UNIT H
MINERALS AND ROCKS

- **ROCKS ARE MADE UP OF MINERALS**
- **MINERAL - *NATURALLY* OCCURRING, *INORGANIC*, CRYSTALLINE SUBSTANCE WITH *CHARACTERISTIC PHYSICAL AND CHEMICAL PROPERTIES.***

ROCK FORMING MINERALS

- **FELDSPAR, QUARTZ, MICA, CALCITE, HORNBLENDE, AUGITE, GARNET, MAGNETITE, OLIVINE, PYRITE AND TALC.**
- **THESE MINERALS MAKE UP MORE THAN 90% OF THE ROCKS IN THE LITHOSPHERE**

IDENTIFYING MINERALS

- ***physical properties are determined by the internal arrangement of atoms***
- **MINERALS ARE CLASSIFIED BY THE FOLLOWING PHYSICAL PROPERTIES:**
- **COLOR**
- **STREAK**
- **LUSTER**
- **HARDNESS**
- **SPECIFIC GRAVITY**
- **FRACTURE/CLEAVAGE**

Luster

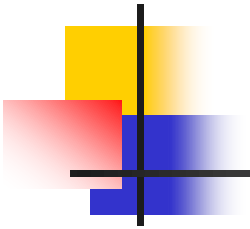
- **Metallic**- looks like shiny metal
- **Non-metallic**- all the other ways that a mineral can shine
- **Glassy/vitreous**- shines like a piece of broken glass (most common non-metallic)
- **Dull/earthy**- no shine at all
- Resinous/waxy- looks like a piece of plastic or dried glue
- **Pearly**- looks oily it may have a slight rainbow like an oil slick on water.

Hardness

- Fingernail 2.5
- Penny 3.5
- Iron Nail 4.5
- Glass Plate 5.5
- Steel File 6.5

MOH'S SCALE OF HARDNESS

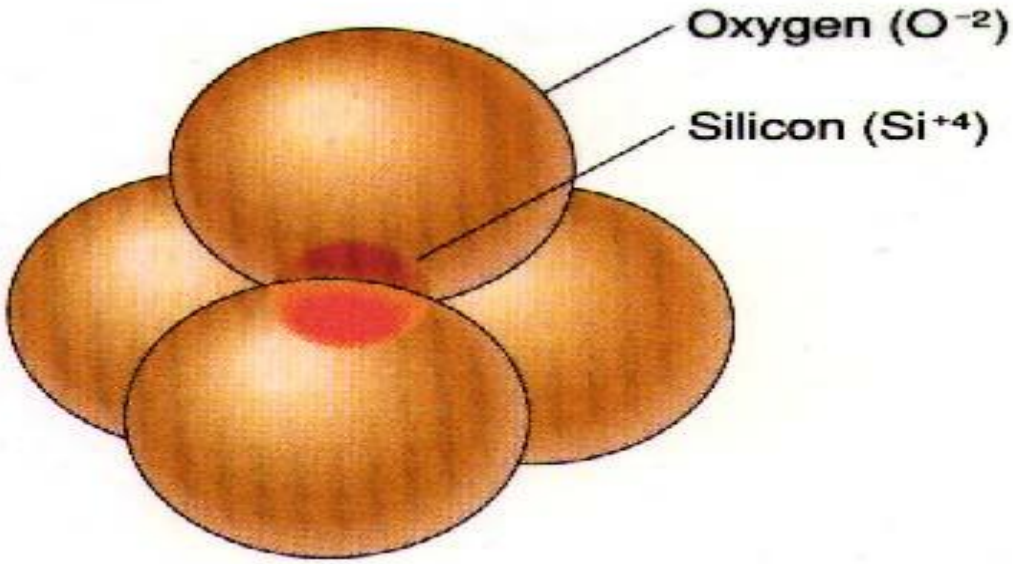
1-TALC	**FINGERNAIL SCRATCHES EASILY**
2-GYPSUM	**FINGERNAIL SCRATCHES**
3-CALCITE	**COPPER PENNY SCRATCHES**
4-FLUORITE	**STEEL FILE SCRATCHES EASILY**
5-APATITE	**STEEL FILE SCRATCHES**



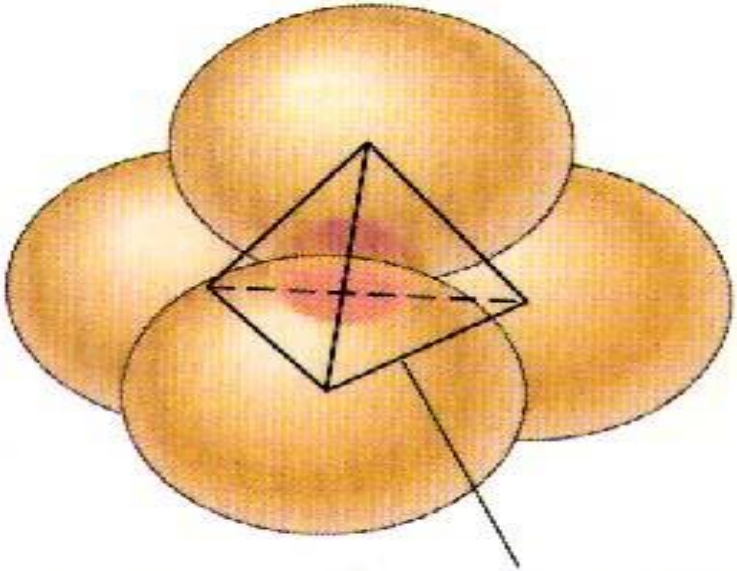
- 6-FELDSPAR SCRATCHES WINDOW GLASS
- 7-QUARTZ HARDEST COMMON MINERAL; SCRATCHES GLASS EASILY
- 8-TOPAZ HARDER THAN ANY COMMON MINERAL
- 9-CORUNDUM SCRATCHES TOPAZ
- 10- DIAMOND HARDEST OF ALL MINERALS

