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REFERENCE TABLES WORKBOOK 4th Edition

The workbook correlates with the 2011 NYS Physical Setting Earth Science Reference Tables.

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- Each section contains an *Overview*, a detail explanation of the *Chart/Map* and *Additional Information* of the table, along with a series of related Regents based practice questions.
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ABOUT THIS WORKBOOK

The Introduction – Overview, The Chart, Additional Information, and Diagrams – In these sections, you will find the essential information about a specific part of the reference table. These areas contain much information, so read each section slowly and carefully to achieve full comprehension of the material.

SET 1 – Questions and Answers – Set 1 group of questions will test your understanding of a specific section of the reference table. It is highly recommended that you first read and have a good knowledge of the introduction pages. Once you have mastered this, the correct answer to each question will be apparent. Try all questions in Set 1, and then correct your work by going to the Answers for Set 1, which are located at the end of the section. The explanation should be clear enough to help you understand any mistakes you have made. If not, ask your teacher for more assistance.

SET 2 – Questions – The answers to these questions are provided in a separate answer key. It's "Show Time"; time to prove to yourself and to your teacher that you know the information for this part of the reference chart. You and your teacher will interact to see how well you have done in this area.

All of us at Topical Review Book Company hope that by mastering the Earth Science Reference Tables, your understanding of Earth Science will be more complete and your grades will improve.

The author:

William Docekal

Retired Earth Science Teacher

4th Edition

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P. O. Box 328

Onsted, MI 49265-0328

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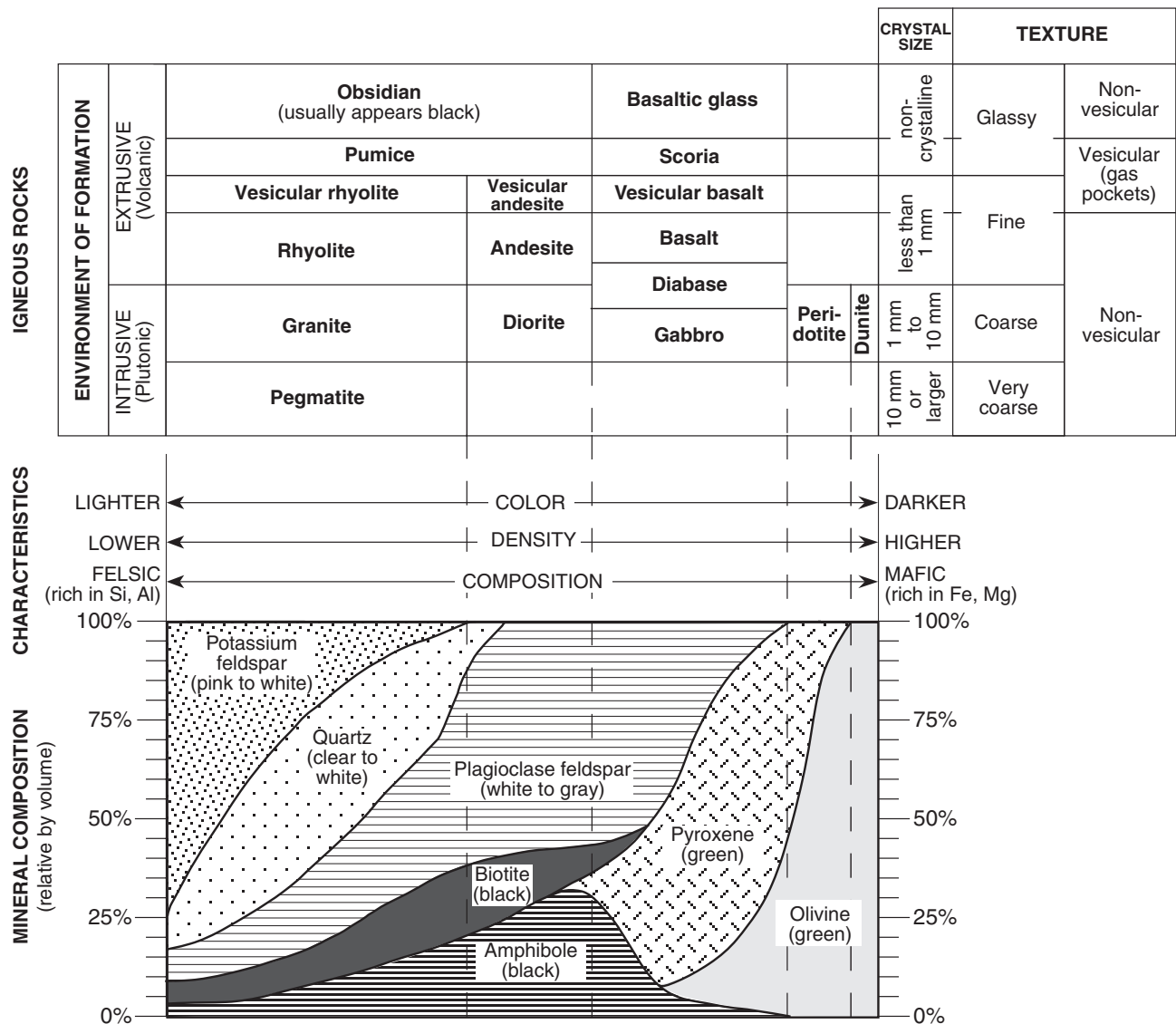
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Scheme for Igneous Rock Identification



