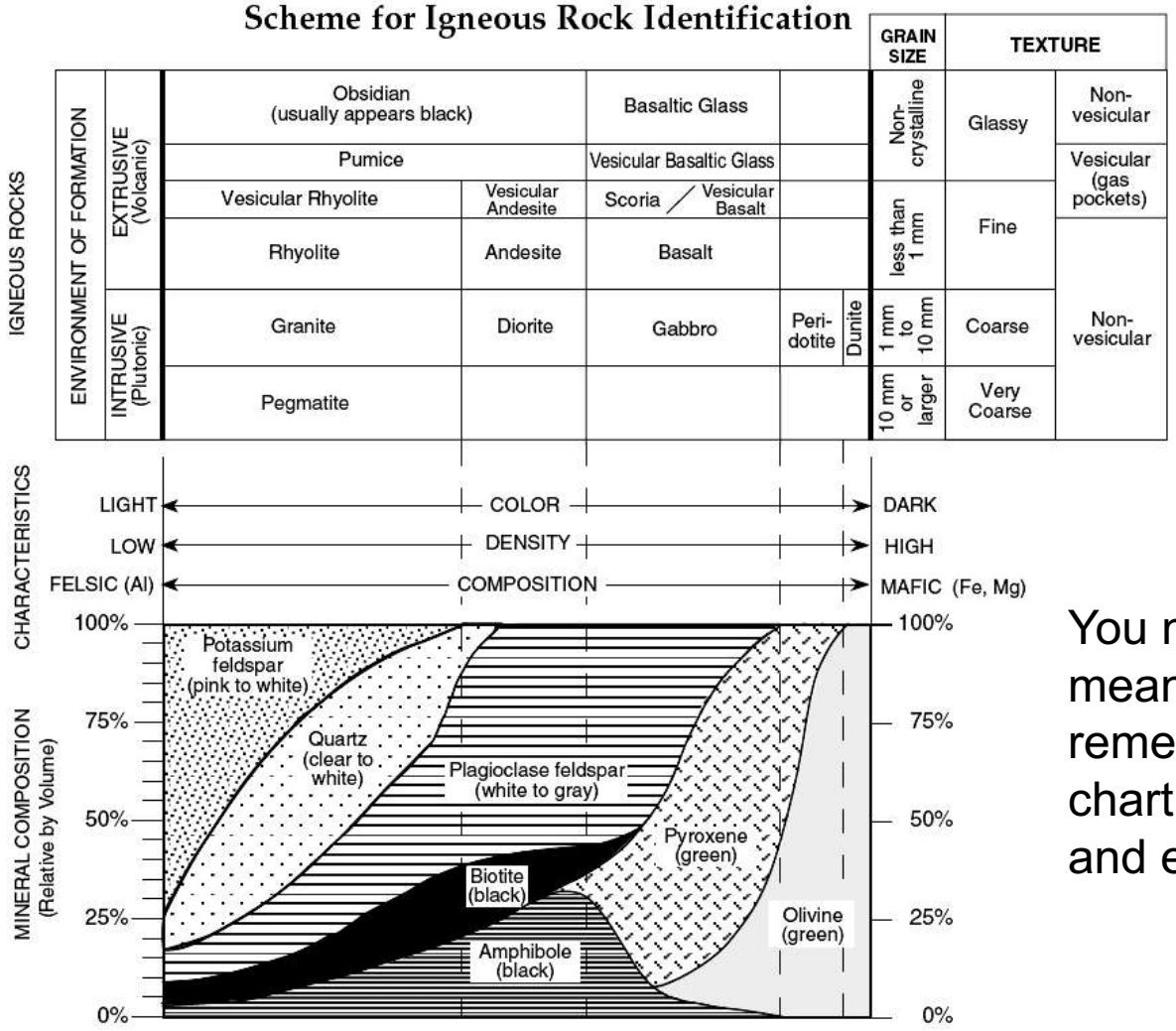
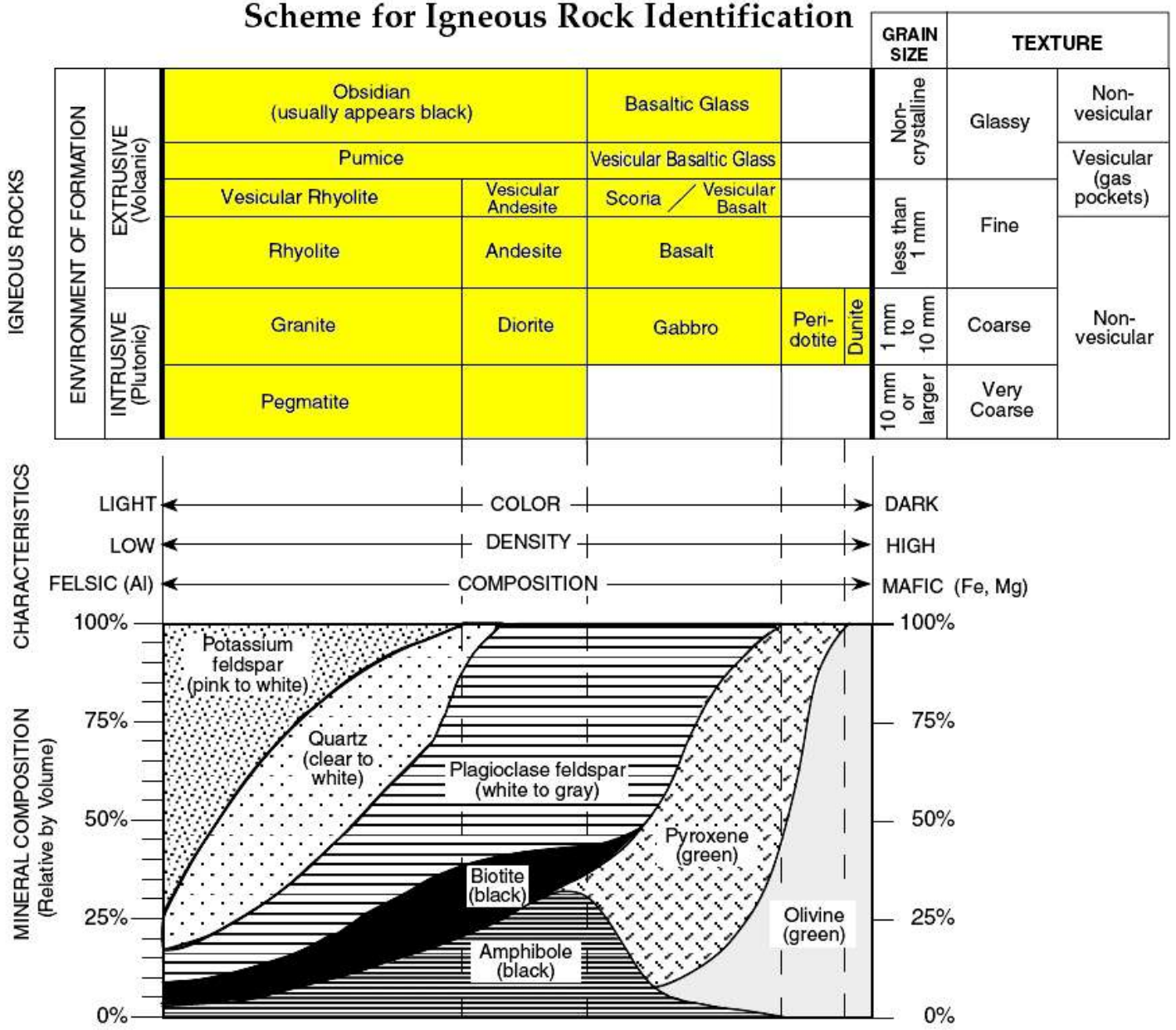
How To Use The Igneous Rock ID Chart (page 6)

