

2.0 The Rock Cycle describes how rocks form and change over time

2.1 What are Rocks and Minerals?

Minerals In Rocks

The building blocks of rocks are naturally occurring materials, called minerals. Rocks contain naturally occurring, non-living minerals. Most minerals are rare and can be elements (pure substances) or compounds (combinations of pure substances). Minerals are not only found in rocks, but they are also found in your body.

- Iron and pyrite help the blood carry oxygen
- Kidneys produce crystals, called kidney stones
- Calcium and dolomite help regulate water in body cells
- Diamonds are used in surgery, razor blades, computers, dentistry, oil drilling and a glass-cutter's wheel has diamonds embedded in it.

Some rocks are made up of only one mineral, like limestone, while other have many different minerals like granite. There are more than 3500 different minerals. Five minerals combine in different ways to form the majority of rocks.

They are:



Prospecting For Wealth

Identifying rocks, besides being a hobby, is also big business. Canada is one of the world's leading producers of gold, copper, nickel, zinc, lead, silver, iron ore, asbestos, potash, sand gravel, and clay.

There are also diamonds mined in Canada.

Using Properties To Identify Rocks

The properties that can be used to identify minerals are:

Colour		Amber is yellow
Lustre		Silver is shiny
Streak		Jade streak is white
Cleavage		Mica cleaves into thin flat sheets

- **Lustre:** this refers to the 'shininess' of the mineral (how light is reflected off the surface)
- **Colour:** colour can vary even within the same mineral, like corundum (it can be white, blue or red), depending on what other elements are present.
- **Streak:** a streak is the color, of the powdered form, of the mineral. (it can be made by scratching a porcelain tile)
- **Cleavage and Fracture:** is the way a mineral breaks apart. If it breaks along smooth, flat surfaces or planes, it has cleavage. If it breaks with rough or jagged edges, it has fracture.

- **Transparency:** it can be **transparent** (see through), **translucent** (shadowy), **opaque** (non-see through).
- Type of mineral/s present (viewed through a microscope)

Moh's Hardness Scale

The hardness of a mineral is measured by how easily it can be scratched. A harder mineral will leave a scratch on a softer mineral.

- Friedrich Mohs developed a scale of hardness with **10 values** in 1812 (see Figure 2.5 p. 372)
- Diamond is the hardest and talc is the softest (check the table to find out how hard common objects, like your fingernail)

2.2 Three classes of Rocks: Igneous, Sedimentary, and Metamorphic

Types of Rock

Rocks are classified into 3 major groups

Igneous Rock

Magma is melted rock found below the Earth's crust. When it flows onto the Earth's surface it is called **lava**. Igneous rock forms when hot **magma** cools and solidifies.

There are two different types of Igneous rock:

Intrusive

(cooled and hardened magma below the Earth's surface)



Pegmatite

Extrusive

(rock that forms when lava - magma released during a volcanic eruption - cools on the surface)



Basalt

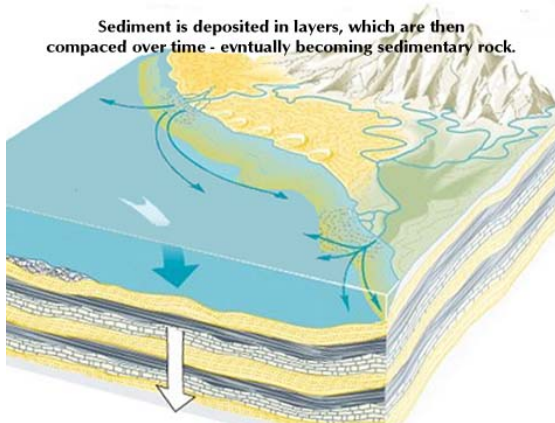
Magma can contain crystals, their size depending on how quickly or slowly the rock cools (large crystals form when the rock cools slowly).

Sedimentary Rock

Sedimentary rock is formed from sediment (loose material - rock, minerals, plant and animal remains - that is layered and compacted together by the pressure of the material above it.

- stratification is the visible evidence of the layers

- cementation - some of the minerals that dissolve with the addition of water, makes a natural cement that glues the pieces of sediment together.



