

SI Geology - Full Discipline Demo

Igneous Rocks

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Geology - Full Discipline Demo
Course	SI Geology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Classify the following statements as true or false.

⚡ Extrusive igneous rocks form above the earth's surface.	
⚡ Intrusive igneous rocks cool slowly due to the lower pressures and temperatures on the earth's surface.	
⚡ Magma is a pure liquid.	
⚡ Magma that cools and solidifies below the surface of the earth are called intrusions.	
⚡ Molten rock that reaches the earth's surface is called magma.	
⚡ Small crystal size is associated with slow cooling in igneous rocks.	
True	False
1	2

Correct answers:

1 Extrusive igneous rocks form above the earth's surface.

Intrusive igneous rocks cool slowly due to the lower pressures and temperatures on the earth's surface.

Magma that cools and solidifies below the surface of the earth are called intrusions.

2 Magma is a pure liquid.

Molten rock that reaches the earth's surface is called magma.

Small crystal size is associated with slow cooling in igneous rocks.

Match the igneous rock textures to its corresponding description.

⌘ Aphanitic

⌘ Pegmatitic

⌘ Phaneritic

⌘ Porphyritic

▶

Rocks containing very large, coarse grained crystals greater than 1 cm in size

Rocks containing a mixture of large and small crystals

Rocks containing coarse grained crystals ranging from 1 - 10 mm in size

Rocks containing fine or microscopic crystals that are less than 1 mm in size

1

2

3

4

Correct answers:

1 Pegmatitic 2 Porphyritic 3 Phaneritic 4 Aphanitic

Match the igneous color index to its corresponding description.

⌘ Felsic		Dark colored (brown or black), similar to gabbro or basalt	1
⌘ Intermediate		Mix of light and dark colors, similar to diorite or andesite	2
⌘ Mafic		Darkest colored igneous rocks (black, green), similar to peridotite or dunite	3
⌘ Ultramafic		Light-colored (tan, peach pink), similar to granite or rhyolite	4

Correct answers:

1 Mafic 2 Intermediate 3 Ultramafic 4 Felsic

Exploration

Lava that cools and solidifies above Earth's surface is called an intrusion.

☐ True

☒ False



Intrusive igneous rocks cool slowly, resulting in rocks with ____.

☒ large crystals

☐ small crystals

☐ no crystals



Rocks with a(n) ____ texture contain crystals that are visible only with a hand lens or microscope.

- ☐ pegmatitic
 - ☐ porphyritic
 - ☐ phaneritic
 - ☒ aphanitic
- ✓

The color of an igneous rock is largely a product of its chemical composition.

- ☒ True
 - ☐ False
- ✓

Which of the following is not a felsic mineral?

- ☐ Quartz
 - ☒ Olivine
 - ☐ Potassium feldspar
 - ☐ Muscovite
- ✓

Exercise 1

What was the crystal size for room temperature environment (large or small)?

Did the room temperature environment represent slow or fast cooling?

What would be the igneous rock texture for the room temperature crystals?

What was the crystal size for the cold temperature environment (large or small)?

Did the cold temperature environment represent slow or fast cooling?

What would be the igneous rock texture for the cold temperature crystals?

Data Table 1: Salol Crystallization
(SAMPLE ANSWER BELOW)

Environment	Observations	Description of Crystals
Petri Dish at Room Temperature	Crystallization started at one point near the middle of the dish after a couple minutes. Crystals grew outward from that point slowly over a period of ~10 minutes.	Large, radiating crystals. Some almost the whole length of the dish
Frozen Petri Dish	Crystals started forming immediately around the edges of the dish. Crystals grew rapidly over a period of ~2 minutes	Tiny, radiating crystals growing in clumps. Some too small to distinguish

Photo 1: Salol Crystals
(SAMPLE ANSWER BELOW)



Data Table 2: Igneous Rock Crystals
(SAMPLE ANSWER BELOW)

Sample	Crystal Size (large, small, mixed)	Rate of Cooling (slow, fast, mixed)	Other Observations
1	Large	Slow	Varies
2	Small	Very fast	Varies
3	Small	Fast	Varies
4	Mixed	Mixed	Varies
5	Large	Slow	Varies
6	Small	Fast	Varies
7	Large	Slow	Varies
8	Small	Very fast	Varies

Exercise 2

Based on your observations, which igneous rock samples would have been formed by magma intrusions? Which would be formed by lava extrusions?