Overview:

Igneous rocks form as molten rock (lava/magma) cools and solidifies. If this solidification process occurs inside the Earth, the magma will form intrusive igneous rocks. When volcanic action brings magma to the surface, it quickly solidifies, creating an extrusive igneous rock. Both of these classifications exhibit different textures based on the size of the crystals that grow. The slower the magma cools, the larger the resulting crystals and the coarser the texture. Lava usually cools so fast that no visible crystals develop. This produces a glassy, non-crystalline rock.

All rocks are composed of minerals. Two igneous rocks may have the same minerals, but have different names. This occurs if they formed from different environments – intrusive or extrusive. The characteristic properties of density, color, and mineral composition, along with texture, are used to identify igneous rocks.

The Chart:

Igneous Rocks section – On the left side is given the Environment Of Formation – Extrusive (Volcanic), meaning outside the Earth, and Intrusive (Plutonic), meaning inside the Earth. Igneous rocks are first classified into one of these environments in which different textures are produced. In the Texture columns are given the different textures for extrusive and intrusive igneous rocks. In extrusive environments, glassy texture may be present. This is caused by the rapid solidification of lava, producing no observable crystals. This is referred to as non-crystalline (see Crystal Size column). Fine texture is when the crystals are less than 1 mm in size. At times, magma/lava is ejected from a volcano and solidifies in the air, producing air holes or gas pockets in the volcanic rock. If this occurs, the rock's texture is referred to as vesicular. This texture is an excellent clue for identifying extrusive igneous rocks. A non-vesicular extrusive rock will not show gas pockets, but it might exhibit a glassy or fine texture. In an intrusive environment, coarse or very coarse textures are produced. As the magma cools within the Earth, atoms have time to “lock” into a crystal pattern. The more insulated the magma is, the slower it cools and larger the crystals it grows.

In this Igneous Rocks section different igneous rocks are positioned over their common minerals and common characteristic properties. For example, basalt and gabbro, positioned on the right side of the chart, have the same minerals and characteristic properties shown under them, but they exhibit different textures due to the different environments of formation – intrusive vs. extrusive. Granite and rhyolite, positioned on the left side of the chart, have the same mineral composition and characteristic properties, but have different textures due to the different environments of formation.

