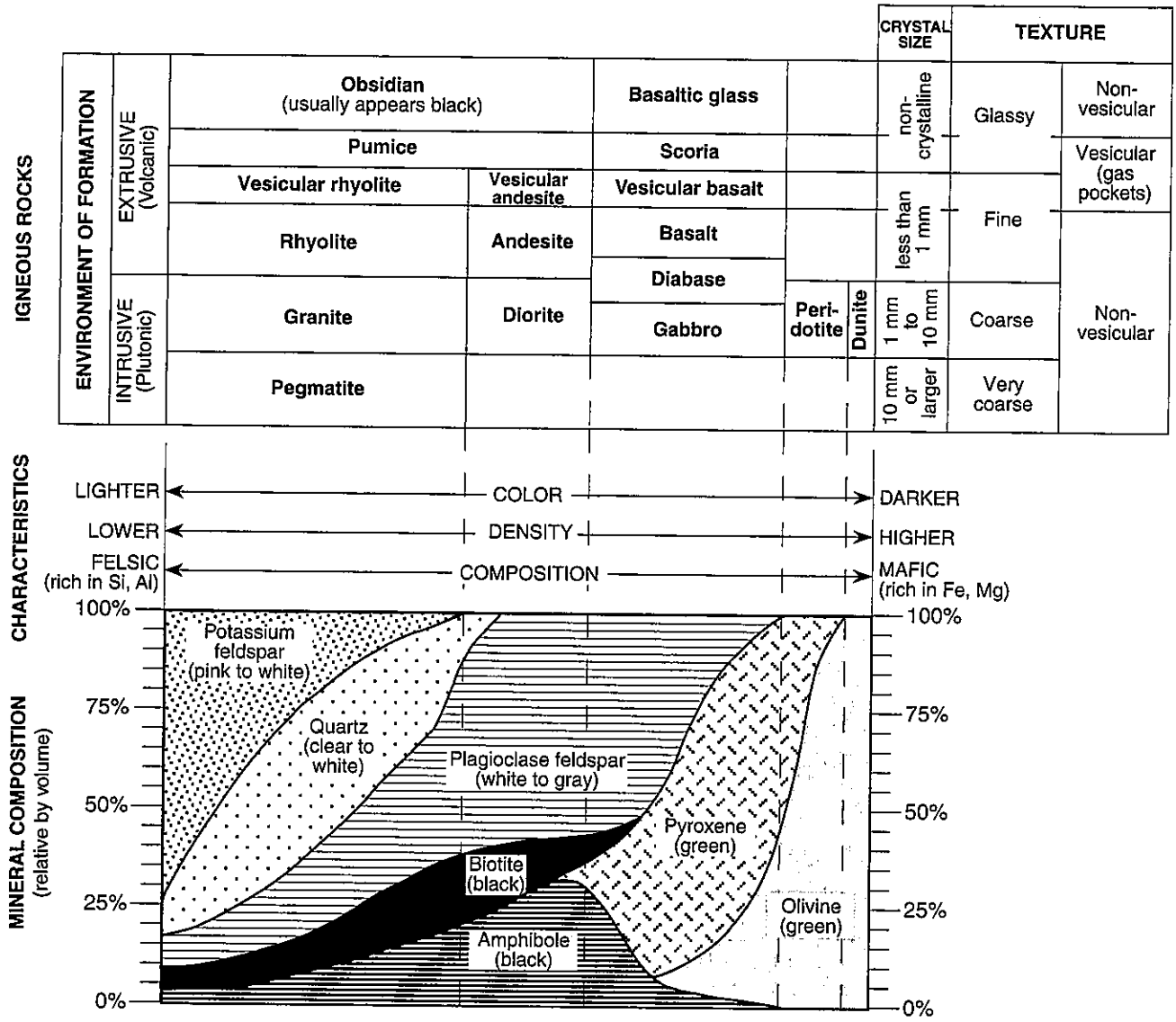
Scheme for Igneous Rock Identification



Overview:

Igneous rocks form as molten material (lava/magma) cools and solidifies. If this solidification process occurs inside the Earth, the magma will make intrusive igneous rocks. When volcanic action brings lava 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 may cool so fast that no 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 composition, along with texture, are used to identify igneous rocks.