MINERAL FAMILIES

- **SILICATES - MADE OF SILICON AND OXYGEN**
- **ABOUT 60% OF ALL MINERALS ARE SILICATES**
- **THE SILICON - OXYGEN TETRAHEDRON - ONE SILICON ATOM AND 4 OXYGEN ATOMS.**
- **A VERY STRONG STRUCTURE**

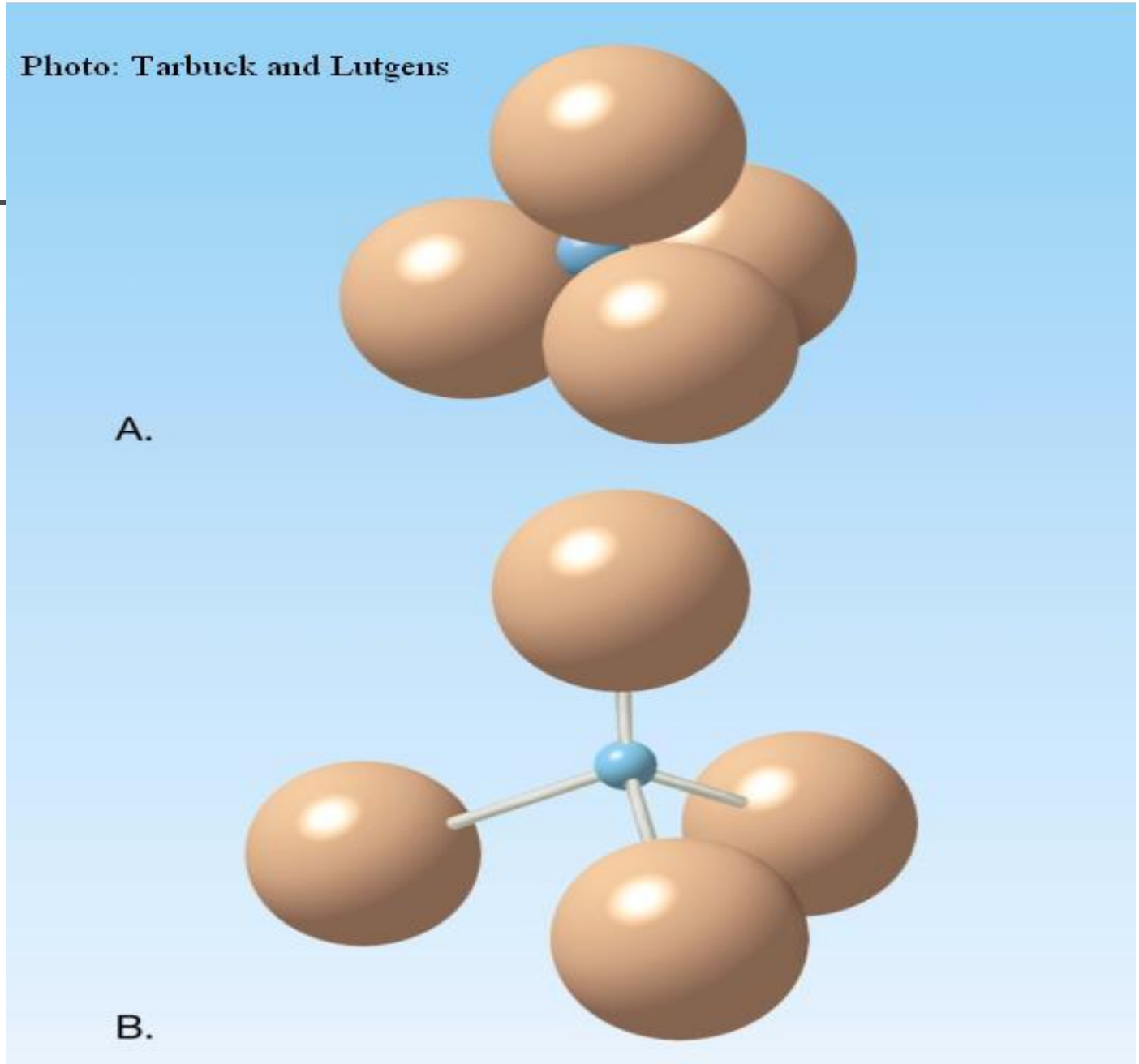


A Arrangement of atoms in silica tetrahedron



B Diagrammatic representation of a silica tetrahedron

SiO tetrahedron

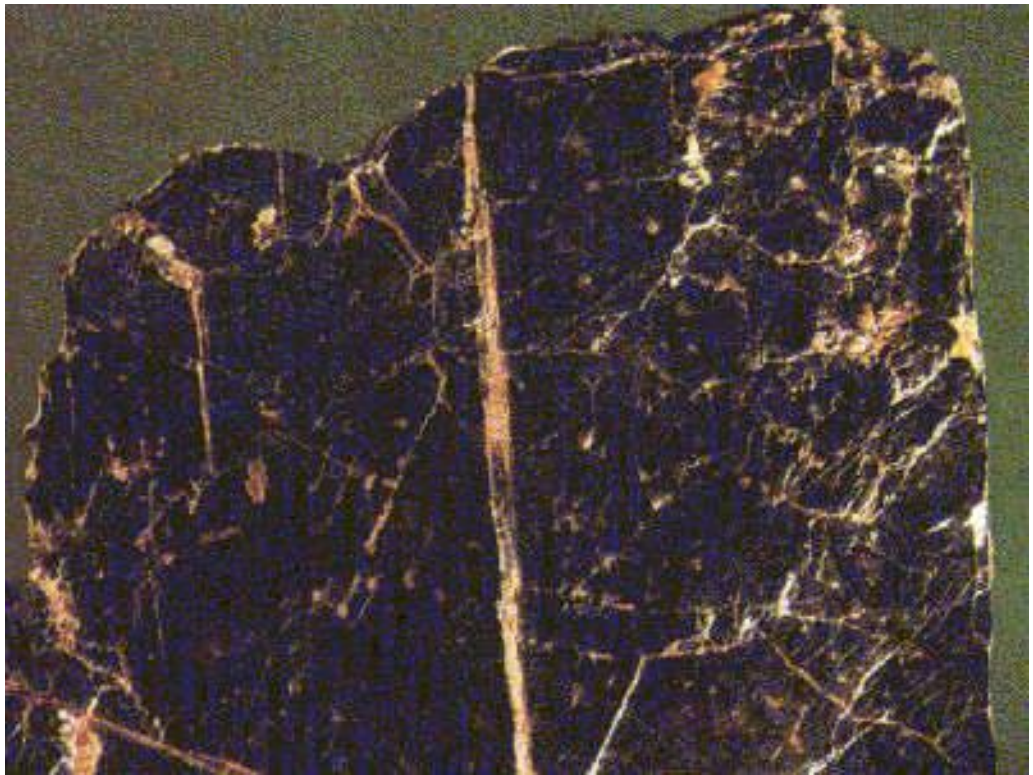


SILICATE FAMILY

- OLIVINE
  - ISOLATED TETRAHEDRA
  - GREENISH COLOR, NO CLEAVAGE PLANES

- ASBESTOS
  - CHAIN TETRAHEDRA
  - FIBERLIKE

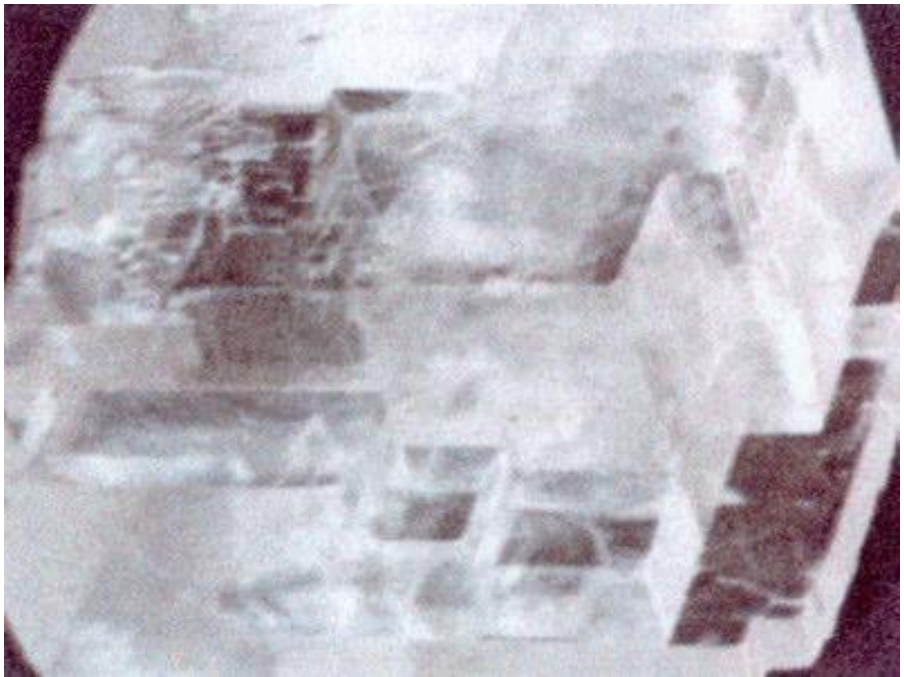
- MICA
  - SHEET TETRAHEDRA



- QUARTZ
  - NETWORK TETRAHEDRA
  - ALL SILICON-OXYGEN TETRAHEDRA

CARBONATE MINERALS

- CARBON ATOM IN COMBINATION WITH 3 OXYGEN ATOMS
- CALCITE



IRON OXIDES AND SULFIDES

- AN OXIDE IS A MINERAL CONSISTING OF A METAL ELEMENT COMBINED WITH OXYGEN.
- HEMATITE

- MAGNETITE

- PYRITE - IRON SULFIDE. FOOLS GOLD

ROCKS

- AS YOU KNOW, MINERALS ARE IDENTIFIED BY THEIR PHYSICAL/CHEMICAL PROPERTIES.
- ROCKS, HOWEVER, ARE IDENTIFIED BY ***"WHERE/HOW THEY FORM"***
- THERE ARE 3 TYPES OF ROCK:
