive heat and pressure.
- \* Marble, slate, gneiss and quartzite are major metamorphic rocks.
- \* Rocks are formed, worn down and then formed again in a cyclical way.
- \* Minerals are of two types: metallic minerals and non-metallic minerals.
- \* Metals are extracted from ores and are very useful.
- \* Coal and petroleum are the most valuable non-metallic minerals.

## Exercises

### A. Tick (✓) the correct option.

1. Which of the following is not an igneous rock?

(a) pumice

☐

(b) marble

☐

(c) basalt

☐

(d) granite

☐

2. Which of the following is not a sedimentary rock?

(a) shale

☐

(b) limestone

☐

(c) gneiss

☐

(d) sandstone

☐

3. Which of the following is a cause of soil erosion?  
 (a) rain ☐ (b) wind ☐ (c) running water ☐ (d) all of these ☐
4. Which of the following is not used in jewellery?  
 (a) aluminium ☐ (b) platinum ☐ (c) gold ☐ (d) silver ☐
5. Which of the following is not a by-product of petroleum?  
 (a) paraffin wax ☐ (b) diesel ☐ (c) coal ☐ (d) LPG ☐

**B. Choose the correct word and fill in each blank.**

1. Basalt is an \_\_\_\_\_ rock. (*intrusive / extrusive*)
2. Some \_\_\_\_\_ rocks are very light and float on water. (*pumice / shale*)
3. Marble is formed from \_\_\_\_\_. (*limestone / sandstone*)
4. We can extract iron from \_\_\_\_\_ ore. (*pyrite / haematite*)
5. \_\_\_\_\_ is also called crude oil or 'black gold'. (*Petrol / Petroleum*)

**C. Answer in one or two words only.**

1. Which rock is used to make blackboards? \_\_\_\_\_
2. What is another name for a metallic mineral? \_\_\_\_\_
3. Name the metal that we extract from galena ore. \_\_\_\_\_
4. What kind of energy is generated using coal? \_\_\_\_\_
5. Name the natural gas that we use as cooking fuel. \_\_\_\_\_

**D. Answer in one sentence only.**

1. Which is the most abundant rock found on the earth?
2. What is a fossil?
3. What is a metamorphic rock?
4. Write some uses of aluminium.
5. Write a few examples of non-metallic minerals.

**E. Answer in a few sentences.**

1. What is the difference between intrusive and extrusive igneous rocks?
2. How does a sedimentary rock form?
3. How do metamorphic rocks form?
4. Explain rock cycle in brief.
5. What is petroleum and what are its uses?



**BRAINSTORM**

1. Why do people prefer marble over bricks for flooring?
2. Why do some pumice stones float on water?
3. Can we use limestone to lay roads? If not, why?







## TELL YOUR TEACHER

Read the following activities and tell your teacher what right or wrong each child does.

- Arpita is very happy today. She is on a class tour to the historical Fatehpur Sikri. She is very excited to see the large monuments made of red sandstone. She wants to leave an impression of her visit. So, she takes out her hair clip and starts inscribing her name on the walls.
- Shaan wants to boil some water. So he takes a pan, fills water in it and puts it on a lighted gas stove. Then he covers the pan with a lid.
- Parv's school is not very far from his house. His father daily insists on dropping him at his school by car, but Parv always refuses and goes on his bicycle.

## FIND OUT



Which Indian city is also known as the 'Pink City'? Why is it called so?



What is the Moh's scale of hardness? What mineral is the hardest and what is the softest?

## Project

1. Collect pictures of ten world famous monuments like the Taj Mahal and the Red Fort. Paste them in your scrapbook. Also write about the main rocks used in their construction.
2. Make a list of any ten items in your home or school that are made of different forms of rocks and minerals. Show it to your teacher.



## Activity Time

### Making a fossil model

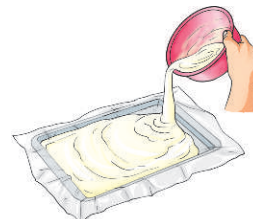
#### Steps



1. Take a baking tray, a plastic sheet, some paste of plaster of Paris and a leaf.



2. Spread the sheet over the tray in a way that its edges hang over the edges of the tray.



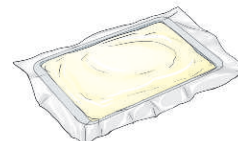
3. Pour a thick paste of plaster of Paris into the tray and spread it evenly.



4. Keep the leaf on the paste.



5. After some time, pour some more paste and spread it.



6. Leave the tray to let the paste harden for a day.



7. Pull out the sheet to take out the rock.



8. Hold the rock and break it carefully to locate the leaf.



9. Remove the leaf. You will see the impression of the leaf on the rock.