Characteristics section – Located between the charts are the characteristics of igneous rocks. If a rock is located on the left side, it will show the properties of being lighter in color and having a lower density with a felsic composition. The chart shows these felsic igneous rocks contain the elements silicon and aluminum (Si, Al). Moving to the right side, the given characteristic properties are different, being darker in color and having a higher density with a mafic composition. The chart shows these mafic igneous rocks contain the elements iron and magnesium (Fe, Mg).

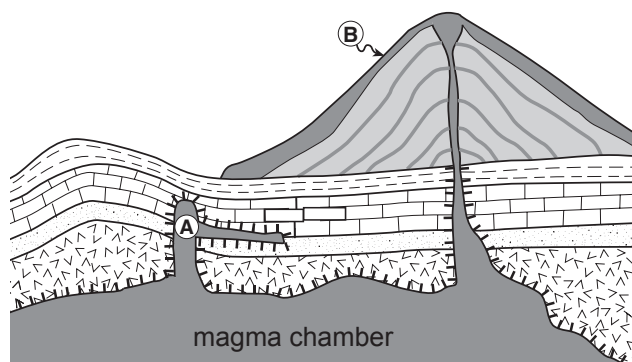
Mineral Composition chart – This chart gives the minerals found in the specific igneous rocks. For example, locate rhyolite on the left side of the Igneous Rocks chart. The minerals found within rhyolite are listed directly below in the Mineral Composition chart. These minerals would include potassium feldspar, quartz, plagioclase feldspar, and smaller amounts of biotite and amphibole. This chart also shows that the percentage of each mineral can vary. The same procedure is used to find the mineral composition of the other given igneous rocks. When this procedure is used, it becomes evident that the igneous rocks located on the left side of the chart, when compared to igneous rocks located on the right side of the chart, will have different mineral compositions.

Observing an unknown igneous rock's characteristic properties, and its texture, as well as identifying some of the minerals within, greatly helps in the identification of the rock.

Additional Information:

- Obsidian usually appears black, but when sliced into thinner sections, it is light in color and translucent.

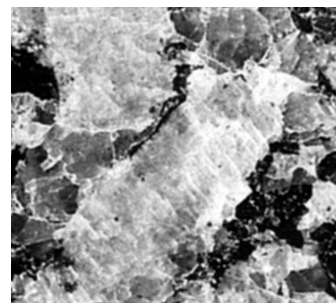
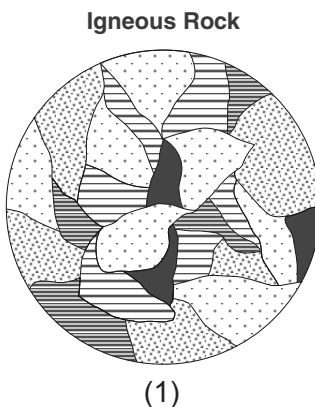
1. **Igneous Environments** – A magma chamber is an underground pool of liquid rock. If the outer part of this chamber (A) cools enough to solidify, the resulting intrusive igneous rocks will have a coarse texture exhibiting large interlocking crystals. If the magma surfaces, the lava (B) will cool quickly, producing an extrusive igneous rock with a fine, glassy, or vesicular texture.



2.

Key	
	Amphibole
	Biotite
	Plagioclase feldspar
	Potassium feldspar
	Quartz

Scale
0 2 4 mm



(2)

Intrusive Igneous Rock – Diagram 1 shows the magnified drawing of the minerals found in an intrusive igneous rock. Based on the size of its intergrown crystals, the environment of formation must have been intrusive (plutonic). Diagram 2 is an actual photograph of such an intrusive igneous rock that cooled slowly, growing large crystals.

3.

