

Petrology

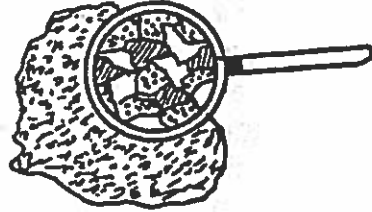
- the branch of science that studies rocks.

I. CLASSIFICATION OF ROCKS

A. Rocks are classified on the basis of their formation / origin

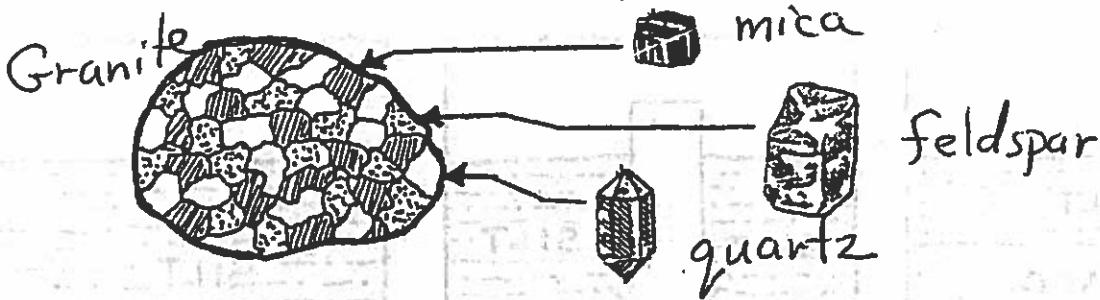
B. The three groups of rocks are:

1. sedimentary
2. igneous
3. metamorphic



II. ROCKS IN RELATION TO MINERALS

A. Many kinds of rocks are composed of minerals



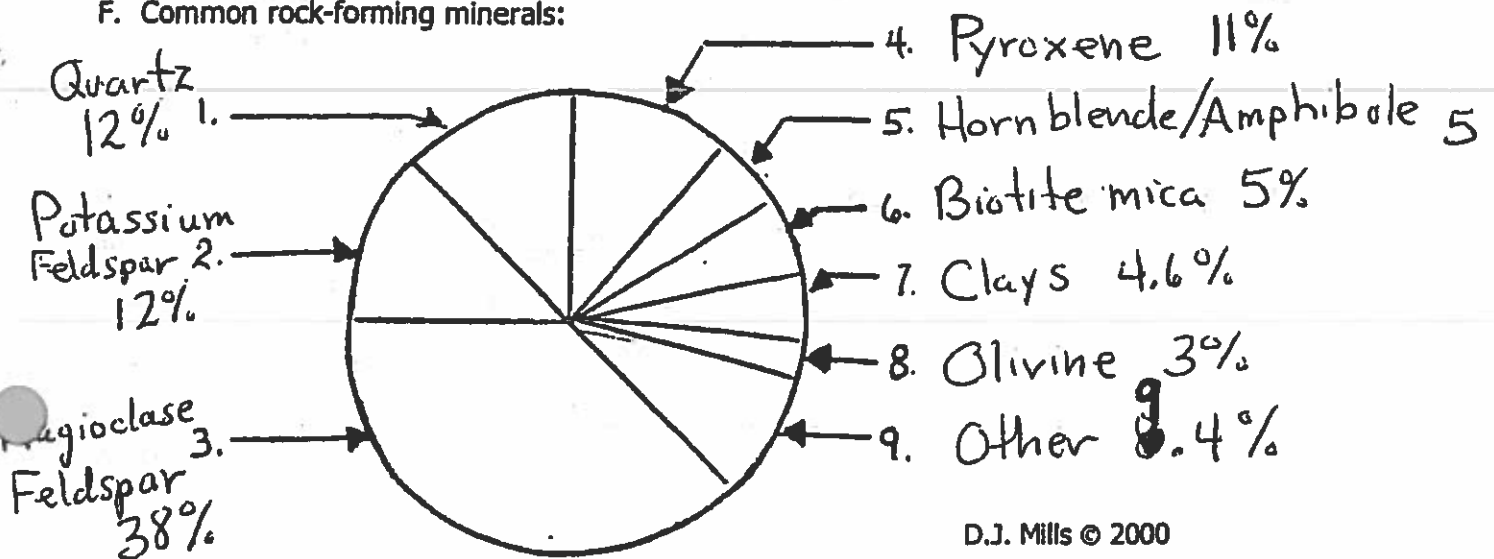
B. Some rocks are monomineralic - composed of only one mineral (limestone → calcite)

