

GEOL113

Igneous Rocks

Goals: To learn how to use igneous texture and composition to identify igneous rocks.

Before Lab: Read pp. 89-95 in Chapter 4 and 103-116 in Chapter 5 in your lab book. Review the figures

Materials: 1 box of unidentified rock samples in large green box, 1 box of Wards igneous rock samples, magnifying devices, pen magnet

Procedure: Your main job today is to use igneous texture and mineral composition to identify igneous rocks. Your lab manual contains extensive information about texture and composition as well as an igneous rock identification procedure.

You will have 10 “unknown” specimens placed along the back of the room for today’s lab. Number a sheet of paper from 1-10 and correctly identify the mineral at the corresponding number.

Next lab meeting, we will have an igneous rock identification quiz. For the quiz, you will be given igneous rock specimens to identify. Some types of igneous rocks may appear more than once on the quiz (just as they do in real life) and I will not use the same specimens on the quiz that you examined in class. I may also ask you to identify minerals in the igneous rock specimens. Igneous rock and mineral names *must* be spelled correctly on the quiz for full credit. Extra credit questions will be given for accessory minerals, textures, composition, formation environment (extrusive/intrusive).

You may use one 8.5x11 inch sheet of paper with notes on one side during the quiz. You may not paste things (e.g., layers of post-it notes) to the paper, but are limited to the plane of the surface of the paper itself. The only other restriction is the size of the sheet. You may write, print, draw or whatever else you like on your sheet of paper.

Igneous rocks that may appear on the quiz: granite, rhyolite, diorite, andesite, gabbro, basalt, pumice, scoria, tuff, obsidian, peridotite, syanite.

Igneous textures that may appear on the quiz: *aphanitic, phaneritic*, (used by default) and porphytic, pegmatitic, vesicular, glassy. (*Must be used when appropriate*)

Minerals: You will also be required to identify accessory minerals (muscovite, hornblende, magnetite, biotite, etc)

Common Minerals in Igneous Rocks

Mineral	Formula	Group
Quartz	SiO ₂	Oxides/Silicates
Muscovite	KAl ₂ (Si ₃ Al)O ₁₀ (OH) ₂	Silicates
K-Feldspar	KAlSi ₃ O ₈	Silicates
Plagioclase	NaAlSi ₃ O ₈ (albite) – CaAl ₂ Si ₂ O ₈ (anorthite)	Silicates
Biotite	K(Mg,Fe) ₃ [AlSi ₃ O ₁₀ (OH,F) ₂]	Silicates
Hornblende	Ca ₂ [Mg ₄ (Al,Fe)]Si ₇ AlO ₂₂ (OH) ₂	Silicates
Augite	(Mg,Fe) ₂ SiO ₄	Silicates
Olivine	(FeMg) ₂ SiO ₄	Silicates
Magnetite	Fe ₃ O ₄	Oxide

Composition of Igneous Rocks

	Rock <i>will</i> be composed primarily of one or more of the following minerals:	Rock <i>might</i> contain 1 or 2 of the following minerals:
Felsic <i>granite, rhyolite, syanite</i>	quartz, K-feldspar, plagioclase (Na-rich) (no quartz in syanite)	muscovite, biotite, amphibole (e.g., hornblende)
Intermediate <i>diorite, andesite</i>	plagioclase feldspar, amphibole (e.g., hornblende)	pyroxene (e.g., augite), biotite
Mafic <i>gabbro, basalt</i>	plagioclase (Ca-rich), pyroxene (e.g., augite)	amphibole (e.g., hornblende) olivine, magnetite
Ultramafic <i>peridotite</i>	olivine	plagioclase (Ca-rich), pyroxene (e.g., augite)
<i>pumice, scoria, tuff, obsidian</i>	None	None (usually)

Igneous Rock Textures

Crystalline Rocks (composed of interlocking mineral crystals)

Phaneritic (coarse grained) e.g., granite, diorite, gabbro	Mineral crystals large enough to see and identify with hand lens.
Aphanitic (fine grained) e.g., rhyolite, andesite, basalt	Mineral crystals too small to see and identify without significant magnification
Porphyritic e.g., porphyritic rhyolite, porphyritic andesite, porphyritic basalt	Rock contains some mineral crystals that are much, much larger than the crystals in the rest of the rock (e.g., aphanitic rock with some clearly visible crystals). The large crystals are called phenocrysts.
Pegmatitic	Phaneritic texture with very large crystals (>3 cm). Granite pegmatites frequently contain exotic minerals such as the gemstones tourmaline, garnets, topaz and spodumene.

Non-Crystalline Rocks (not composed of interlocking mineral crystals)

Glassy (e.g., obsidian)	Transparent in thin slices. Light-colored minerals sometimes found in volcanic glass (e.g., snowflake obsidian)
Vesicular (e.g., scoria)	Rock contains large openings corresponding to the position of gas bubbles that were preserved when the lava solidified. Minerals sometimes form in the voids after the lava has cooled.
Frothy (e.g., pumice)	Rock contains many tiny openings like those in vesicular rocks, but much smaller. The openings lower the density of the rock enough that some frothy-textured rocks float in water.
Pyroclastic (e.g., tuff)	Rock composed of materials blown into the air during an explosive eruption. Individual fragments range in size from microscopic ash to boulder-sized bombs.