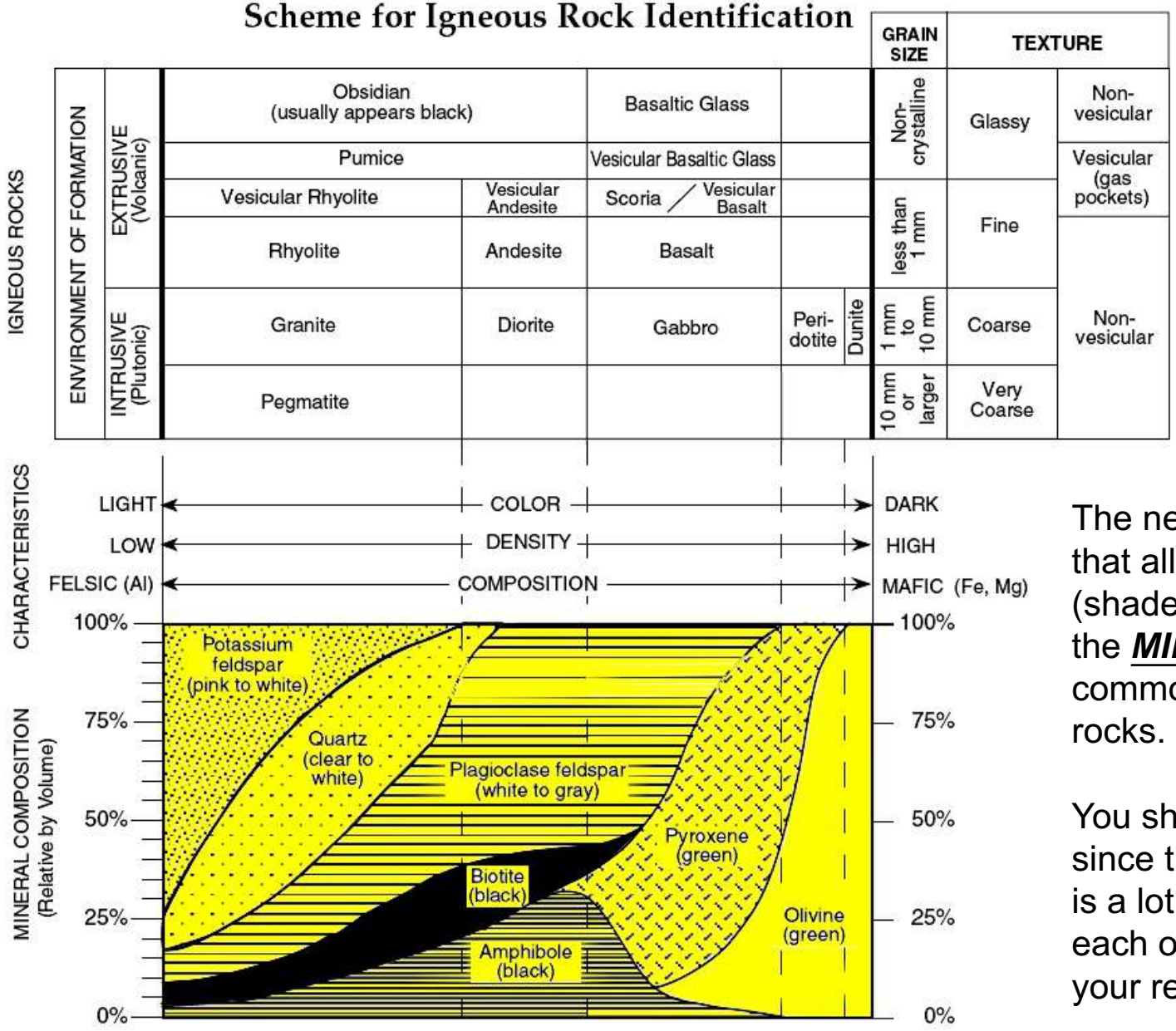


The very first thing to understand is that you **must** become familiar with all the vocabulary on the page.

You need to know what the words mean and you also need to remember where they are on the chart so you can find them quickly and easily.