C. Most rocks are polymineralic - composed of two or more minerals (granite)

D. LETTERS:WORDS::MINERALS:ROCKS

E. There are almost 3000 types of minerals, but only 8 of these minerals (mineral families) make-up 90 % of the rocks of Earth's crust.

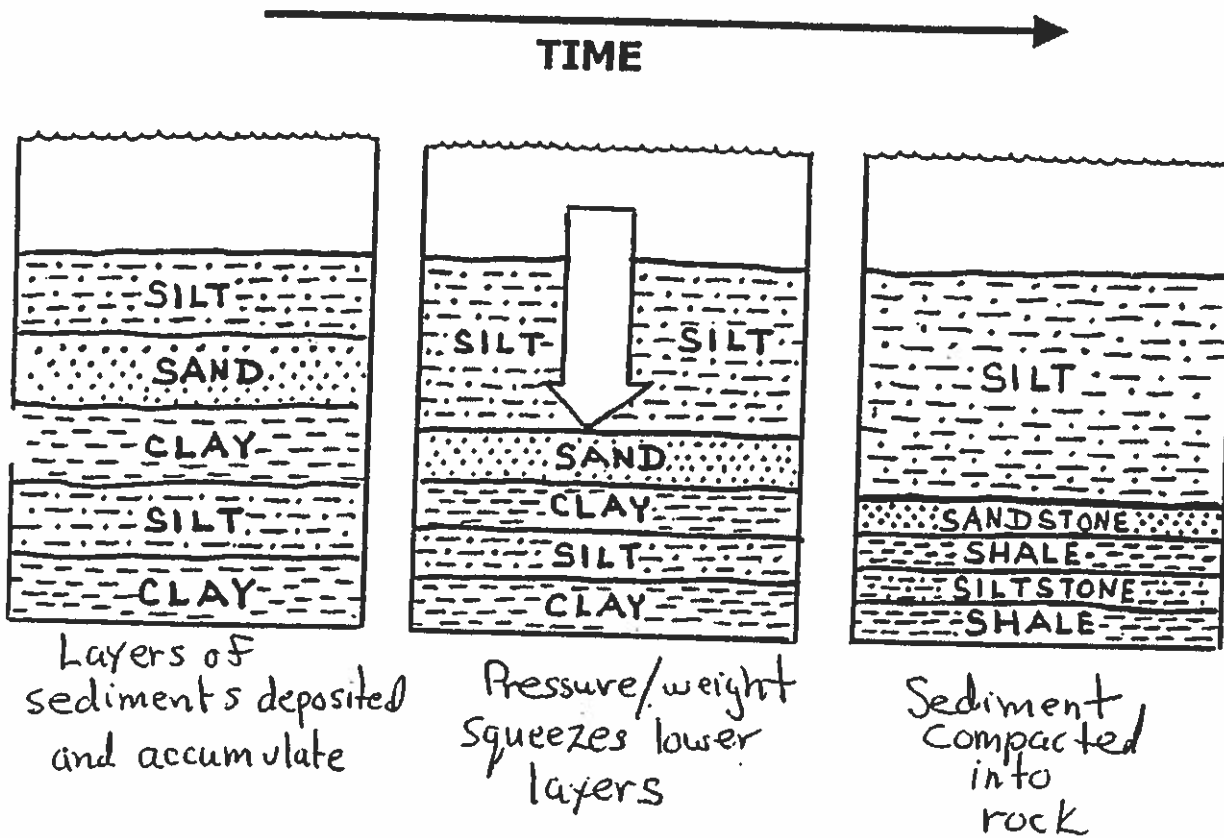
F. Common rock-forming minerals:



