

Where Igneous Rocks Form

Lesson 2

Pyroclastic rock is a general term used for all rocks that form during volcanic eruptions. The term pyroclastic means fire broken or fire fragments. New pyroclastic rocks form each time a volcano erupts molten rock that cools and hardens on the Earth's surface. These rocks are the newest rocks on our planet..



USGS

Tephra rocks blow into the air during an eruption.

Tephra

Tephra (TEPH-ra) are igneous rocks blown into the air during a volcanic eruption. Tuff, welded tuff and scoria are examples of tephra in your kit.

1. **Pumice** — The minerals in pumice are light in color and light in weight.
 - a. The surface of pumice is rough because it blew out of a volcano while the rock was still molten and cooled while airborne.
 - b. Pumice usually forms when rhyolite or dacite begins to froth as the magma nears the Earth's surface forming a light spongy rock filled with gas bubble holes.
2. **Scoria and cinders**
 - a. Scoria is a glassy rock similar to pumice but created by lavas that contain minerals rich in iron and magnesium.
 - b. Scoria forms when semi-liquid basalt blows out of a volcano.
 - c. Cinders may be semi-liquid or solid when blown from a volcano.
 - d. Scoria and cinders are basalt lavas containing dark, iron-rich minerals that are microscopic. Part of the rock cools before crystallizing.
 - e. Geologists use the term cinder to describe any rock created during the formation of a cinder cone.

3. **Ash and tuff**

- a. Ash is pulverized rock blown out of volcanoes during violent eruptions.
- b. All types of lava produce ash during explosive eruptions.
- c. Ash can travel in the jet stream for several years before fall back to Earth.
- d. Ash tuff forms when hot ash falls to the Earth near a volcano and compacts into a soft rock.

4. Welded tuff

- a. Pyroclastic flows occur during violent volcanic eruptions. The ash column collapses and begins flowing down the volcano's slope.
- b. Ignimbrite forms when the superheated rocks begin to cool. The superheated center layer of rock remains hot longer and "welds" ash, pumice and other materials into welded tuff.
- c. Welded tuff is a building stone used in the construction of some buildings.

Lava

Lava is the molten rock that flows out of a volcano during an eruption. It is also the term used to describe igneous rocks formed during a lava flow.

1. Basalt

- a. Basalt lava is usually very fluid and often forms a river of molten rock.
- b. Basalt lava contains primarily iron-rich minerals like olivine, augite and hornblende.
- c. Pillow basalt forms at spreading ridges on ocean floors when two oceanic plates are separating.

2. Andesite

- a. Andesite is thicker and slower moving than basalt lavas and has more quartz.
- b. Andesitic lava forms thick flows on the slopes of volcanoes.
- c. Volcanoes made primarily of andesite surround the Pacific Ocean.



Kilauea, lava flow

3. Dacite

- a. Dacite has more quartz than andesite and less than rhyolite.
- b. Dacite is a thick pasty type of lava that often forms dome volcanoes.
- c. The dacite in your kit is from a dome volcano in the Cascade Mountain of Oregon and is similar to the lava dome on Mount Saint Helens.

4. Rhyolite and obsidian

- a. Rhyolite is the lightest colored igneous rock in your kit. It is primarily quartz and feldspar. Both these minerals are light colored and light in weight.
- b. Rhyolite has more quartz than basalt, andesite and dacite.
- c. Rhyolite lava is very explosive and is associated with large caldera eruptions.
- d. Obsidian forms when rhyolite lava does not crystallize creating glassy rocks.
- e. Obsidian comes in many colors. The color depends on impurities in the rock when it cooled and hardened.
- f. Magnetite crystals give black obsidian its dark color.

Intrusive and plutonic rocks

Intrusive rocks are igneous rocks that form near the surface of the Earth. Plutonic rocks are igneous rocks that form deep within the Earth.

1. Gabbro

- a. Gabbro is the intrusive form of basalt.
- b. Most of the minerals in gabbro are dark colored.

2. Diorite

- a. Diorite is the intrusive form of andesite.
- b. Notice how the minerals are scattered in a random order throughout the rock.
- c. Minerals scattered in random order in a rock is a major key in identifying igneous rocks.

3. Granodiorite

- a. Granodiorite is the intrusive form of dacite.
- b. Granodiorite is usually lighter in color than diorite with a higher percentage of quartz and feldspar.

4. Granite

- a. Granite is the intrusive form of rhyolite.
- b. Granite always contains quartz and feldspar minerals.
- c. Dark minerals in granite are usually hornblende and biotite.

Lesson summary

- ◆ Tephra are igneous rocks blown into the air during a volcanic eruption.
- ◆ Lava is molten rock that flows out of a volcano during an eruption.
- ◆ Lava is the term used to describe igneous rocks formed during a lava flow.
- ◆ Intrusive rocks form near the Earth's surface while plutonic rocks cool deep underground.

Name _____

Date _____

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Quiz 2

Fill in the blanks using words from the Word Bank

1. Pumice usually forms when rhyolite or dacite begins to froth as the magma nears the Earth's surface forming a light _____ rock.
2. _____ is the term used to describe igneous rocks formed in a lava flow.
3. _____ basalt forms at spreading ridges on ocean floors when two oceanic plates are separating.
4. Intrusive rocks form near the Earth's surface while _____ rocks cool deep underground.
5. Obsidian forms when _____ does not crystallize creating a glassy rock.
6. Tephra are igneous rocks blown into the _____ during a volcanic eruption.
7. _____ is a common rock that forms when rhyolite cools underground.
8. Lava is the _____ rock that flows out of a volcano during an eruption.
9. Rhyolite lava is very explosive and is associated with large _____ eruptions.
10. The _____ center layer of a pyroclastic flow remains hot longer and "welds" ash, pumice and other materials into welded tuff.

Word Bank

caldera	spongy	granite	plutonic	air
rhyolite	pillow	superheated	molten	lava

Picturing Your Rocks

Activity 2

Introduction

You have just read about how each of the rocks in your kit formed. In this activity, you are going to create a cross section of a volcano and show where the rocks in your kit formed.



Materials

- ◆ White sheet of drawing paper
- ◆ Colored pens and pencils
- ◆ Water colors

Directions

1. Draw a picture of a volcano similar to the picture on this page.
2. Reread the information about the rocks in your kit and where they formed.
3. Divide the rocks in your kit into three groups.
 - a. Rocks that cooled within the Earth
 - b. Rock that cooled in lava flows
 - c. Rocks that were airborne for a period during a volcanic eruption
4. Label where the intrusive rocks in your kit formed.
5. Label where the lava rocks in your kit formed.

6. The welded tuff in your kit formed in a pyroclastic flow so be sure and include a pyroclastic flow on the side of the volcano for this rock.
7. Finally, label places where you might see the tephra rocks during a volcanic eruption.
8. If you are not sure where each of the rocks formed just draw the picture and set it aside. As you go through the lessons in this unit, you can complete the information at that time.

Extending the activity

- ◆ You will be reading out some igneous rocks not included in your kit. Add these rocks as you read about them.
- ◆ Draw pictures of a shield volcano, stratovolcano, dome, and cinder cone. Label the picture with rocks that form on each of these different types of volcanoes.