

# ANSWER KEY

## IGNEOUS ROCK CLASSIFICATION PRACTICE SET – ANSWER KEY

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### INTRODUCTION

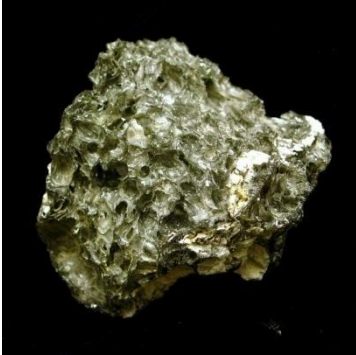

This igneous rock practice set has been assembled for use by student geologists who wish to better familiarize themselves with some of the various types of igneous rocks and their classification. The ability to classify these rocks will rely on both your ability to identify visible minerals when possible in the rock, as well as your ability to distinguish between the various textures these rocks exhibit. They also provide useful information about the conditions under which the rocks were formed and provide clues to the geologic history of the region where they are located.



The following mineral practice set includes 24 igneous rock samples (two per basket). Use the mineral identification kits provided (orange baskets), your laboratory manual (*Laboratory Manual in Physical Geology*, Busch & Tasa, American Geological Institute, 9th ed., 2011.), textbook, notes and any other available resources to fill out the attached mineral identification worksheets. The more you practice with and familiarize yourself with these rocks, the easier it will become to identify the various textures and compositions that distinguish these rocks from one another.



### GUIDELINES FOR ROCK & MINERAL IDENTIFICATION



- 1.) Work with only one category of unknown samples at a time (minerals, igneous, sedimentary or metamorphic). Return the complete sample set to the geology cabinet before moving on to another unknown sample set.
- 2.) Each basket contains two distinctly different samples for identification/classification. It is suggested that you select one of the two samples from the basket to work with before returning it and working with the second sample.
- 3.) Work with only one basket (2 samples) at a time. When finished, return both samples to the basket they came from before moving on to the next one. This will prevent samples from getting mixed up and placed in the wrong numbered baskets and will maintain the integrity of the answer key.
- 4.) Use the mineral identification kits (orange baskets) to help you identify minerals and classify the rocks as needed. An optical microscope is also available in the Science Learning Center (SLC) for closer examination. Remember to use caution and good judgment when using the bottles of HCl. Although the acid test is often good fun, try to limit your use of HCl to those samples that you believe have a reasonable chance of fizzing. There is no need to hit every sample with HCl.
- 5.) Use your textbook, lab manual, class notes, or other available resources to help you identify minerals and classify the variety of rocks.
- 6.) Have fun! Some of the samples found in these sets are intended to challenge you, so don't be discouraged if you're stumped...in the field, not every rock or mineral you encounter will be a pristine museum quality sample. Geology is rarely so simple. ☺

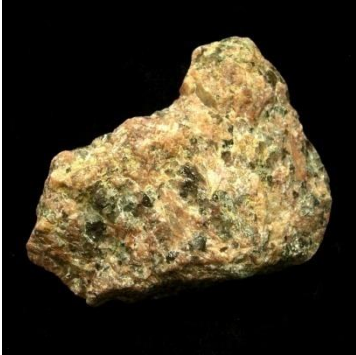
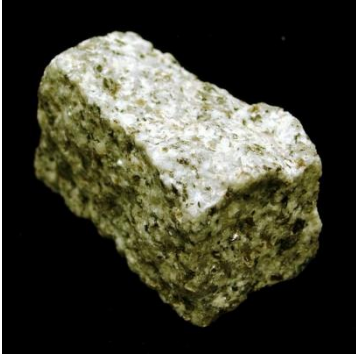
Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Phaneritic (course-grained)</b></p>	<p style="text-align: center;"><b>Felsic</b></p>	<p style="text-align: center;"><b>Quartz, Plagioclase Feldspar (Na-rich), Biotite, (Amphibole).</b></p>	<p style="text-align: center;"><b>Granite</b></p>
<p><b>1a.)</b> Is this an intrusive or extrusive igneous rock? <b>Intrusive.</b>  Would you expect the plagioclase feldspar in this rock to be sodium-rich or calcium-rich?  <b>Sodium-rich.</b></p>				
	<p style="text-align: center;"><b>Aphanitic (fine-grained)</b></p>	<p style="text-align: center;"><b>Mafic</b></p>		<p style="text-align: center;"><b>Basalt</b></p>
<p><b>1b.)</b> Would you expect to find this rock in continental or oceanic crust? <b>Oceanic.</b>  Did this rock experience slow or rapid cooling? <b>Rapid cooling.</b></p>				



Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Vesicular</b></p>	<p style="text-align: center;"><b>Mafic</b></p>		<p style="text-align: center;"><b>Scoria</b></p>
<p><b>2a.)</b> Would you expect to find this rock near a composite volcano or a shield volcano?  <b>Shield volcano.</b>  Is this rock silica-rich or silica-poor? <b>Silica-poor.</b></p>				
	<p style="text-align: center;"><b>Glassy</b></p>	<p style="text-align: center;"><b>Felsic (or Mafic)</b></p>		<p style="text-align: center;"><b>Obsidian</b></p>
<p><b>2b.)</b> Is this an intrusive or extrusive igneous rock? <b>Extrusive.</b>  This rock exhibits what type of fracture? <b>Conchoidal.</b></p>				