III. SEDIMENTARY ROCKS

A. Rocks that usually form in layers from the accumulation of sediments, organic matter, or chemical precipitates.

1. Most sedimentary rocks are made-up of solid sediments that have been weathered from other rocks. The weathered sediments are then eroded (transported) by water, wind, and moving ice. Eventually the eroded sediments are deposited at new locations either in water or on land. Most sedimentary rocks form in layers underwater in lakes, seas or oceans.
2. From sediments to rocks:



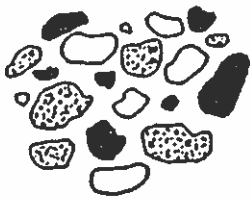
B. Types of Sedimentary Rocks

1. CLASTIC - form from rock particles/sediments that are pressed and cemented together.

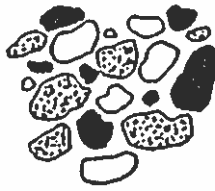
- a. Compaction - pressed by weight of overlying rock
- b. Cementation - glued by natural cement in water (calcite)

individual particles
of rock - sediment

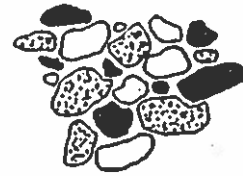
pressure
↓



after
deposition



compaction



cementation

c.

ROCK NAME	GRAIN SIZE (CM)	COMMENT	MAP SYMBOL
Conglomerate	boulders 25.6	Various size rock Particles and mud Silt and sand cemented together	
	cobbles 6.4		
	pebbles .2		
Sandstone	Sand	Fine to coarse grains cemented together	
Siltstone	Silt	very fine grained	
Shale	clay	compact, may split easily	

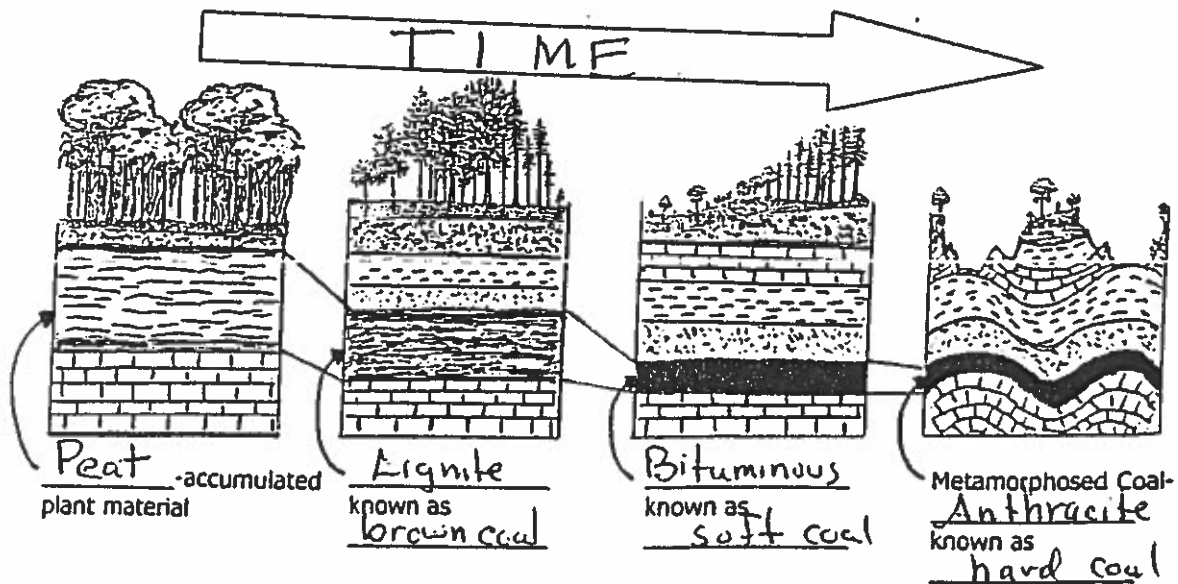
2. Chemical - form from dissolved minerals
in water that settle-out/precipitate.
Dissolved minerals left behind when
water evaporates

