

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

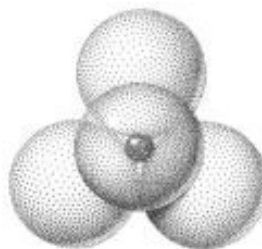
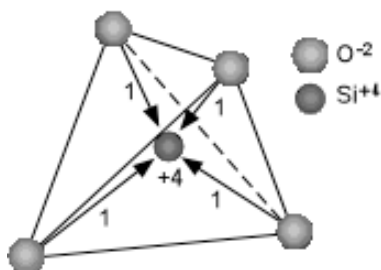
# Minerals and Rocks

The Physical Setting: Earth Science

## Class Notes: Minerals and Rocks

### I. Minerals

- Minerals are the ingredients needed to form the different types of rocks
- Rock - \_\_\_\_\_  
\_\_\_\_\_
- Mineral - \_\_\_\_\_  
\_\_\_\_\_
- Inorganic - \_\_\_\_\_  
\_\_\_\_\_
- Crystalline - \_\_\_\_\_  
\_\_\_\_\_
- Minerals form by three methods:
  1. Crystallization - a process of organizing \_\_\_\_\_ to form crystalline solids
  2. Recrystallization - the cooling and hardening of \_\_\_\_\_ or magma into minerals
  3. Rearrangement - the realignment of atoms in minerals under high \_\_\_\_\_ and \_\_\_\_\_
- Most rock forming minerals are silicates that result in a tetrahedron shape
  - Four-sided units of 4 \_\_\_\_\_ and 1 \_\_\_\_\_

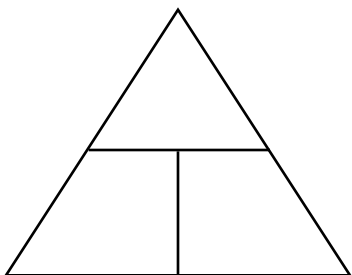


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# Class Notes: Minerals and Rocks

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- Crystal structure or “\_\_\_\_\_” are responsible for the physical and chemical properties a mineral possesses
- Each mineral has a set of physical and chemical properties that can be used to identify the sample
- The methods we use to classify minerals are:
  1. Color - a visual attribute of an object based on perception
    - One of the most obvious, but not the most reliable
    - Many of the 4000 known minerals share similar colors
  2. Streak - \_\_\_\_\_  
\_\_\_\_\_
    - Weathering changes the outside color, but streak gives the true color
  3. Luster - \_\_\_\_\_  
\_\_\_\_\_
    - Two types of luster:
      - Metallic Luster - shines like stainless steel
      - Nonmetallic Luster - earthy or dull shine
  4. Density - \_\_\_\_\_  
\_\_\_\_\_
    - Sample Problem: a student measures the mass of a mineral to be \_\_\_\_\_ g and calculates the volume to be \_\_\_\_\_ mL. What is the density?



Write the Formula:

Show All Work:

Answer:

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# Class Notes: Minerals and Rocks

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- The methods we will use are (continued):

5. Hardness - \_\_\_\_\_

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- Mohs Hardness Scale is used to classify hardness

Hardness	Mineral	Test
1	Talc	Finger nail scratches easily
2	Gypsum	Finger nail scratches
3	Calcite	Copper penny scratches
4	Fluorite	Steel knife scratches easily
5	Apatite	Steel knife scratches
6	Feldspar	Steel knife will not scratches
7	Quartz	Will scratch glass and steel
8	Topaz	Harder then any common mineral
9	Corundum	Scratches topaz
10	Diamond	Hardest mineral

6. Cleavage - \_\_\_\_\_

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- Mohs Hardness Scale is used to classify hardness



7. Fracture - \_\_\_\_\_

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- Tends to lack preferred zones of weakness



8. Acid Test - \_\_\_\_\_

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- Calcite and Dolomite both react with acid

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# Class Notes: Minerals and Rocks