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Phaneritic (coarse-grained)</b></p>	<p style="text-align: center;"><b>Ultra-mafic</b></p>	<p style="text-align: center;"><b>Olivine, (Pyroxene)</b></p>	<p style="text-align: center;"><b>Peridotite</b></p>
<p><b>3a.)</b> Did the minerals in this rock crystallize at high temperatures (&gt;1000°C) or low temperatures (&lt;800°C)? <b>High temperatures.</b>  Where is the formation of this rock most prominent? <b>The mantle.</b></p>				
	<p style="text-align: center;"><b>Aphanitic (fine-grained)</b></p>	<p style="text-align: center;"><b>Felsic</b></p>		<p style="text-align: center;"><b>Rhyolite</b></p>
<p><b>3b.)</b> Would you expect to find this rock in continental or oceanic crust? <b>Continental crust.</b>  What type of mineral composition would you expect this rock to have? <b>Quartz, feldspar, muscovite, minor amounts of amphibole and/or biotite.</b></p>				


Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p><b>Phaneritic (coarse-grained)</b></p>	<p><b>Intermediate</b></p>	<p><b>Quartz, Plagioclase Feldspar, Potassium Feldspar, Amphibole, (Pyroxene)</b></p>	<p><b>Diorite</b></p>
<p><b>4a.)</b> Is this an intrusive or extrusive rock? <b>Intrusive.</b>  What felsic mineral is a primary component of this rock? <b>Plagioclase feldspar.</b></p>				
	<p><b>Pyroclastic</b></p>	<p><b>Felsic</b></p>		<p><b>Volcanic tuff</b></p>
<p><b>4b.)</b> Did this rock experience slow or rapid cooling? <b>Rapid cooling.</b>  Is this rock silica-rich or silica-poor? <b>Silica-rich.</b></p>				

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p><b>Phaneritic (coarse-grained)</b></p>	<p><b>Mafic</b></p>	<p><b>Plagioclase Feldspar (Ca-rich), Pyroxene, (Amphibole)</b></p>	<p><b>Gabbro</b></p>
<p><b>5a.)</b> Would you be more likely to find this rock in a dike or a lava flow? <b>Dike.</b>  Would you be more likely to find this rock near a convergent or divergent plate boundary?  <b>Divergent plate boundary.</b></p>				
	<p><b>Vesicular</b></p>	<p><b>Mafic</b></p>		<p><b>Vesicular basalt</b></p>
<p><b>5b.)</b> Is this an intrusive or extrusive rock? <b>Extrusive.</b>  What type of mineral composition would you expect this rock to have? <b>Amphibole, pyroxene, olivine, Ca-rich plagioclase feldspar.</b></p>				


Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Phaneritic (coarse-grained)</b></p>	<p style="text-align: center;"><b>Felsic</b></p>	<p style="text-align: center;"><b>Quartz, Potassium Feldspar</b></p>	<p style="text-align: center;"><b>Granite</b></p>
<p><b>6a.)</b> Did the minerals in this rock crystallize at high temperatures (&gt;1000°C) or low temperatures (&lt;800°C)? <b>Low temperatures.</b>          What mineral is responsible for the pink color of this rock? <b>Potassium feldspar.</b></p>				
	<p style="text-align: center;"><b>Phaneritic (coarse-grained)</b></p>	<p style="text-align: center;"><b>Felsic</b></p>	<p style="text-align: center;"><b>Quartz, Plagioclase Feldspar (Na-rich), Potassium Feldspar, Biotite, Muscovite</b></p>	<p style="text-align: center;"><b>Granite</b></p>
<p><b>6b.)</b> Would you expect to find this rock in continental or oceanic crust? <b>Continental crust.</b>          Did this rock experience slow cooling or rapid cooling? <b>Slow cooling.</b></p>				

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Pegmatitic</b></p>	<p style="text-align: center;"><b>Felsic</b></p>	<p style="text-align: center;"><b>Quartz, Muscovite, Potassium Feldspar, (Plagioclase Feldspar)</b></p>	<p style="text-align: center;"><b>Pegmatitic Granite (Pegmatite)</b></p>
<p><b>7a.)</b> Would you expect this rock to have crystallized from a H<sub>2</sub>O-rich or H<sub>2</sub>O-poor magma?  <b>H<sub>2</sub>O-rich.</b>  Would you expect to find this rock in continental or oceanic crust? <b>Continental crust.</b></p>				
	<p style="text-align: center;"><b>Phaneritic (coarse-grained)</b></p>	<p style="text-align: center;"><b>Intermediate</b></p>	<p style="text-align: center;"><b>Quartz, Plagioclase Feldspar, Amphibole, (Pyroxene)</b></p>	<p style="text-align: center;"><b>Diorite</b></p>
<p><b>7b.)</b> Is this an intrusive or extrusive rock? <b>Intrusive.</b>  Would you be more likely to find this rock near a convergent or divergent plate boundary?  <b>Convergent.</b></p>				







Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Aphanitic (fine-grained)</b></p>	<p style="text-align: center;"><b>Felsic</b></p>		<p style="text-align: center;"><b>Rhyolite</b></p>



**8a.)** Did this rock experience slow or rapid cooling? **Rapid cooling.**  
 Would you expect to find this rock near a composite or a shield volcano? **Composite volcano.**



	<p style="text-align: center;"><b>Aphanitic (fine-grained)</b></p>	<p style="text-align: center;"><b>Mafic</b></p>		<p style="text-align: center;"><b>Basalt</b></p>
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**8b.)** Is this an intrusive or extrusive rock? **Extrusive.**  
 What type of mineral composition would you expect this rock to have? **Pyroxene, amphibole, olivine, Ca-rich plagioclase feldspar.**

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Phaneritic (coarse-grained)</b></p>	<p style="text-align: center;"><b>Felsic</b></p>	<p style="text-align: center;"><b>Quartz, Plagioclase Feldspar, Potassium Feldspar, Amphibole, (Biotite)</b></p>	<p style="text-align: center;"><b>Granite</b></p>
<p><b>9a.)</b> Would you be more likely to find this rock in a sill or lava flow? <b>Sill.</b> Is this rock silica-rich or silica-poor? <b>Silica-rich.</b></p>				
	<p style="text-align: center;"><b>Phaneritic (coarse-grained)</b></p>	<p style="text-align: center;"><b>Mafic</b></p>	<p style="text-align: center;"><b>Plagioclase Feldspar (Ca-rich), Pyroxene, (Amphibole)</b></p>	<p style="text-align: center;"><b>Gabbro</b></p>
<p><b>9b.)</b> Did this rock experience slow or rapid cooling? <b>Slow cooling.</b> Did the minerals in this rock crystallize at high temperatures (&gt;1000°C) or low temperatures (&lt;800°C)? <b>High temperatures.</b></p>				

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Vesicular</b></p>	<p style="text-align: center;"><b>Mafic</b></p>		<p style="text-align: center;"><b>Pumice</b></p>
<p><b>10a.)</b> Is this an intrusive or extrusive rock? <b>Extrusive.</b>            What are some of the possible volcanic gases that may be responsible for the texture of this rock? <b>Water vapor (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), Nitrogen, sulfur, etc.</b></p>				
	<p style="text-align: center;"><b>Aphanitic (fine-grained)</b></p>	<p style="text-align: center;"><b>Intermediate</b></p>		<p style="text-align: center;"><b>Andesite</b></p>
<p><b>10b.)</b> Would you be more likely to find this rock in a batholith or a lava flow? <b>Lava flow.</b>            What type of mineral composition would you expect this rock to have? <b>Plagioclase feldspar, quartz, pyroxene, amphibole.</b></p>				

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p><b>Phaneritic (coarse-grained)</b></p>	<p><b>Intermediate</b></p>	<p><b>Potassium Feldspar, Quartz, Biotite, (Plagioclase Feldspar)</b></p>	<p><b>Diorite</b></p>
<p><b>11a.)</b> Did this rock experience slow or rapid cooling? <b>Slow.</b>  As this rock cooled, what minerals crystallized first? <b>Amphibole and pyroxene.</b></p>				
	<p><b>Vesicular</b></p>	<p><b>Mafic</b></p>		<p><b>Scoria</b></p>
<p><b>11b.)</b> Would you be more likely to find this rock near a convergent plate boundary or volcanic hot spot? <b>Hot spot.</b>  What type of mineral composition would you expect this rock to have? <b>Amphibole, pyroxene, Ca-rich plagioclase feldspar.</b></p>				

Sample	Texture	Composition	Visible Minerals	Rock Classification
	<p style="text-align: center;"><b>Pyroclastic</b></p>	<p style="text-align: center;"><b>Felsic</b></p>		<p style="text-align: center;"><b>Volcanic Breccia</b></p>
<p><b>12a.)</b> Is this an intrusive or extrusive rock? <b>Extrusive.</b>          Would you expect to find this rock near a composite volcano or a shield volcano?  <b>Composite volcano.</b></p>				
	<p style="text-align: center;"><b>Porphyritic</b></p>	<p style="text-align: center;"><b>Mafic</b></p>	<p style="text-align: center;"><b>Amphibole, (Pyroxene)</b></p>	<p style="text-align: center;"><b>Porphyritic Basalt</b></p>
<p><b>12b.)</b> Did this rock experience slow or rapid cooling? <b>Both slow and rapid cooling!</b>          What type of igneous rock would likely have formed if slow cooling had been allowed to continue? <b>Gabbro.</b></p>				