ROCK NAME	COMPOSITION	COMMENT	MAP SYMBOL
Limestone	calcite	Minerals dissolved in water precipitate out and forms as crystals on the sea floor Includes evaporites	
Rock salt	halite		
Rock gypsum	gypsum		
Dolostone	dolomite	Changed form of limestone	

3. Organic - form from the accumulation of plant/animal matter that undergoes a transformation into rock.

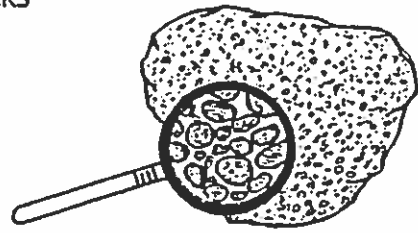
ROCK NAME	COMPOSITION/COMMENT	MAP SYMBOL
Limestone	Cemented shell fragments	
Coal	Carbon from plant remains	

Formation of Coal



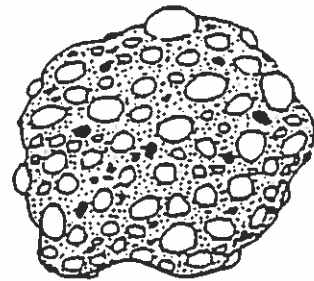
C. Important characteristics of sedimentary rocks

1. They are composed of rock fragments or organic particles.



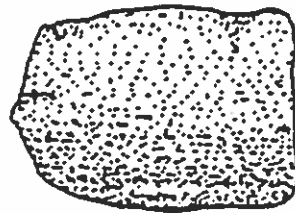
- a. Some have a range of particle or sediment size

conglomerate



- b. Others consist mainly of one size of sediments – due to sorting during deposition

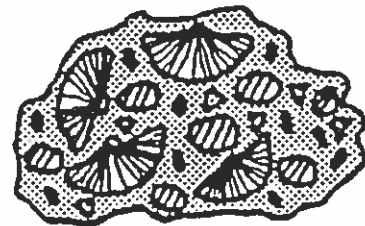
sandstone



2. Some are organic – they form from plant and animal remains

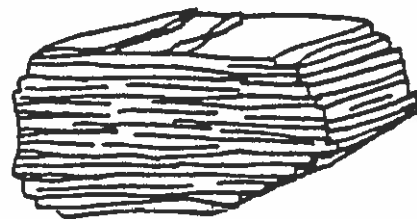
fossils

fossil limestone



3. Form in layers
called strata or beds

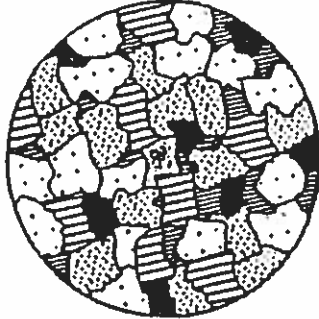
shale



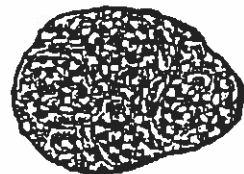
IV. IGNEOUS ROCKS

A. Forms from the cooling and solidification/crystallization of molten lava and magma.

1. When molten(liquid) lava or magma cools and solidifies, crystals of different minerals form the rock.
 - a. The rock contains a crystalline structure of intergrown crystals of different sizes, shapes and composition
 - b.