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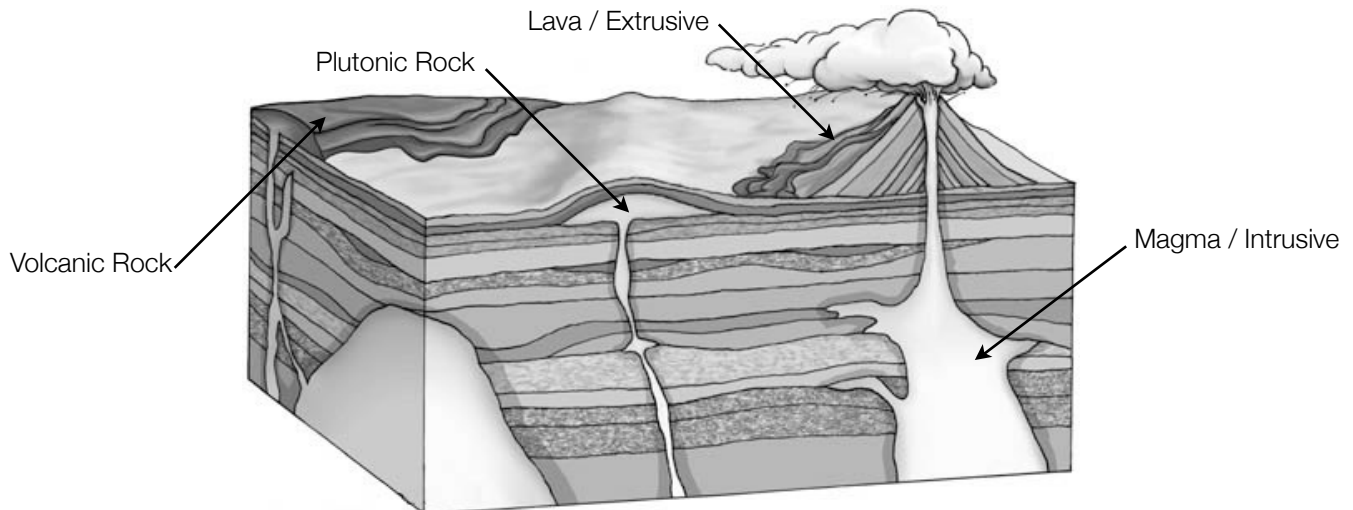
## II. Igneous Rocks

- Igneous Rocks - \_\_\_\_\_  
\_\_\_\_\_

- Methods to classify igneous rocks:

1. Environment of Formation - \_\_\_\_\_  
\_\_\_\_\_

- Magma - \_\_\_\_\_  
\_\_\_\_\_
- Plutonic - \_\_\_\_\_  
\_\_\_\_\_
- Intrusive - \_\_\_\_\_  
\_\_\_\_\_
- Lava - \_\_\_\_\_  
\_\_\_\_\_
- Volcanic - \_\_\_\_\_  
\_\_\_\_\_
- Extrusive - \_\_\_\_\_  
\_\_\_\_\_



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# Class Notes: Minerals and Rocks

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2. Color - \_\_\_\_\_  
\_\_\_\_\_

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

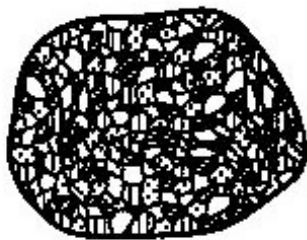
- Felsic - \_\_\_\_\_  
\_\_\_\_\_
- Mafic - \_\_\_\_\_  
\_\_\_\_\_

4. Texture - \_\_\_\_\_  
\_\_\_\_\_

- Vesicular - \_\_\_\_\_  
\_\_\_\_\_
- Porphyritic - \_\_\_\_\_  
\_\_\_\_\_

5. Crystal Size - \_\_\_\_\_  
\_\_\_\_\_

- Crystal size is an important factor to determine the environment of formation
  - The \_\_\_\_\_ the cooling time the \_\_\_\_\_ the crystal size (coarse or very coarse)
  - The \_\_\_\_\_ the cooling time the \_\_\_\_\_ the crystal size (glassy or fine)



