

March 11

Do Now: Complete the table

Class Notes: Igneous Rocks

Do Now: Two Minutes

K What I know	W What I Want to Find Out
1.	1.
2.	2.
3.	3.

3:00

Igneous Rocks

What are igneous rocks and how do we classify them?

Igneous Rocks

- Igneous Rocks – rock type that forms when molten material solidifies
- Methods to classify Igneous Rocks:



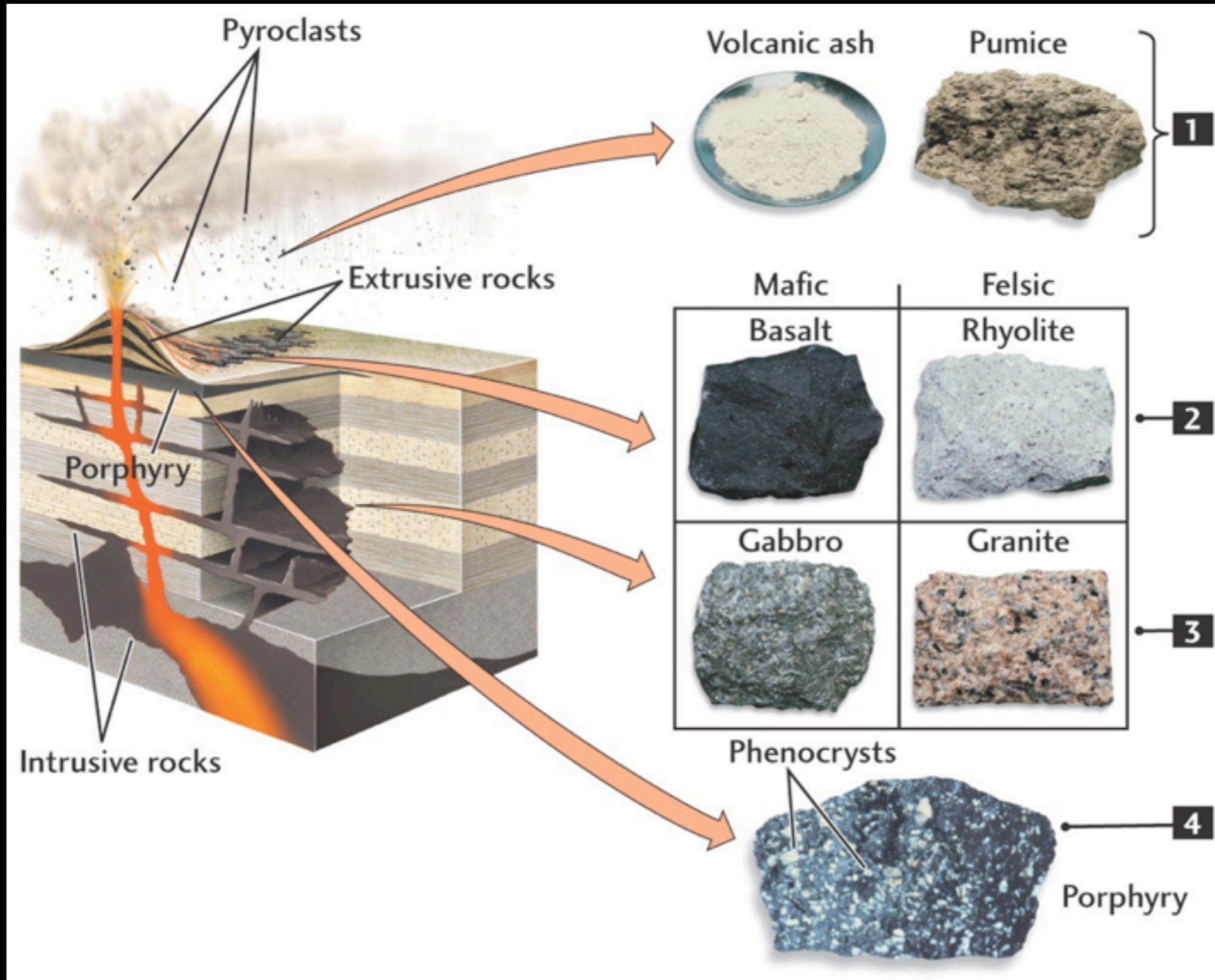
Igneous Rocks

1. Environment of Formation

- The location where liquid rock solidifies into solid rock



Igneous Rocks



Igneous Rocks

Environment of Formation

- Magma – molten rock that is inside of the Earth
- Plutonic – rock that formed deep within the Earth
- Intrusive – below Earth's crust

Igneous Rocks

Environment of Formation

Intrusive
or
Igneous
Intrusion



Igneous Rocks

Environment of Formation

- Lava – molten rock that is outside of the Earth
- Volcanic – rock that formed on the Earth's surface
- Extrusive – above Earth's crust