  - SEDIMENTARY, IGNEOUS AND METAMORPHIC.

SEDIMENTARY ROCKS

- ***ALL*** SEDIMENTARY ROCKS FORM UNDER WATER.
  - CLASTIC
    - FORMED FROM PARTICLES OF ROCK THAT HAVE BEEN PRODUCED BY WEATHERING AND EROSION OF EXISTING ROCK.

- CLASTIC SEDIMENTS ARE CHANGED INTO ROCK ***(LITHIFIED)*** IN 2 WAYS:
  - COMPACTION/CEMENTATION
    - THE SEDIMENTS ARE DEPOSITED, COMPACTED AND "GLUED TOGETHER" (**CALCIUM CARBONATE)**

CLASTIC EXAMPLES

- **SEE PAGE 7 IN REFERENCE TABLES**

CHEMICAL

- CHEMICAL SEDIMENTARY ROCKS ARE FORMED FROM MATERIALS THAT WERE ONCE DISSOLVED IN WATER.
- "EVAPORITES AND PRECIPITATES"
  - SEE REFERENCE TABLES FOR NAMES
  - ALL CHEMICAL SED. ROCKS ARE "MONOMINERALIC"

ORGANIC

- ORGANIC SEDIMENTARY ROCKS ARE FORMED AS THE RESULT OF BIOLOGIC PROCESSES.
- EXAMPLE: COAL
  - PEAT - LIGNITE - BITUMINOUS COAL
  - FOSSILIFEROUS LIMESTONE
    - SHELLS OF ANCIENT MARINE ANIMALS

Characteristics of Sedimentary Rocks

1. Layering (stratification or stratified)
2. Fossils
3. Monomineralic
4. Cemented Shells

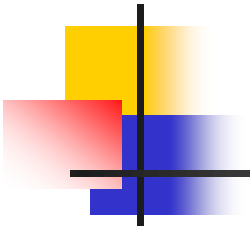
- Note: all pictures from
- http://geology.about.com/library/bl/images/blrockindex.htm

