

Module F

Unit 1

Lesson 2

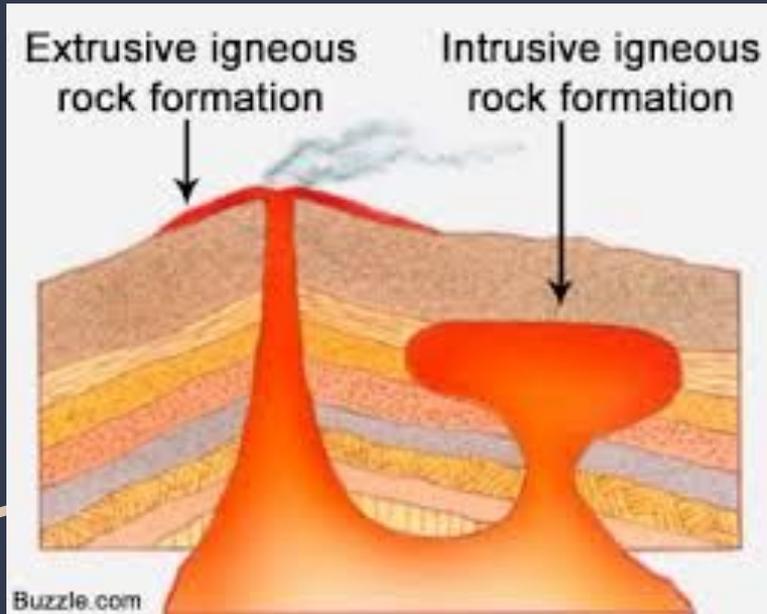
Exp 2

**Relating Igneous Rocks to
The Earth's systems**

Igneous Rocks

- Formed by cooling magma
 - **BELOW ground and cooling lava ABOVE ground**
- Magma cools below ground in large chambers, in cracks, or between surrounding rock layers.
- The mineral composition of igneous rocks depends on the chemical makeup of the magma, or lava that formed it, and on how quickly that magma or lava cooled.
- Some igneous rocks are made up of many types of minerals.
- Other igneous rocks have fewer minerals in their make-up.

Intrusive vs Extrusive



- **Intrusive igneous rock** forms when magma pushes, or intrudes, into the rock below Earth's surface and cools. (Inside)
- **Extrusive igneous rock** forms when lava erupts, or is extruded, onto Earth's surface. (Outside)
 - Extrusive igneous rock is common at the sides and base of volcanoes.



Starling Pixels

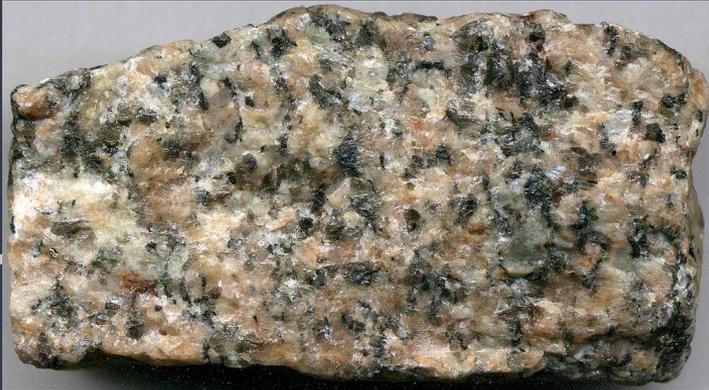
Extrusive igneous rocks

Extrusive igneous rocks cool from lava rapidly because they form at the surface, so they have small crystals.



Intrusive igneous rocks

Intrusive igneous rocks cool from magma slowly because they are buried beneath the surface, so they have large crystals.



extrusive

lava

**fast
cooling**

intrusive

magma

**slow
cooling**



Time Scale

Intrusive

- Below Earth's surface magma cools **very slowly**.
- The longer the cooling the more time crystals have to grow.
- **Coarse-grained Rocks** formed under these conditions generally have large visible crystals.
 - Examples are granite and dolerite.



Extrusive

- Magma that reaches Earth's surface, called lava, cools **very quickly** when exposed to air meaning little time for crystals to form
- **Fine-grained rocks** are made up of very small crystals.
 - Examples are Basalt and andesite



- Super-fast cooling of magma can result in no crystals at all.
 - Obsidian (ahb•SID•ee•uhn) is an igneous rock that cools so rapidly that no crystals form. Obsidian is glassy in appearance and is called volcanic glass.



LAVA

TO GEMSTONE



Igneous Rock in the Geosphere

- Extrusive igneous rock, such as basalt, is easily found **ON** Earth's surface. This is where it formed.
- Intrusive igneous rock is located **beneath** Earth's surface, where it formed. Can be exposed when large regions of Earth's crust are pushed toward the surface during a process called uplift and the layers above are eroded.
 - The Rockies, the largest mountain range of western North America, are made mostly of intrusive igneous rock, especially granite.