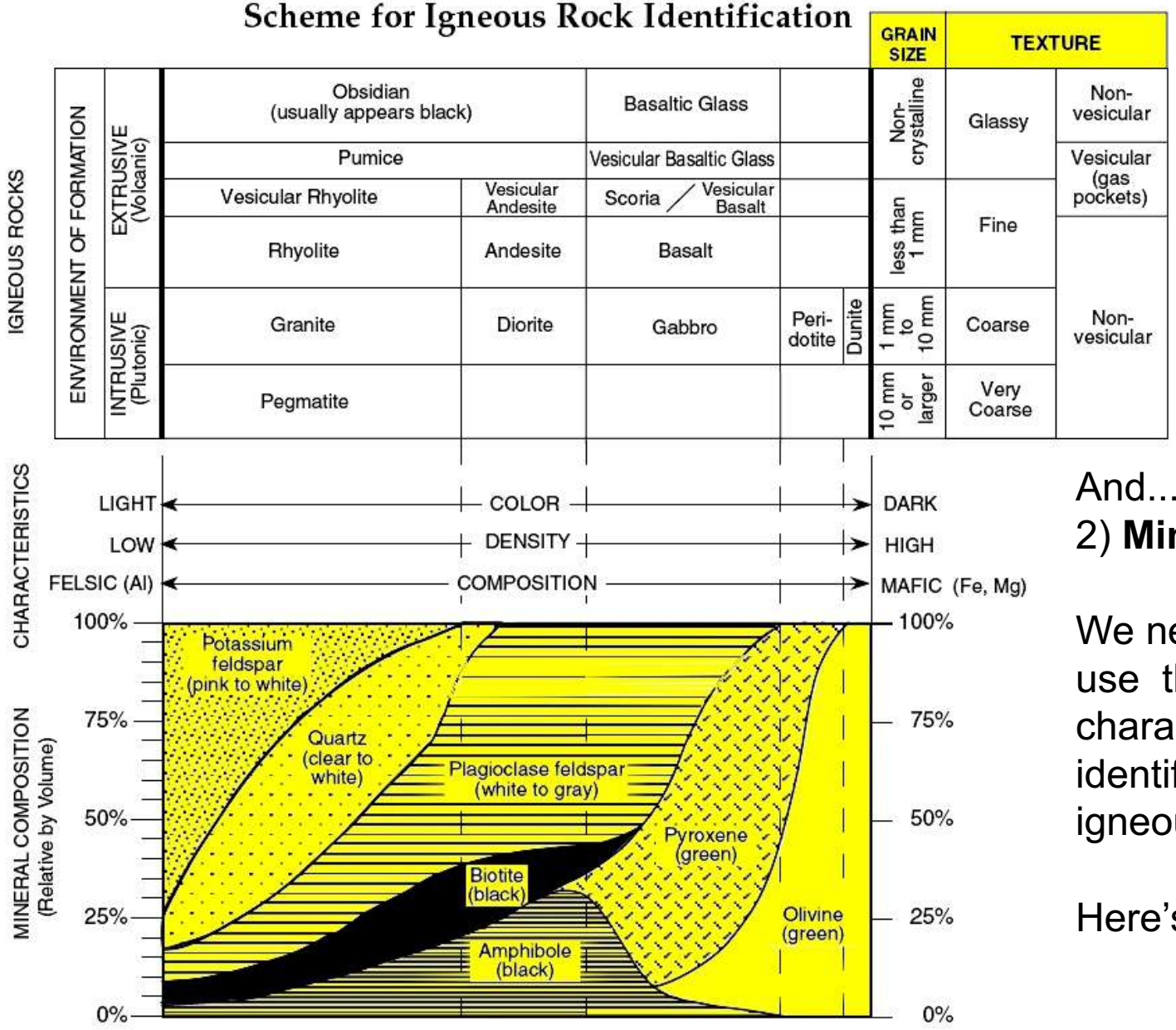


The first thing to understand is that all of the names in the upper (shaded) part of the chart are the igneous ***ROCKS.*** If you are asked for the name of an igneous ***rock***, it must be one of these.



The next thing to understand is that all the names on the lower (shaded) part of the chart are the ***MINERALS*** that are commonly found in igneous rocks.

You should keep in mind that since these are minerals, there is a lot of information about each of them on page 16 of your reference tables.



Igneous rocks are classified according to two basic characteristics:

1) **TEXTURE** which is also known as **GRAIN SIZE**.

And.....

2) **Mineral composition**.

We need to be able to use these ***two*** characteristics in order to identify ***one*** particular igneous rock.

Here's how.....

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

ENVIRONMENT OF FORMATION						GRAIN SIZE	TEXTURE	
EXTRUSIVE (Volcanic)		Obsidian (usually appears black)		Basaltic Glass		Non-crystalline	Glassy	Non-vesicular
		Pumice		Vesicular Basaltic Glass				Vesicular (gas pockets)
		Vesicular Rhyolite	Vesicular Andesite	Scoria / Vesicular Basalt		less than 1 mm	Fine	
		Rhyolite	Andesite	Basalt				Non-vesicular
INTRUSIVE (Plutonic)		Granite	Diorite	Gabbro	Peri-dotite / Dunite	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very Coarse	

Let's deal with the top part ***(IGNEOUS ROCKS)*** first.

All the igneous rocks are classified according to **TEXTURE**, also called **GRAIN SIZE**.

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

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EXTRUSIVE (Volcanic)	Obsidian (usually appears black)		Basaltic Glass			Non-crystalline	Glassy	Non-vesicular
	Pumice		Vesicular Basaltic Glass					Vesicular (gas pockets)
	Vesicular Rhyolite	Vesicular Andesite	Scoria / Vesicular Basalt			less than 1 mm	Fine	
	Rhyolite	Andesite	Basalt					Non-vesicular
INTRUSIVE (Plutonic)	Granite	Diorite	Gabbro	Peridotite	Dunite	1 mm to 10 mm	Coarse	
	Pegmatite					10 mm or larger	Very Coarse	

Intrusive (Plutonic) rocks formed deep within the crust. Because they were so deep they cooled very slowly giving the mineral crystals in the rocks a very long time to grow. That's why ***intrusive*** igneous rocks usually have a ***coarse*** to ***very coarse*** texture.

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

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EXTRUSIVE (Volcanic)		Obsidian (usually appears black)		Basaltic Glass		Non-crystalline	Glassy	Non-vesicular
		Pumice		Vesicular Basaltic Glass				Vesicular (gas pockets)
		Vesicular Rhyolite	Vesicular Andesite	Scoria / Vesicular Basalt		less than 1 mm	Fine	
		Rhyolite	Andesite	Basalt				Non-vesicular
INTRUSIVE (Plutonic)		Granite	Diorite	Gabbro	Peri-dotite / Dunite	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very Coarse	

As you can see from the chart, coarse texture = grain sizes of 1 to 10 mm and very coarse texture = grain sizes of 10mm and larger.

Granite, Diorite, Gabbro, Peridotite and Dunite are the names of the ***coarse grained igneous rocks***. These rocks are **INTRUSIVE (Plutonic) rocks.**

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

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EXTRUSIVE (Volcanic)		Obsidian (usually appears black)		Basaltic Glass		Non-crystalline	Glassy	Non-vesicular
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INTRUSIVE (Plutonic)		Granite	Diorite	Gabbro	Peri-dotite / Dunite	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very Coarse	

Pegmatite is another **INTRUSIVE (Plutonic)** igneous rock. It has very coarse texture with a grain size of 10mm or larger.

REMEMBER

INTRUSIVE = SLOW COOLING = COARSE TEXTURE

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

ENVIRONMENT OF FORMATION						GRAIN SIZE	TEXTURE	
EXTRUSIVE (Volcanic)		Obsidian (usually appears black)		Basaltic Glass		Non-crystalline	Glassy	Non-vesicular
		Pumice		Vesicular Basaltic Glass				Vesicular (gas pockets)
		Vesicular Rhyolite	Vesicular Andesite	Scoria / Vesicular Basalt		less than 1 mm	Fine	
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INTRUSIVE (Plutonic)		Granite	Diorite	Gabbro	Peri-dotite / Dunite	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very Coarse	

Igneous rocks with fine texture have grain sizes less than 1mm. These rocks formed at or near the surface and are called **EXTRUSIVE (Volcanic)** rocks.

Because they formed at or near the surface they cooled rapidly. Their crystals (grains) had very little time to grow so they remain small.