Igneous Rocks

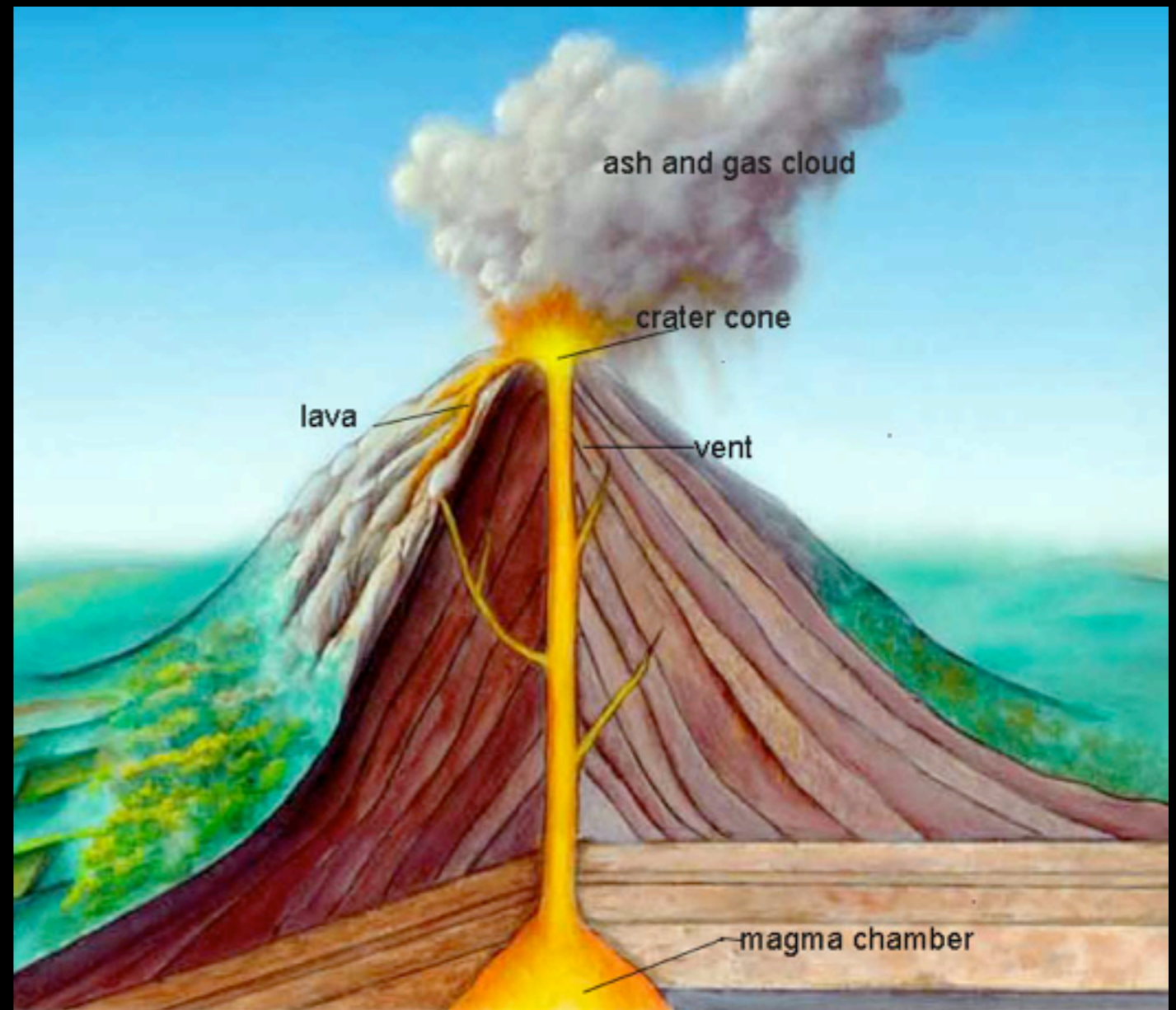
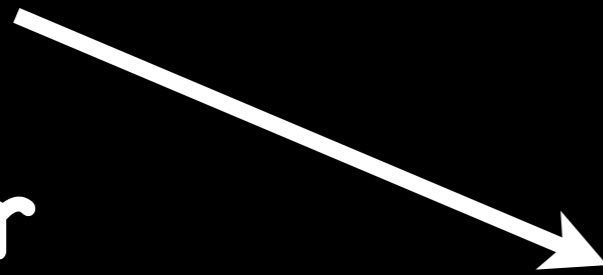
Environment of Formation

Extrusive

or

Igneous

Extrusion



Igneous Rocks

2. Color

- Color – for igneous rocks color is broken into two categories of light or dark



Dark



Light

Igneous Rocks

3. Composition

- Composition – a mixture of materials that make up an igneous rock



Igneous Rocks

Composition

- Felsic – light colored rocks that have a high aluminum (Al) content



Granite



Rhyolite

Igneous Rocks

Composition

- Mafic – dark colored rocks that have a high iron (Fe) or magnesium (Mg) content



Basalt



Scoria

Igneous Rocks

4. Texture

- Texture – the appearance or character of a rock
 - Vesicular – texture that consists of gas pockets that give the appearance of having holes
 - Porphyritic – texture that contains large crystals in a fine grained matrix

Igneous Rocks



Vesicular



Porphyritic

Igneous Rocks

5. Grain Size

- Grain Size – refers to an actual measurement of the individual grains or aggregate



