

THE ROCK CYCLE

The earth's surface is a shell or "crust" of rock surrounding its interior. Just as the earth's surface is constantly changing, so too are the rocks of which it is composed. They are divided into three types on the basis of the way they are formed. The different types of rock give us different mineral resources.

Geologists know how to identify one rock from another. They know the type of rock and the structures within each rock that may contain minerals. With this knowledge, they can advise companies where to search for specific mineral resources. For example, on the geologist's advice, an oil company will search only in areas where the type of rock and the structure within that rock promises oil or gas (see Chapter 25, Student Book p. 324). Without the help of the geologist's specialized knowledge, mining companies could waste time and money searching for minerals in the wrong places.

To help you understand a little of what geologists know about the three types of rock, complete the following activity. As you work through this exercise, complete Fig. 1 to see the processes that formed the rocks of the earth.

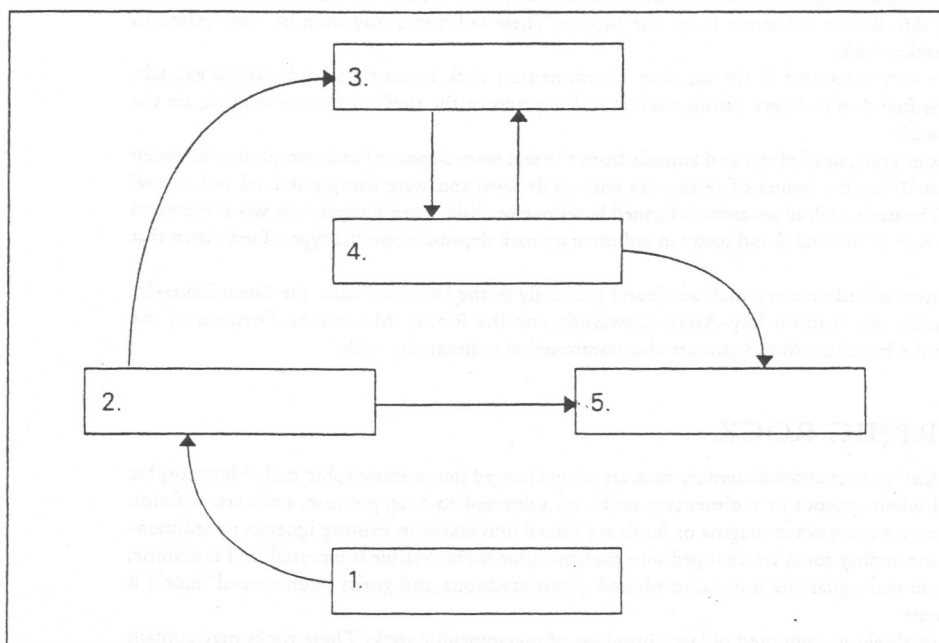


Fig. 1

MAGMA/LAVA

Below the earth's crust is a layer of solid rock. Within this layer are places where the rock has melted. This melted or molten rock is called magma. If magma is forced to the earth's surface it is called lava. In box 1, write the terms *magma* and *lava*.

IGNEOUS ROCK

Rock that forms when magma or lava cools is called igneous rock. All rocks originally came from igneous rocks. In box 2, write *igneous rock*.

When magma cools deep within the earth, it does so very slowly because it is not exposed to cool temperatures. Slow cooling allows large crystals to develop in the rock. Magma cooling near the surface does so more quickly; this allows only much smaller crystals to form. Rocks that form beneath the earth's surface, with either large or small crystals, have a coarse texture and are known as intrusive igneous rock. Granite is a common intrusive igneous rock.

Lava cools very quickly on the earth's surface because it is suddenly exposed to cool temperatures. Crystals often do not have time to develop in the rock that forms. Rock, such as basalt, that forms without crystals on the earth's surface has a fine texture, and is called extrusive igneous rock.

Igneous rock contains metallic minerals such as nickel, copper, gold, and silver. The Canadian Shield is partially composed of igneous rock, and consequently, contains large amounts of these minerals. In fact, the Shield is often referred to as Canada's "storehouse of metallic minerals." The Coast Mountains of British Columbia are also made of igneous rock and they too contain metallic minerals.