Rhyolite, Andesite, and Basalt are the fine grained igneous rocks

EXTRUSIVE = RAPID COOLING = FINE TEXTURE

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

ENVIRONMENT OF FORMATION						GRAIN SIZE	TEXTURE	
EXTRUSIVE (Volcanic)		Obsidian (usually appears black)		Basaltic Glass		Non-crystalline	Glassy	Non-vesicular
		Pumice		Vesicular Basaltic Glass				Vesicular (gas pockets)
		Vesicular Rhyolite	Vesicular Andesite	Scoria / Vesicular Basalt		less than 1 mm	Fine	
		Rhyolite	Andesite	Basalt				Non-vesicular
INTRUSIVE (Plutonic)		Granite	Diorite	Gabbro	Peri-dotite / Dunite	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very Coarse	

Some **EXTRUSIVE (Volcanic)** igneous rocks cool so fast that crystals cannot form. Such rocks have no crystal structure (grain) and are classified as **GLASSY**. They are really volcanic glass.

Obsidian, Pumice, and Basaltic Glass are **EXTRUSIVE (volcanic),** glassy igneous rocks. They are **non-crystalline**.

Scheme for Igneous Rock Identification

IGNEOUS ROCKS

ENVIRONMENT OF FORMATION						GRAIN SIZE	TEXTURE	
EXTRUSIVE (Volcanic)		Obsidian (usually appears black)		Basaltic Glass		Non-crystalline	Glassy	Non-vesicular
		Pumice		Vesicular Basaltic Glass				Vesicular (gas pockets)
		Vesicular Rhyolite	Vesicular Andesite	Scoria / Vesicular Basalt		less than 1 mm	Fine	
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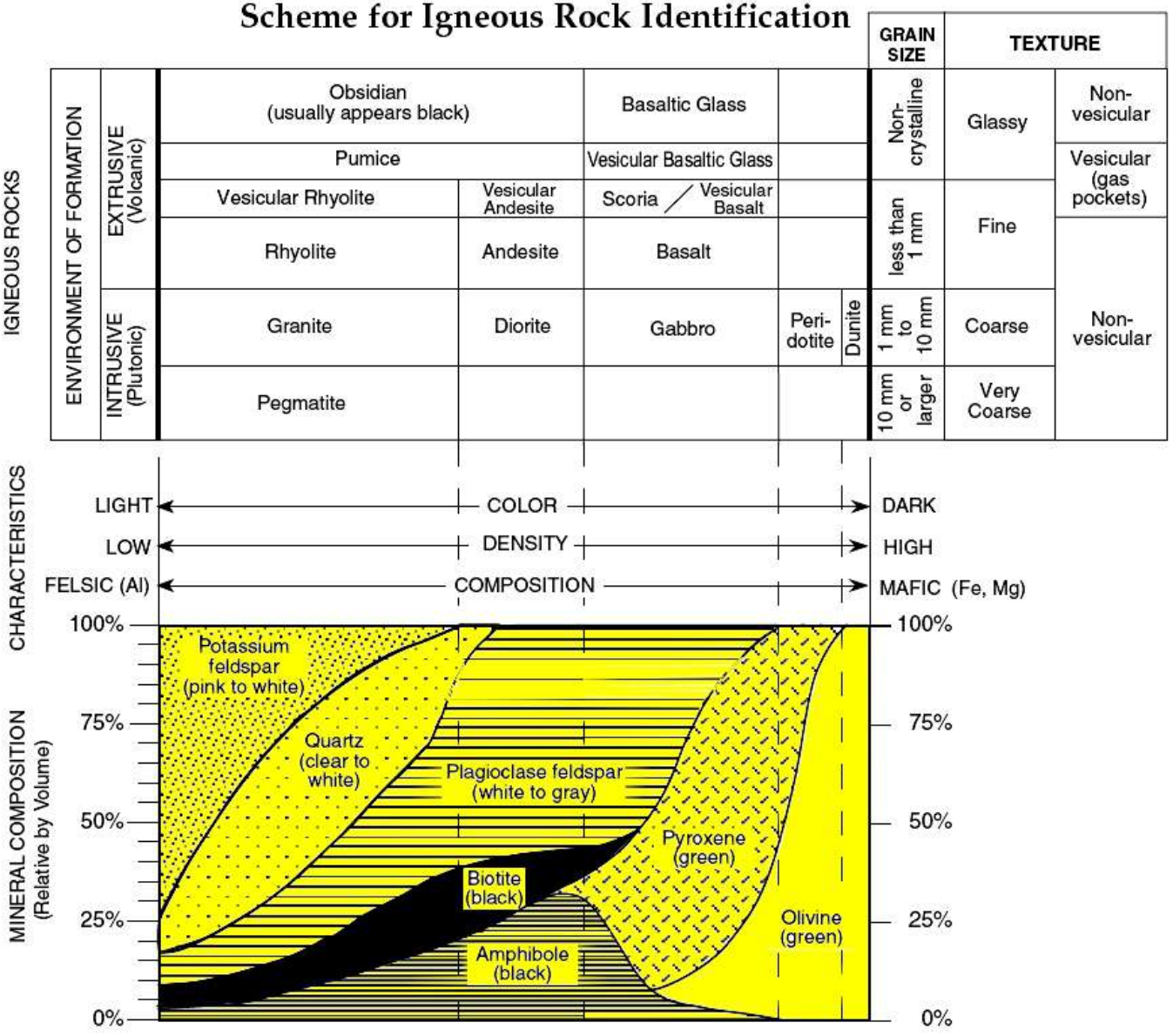
INTRUSIVE (Plutonic)		Granite	Diorite	Gabbro	Peri-dotite / Dunite	1 mm to 10 mm	Coarse	
		Pegmatite				10 mm or larger	Very Coarse	