**B. Types of Igneous Rocks**

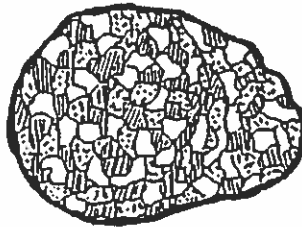
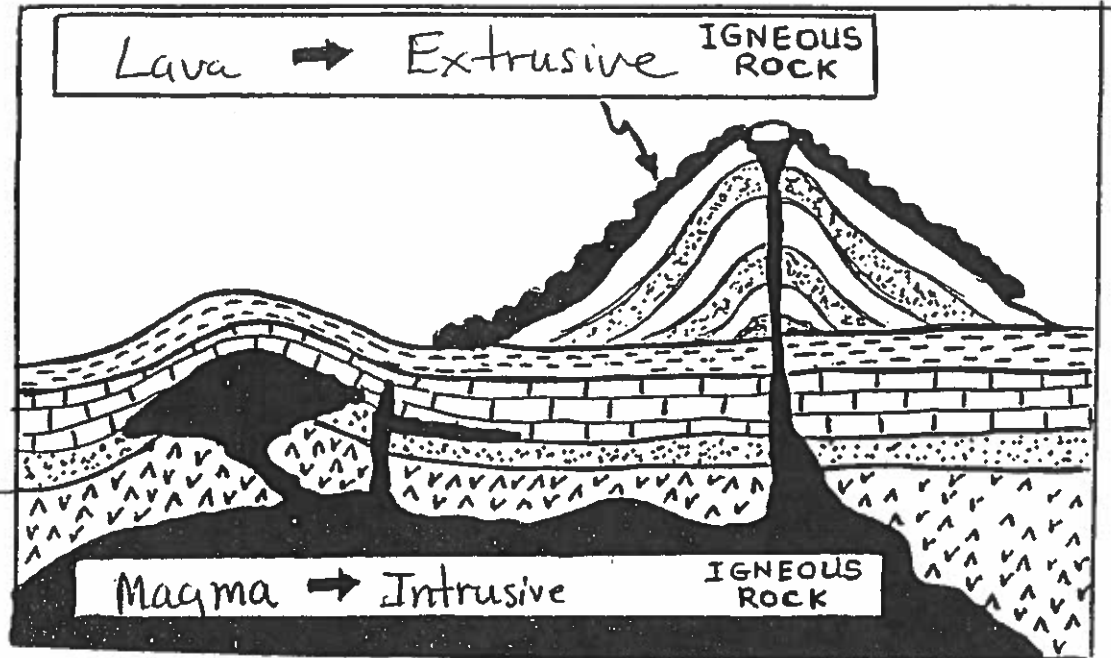
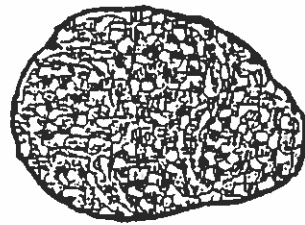
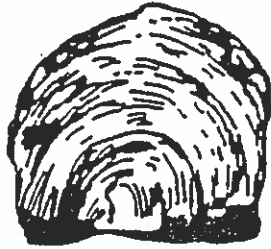
1. Extrusive/Volcanic
forms from the fast cooling of
lava on or near Earth's surface.
Fast cooling does NOT allow time for
crystals to grow. Rocks have small
or no crystals - therefore a
smooth/fine texture.



2. Intrusive/Plutonic
forms from slow cooling of
magma within the Earth.
Slow cooling allows time for
large crystals to grow.
Rocks have large crystals -
therefore a coarse/rough texture.