Mineral Name	Percentage of Mineral Present
plagioclase feldspar	55%
biotite	15%
amphibole	30%

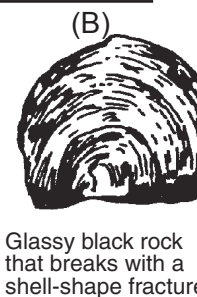
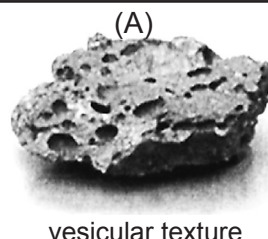


0 1
centimeter

Identifying an Igneous Rock – The three given minerals and their mineral percentages would be positioned in the center section of the Mineral Composition chart. The name of this rock would be directly above this middle section within the Igneous Rock chart. Measurement of the grain sizes indicates that the texture is coarse. Diorite is situated above the given minerals and has a coarse texture.

4. **Extrusive Igneous Rocks** – Rock A has gas pockets, making its texture vesicular. This rock cooled rapidly, trapping air as lava was ejected from a volcano. This rock is vesicular basalt.

Rock B shows a glassy texture making it non-crystalline. A lava flow on the Earth's surface cooled quickly, producing this texture. This rock is obsidian.



Set 1 — Scheme for Igneous Rock Identification

1. Which three minerals are most commonly found in the igneous rock granite?
- (1) amphibole, calcite, and hematite
 - (2) amphibole, biotite mica, and gypsum
 - (3) plagioclase feldspar, pyroxene, and olivine
 - (4) plagioclase feldspar, potassium, feldspar, and quartz
- 1 _____

2. The three statements below are observations of the same rock sample:

- The rock has intergrown crystals from 2 to 3 millimeters in diameter.
- The minerals in the rock are gray feldspar, green olivine, green pyroxene, and black amphibole.
- There are no visible gas pockets in the rock.

This rock sample is most likely

- (1) sandstone (3) granite
 - (2) gabbro (4) rhyolite
- 2 _____

3. Which igneous rock has a vesicular texture and a felsic composition?

- (1) pumice (3) granite
 - (2) basalt (4) scoria
- 3 _____

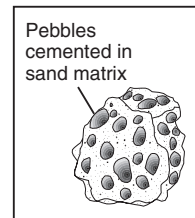
4. Name an igneous rock with mineral crystals ranging in size from 2 to 6 millimeters. The rock is composed of 58% plagioclase feldspar, 26% amphibole, and 16% biotite. What is the name of this rock?

- (1) diorite (3) andesite
 - (2) gabbro (4) pumice
- 4 _____

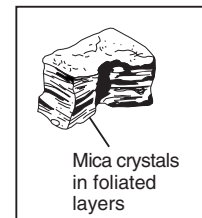
5. Which extrusive igneous rock could be composed of approximately 60% pyroxene, 25% plagioclase feldspar, 10% olivine, and 5% amphibole?

- (1) granite (3) gabbro
 - (2) rhyolite (4) basalt
- 5 _____

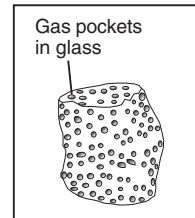
6. Which rock most probably formed directly from lava cooling quickly at Earth's surface?



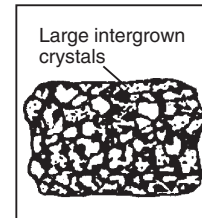
(1)



(3)



(2)



(4)

6 _____

7. Which characteristic provides the best evidence that obsidian rock formed in an extrusive environment?

- (1) layers of rounded fragments
- (2) distorted bands of large mineral crystals
- (3) noncrystalline glassy texture
- (4) mineral cement between grains

7 _____

8. For an igneous rock to be classified as rhyolite, it must be light colored, be fine grained, and contain

- (1) quartz (3) pyroxene
 - (2) calcite (4) olivine
- 8 _____

Set 2 — Scheme for Igneous Rock Identification

13. The end product of the weathering of gabbro or basalt rocks is a solution of dissolved material that most likely would contain high amounts of
- (1) iron and magnesium
 - (2) magnesium and potassium
 - (3) aluminum and iron
 - (4) aluminum and potassium
- 13 _____

14. The photograph below shows an igneous rock.

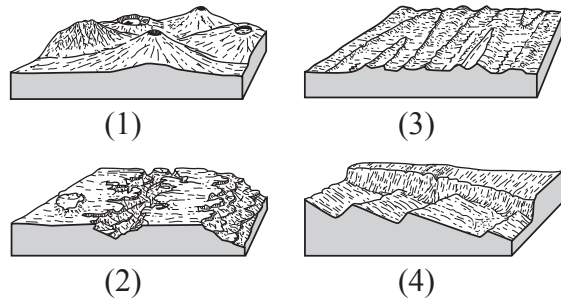


What is the origin and rate of formation of this rock?

