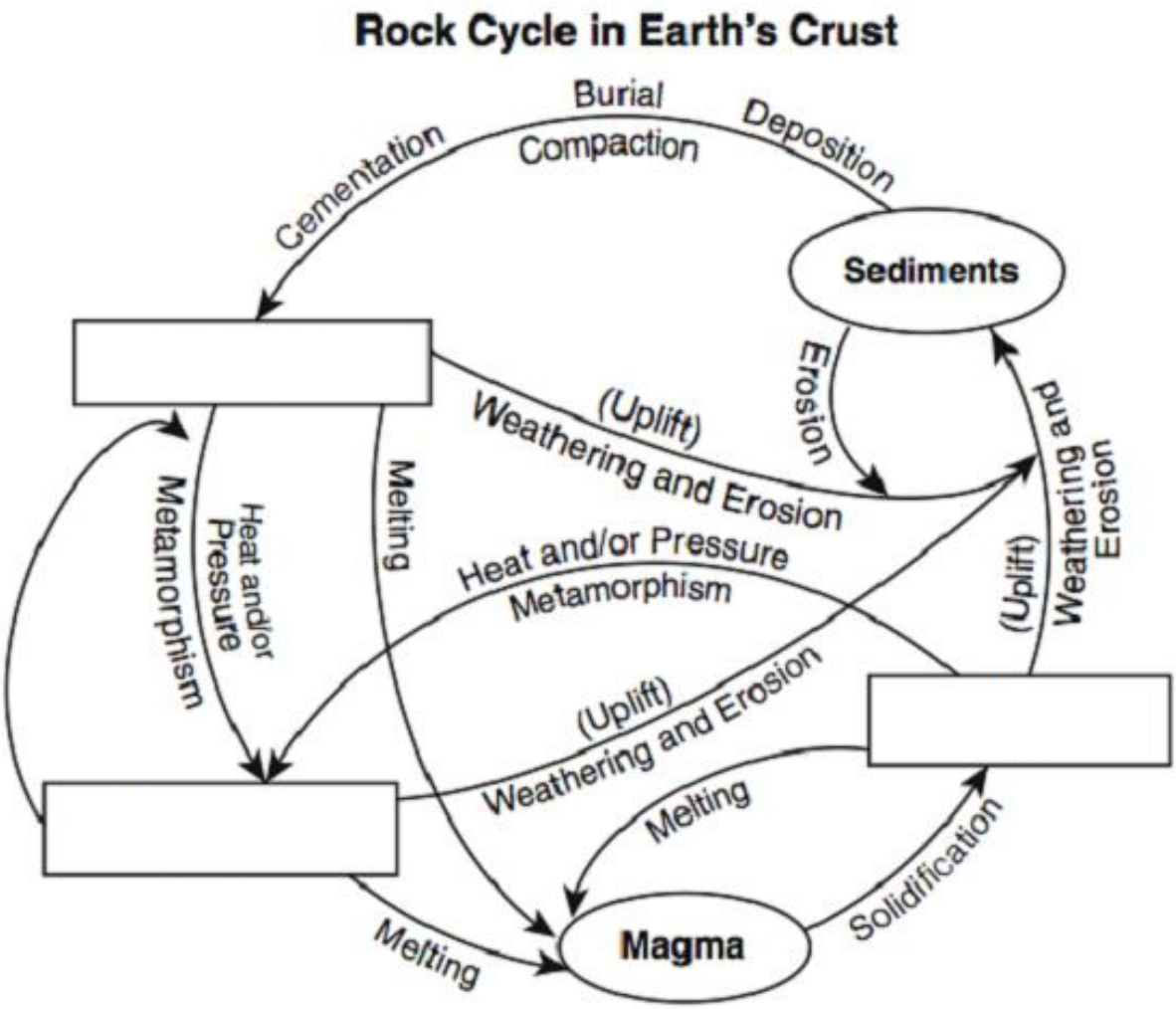
Name: _____

Chapter 10 Notes - Rocks

What is a rock? A group of _____ bound together in some way.