Obsidian



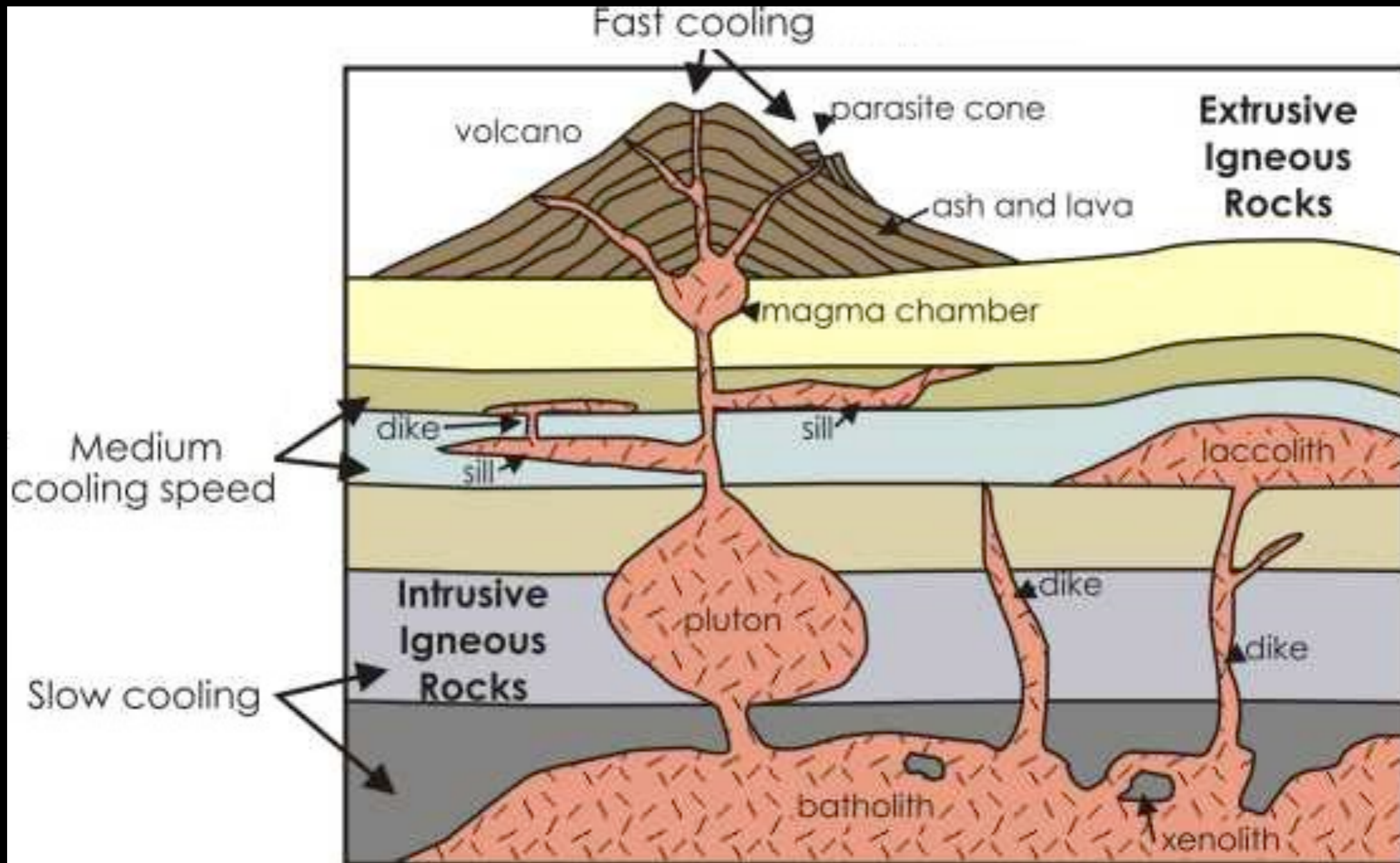
Granite

Igneous Rocks

Grain Size

- Grain size is an important factor to determine the environment of formation
 - The longer the cooling time the larger the grain size (coarse grained)
 - The shorter the cooling time the smaller the grain size (fine grained)