NONSEDIMENTARY ROCKS

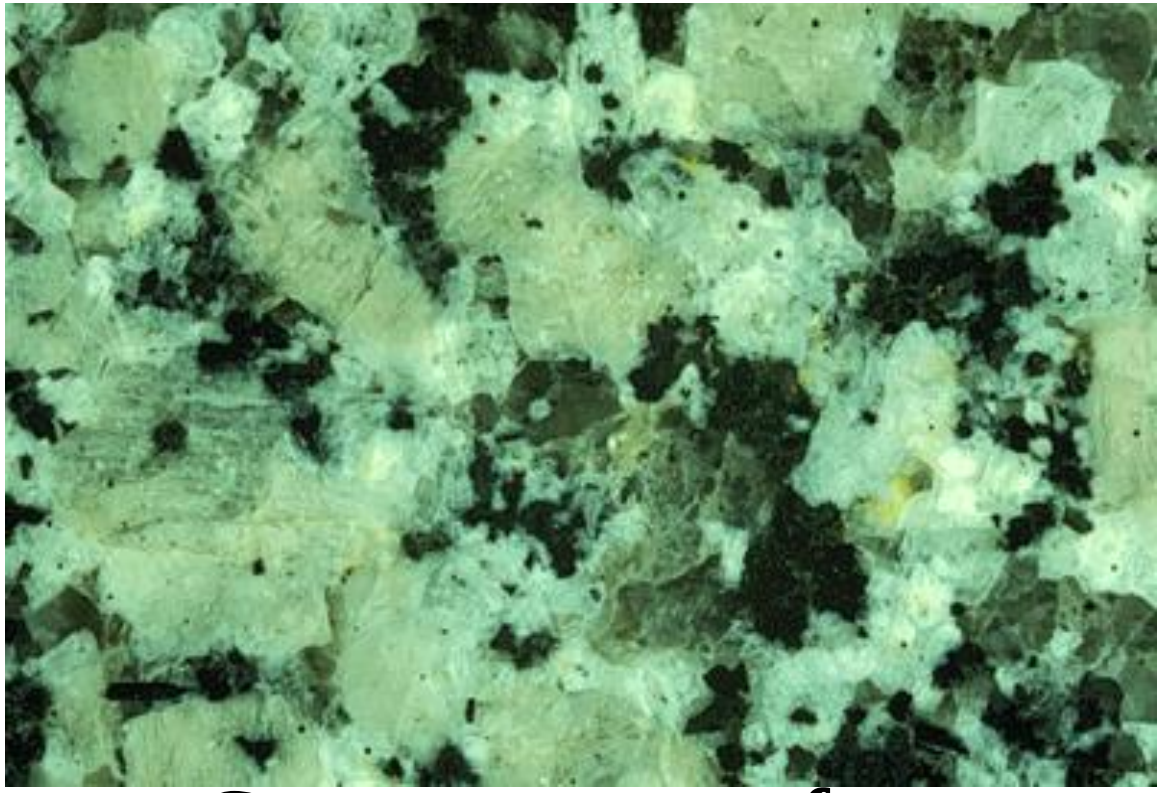
- IGNEOUS AND METAMORPHIC
- IGNEOUS
  - ROCKS THAT FORM AS A RESULT OF THE COOLING AND HARDENING OF ROCK MATERIAL THAT WAS ONCE **LIQUID. (MOLTEN)**

2 CATEGORIES OF IGNEOUS ROCK

- **INTRUSIVE (PLUTONIC)**
  - ***MAGMA*** COOLS SLOWLY FORMING LARGE CRYSTALS
  - TEND TO HAVE A ROUGH TEXTURE
- **EXTRUSIVE (VOLCANIC)**
  - ***LAVA*** COOLS QUICKLY FORMING SMALL CRYSTALS
  - SMOOTHER TEXTURE(PG. 6 REF TABLE)

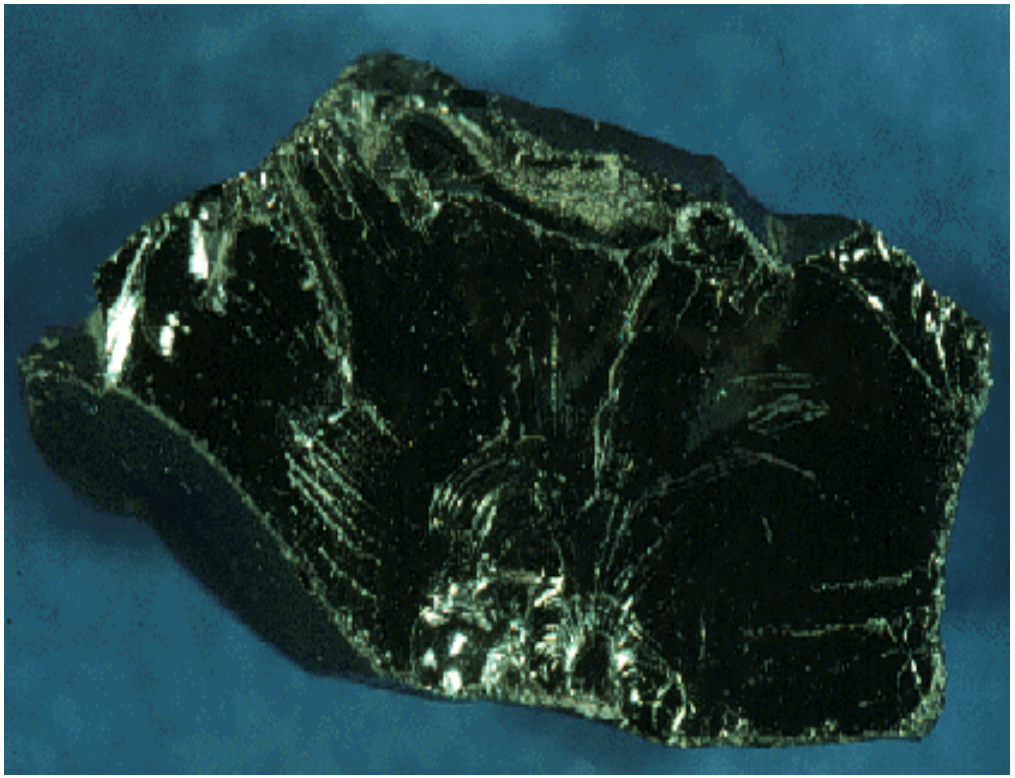


- IGNEOUS
  - TEXTURE
  - INTRUSIVE OR EXTRUSIVE
  - MINERALS PRESENT
  - COMPOSITION (FELSIC OR MAFIC).