- (1) plutonic with slow cooling
 - (2) plutonic with rapid cooling
 - (3) volcanic with slow cooling
 - (4) volcanic with rapid cooling
- 14 _____
15. An igneous rock is a dark-colored crystalline rock that formed when a lava flow cooled and solidified quickly on the surface of Earth. This igneous rock is classified as an
- (1) extrusive igneous rock with a coarse texture and felsic composition
 - (2) extrusive igneous rock with a fine texture and a mafic composition
 - (3) intrusive igneous rock with a coarse texture and a felsic composition
 - (4) intrusive igneous rock with a fine texture and a mafic composition
- 15 _____

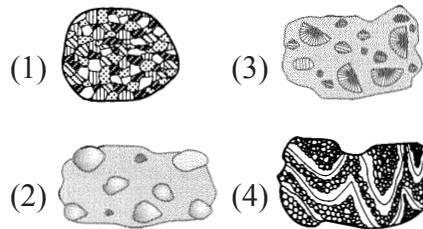
16. Which igneous rock has a vesicular texture and contains the minerals potassium feldspar and quartz?
- (1) andesite
 - (2) pegmatite
 - (3) pumice
 - (4) scoria
- 16 _____

17. Which diagram represents a landscape where fine-grained igneous bedrock is most likely to be found?



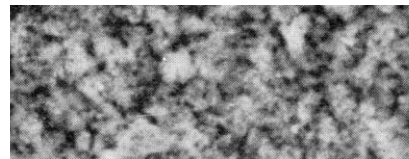
17 _____

18. Which diagram best represents a sample of an igneous rock?



18 _____

19. The photograph below shows actual crystal sizes in a light-colored igneous rock that contains several minerals, including potassium feldspar, quartz, and biotite mica.



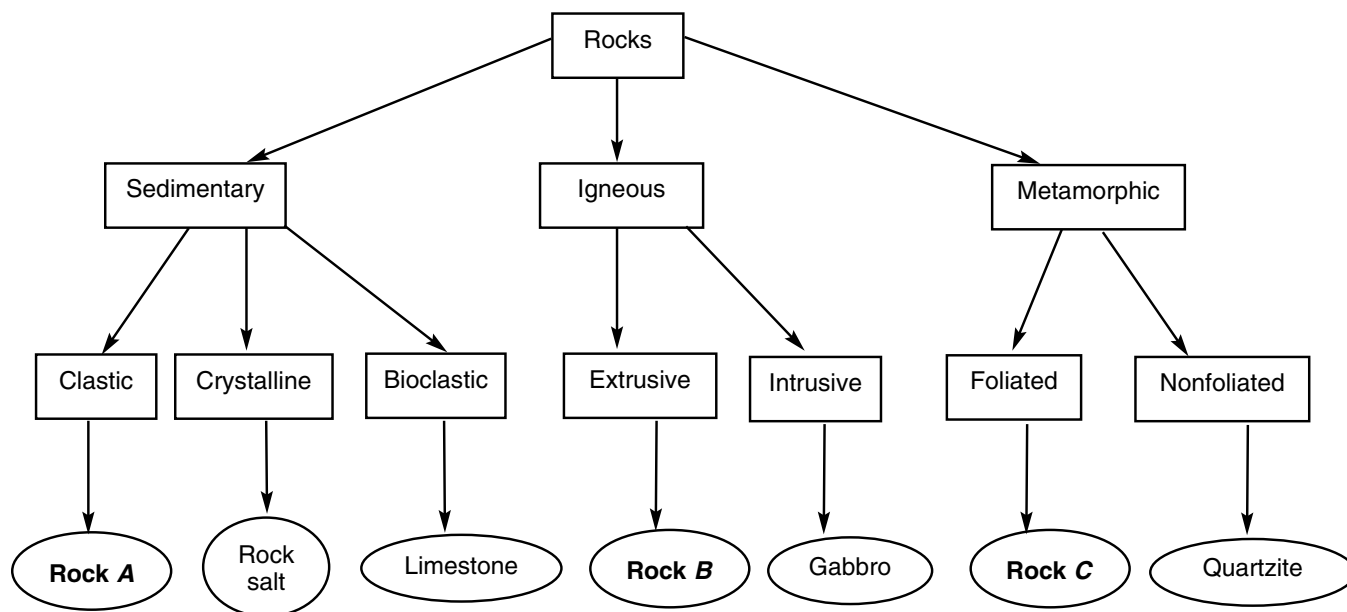
(Shown to actual size)