Igneous Rocks



Igneous Rocks



Coarse Grained
Long Cooling



Fine Grained
Short Cooling

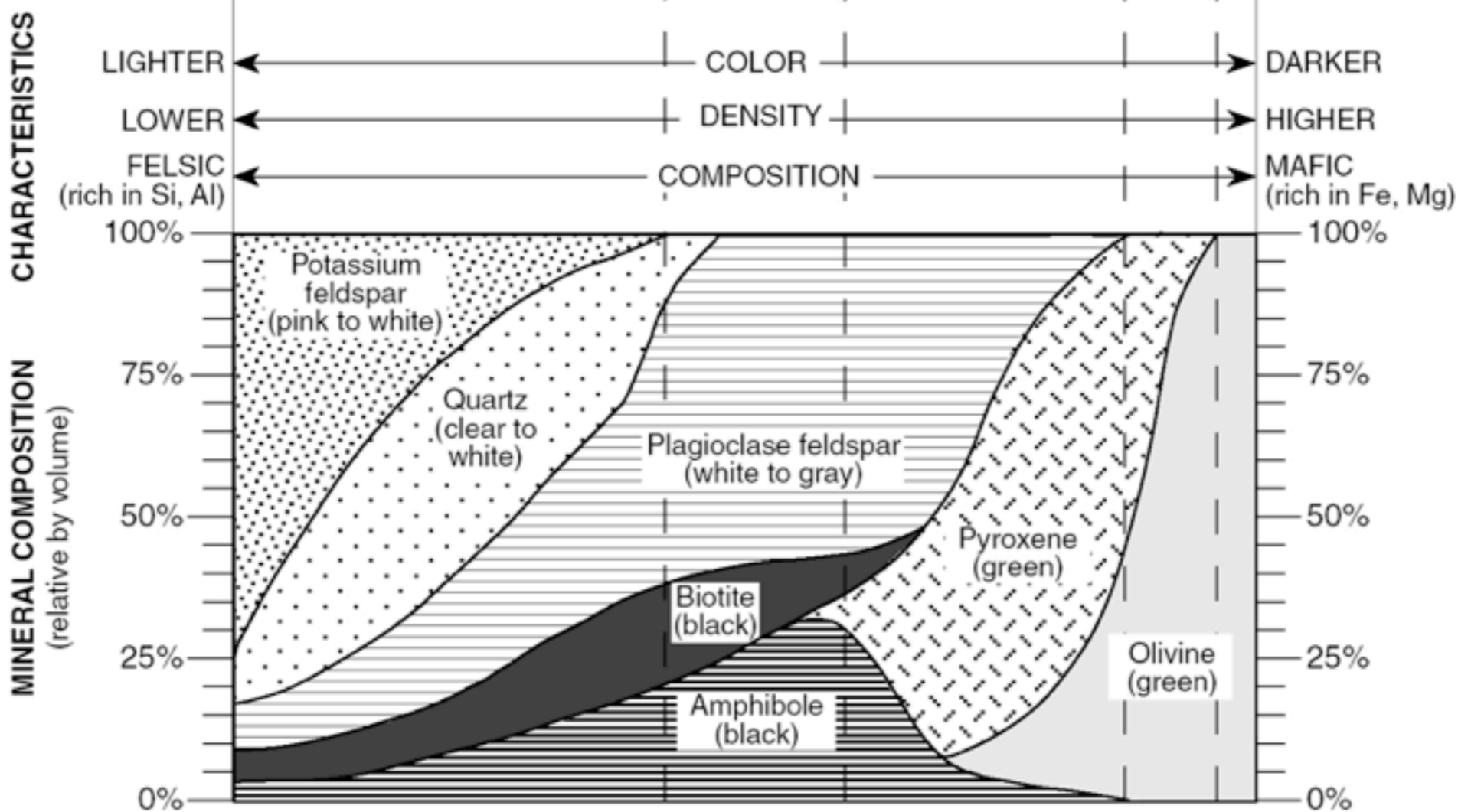
Igneous Rocks

Earth Science Reference Table

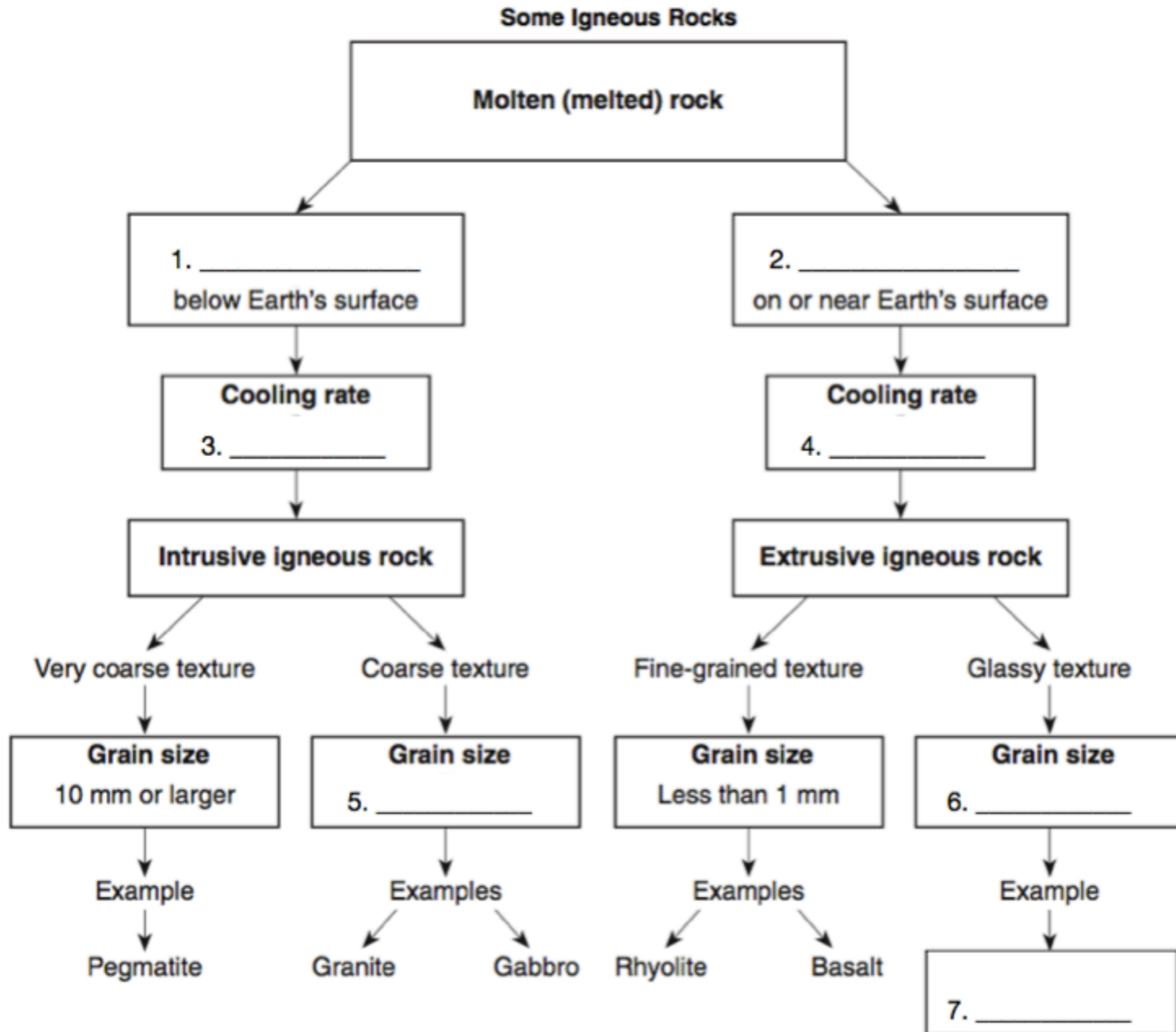
- Color
- Texture
- Density
- Grain Size
- Composition
- Environment of Formation