Coarse texture of intrusive igneous rock

Fine texture of extrusive igneous rock.

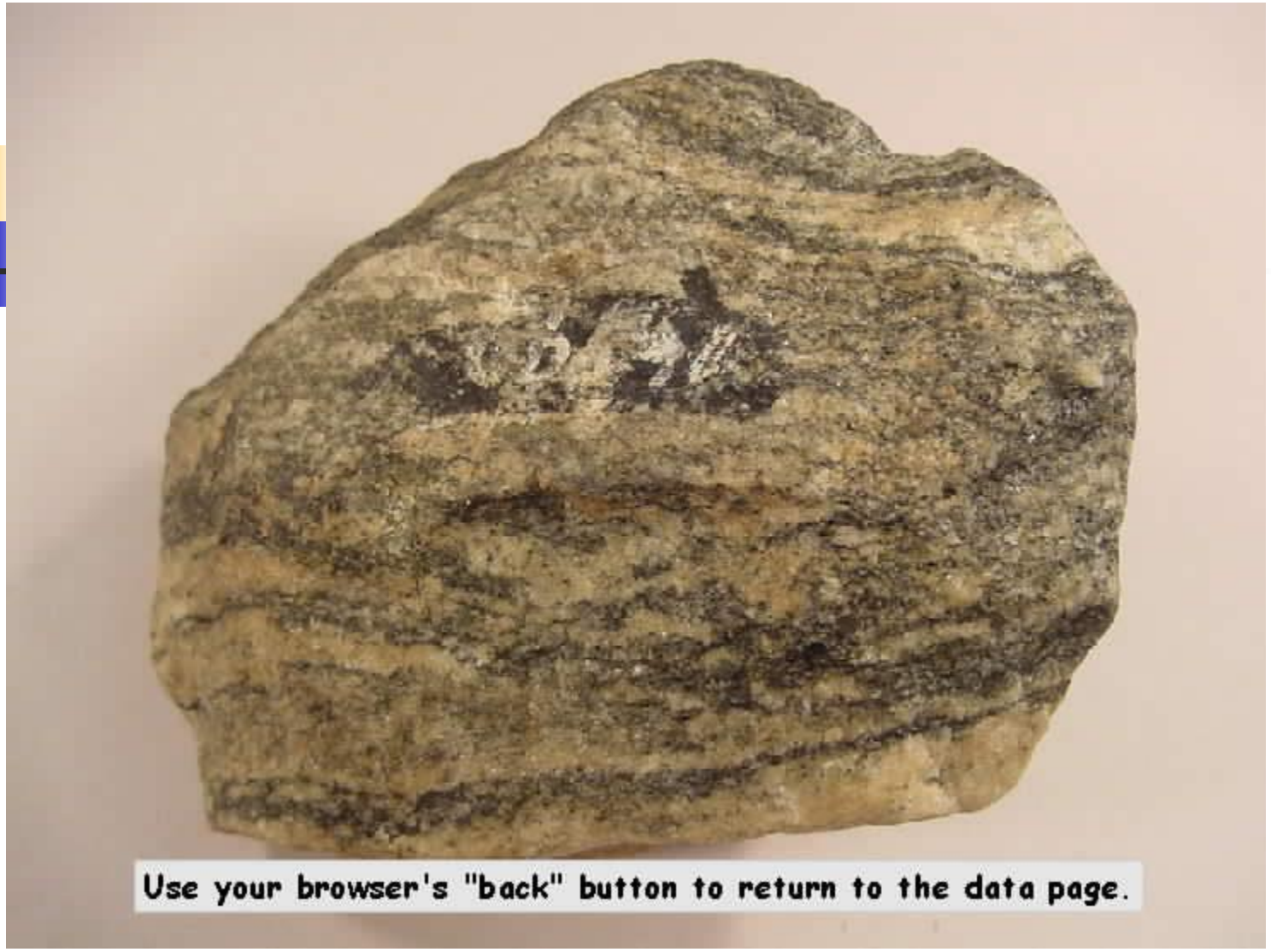


Glassy texture.

An example of porphyritic texture.

METAMORPHIC

- **METAMORPHIC (CHANGE)**
  - **ROCKS THAT FORM AS THE RESULT OF HEAT AND PRESSURE.**
- **CHARACTERISTICS**
  - **DISTORTION**
  - **BANDING OR ZONING**
  - **INCREASED DENSITY**
  - **CHEMICAL CHANGE (recrystallization)**



Example of Banding and Zoning

Schist foliation.

2 TYPES OF METAMORPHIC ROCK

- REGIONAL
  - WIDE AREAS USUALLY RESULT OF MOUNTAIN BUILDING
- CONTACT
  - FORMED AT THE INTERFACE OF HOT MAGMA AND EXISTING ROCK
  - SEE BOARD