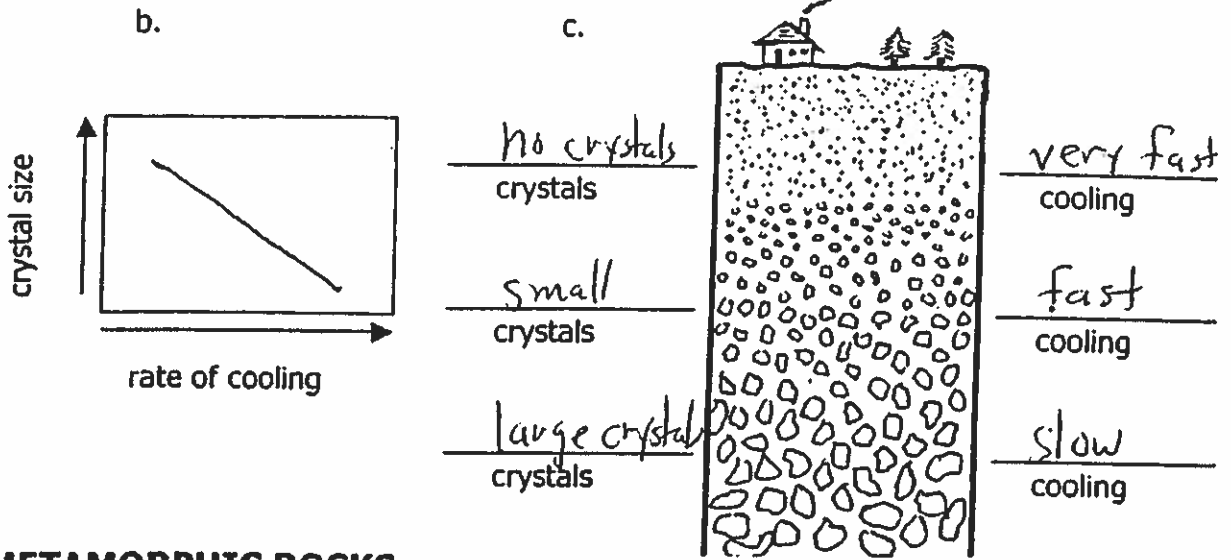
3.



4.

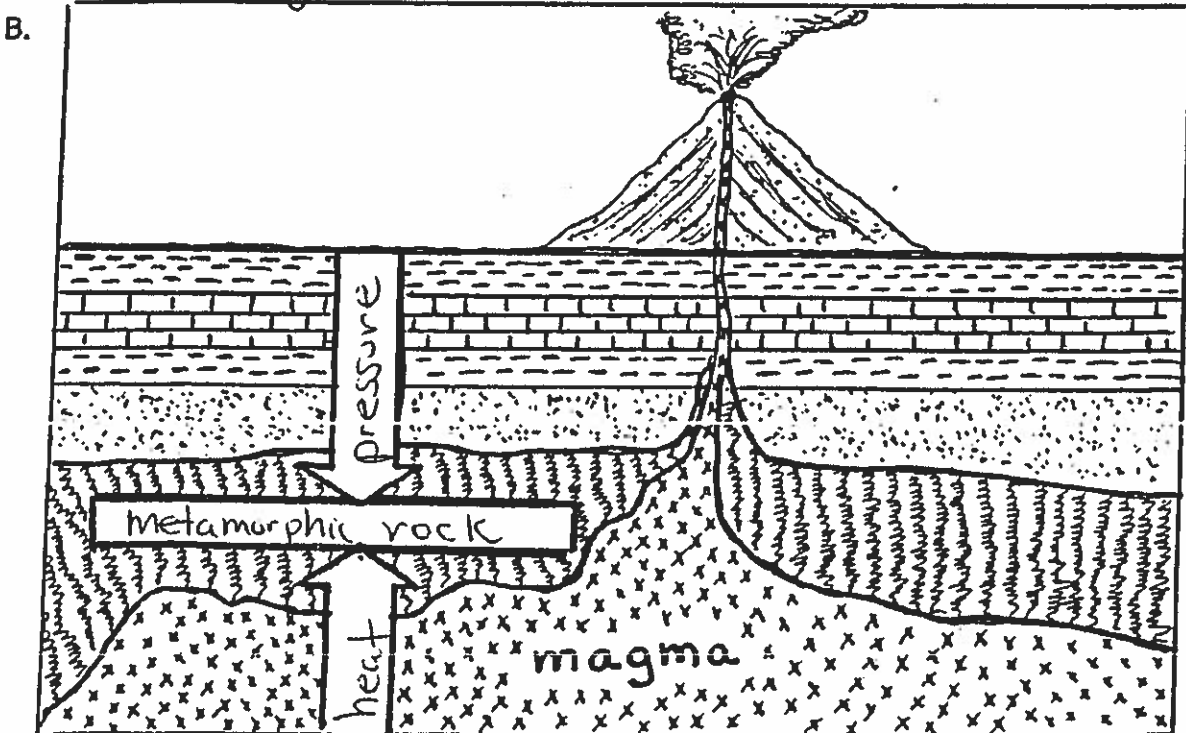
	ENVIRONMENT OF FORMATION		
	EXTRUSIVE (volcanic)		INTRUSIVE (plutonic)
RATE OF COOLING	very fast	fast	slow
GRAIN SIZE	non-crystalline	less than 1 mm	1 mm or larger
TEXTURE	glassy	fine	coarse
EXAMPLES	obsidian	basalt rhyolite	granite gabbro