Fine Grained



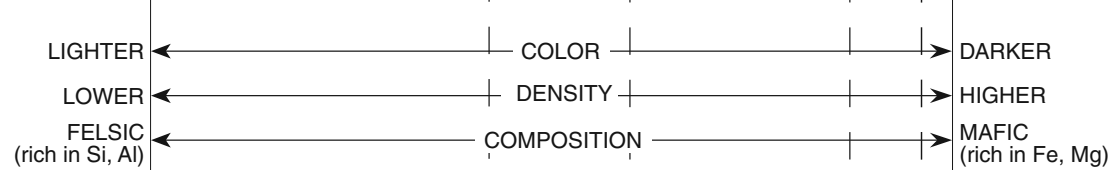
Coarse Grained

# Class Notes: Minerals and Rocks

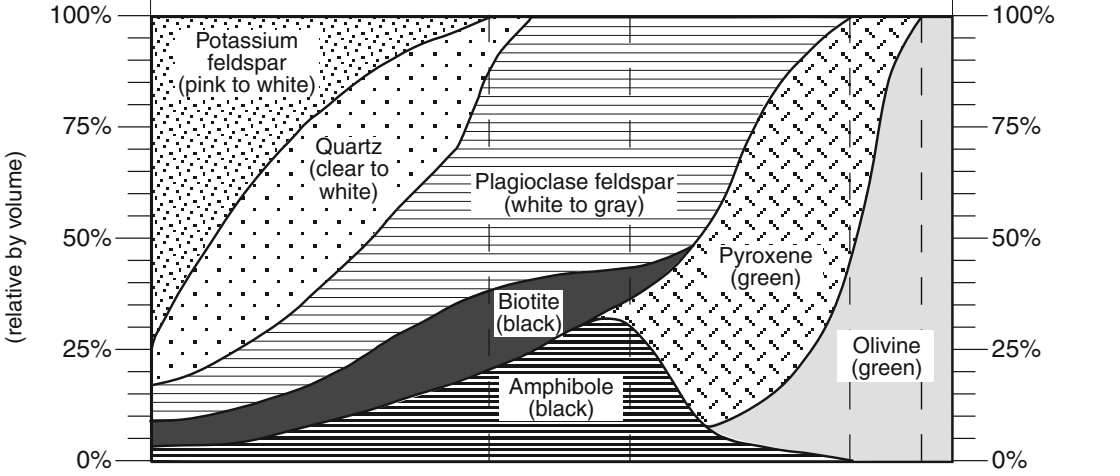
## Scheme for Igneous Rock Identification

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

CHARACTERISTICS



MINERAL COMPOSITION  
(relative by volume)



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# Class Notes: Minerals and Rocks

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## III. Sedimentary Rocks

- Sedimentary Rocks - \_\_\_\_\_  
\_\_\_\_\_

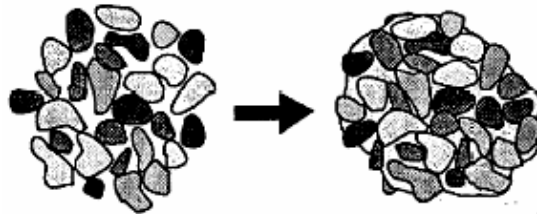
- Lithification - \_\_\_\_\_  
\_\_\_\_\_

- Methods to classify sedimentary rocks:

1. Texture - \_\_\_\_\_  
\_\_\_\_\_

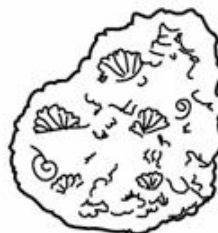
- Texture is the main factor in sedimentary rock identification