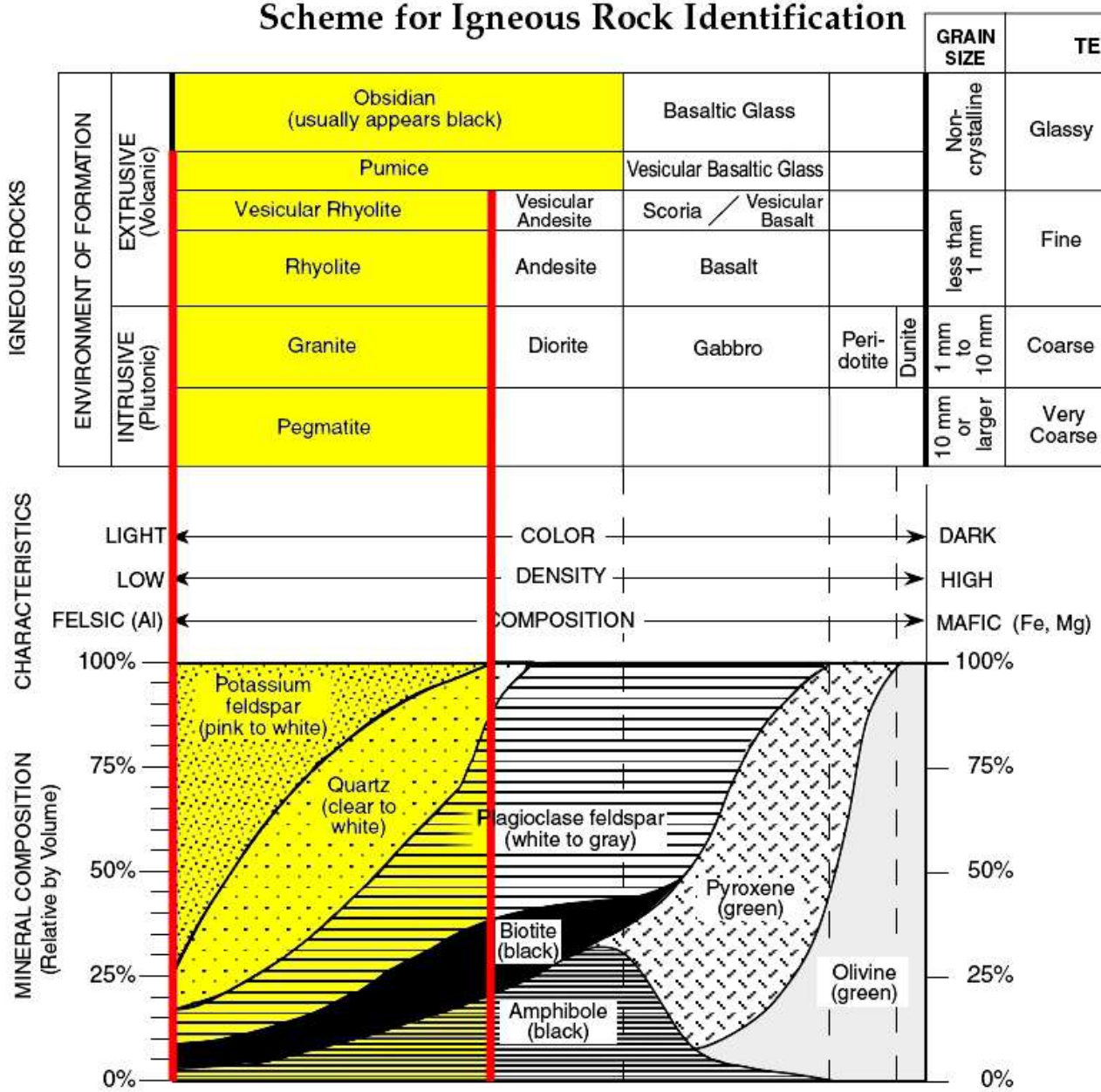
Some **EXTRUSIVE** igneous rocks are described as **VESICULAR**. That means that they have many small holes formed as gas escaped while they were cooling.

It's as if you suddenly solidified the foam that escaped from a can of soda that you shook before you popped the top. Vesicular rocks are like solidified foam.

As you can see, some are **fine grained**, some are **glassy**, and all are **extrusive**.

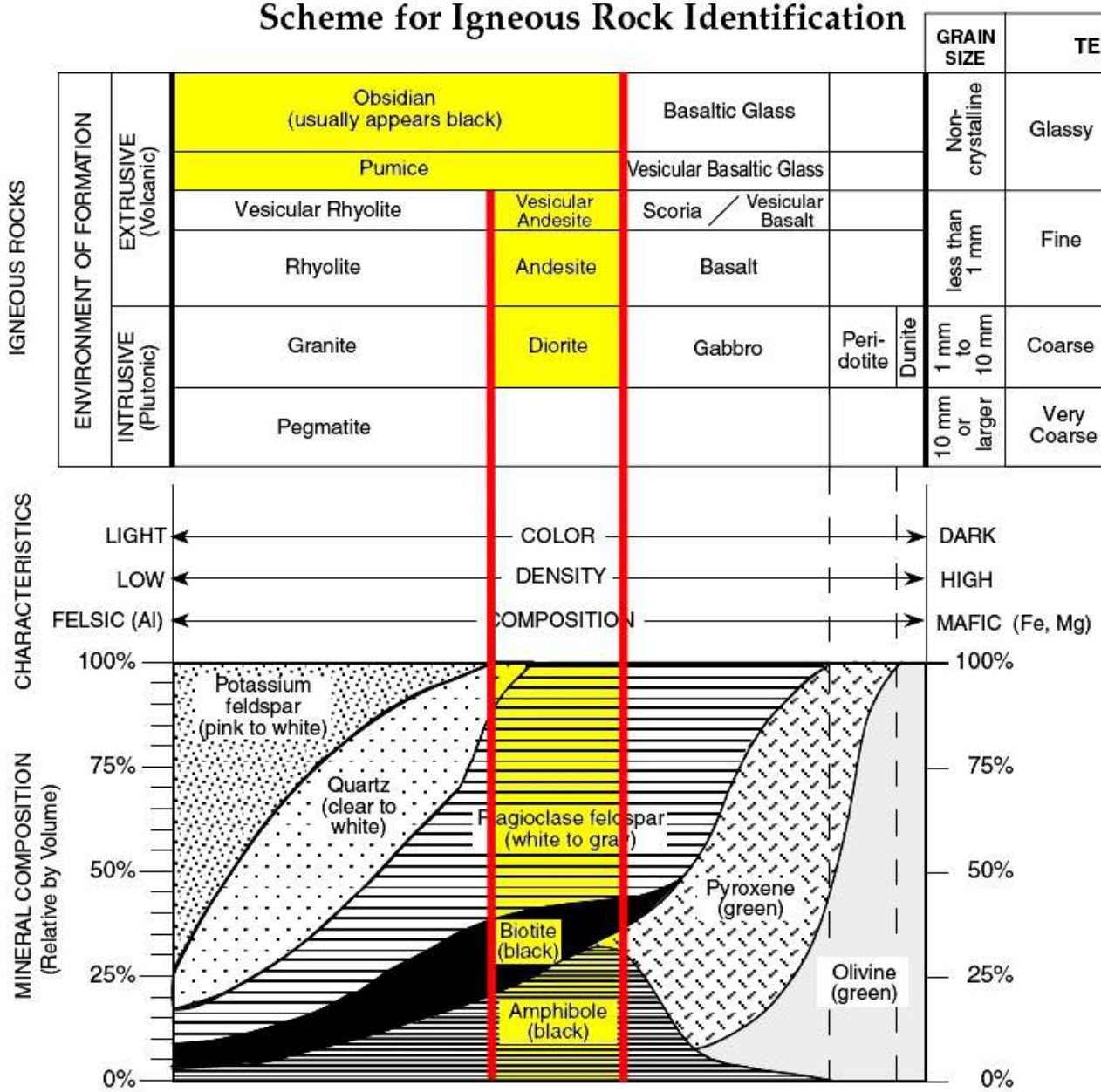


Now let's look at the **MINERALS** that are found in igneous rocks.