***The Chart*:**

On the left side is given the Environment of Formation - intrusive (plutonic) meaning inside the Earth, and extrusive (volcanic) meaning outside the Earth. On the right side is the Grain Size, which is the size of the crystal giving its texture. Glassy texture is produced by the rapid solidification of lava, producing no observable crystals. Very coarse texture is always made in an intrusive environment, producing large crystals 10 mm or larger in grain size. In the Texture column, locate non-vesicular and vesicular. Some extrusive igneous rocks will exhibit air holes or gas pockets. If this is present, the rock is referred to as vesicular. This usually occurs when lava is ejected from a volcano and solidifies in air. The rapid change from a liquid to a solid traps air, forming gas pockets. A vesicular texture is an excellent clue that it is an extrusive igneous rock. The main section of this chart gives the names of the igneous rocks position by their properties. For example, basalt and gabbro, being on the right side of the chart would be very similar in composition, while granite and rhyolite would have the same composition. Only their texture would be different.

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

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, have a lower density, with a Felsic composition. Being felsic, the chart indicates these igneous rocks contain the elements aluminum and silicon. Moving to the right side, the given characteristic properties are different, being darker in color and having higher density with a Mafic composition. Being mafic, the chart indicates that the elements iron and magnesium would be rich within these igneous rocks.

As you see, there is a lot of information in the Scheme for Igneous Rock Identification chart. When given certain properties of an unknown igneous rock, this chart can be used to identify the rock.

Additional Information:

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

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.

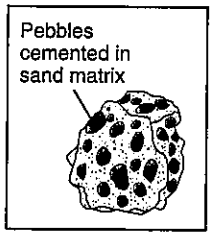
   This rock sample is most likely

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

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

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

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



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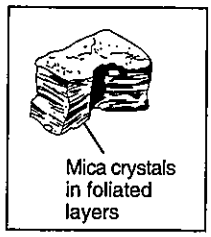

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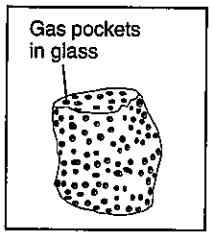

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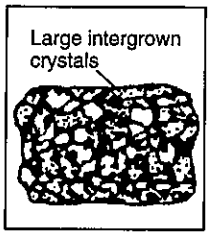


(4) 4_____

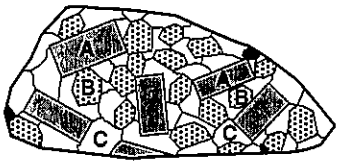
5. Which characteristic provides the best evidence that obsidian rock formed in an extrusive environment?

   (1) layers of rounded fragments
   (2) distorted bands of large mineral crystals
   (3) noncrystalline glassy texture
   (4) mineral cement between grains 5_____

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

   (1) quartz
   (2) calcite
   (3) pyroxene
   (4) olivine 6_____

Base your answers to questions 7 through 9 on the diagram and table below. The diagram represents a felsic igneous rock. Letters *A*, *B*, and *C* represent three different minerals in the rock sample. The table describes the physical properties of minerals *A*, *B*, and *C* found in the igneous rock sample.



(Actual size)

Mineral	Key	Physical Properties
A		pink, cleaves in two directions at 90°
B		white, cleaves in two directions, striations visible
C		colorless or clear with a glassy luster

7. State the texture of this igneous rock. _____

8. State *two* processes responsible for the formation of an igneous rock.

   1) _____ 2) _____

9. Using the Properties of Common Minerals chart, give the name of:

   Mineral *A* _____

   Mineral *B* _____

   Mineral *C* _____

10. 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 10_____

11. 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 11_____

12. 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

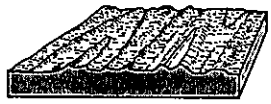
12_____

13. Which igneous rock has a vesicular texture and contains the minerals potassium feldspar and quartz?

(1) andesite (3) pumice
(2) pegmatite (4) scoria 13 _____

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


(1)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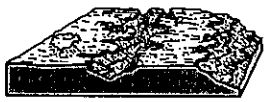
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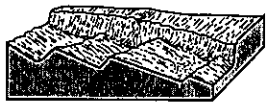
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14 _____