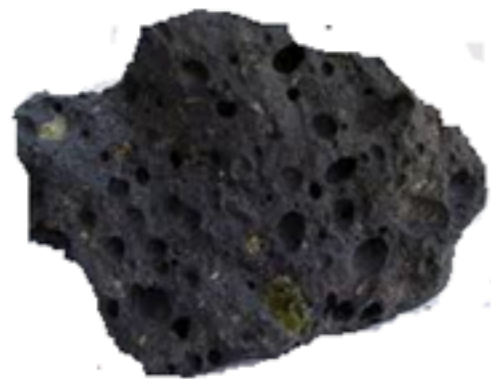
Scheme for Igneous Rock Identification

ENVIRONMENT OF FORMATION		IGNEOUS ROCKS				CRYSTAL SIZE	TEXTURE	
		Obsidian (usually appears black)	Basaltic glass				Glassy	Non-vesicular
EXTRUSIVE (Volcanic)		Pumice	Scoria			non-crystalline	Glassy	Non-vesicular
		Vesicular rhyolite	Vesicular andesite	Vesicular basalt				
		Rhyolite	Andesite	Basalt		1 mm to 10 mm	Coarse	Non-vesicular
		Granite	Diorite	Diabase	Peridotite Dunite			
INTRUSIVE (Plutonic)	Pegmatite		Gabbro					



Directions: fill in the flowchart (numbers 1-7) below with your knowledge of Earth Science and using the Earth Science Reference Tables.





Vesicular
Basalt

Rhyolite



Fine Texture
Extrusive

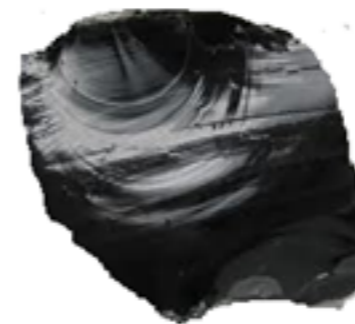
Basalt



Vesicular
Texture
(gas bubbles)



Pumice



Obsidian
(quenching)
(glassy texture)