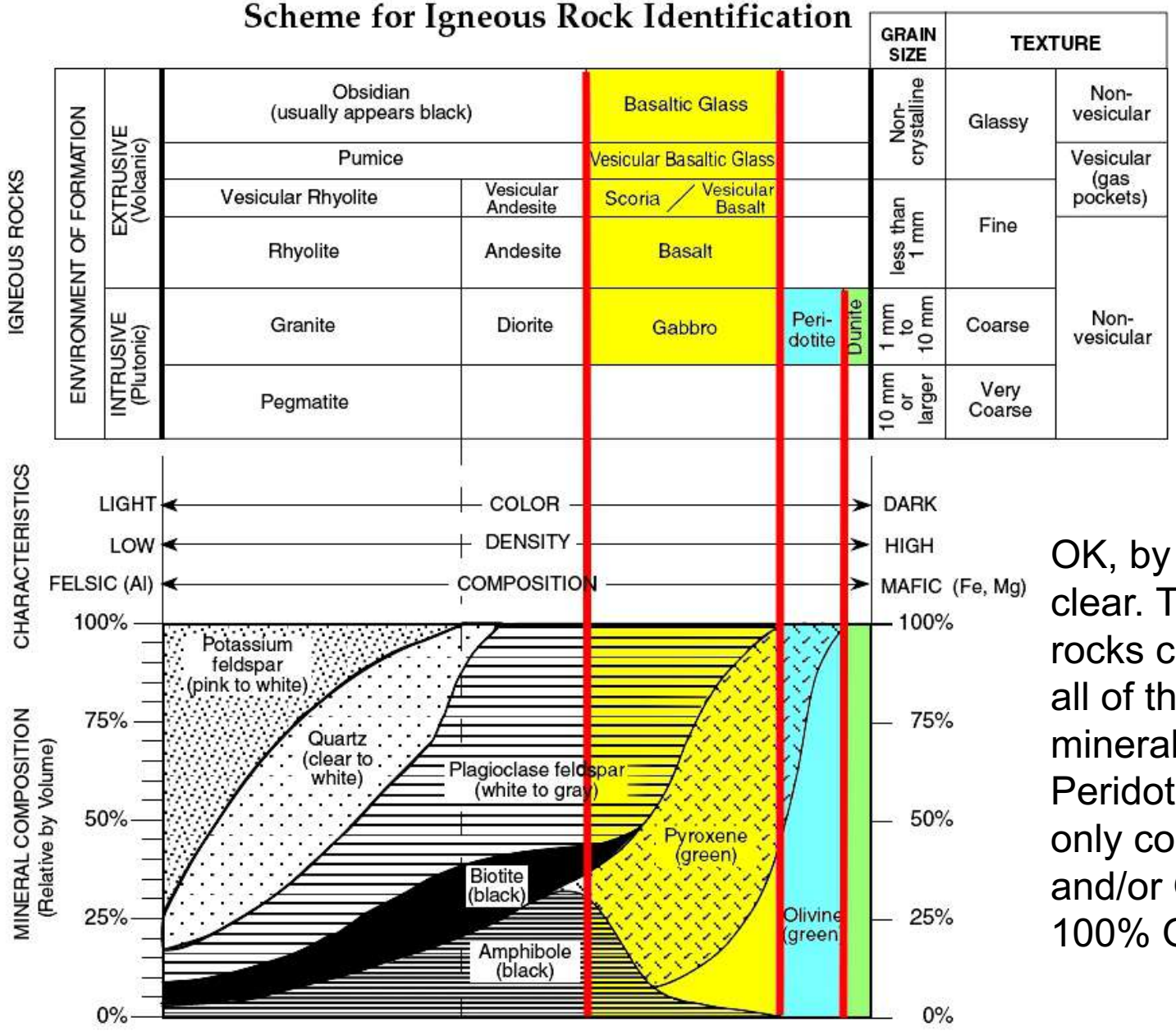
Any or all of the minerals in the shaded area (below) can be found in any of the rocks in the shaded area (above).

But granite, for example, would never contain olivine or pyroxene.



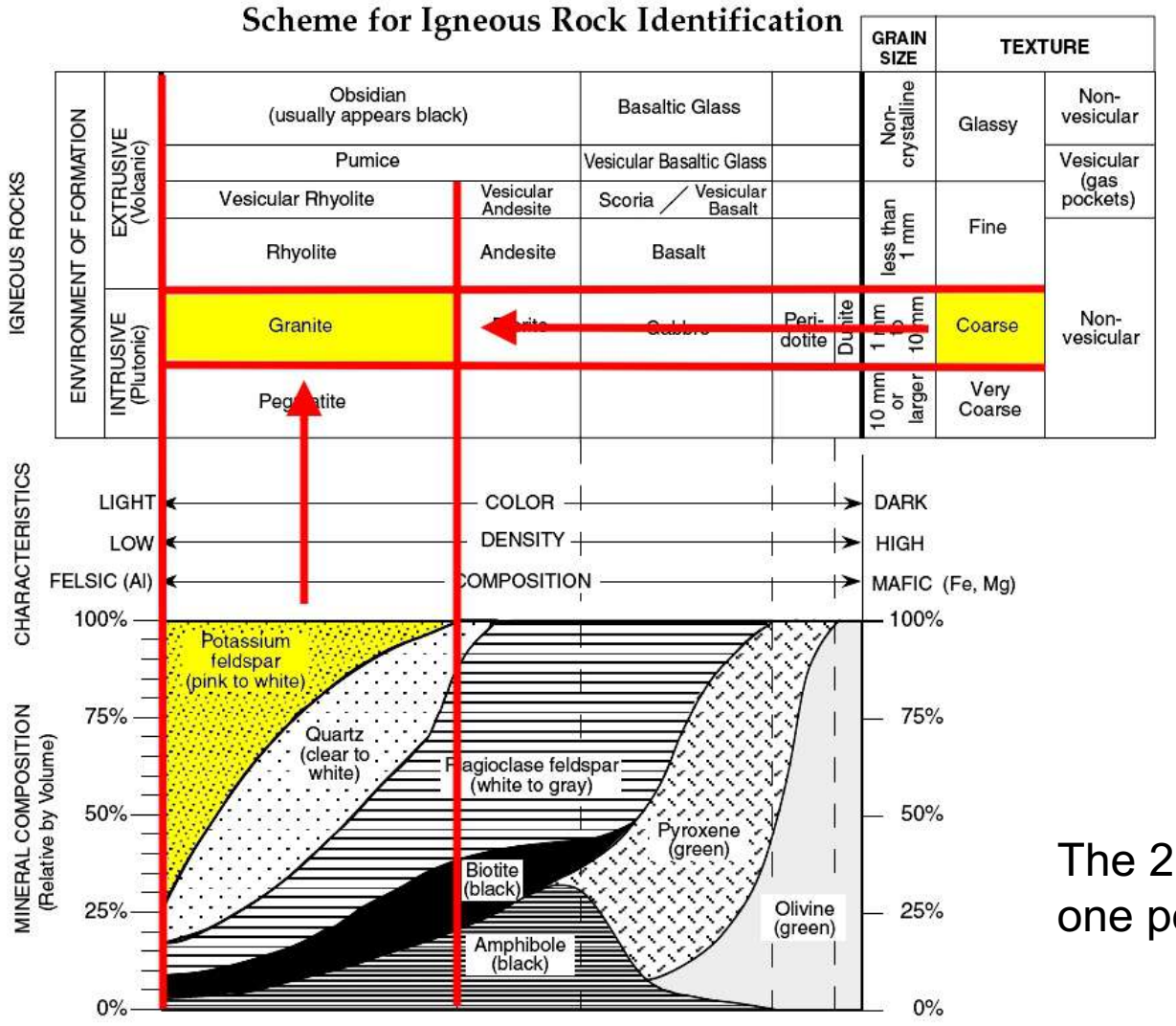
The same rule applies to the minerals in the next zone (shaded). Any or all of these may be found in the rocks in the shaded area above.