COMMON METAMORPHIC ROCKS

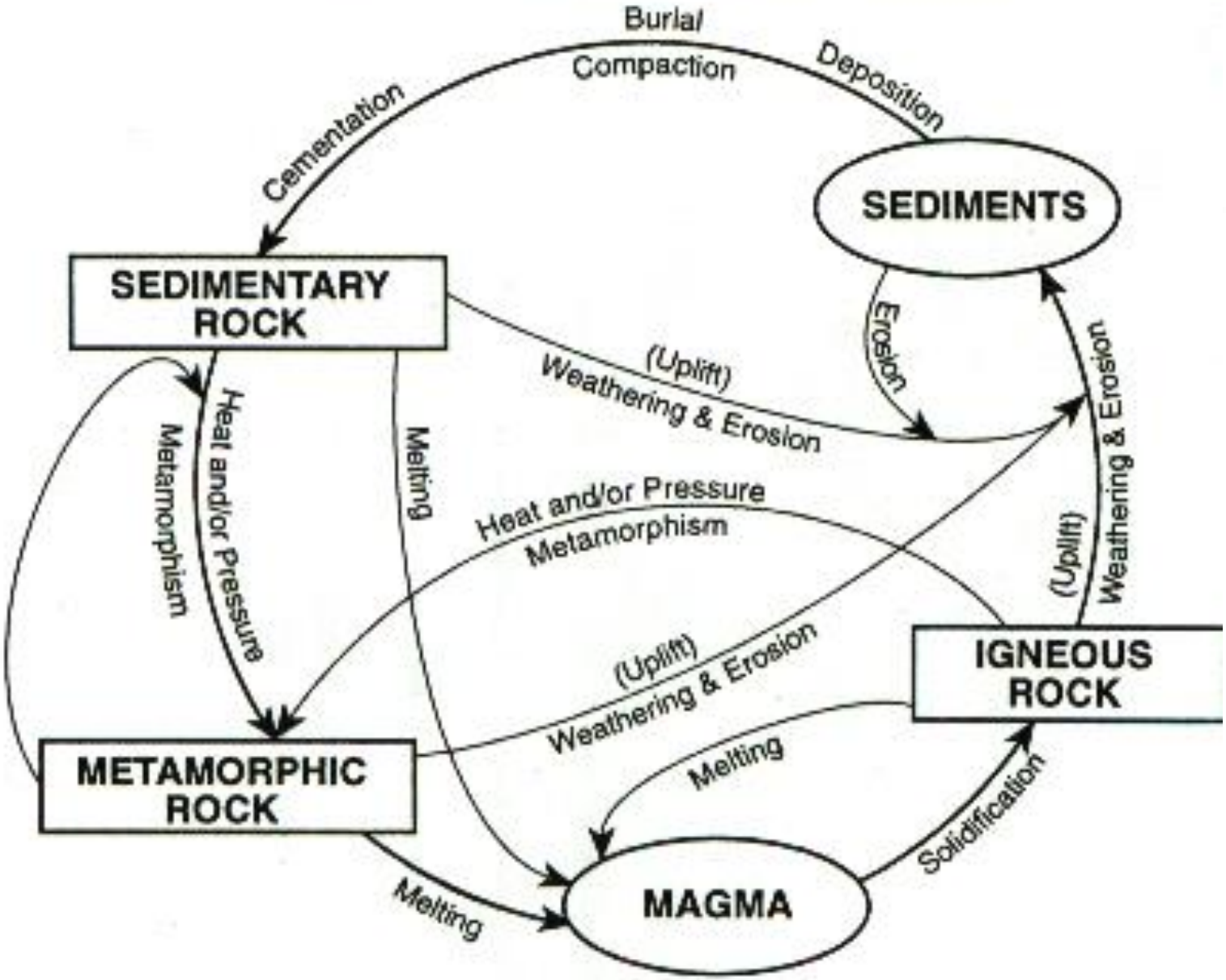
METAMORPHIC ROCK	PARENT ROCK
MARBLE	LIMESTONE
SLATE	SHALE
QUARTZITE	SANDSTONE
GNEISS	GRANITE
SCHIST	MICA/GARNET

SUMMARY

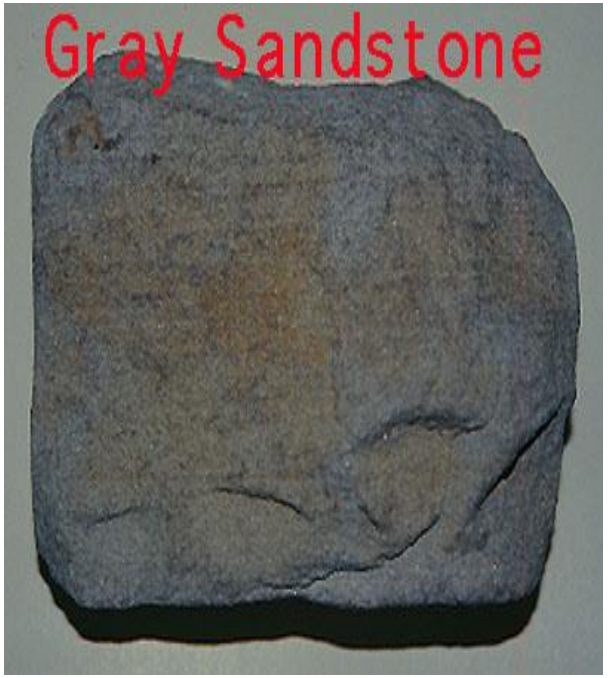
- SEDIMENTARY
  - FOSSILS, LAYERS, CLASTIC, CHEMICAL, ORGANIC
  - METHOD OF LITHIFICATION:
  - EVAPORATION, PRECIPITATION; COMPACTION/CEMENTATION OF LAND DERIVED SEDIMENTS; COMPACTION/CEMENTATION OF ORGANIC MATERIAL.

- METAMORPHIC
  - FOLIATED (APPEARANCE OF LAYERS)
  - TYPE OF FOLIATION FOUND P.7 REF TABLES.
  - TYPE OF METAMORPHISM (REGIONAL OR CONTACT)
  - ORIGINAL ROCK