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

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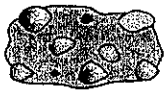
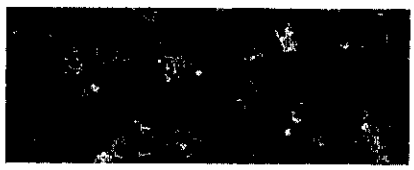
(3) 
(2) 
(4) 
15 _____

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



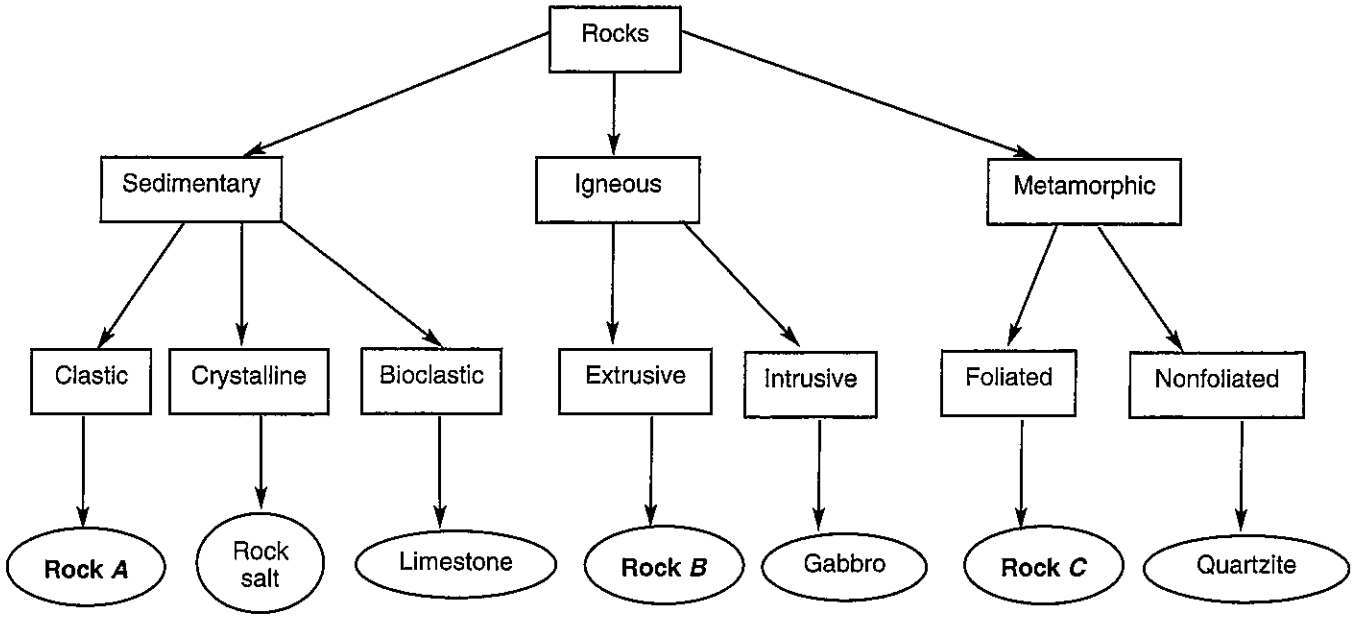
(Shown to actual size)

The rock should be identified as

(1) granite (3) basalt
(2) gabbro (4) rhyolite 16_____

Base your answers to questions 17 through 19 on the Rock Classification flowchart. Letters *A*, *B*, and *C* represent specific rocks in this classification scheme.

Rock Classification Flowchart



17. Rock *B* has a fine vesicular texture and is composed mainly of potassium feldspar and quartz. State the name of rock *B*. _____

18. Granite could be placed in the same position in the flowchart above as gabbro. Describe *two* differences between granite and gabbro.

    1) _____

    2) _____

19. Which rock letter could be scoria? _____

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

Characteristic of Basalt	Description
Texture	
Color	
Density	