Photo 2: Igneous Rock Set
(SAMPLE ANSWER BELOW)



Data Table 3: Igneous Rock Identification
(SAMPLE ANSWER BELOW)

Sample	Color	Mafic Color Index	Minerals Present	Texture	Rock Name
1	White, gray, pink, black spots	Felsic	Quartz, K-spar, biotite, muscovite	Phaneritic	Granite
2	Tan, light gray, white	Felsic	Quartz, K-spar, plagioclase	Vesicular	Pumice
3	Dark gray/black	Mafic	Plagioclase, amphibole	Aphanitic	Basalt
4		Intermediate	Quartz, plagioclase, amphibole	Porphyritic	Porphyritic Andesite
5	Black, green, brown, dark gray	Mafic	Plagioclase, pyroxene, olivine	Phaneritic	Gabbro
6	Light pink, tan	Felsic	Quartz, K-spar, biotite, muscovite	Aphanitic	Rhyolite
7	White and black	Intermediate	Plagioclase, amphibole, biotite, quartz	Phaneritic	Diorite
8	Black	can be categorized as felsic, intermediate, or mafic according to the flow chart	Variable (composed of amorphous silica)	Glassy	Obsidian

Competency Review

Mafic minerals are rich in ____ and ____.

- ☐ iron; aluminum
- ☐ tin; aluminum
- ☒ iron; magnesium ✓
- ☐ magnesium; tin

Extrusive igneous rocks cool ____, resulting in the formation of ____ crystals.

- ☐ rapidly; large
- ☒ rapidly; small ✓
- ☐ slowly; large
- ☐ slowly; small

An igneous rock with a mixture of large and small crystals would be classified as ____.

- ☒ porphyritic ✓
- ☐ phaneritic
- ☐ aphanitic
- ☐ pegmatitic

Which of the following is not a mafic mineral?

- ☐ Olivine
- ☐ Pyroxine
- ☐ Amphibole
- ☒ Quartz ✓

When simulating igneous rock formation using salol, cooling at room temperature represents extrusive igneous rock formation.

- ☐ True
- ☒ False

✓

The rocks in the image below are ____.



- ☐ rhyolite
- ☐ pumice
- ☒ granite
- ☐ gabbro

✓

Phaneritic rocks contain coarse grained crystals ranging from 1 - 10 mm.

- ☒ True
- ☐ False

✓

A mafic igneous rock sample that is phaneritic in texture and contains the minerals plagioclase, pyroxene, and olivine would be classified as ____.

- ☐ obsidian
- ☒ gabbro
- ☐ diorite
- ☐ basalt



Extension Questions

Iceland is known for its unique geology, including rock columns, such as the ones found at Reynisfjara Beach. See figure below.

- **Research the geology of Iceland, with a particular focus on the types of rocks present. Why are these rocks predominant?**
- **What type of rock creates the columns in the figure? How are these columns formed?**



(SAMPLE ANSWER BELOW)

Iceland is located on the boundary of two tectonic plates, as well as on top of a hotspot. As a result, there is a high degree of volcanic activity in Iceland, resulting in a high amount of igneous rocks. In fact, the majority of rocks in Iceland are igneous rocks. The columns depicted are basalt columns. Basalt is an extrusive igneous rock. These rocks exhibit columnar jointing as a result of their rapid cooling, giving them a unique, hexagonal shape.