- Clastic - \_\_\_\_\_  
\_\_\_\_\_



- Crystalline - \_\_\_\_\_  
\_\_\_\_\_

- Bioclastic - \_\_\_\_\_  
\_\_\_\_\_



Bioclastic  
Contains Shell Fragments

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# Class Notes: Minerals and Rocks

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- Methods to classify sedimentary rocks (continued):

## 2. Formation - \_\_\_\_\_

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- Most sedimentary rocks form under large bodies of water by the following:

- Cementation - \_\_\_\_\_

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- Occurs as water between sediments dissolves and the remaining materials hold the clasts together

- Compaction - \_\_\_\_\_

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- Usually results in a decrease in pore space and sediments become more tightly packs

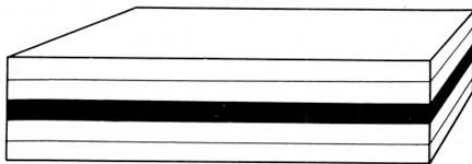
- Chemical Action - \_\_\_\_\_

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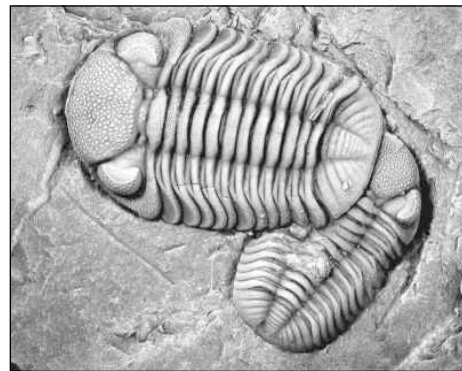
## 3. Characteristics - \_\_\_\_\_

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- Form at or near Earth's surface where weathering can break down rocks into pieces
- Forms in horizontal layers
- May contain fossils



Horizontal Layers


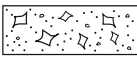
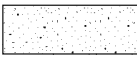
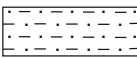

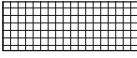


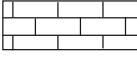


Fossils



# Class Notes: Minerals and Rocks

## Scheme for Sedimentary Rock Identification

INORGANIC LAND-DERIVED SEDIMENTARY ROCKS					
TEXTURE	GRAIN SIZE	COMPOSITION	COMMENTS	ROCK NAME	MAP SYMBOL
Clastic (fragmental)	Pebbles, cobbles, and/or boulders embedded in sand, silt, and/or clay	Mostly quartz, feldspar, and clay minerals; may contain fragments of other rocks and minerals	Rounded fragments	<b>Conglomerate</b>	
			Angular fragments	<b>Breccia</b>	
	Sand (0.006 to 0.2 cm)		Fine to coarse	<b>Sandstone</b>	
	Silt (0.0004 to 0.006 cm)		Very fine grain	<b>Siltstone</b>	
Clay (less than 0.0004 cm)	Compact; may split easily	<b>Shale</b>			
CHEMICALLY AND/OR ORGANICALLY FORMED SEDIMENTARY ROCKS					
TEXTURE	GRAIN SIZE	COMPOSITION	COMMENTS	ROCK NAME	MAP SYMBOL
Crystalline	Fine to coarse crystals	Halite	Crystals from chemical precipitates and evaporites	<b>Rock salt</b>	
		Gypsum		<b>Rock gypsum</b>	
		Dolomite		<b>Dolostone</b>	
Crystalline or bioclastic	Microscopic to very coarse	Calcite	Precipitates of biologic origin or cemented shell fragments	<b>Limestone</b>	
Bioclastic		Carbon		Compacted plant remains	<b>Bituminous coal</b>

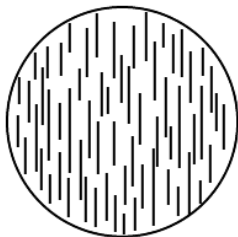
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# Class Notes: Minerals and Rocks