Scoria



Granite

Coarse Texture
Intrusive



Pegmatite



Diorite

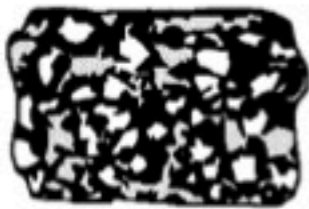
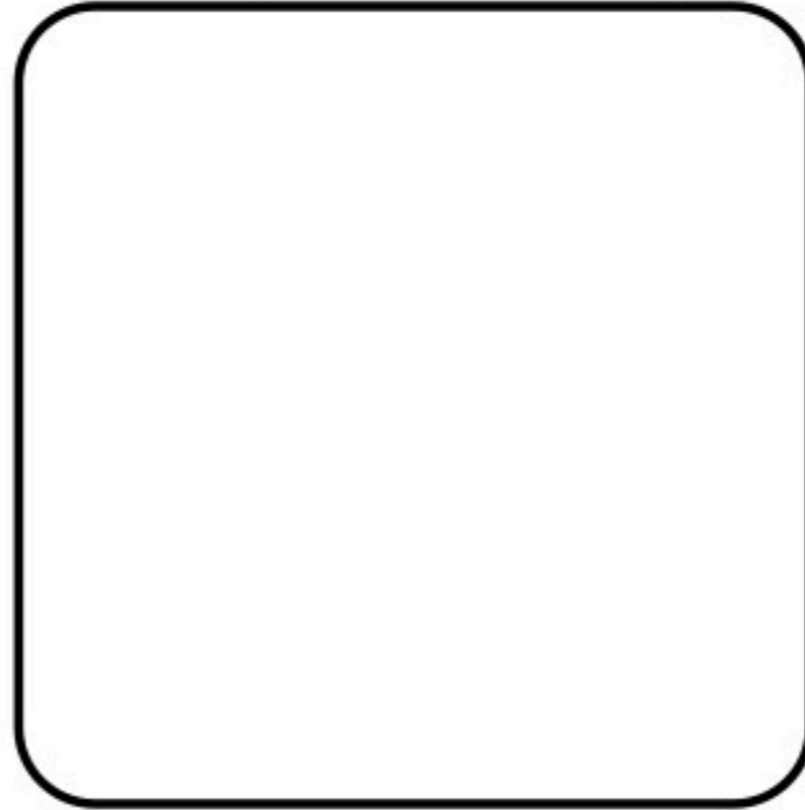
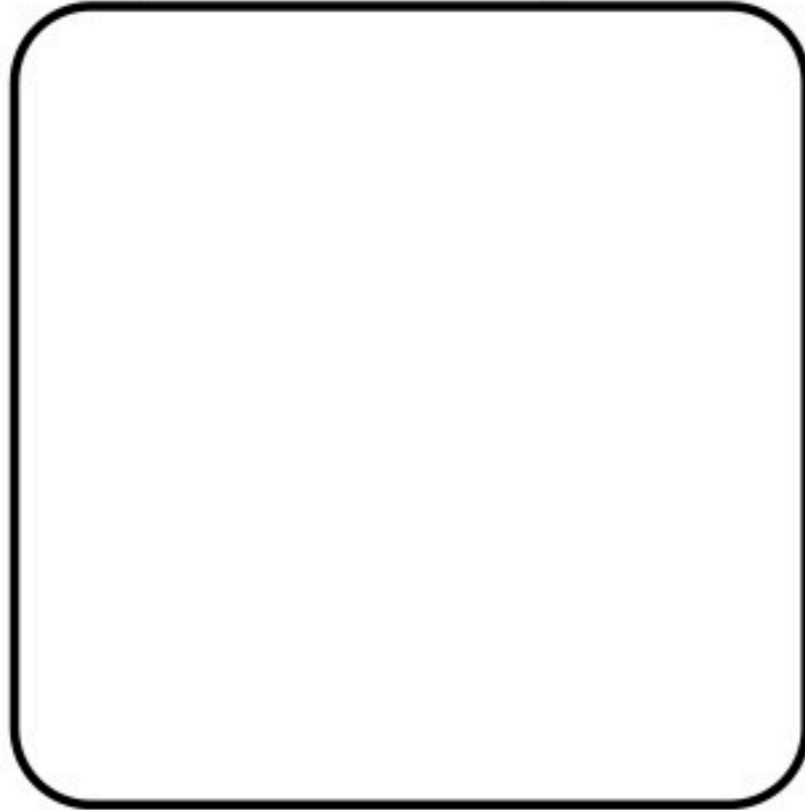
Igneous Rocks: Important Information

- Inside the earth, temperatures are so high, rock melts to become _____.
- This magma rises towards the surface of the earth due to it's _____.
- If it escapes through a volcanic eruption, the melted rock is then called _____.
- Igneous rocks are rocks formed from _____.
- _____ occurs both inside (where it's hot) and on the earth (where it's cool).

IGNEOUS ROCKS

Intrusive

Extrusive



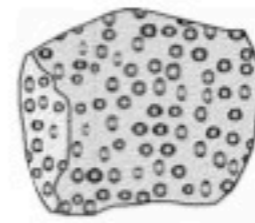
Granite
Large crystals
Slow cooling
Intrusive