For example, Diorite might contain Biotite or Amphibole but it is very unlikely that it would contain Potassium feldspar or even much quartz.



OK, by now it should be clear. The yellow shaded rocks could contain any or all of the yellow shaded minerals.
Peridotite could only contain Pyroxene and/or Olivine and Dunite is 100% Olivine.

So lets put this all together and use the information to identify a specific rock.



Name a coarse grain igneous rock that contains Amphibole, Biotite. Plagioclase Feldspar and Potassium Feldspar.

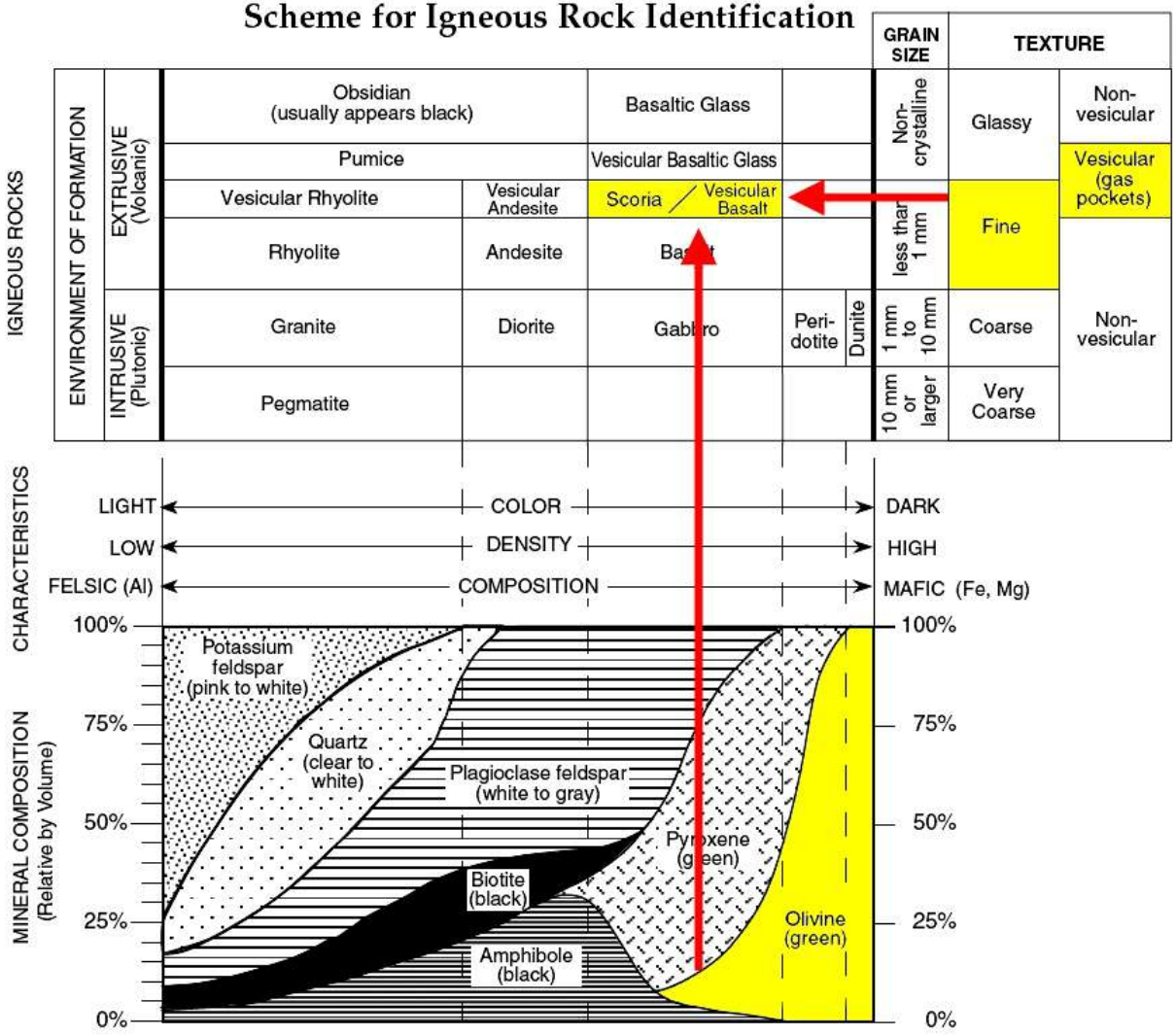
OK, if it has coarse grain it must be one of these shaded rocks.

Amphibole, Plagioclase and Biotite are no help because they are found in more than one zone but Potassium Feldspar is the important clue.

The 2 clues together point to only one possible igneous rock.....

GRANITE!

Let's try another.....

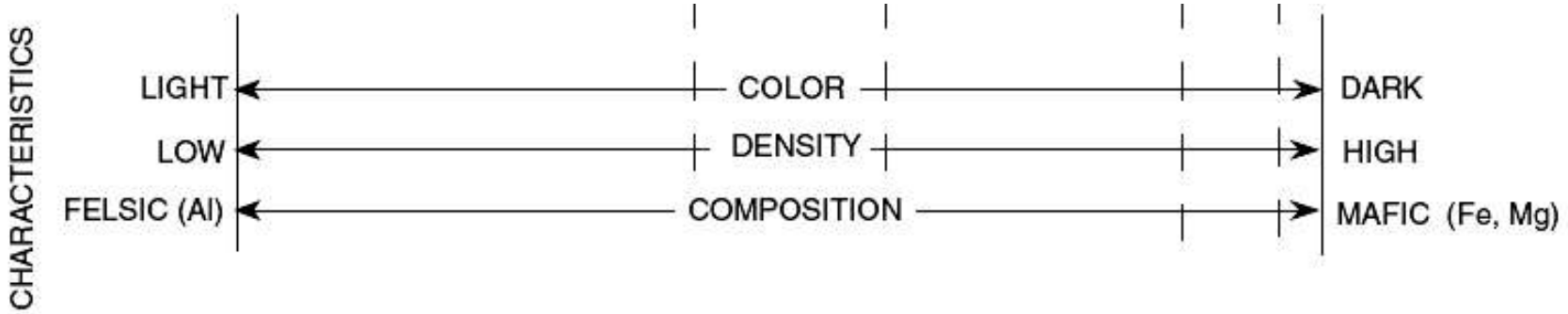


Name a fine grain, vesicular igneous rock which contains Plagioclase feldspar, Biotite, and Olivine.

