

## **Rocks, Minerals & Crystals**

Rocks come in many shapes, sizes and colours, but all rocks have one thing in common:

**All rocks are made of one or more types of minerals**

### **But What Is A Mineral?**

Minerals are natural, inorganic (non-living) substances. Minerals can be made of single elements like silicon, gold, aluminum, or can be a combination of two or more of the 117 elements on the periodic table.

A common igneous rock like granite is made of the elements quartz, hornblende, feldspar and mica.

## **How Can We Tell One Rock From Another?**

There are 5 main criteria that geologists use to identify rocks:

- **Hardness**

Every mineral has a different degree of hardness or softness. Some minerals, like diamonds, are extremely hard, while others like talc, are very soft. Geologists use a 10 point scale to describe how hard or soft a mineral is.

A score of 1 means a mineral is very soft like talc, but a score of 10, like a diamond, is the hardest substance known to mankind.

This scale is known as the Moh's Hardness Scale. A copy of the scale is shown below:

Moh's Scale of Hardness	
Talc	1
Gypsum	2
Calcite	3
Flourite	4
Apatite	5
Orthoclase	6
Quartz	7
Topaz	8
Corundum (natural)	9
Diamond	10

### **How Can We Tell One Rock From Another Continued?**

- **Lustre**

Lustre is another word for how shiny or dull a mineral is. Some minerals like gold are very shiny, but other minerals like talc are very dull and have no shine.

- **Colour**

The colour of a mineral is one of the main characteristics that attract people to a certain stone and make some minerals more valuable than others. Colour can help us to identify minerals but it cannot be counted on as the main method of identification because some minerals like corundum are one colour when pure, but other colours when impurities are mixed in.

See the example below:

Pure Corundum = White

Corundum plus iron or titanium = Blue (Sapphire)

Corundum plus chromium = Red (Ruby)

## **How Can We Tell One Rock From Another Continued?**

- **Streak**

When a mineral is rubbed across a piece of unglazed porcelain tile, it will leave behind a coloured, powdered streak. Minerals that look alike, such as gold and pyrite (Fool's Gold) leave different streaks. Gold leaves behind a yellow streak, whereas pyrite leaves behind a greenish-black streak. Minerals that are harder than porcelain tile will not leave behind a streak.

- **Cleavage & Fracture**

The way a mineral breaks apart can be a clue to its identity.

If a mineral breaks along a smooth, flat surface it is said to have **cleavage**. Mica is the perfect example of a mineral with cleavage because you can separate layers of mica like separating pages in a phone book.

If a mineral breaks with rough or jagged edges, it is said to have **fracture**. Obsidian is a good example of a mineral with fracture because it breaks with sharp, jagged edges.

## **Rock Families**

There are three rock families that a rock can belong to:

- **Sedimentary Rocks**

Sedimentary rocks are made of sediment. Sediment is loose material, usually small in size, such as rocks, minerals, and plant and animal remains. Over time the sediment is packed together into layers by intense pressure and forms rock. The layers of sediment are called **beds**. The process of intense pressure changing beds of sediment into rock is called **compaction**.

About 75% of the rock on Earth is sedimentary.

## **Rock Families Continued**

- **Igneous Rocks**

Igneous rocks form when hot magma and when hot lava cool and solidify. **Magma** is melted rock found below the Earth's crust, where temperature and pressure are high. Any rock that is heated deep within the Earth can melt into magma. The hot magma can actually melt other rock making a magma pocket in the Earth. When the pressure becomes too great, the magma can push up through the Earth's surface. When magma escapes to the Earth's surface through the opening of a volcano, it is renamed **lava**.

There are two main types of igneous rocks and the main difference is how they are formed.

- 1) **Intrusive Igneous Rocks** are rocks that are formed when magma cools and hardens below the Earth's surface.
- 2) **Extrusive Igneous Rocks** are rocks that are formed when lava cools on the Earth's surface.

## **Rock Families Continued**

- **Metamorphic Rocks**

Metamorphic rocks are made when a sedimentary or igneous rock is changed because of intense heat and pressure. When a sedimentary or igneous "parent rock" is subjected to intense pressure and heat below the Earth's surface, it undergoes changes depending on the amount of pressure that is placed on the rock. Metamorphic rocks can even be changed to other forms of metamorphic rocks if more pressure and heat are applied.

## **The Rock Cycle**

Like water, there is a fixed amount of rock on Earth, therefore rock must be recycled so that new rocks can form as older rocks break down from weathering and erosion.

The rock cycle is a lot like a water wheel. Hot lava and magma form rocks that are weathered and eroded by wind, weather, flowing water and human activity. The sediment created by the erosion of rock is eventually compacted in layers (**beds**), and forms sedimentary rock that is pushed below the Earth's surface as layers of sediment are deposited. When the rock is deep below the Earth's surface, it melts because of high heat and pressure and becomes magma again.



## **Weathering & Erosion**

Sediment is created when larger rocks are broken down or worn away by a natural process known as **weathering**.

There are 3 types of weathering:

- **Mechanical Weathering**

Mechanical weathering happens when natural forces like weather, gravity, freezing and thawing, and erosion break larger rocks into smaller rocks and eventually into small pieces of sediment.

- **Chemical Weathering**

Chemical weathering occurs when rocks are broken down by chemicals that are found in the environment. Chemicals that are found in the air, or that are dissolved in water can speed the process of erosion and weathering. A prime example is acid rain.

- **Biological Weathering**

Biological weathering is when the breakdown of a rock is helped by living things such as plants, animals, fungi or bacteria. For example, trees roots or plants growing in the crack of a rock or on the surface.