The rock should be identified as

- (1) granite
 - (2) gabbro
 - (3) basalt
 - (4) rhyolite
- 19 _____

Base your answers to question 20 on the Rock Classification Flowchart. Letters *A*, *B*, and *C* represent specific rocks in this classification scheme.

Rock Classification Flowchart



20. a) Rock *B* has a fine vesicular texture and is composed mainly of potassium feldspar and quartz. State the name of rock *B*. _____
- b) Granite could be placed in the same position in the flowchart above as gabbro. Describe *two* differences between granite and gabbro.
- 1) _____
- 2) _____
- c) If Rock *B* is scoria, give two descriptions of its properties. _____
- _____

21. Complete the table below, with descriptions of the observable characteristics used to identify basalt.

Characteristic of Basalt	Description
Texture	
Color	
Density	

22. Name a nonvesicular rock made entirely of green 2-millimeter-diameter crystals that has a hardness of 6.5 and exhibits fracture (see page 207).

Scheme for Igneous Rock Identification

Set 1 – Answers

1. 4 The minerals that make up an igneous rock are located directly under it in the Mineral Composition chart. The listed minerals under granite match those in choice 4.
2. 2 The listed minerals are located on the right side of the Mineral Composition chart. The sample rock would be positioned directly above these minerals in the Igneous Rock chart. Grain size 2-3 mm, would be coarse. Gabbro is the sample rock.
3. 1 Locate the vesicular (gas pockets) texture section. Moving to the left, pumice is aligned with this texture. As shown in the Characteristics section, felsic composition rocks are located on the left side, where pumice is positioned.
4. 1 Due to the grain size, this rock would be located in the coarse texture row. The listed minerals and their percentages are located in the center section of the Mineral Composition chart. The rock diorite is above these minerals and positioned in the coarse texture column.
5. 4 Locate basalt. Directly under it are the minerals that it would contain. Basalt is an extrusive rock that has the mineral composition given in the question.
6. 2 When lava is ejected into the air, gases are trapped producing a vesicular texture. Because the lava solidified quickly, a glassy texture also is exhibited.
7. 3 To the right of obsidian is given the crystal size and texture as non-crystalline and glassy. Extrusive igneous rocks cool very fast producing a smooth glassy texture.
8. 1 Open to the Igneous Rock chart and locate rhyolite. Directly under rhyolite in the Mineral Composition chart, it shows that rhyolite contains quartz in its composition.
9. 1 Granite, an intrusive rock having the largest crystals, must have had the longest cooling time. Pumice, with a glassy texture, producing no visible crystals, must have cooled the fastest of the rocks.
10. a) Answer: Coarse
Explanation: Coarse texture having crystal sizes of 1 mm to 10 mm, is the correct range size of the minerals in the diagram.

Please be advised that all Set 1 answers are explained and appear in the actual workbook.