Rock Cycle in Earth's Crust

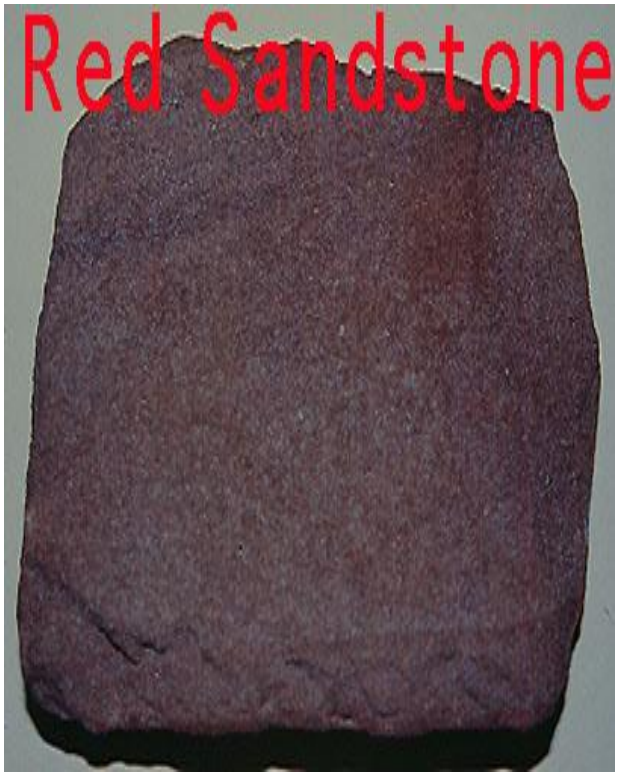


Sample Rock Pics Sedimentary



Sedimentary (Cont.)

Sedimentary (Cont.)



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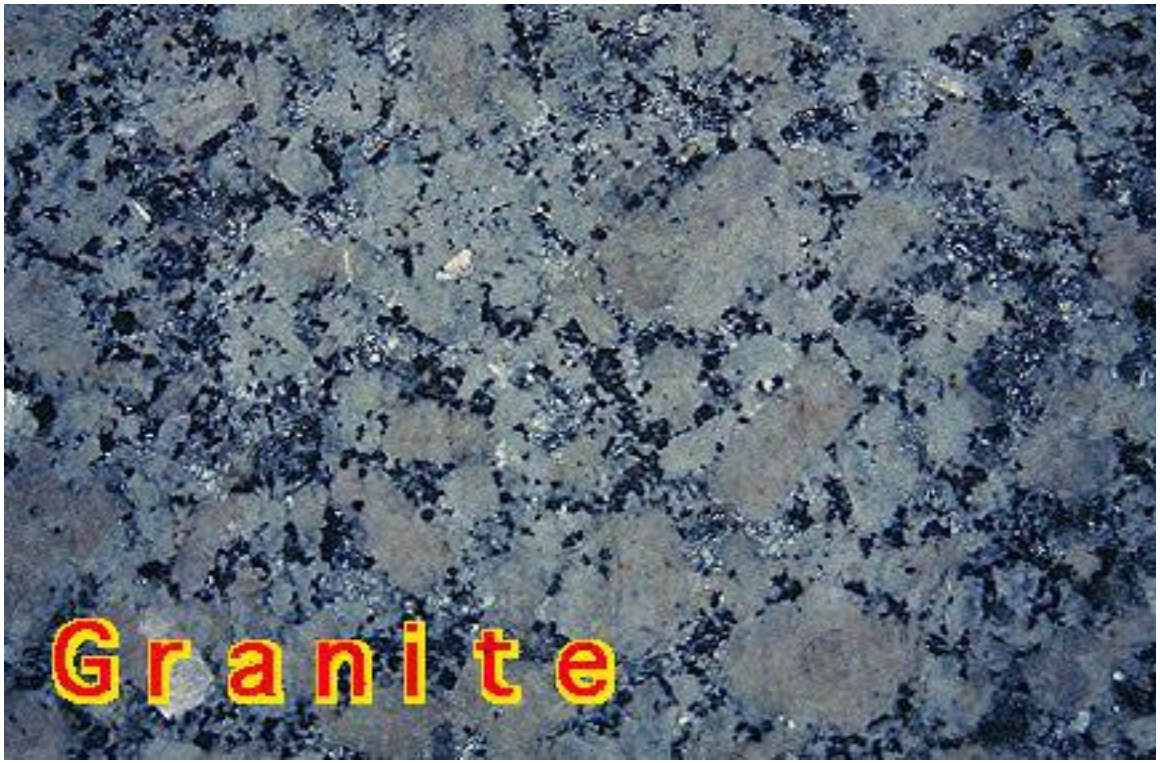
Sedimentary