The only rocks that have fine grain **AND** are vesicular are Vesicular Rhyolite, Vesicular Andesite, and Scoria/Vesicular Basalt. Now we have to look to the mineral content to narrow the possibilities.

The key is the Olivine which is found in only one fine grain vesicular rock: **Scoria/Vesicular Basalt.**

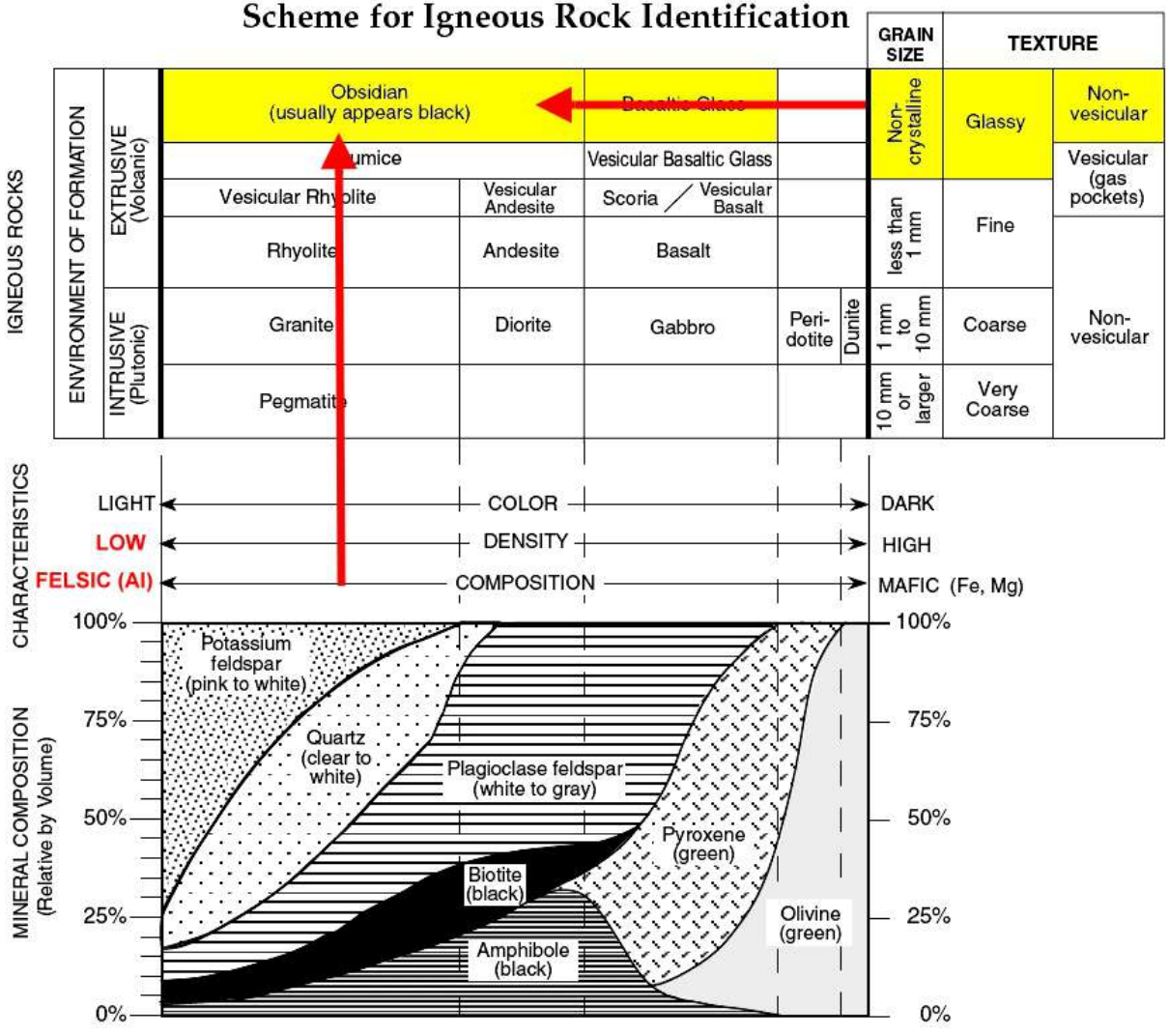
One last item to understand: Characteristics (those items between the rocks and the minerals).



This part is easy. Rocks on the left side are light (in color), low (density) and ***FELSIC.*** The term FELSIC means that these rocks contain a lot of the mineral feldspar. If you look up both kinds of feldspar on page 16 of the reference table you will see that both contain the element aluminum (Al). That's why (Al) appears after the word FELSIC. FELSIC rocks contain a lot of aluminum.

Rocks on the right are ***MAFIC***. These rocks are usually dark in color, have a high density and contain a lot of iron (Fe) and magnesium (Mg). The word MAFIC was made up by combining MA from magnesium and F from the word ferric which describes minerals rich in iron. If you look up Biotite, Pyroxene, and Olivine on page 16 of the reference tables you'll see they all contain iron and magnesium.

Let's try one last igneous rock identification.....



Identify a non-vesicular, non-crystalline igneous rock which has low density and contains a lot of aluminum.

Non-crystalline could be any of the glassy rocks but only Obsidian and Basaltic Glass are both non-crystalline and non-vesicular. But which is it?

The low density, FELSIC rocks (contain Aluminum) are on the left side so the rock we're looking for must be Obsidian.

Wait a minute! Aren't the low density, FELSIC rocks supposed to be light colored. But Obsidian is usually black!

True. But remember that this chart just provides general guidelines. There are an almost infinite variety of igneous rocks and many don't fit these rules. That's just the way it is.

What to take away:

1) Make sure you are familiar with the vocabulary. When you read the word MAFIC or VESICULAR or PLUTONIC in a regents question you should know what the word means and also that you should probably be opening your reference table to page 6.
2) Use information about *texture, grain size, intrusive or extrusive, vesicular or non-vesicular* to **narrow your choices** to certain igneous rocks that fit the information in the question.
3) Use information about the 'characteristics' and/or the 'mineral composition' to refine your choices to ***one*** igneous rock.
4) Remember that the ***ONLY*** way to get good at this is to practice and practice some more. So find as many old regents questions as you can and see how you do. It's no different than any sport. The more you practice the better you get!