On your diagram, you should now have boxes 1 and 2 filled in. Beside the arrow from box 1 to box 2, write the word that describes what happens to change magma/lava into igneous rock.

SEDIMENTARY ROCK

Sedimentary rock is formed from igneous rock that was eroded by wind, water, and ice. Tiny pieces of igneous rock were eroded and carried by running water into prehistoric seas. Over millions of years these particles, or sediments, were deposited in horizontal layers thousands of metres thick. In box 3, write *sediments*. Beside the arrow from box 2 to box 3 describe what happens to change igneous rock into sediments.

The weight of the seas, and of the sediments themselves, compressed the layers into rock. If the sediments were composed of clay or mud, the resulting sedimentary rock was shale. If the sediments were sand, the resulting sedimentary rock was sandstone.

In box 4, write *sedimentary rock*. Beside the arrow from box 3 to box 4, describe the process that changes sediments into sedimentary rocks. Sedimentary rocks themselves may be eroded to form sediments. Find the arrow that shows this. Beside the arrow name the process. These sediments may then be compressed to form new sedimentary rock.

Geologists are very interested in the location of sedimentary rock because coal, oil, natural gas, salt, and potash may be found in its layers. Fossils, such as leaf imprints or the shells of marine animals, are the remains of ancient life.

Over millions of years, dead plants and animals from the seas were deposited and compressed between layers of sediments. When the bodies of certain sea animals decayed and were compressed, oil and natural gas were formed. The shells of dead sea animals formed limestone or chalk. Swamp vegetation was compressed to form coal. The type of mineral found today in sedimentary rock depends upon the type of sediments that were deposited.

Horizontal layers of sedimentary rock are found primarily in the Interior Plains, the Great Lakes-St. Lawrence Lowlands, the Hudson Bay-Arctic Lowlands, and the Rocky Mountains. Portions of the Appalachians and the Innuitian Mountains are also composed of sedimentary rock.

METAMORPHIC ROCK

Geologists know that igneous and sedimentary rock are often changed into metamorphic rock. Metamorphic rocks are formed when igneous or sedimentary rocks are subjected to heat, pressure, and certain fluids. Metamorphism often occurs when magma or fluids are forced into cracks in existing igneous or sedimentary rocks. The surrounding rocks are changed into metamorphic rocks. Marble is recrystallized limestone, slate is formed from shale, quartzite is metamorphosed quartz sandstone, and gneiss (pronounced "nice") is formed from granite.

The Canadian Shield is composed of large numbers of metamorphic rocks. These rocks may contain deposits of metallic minerals.

In box 5, write *metamorphic rock*. Beside the arrows from box 4 to box 5 and box 2 to box 5, name what is needed to change sedimentary and igneous rocks into metamorphic rock.

Metamorphic rocks may be eroded to form sediments. Draw an arrow between box 5 and box 3 to show this. Label the arrow to show how this happens.

Metamorphic, igneous, and sedimentary rocks can sometimes melt and form magma. Draw the arrows from boxes 2, 4, and 5 to box 1. Label the arrows to show how this happens.

The diagram you have just completed is called The Rock Cycle. It shows the three main types of rock and the major processes that create them. Put a title on your diagram.

QUESTIONS

- Why is the geologist's knowledge of rocks important to some companies?
Explain how intrusive igneous rocks are formed, describe their characteristics, and give an example.
- Explain how extrusive igneous rocks are formed, describe their characteristics, and give an example.
- Where in Canada are igneous rocks commonly found?
- Describe the process that forms sedimentary rock.
- What parts of Canada largely contain sedimentary rocks and what minerals are found in them?
- Describe how metamorphic rocks are formed.

- In your notebook, complete the following chart.

Igneous/Sedimentary Rock	Metamorphic Rock
Limestone	becomes
Shale	becomes
Quartz sandstone	becomes
Granite	becomes

- Without looking back at your notes, draw the rock cycle. Begin with five boxes. Label each box. Draw and label arrows between boxes to represent the processes involved in the rock cycle.