Basalt
Small crystals
Quick cooling
Extrusive



Obsidian
No crystals- glassy
Very quick cooling
Extrusive



Pumice
No crystals- glassy
Very quick cooling
Gas Pockets- Vesicular
Extrusive

REGENTS EARTH SCIENCE
Igneous Rock Identification

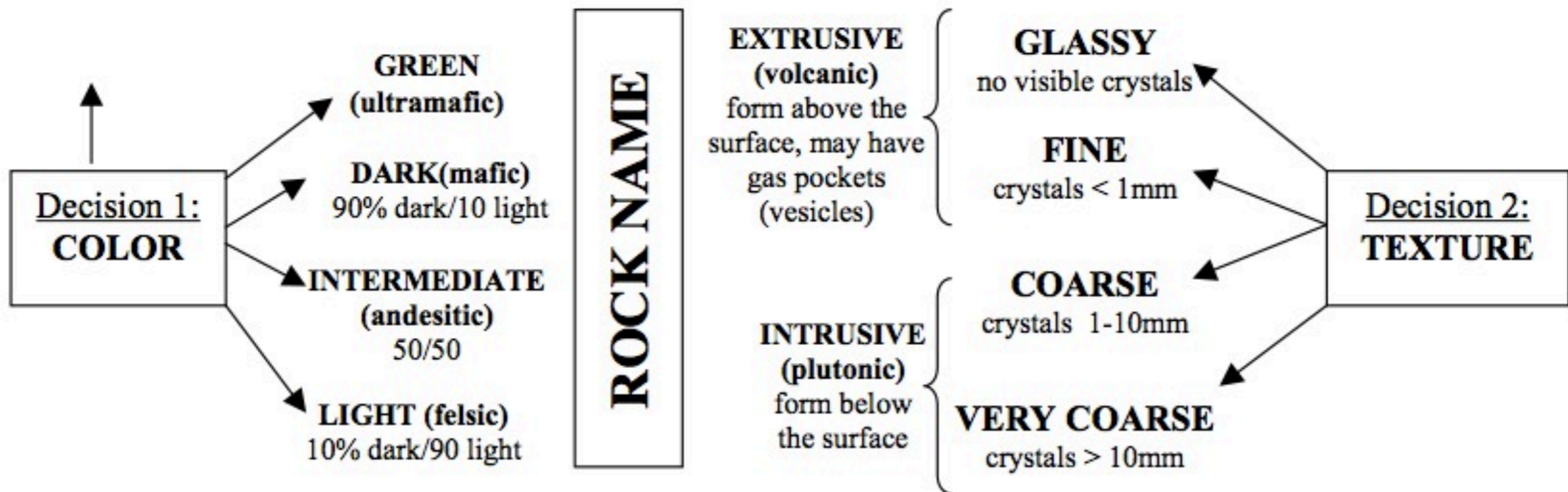
Name: _____

As you now know, rocks are composed of minerals or a combination of minerals. Rocks are categorized into types based on the way in which they form. Igneous rocks form as molten, mineral-rich material cools (or, you might say, “freezes”) as it rises toward earth’s surface. Igneous rocks are classified based on two main characteristics- ***mineral composition*** and ***mineral grain size (texture)***. These characteristics, in turn, signify a particular ***environment of formation***. Herein lies the key: **if you know the rock, you know the past environment!** Remember, rocks form the sentences and paragraphs of earth’s language. Using your senses and the **Scheme for Igneous Rock Identification** found in your reference tables, you will be able to first classify then identify the environment of formation of a variety of different igneous rocks.

PROCEDURE

First, take some time to familiarize yourself with the **flow** of the identification chart. The chart is read by "plotting" two major physical characteristics- **color** and **texture**. The outline below may be helpful as a guide:

Although color is a poor indicator for minerals, igneous rocks are typically composed of a combination of 7 major minerals with specific coloration. As a result, color turns out to be very useful for identifying composition.



Environments of Formation

The **composition** and **density** of igneous rocks determine *where* they are formed on the earth. As you already know, **plutonic** rocks form below the surface (big crystals), while **volcanic** rocks form at or above the surface (fine or glassy texture).

Low Density/Light Color
Felsic



High Density/Dark Color
Mafic/Ultra Mafic

CONTINENTAL

Rocks form at the surface or beneath the surface of the Land (continent).

INTERMEDIATE

Rocks form where ocean crust and continent crust meet or collide (Andes Mtns)

OCEANIC

Rocks form in the ocean or beneath the ocean crust.

MANTLE

Rocks form in the mantle

Igneous Rocks - Due @ end of class

1. Obsidian
 2. Pumice
 3. Rhyolite
 4. Pink Granite
 5. White Granite
 6. Pegmatite
 7. Diorite
 8. Basalt
 9. Gabbro
- No Cell Phones, Food or Drink during Lab! -
1 point off!
- 1 point off, if you are late
- Please do not mix up the rocks
- If you finish early, work on**
(1) Igneous Rock Identification Worksheet
(2) Descriptive Essay (Due Friday)

Lab's are to be written in Pencil only (2 points off for Pen)

Use page 6 in your esrt

Igneous Rock Exam - Monday, March 18

Descriptive Essay due Friday!

Igneous Rocks - Bell Ringer 2 minutes

Rewrite & fill in the blanks in your notebook

I know a rock is _____ if:

I see randomly located interlocking _____ or

I see _____ where gases escaped as lava cooled or

The texture of the rock is _____ due to extremely
_____ cooling (it is Obsidian!)