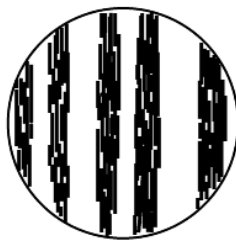
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## IV. Metamorphic Rocks

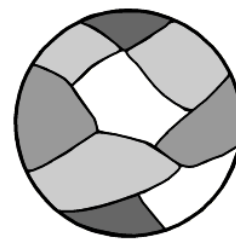
- Metamorphic Rocks - \_\_\_\_\_  
\_\_\_\_\_
- Parent Rock - \_\_\_\_\_  
\_\_\_\_\_
- Heat
  - Rock expands when heated causing the atoms to break apart and move freely
  - As temperature decreases atoms join with other atoms to form different compounds
  - The result is a structural and chemical change
- Pressure
  - Under extreme pressure at great depths inside the Earth, atoms bonds are broken and re-arranged into a denser and more compact structure
- Methods to classify metamorphic rocks:
  1. Texture - the general appearance of the rock
    - Foliation - \_\_\_\_\_  
\_\_\_\_\_
    - Banding - \_\_\_\_\_  
\_\_\_\_\_
    - Non-foliated - \_\_\_\_\_  
\_\_\_\_\_



Foliated



Banding



Non-foliated

# Class Notes: Minerals and Rocks

- Methods to classify metamorphic rocks (continued):

2. Grain Size - \_\_\_\_\_

\_\_\_\_\_

3. Composition- \_\_\_\_\_

\_\_\_\_\_

4. Type of Metamorphism-

- Regional Metamorphism - \_\_\_\_\_


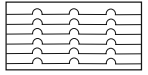
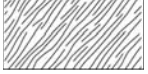
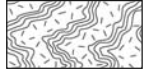

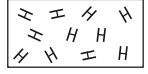
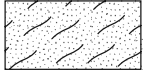


\_\_\_\_\_

- Most metamorphic rocks form regionally under a mountain or deep inside the Earth

- Contact Metamorphism - \_\_\_\_\_

\_\_\_\_\_

## Scheme for Metamorphic Rock Identification

TEXTURE		GRAIN SIZE	COMPOSITION	TYPE OF METAMORPHISM	COMMENTS	ROCK NAME	MAP SYMBOL
FOLIATED	MINERAL ALIGNMENT	Fine	MICA QUARTZ FELDSPAR AMPHIBOLE GARNET PYROXENE	Regional (Heat and pressure increases) ↓	Low-grade metamorphism of shale	<b>Slate</b>	
		Fine to medium			Foliation surfaces shiny from microscopic mica crystals	<b>Phyllite</b>	
		Medium to coarse			Platy mica crystals visible from metamorphism of clay or feldspars	<b>Schist</b>	
	BANDING	High-grade metamorphism; mineral types segregated into bands			<b>Gneiss</b>		
NONFOLIATED	Fine	Carbon	Regional	Metamorphism of bituminous coal	<b>Anthracite coal</b>		
	Fine	Various minerals	Contact (heat)	Various rocks changed by heat from nearby magma/lava	<b>Hornfels</b>		
	Fine to coarse	Quartz	Regional or contact	Metamorphism of quartz sandstone	<b>Quartzite</b>		
		Calcite and/or dolomite		Metamorphism of limestone or dolostone	<b>Marble</b>		
	Coarse	Various minerals		Pebbles may be distorted or stretched	<b>Metaconglomerate</b>		

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# Class Notes: Minerals and Rocks

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## V. Rock Cycle

- Rock Cycle - \_\_\_\_\_  
\_\_\_\_\_
  - Any rock type can change into another rock type
  - Therefore any rock could contain materials that were one part of another rock
- Igneous Rock - \_\_\_\_\_  
\_\_\_\_\_
- Sedimentary Rock - \_\_\_\_\_  
\_\_\_\_\_
- Metamorphic Rock - \_\_\_\_\_  
\_\_\_\_\_
- Driving Forces - the processes that create uplift, weathering, erosion, pressure, and melting to form the different rock types
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