Types of sedimentary rock include:

- shale (formed from fine clay or mud)
- sandstone (sand, made of quartz)
- conglomerate (pebbles and small stones cemented together)
- limestone (organic sedimentary rock, containing fossils - plant and animal remains)
- organic sedimentary rock forms from living material that has been buried and is under pressure over thousands of years. (Coal is an example)

Metamorphic Rock

This type of rock has changed its form from what it was originally. It is formed below the Earth's surface by extreme pressure and heat

- the parent rock will become another type of rock depending on how much pressure and heat is used to change it. (example: shale → slate → schist)

Identifying Classes of Rock

Scientists classify rocks into categories which have shared characteristics.

Geology Tools and Techniques

Remote Sensing – satellite mapping of the Earth's surface

Geophysical prospecting – sensitive instruments like the magnetometer detect minerals hidden deep beneath the surface of the Earth.

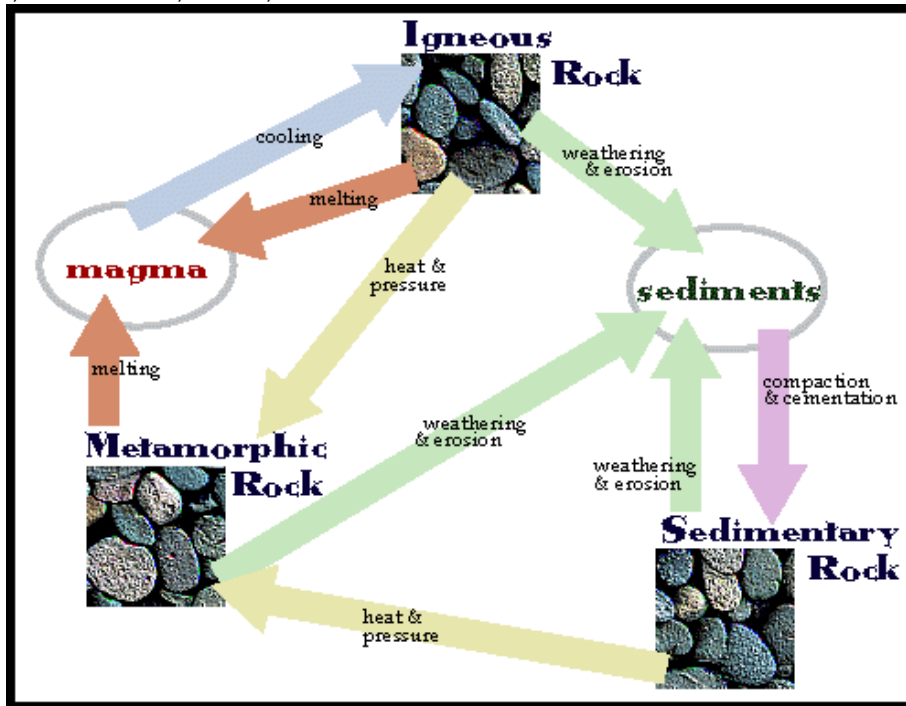
Geochemical prospecting – chemical analysis of core samples

Exploration – drilling with diamond-tipped drill bits

2.3 The Rock Cycle

<http://www.cotf.edu/ete/modules/mse/earthsysflr/rock.html>

Rocks are constantly changing. The Rock Cycle does not have a set order as they are weathered, consolidated, buried, melted and solidified.



Investigating The Rock Cycle

Soil formation is determined by climate, type of rock present, amount of water, organic material, air spaces, living organisms in the soil. It takes nearly 1000 years for 5mm of soil to form.

The Alberta Story: Investigating The Changing Earth

The rocks that make up Alberta were laid down in layers over hundreds of millions of years ago. The oldest layer, the **Precambrian Shield**, is at the bottom. This layer is made up of igneous and metamorphic rocks that were formed between 544 and 4500 million years ago. This layer of rock covers all of Alberta, but is only exposed in the upper northeastern part of the province. 87% of the Alberta landscape lies over the **Interior Plain**, which is sandwiched between the **Canadian Shield** and the **Rocky Mountains**. The Interior Plain has various layers of sedimentary rock that are between 544 million and 1.5 million years old.

Pelican Rapids

(where metamorphic rock is exposed)



Dinosaur Provincial Park

(where you can see sedimentary rock layers)



Rocky Mountains

(rocks that have been formed and changed)