Coquina

Igneous Rocks

- Basalt

Gabbro

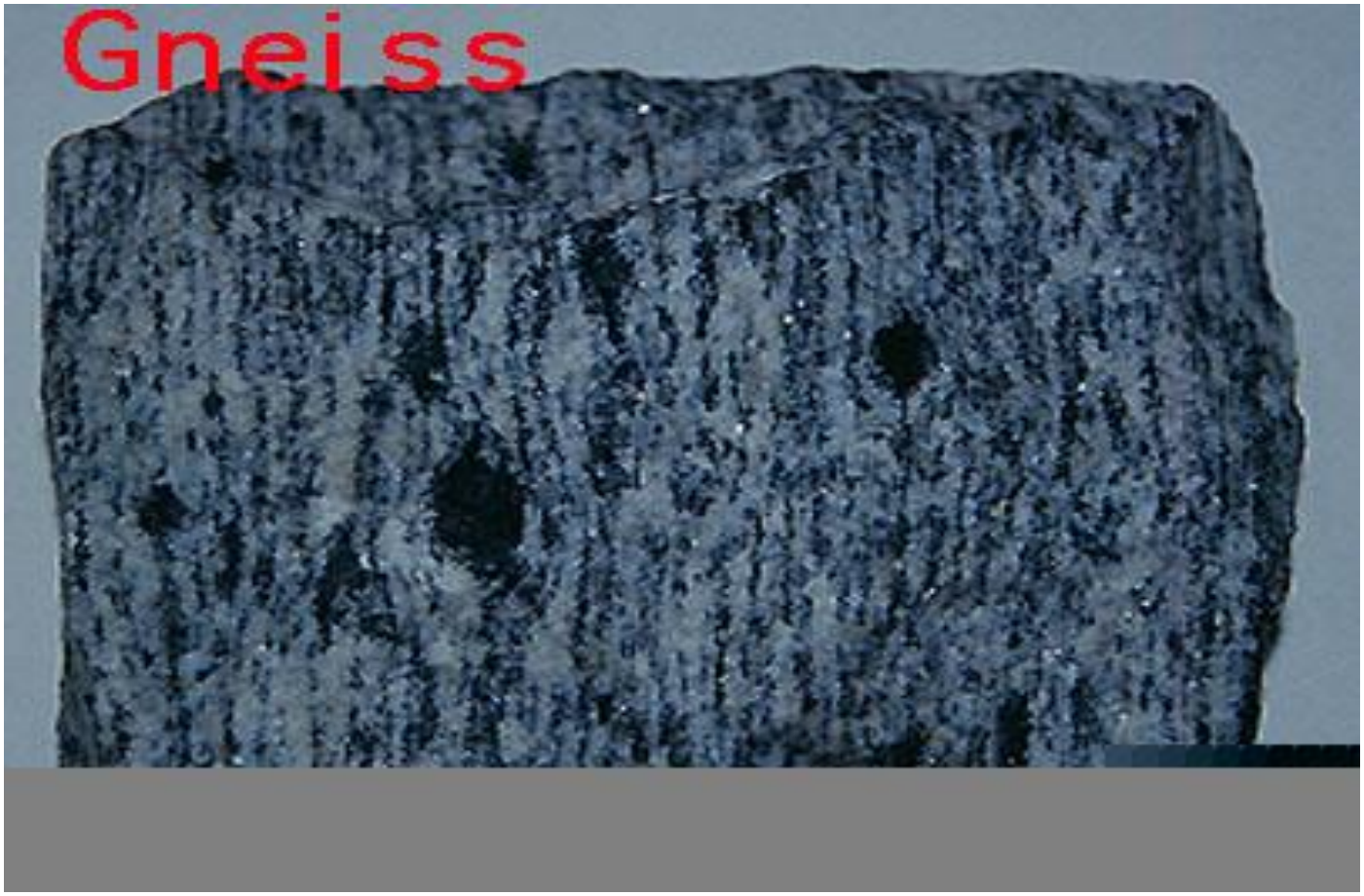

Granite

Obsidian

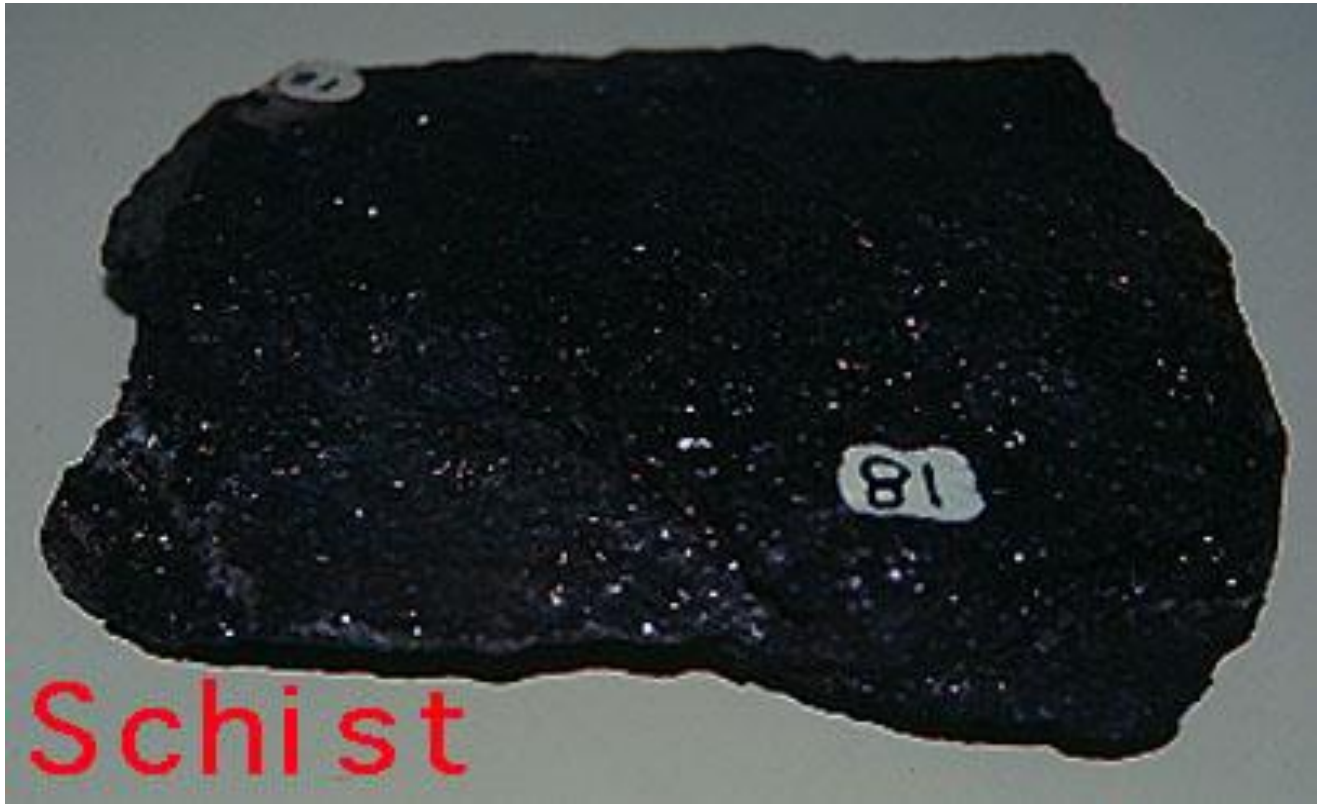
Pumice

Rhyolite

Metamorphic



Quartzite


81
Schist

Slate

White Marble

NATURAL RESOURCES

- **RENEWABLE**
  - **RESOURCES CAN BE REPLACED AFTER THEY HAVE BEEN USED**
    - **TREES, FRESH WATER ARE EXAMPLES**
- **NONRENEWABLE**
  - **CANNOT BE REPLACED FOR MILLIONS OF YEARS**
    - **NATURAL METALS (GOLD), ORES OF METALS (AL, FE)**
    - **FOSSIL FUELS**