5. Relationship between crystal size and rate of cooling (the environment effects the cooling rate)
- a. As rate of cooling increases, crystal size decreases.



V. METAMORPHIC ROCKS

- A. Form from other preexisting rock (sed., meta, igneous) that have been changed.



C. Conditions that cause rocks to undergo metamorphism include:

1. heat
2. pressure
3. chemical activity

Such conditions are often associated with deep burial and pressure that result from mountain formation. Therefore, metamorphic rocks are often found in mountainous regions where weathering and erosion have exposed this rock that was once deeply buried.

Under conditions of high temperature and high pressure, many metamorphic rocks form by the process of recrystallization. This is the growth of new mineral crystals from the sediments of a sedimentary rock or the growth of new mineral crystals from the crystals of an igneous or metamorphic rock. Recrystallization occurs without true melting.

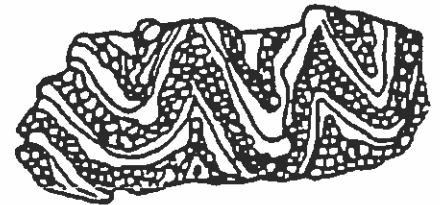
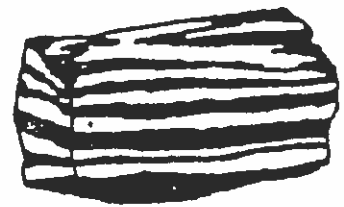
D. Changes in a rock caused by metamorphism:

1. increased density
2. chemical change/new minerals
- * 3. Banding - is a

layered arrangement of firmly joined crystals of minerals; the minerals are aligned in layers or bands. These bands are formed when rock is subjected to extreme pressure and temperature.

Usually, the greater the pressure and temperature, the thicker the bands.

4. Distorted structure - is the curving and folding of the bands. These distortions of once horizontal bands are caused by great environmental pressure exerted on the rock from different directions.



E. Types of metamorphic rocks:

1. Foliated - have mineral crystals arranged in parallel layers or "bands"
2. Unfoliated - do NOT have mineral crystals in bands - do not break in layers/sheets

F.

METAMORPHIC ROCK		ORIGINAL ROCK	ORIGINAL TYPE
Foliated	slate	shale	sed.
	schist	slate	meta
	gneiss	granite	igne.
Unfoliated	marble	limestone	sed.
	quartzite	sandstone	sed.
	anthracite	bituminous coal	sed.
	coal		

VI. THE ROCK CYCLE