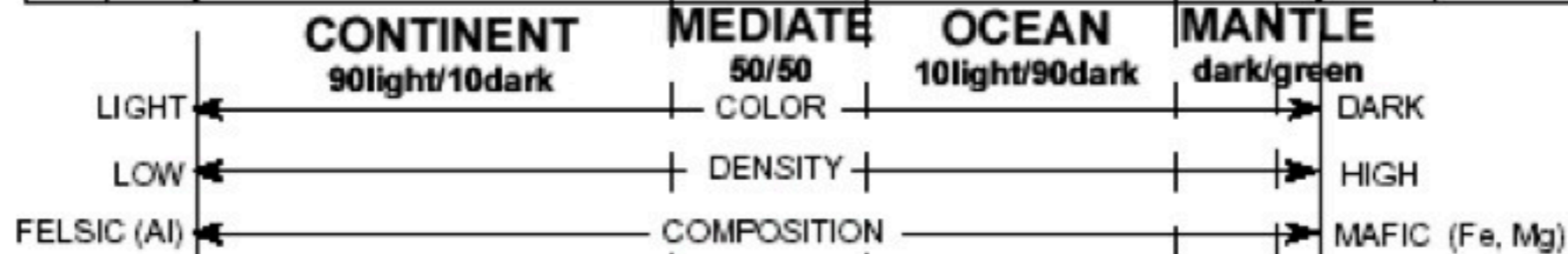
2:00

Scheme for Igneous Rock Identification

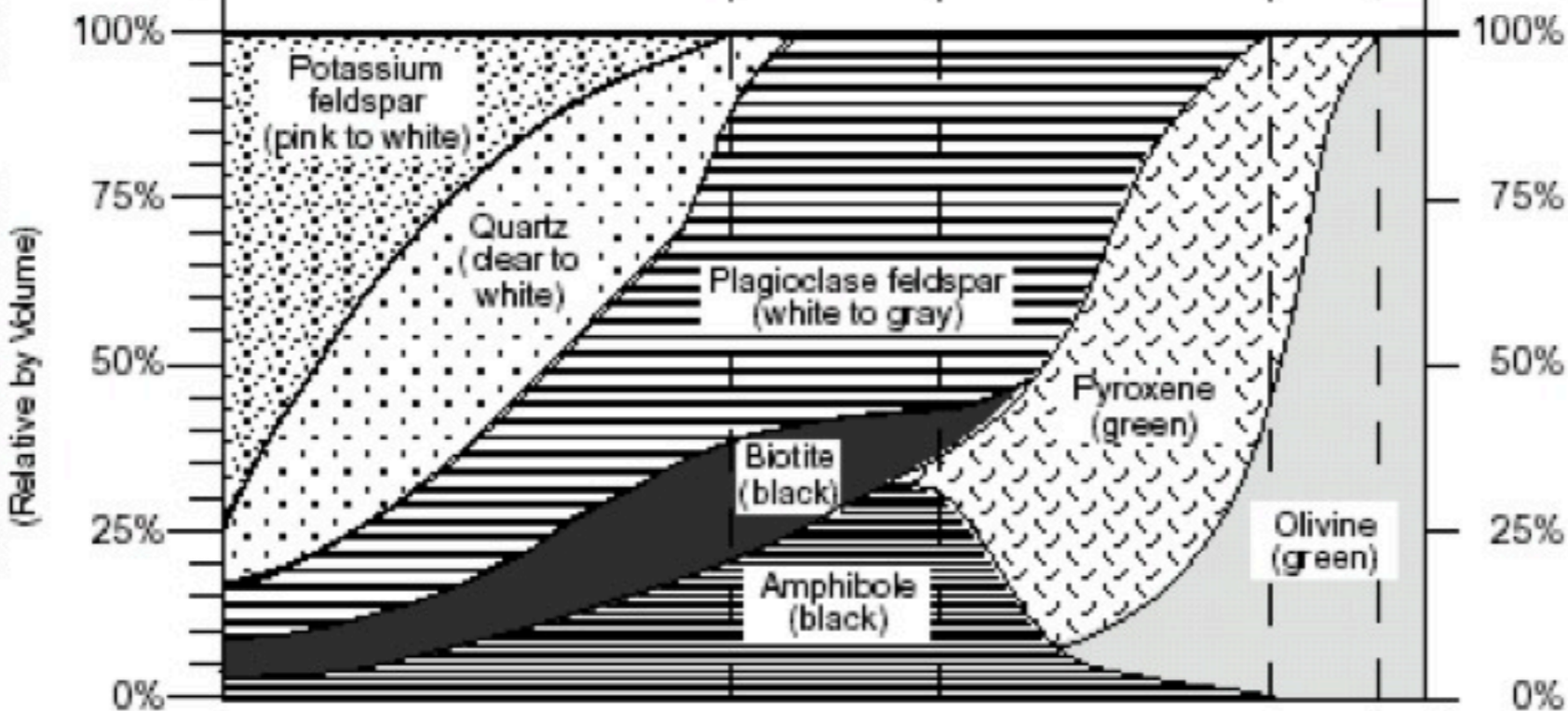
IGNEOUS ROCKS

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					
INTRUSIVE (Plutonic)	Granite	Diorite	Gabbro	Peridotite Dunite	1 mm to 10 mm	Coarse	Non-vesicular	
	Pegmatite							10 mm or larger
			INTER-					

CHARACTERISTICS



MINERAL COMPOSITION
(Relative by Volume)



ROCK TYPE	COLOR (Dark w/green, Dark, Intermediate, Light)	TEXTURE (Glassy, Fine, Coarse, Very Coarse, Vesicular/Non)	ROCK NAME	INTRUSIVE or EXTRUSIVE	ENVIRONMENT (Mantle, Ocean, Intermediate, Continental)
1. Igneous					
2.					
3.					
4.					
5.					
6.					