Three Major Types of Rock:

1. **Igneous** – rock that forms when _____ or magma cools and hardens
   - Example: Rhyolite
2. **Sedimentary** – rock that forms when _____ deposits harden after being compressed and cemented together
   - Example: Sandstone
   - **sediment** – rock, minerals, and organic matter that have been _____ into fragments by forces like wind, water, and ice
3. **Metamorphic** – rock changed by tremendous pressure, extreme _____, and chemical processes
   - Example: Marble



- Any of the three major types of rock can be _____ into another type.

IGNEOUS ROCK

- Two Types:
  1. **Plutonic** or **Intrusive** – SLOW cooling of mama deep _____ the crust
  2. **Volcanic** or **Extrusive** – the RAPID cooling of lava _____ earth's surface

Igneous Texture

- The biggest difference between intrusive and extrusive igneous rock is the _____ size.
  - Intrusive → large grains → rough or _____-grained texture
    - Example: Granite
  - Extrusive → small grains → smooth or _____-grained texture
    - Example: Basalt
- What if a sample of rock has both small and large crystals? What do you think occurred to the rock to produce both sizes of crystals?
  - _____ **texture** – an igneous rock with a mixture of large and small crystals
  - The magma cools slowly at first and then more rapidly as it nears the surface.

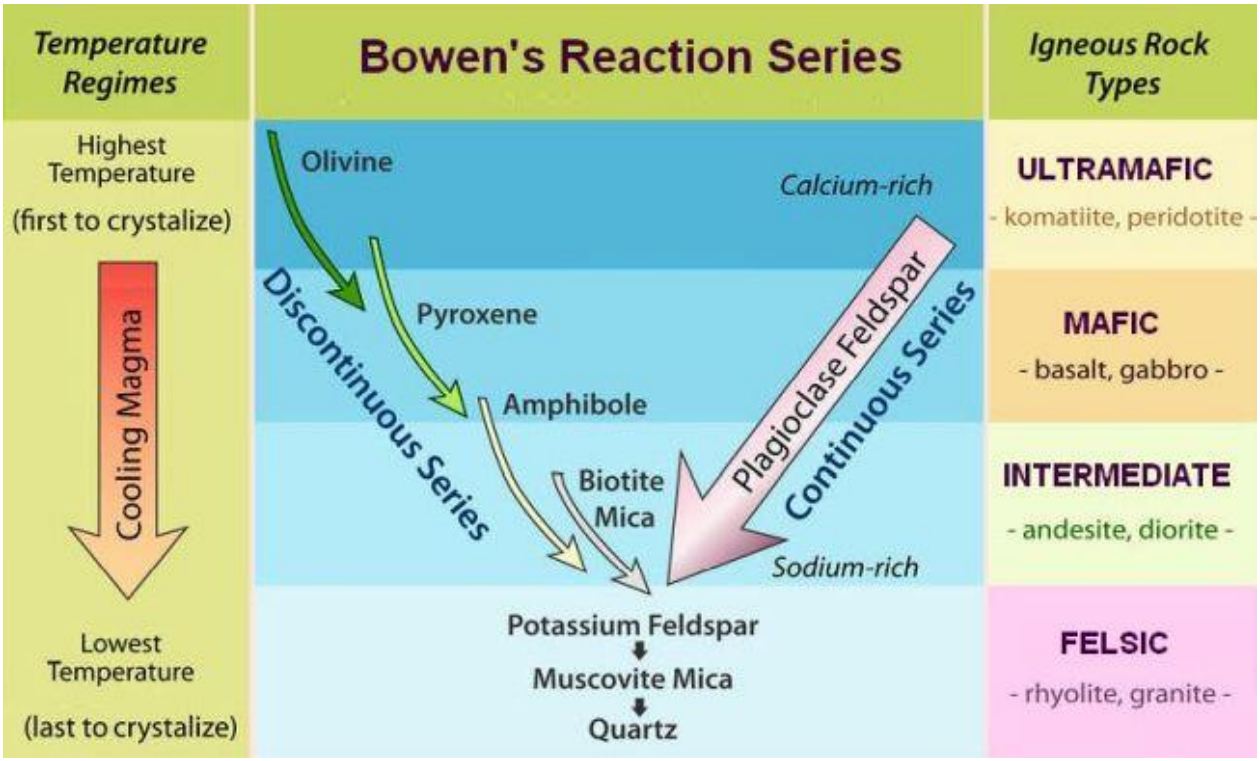
Other Igneous Rock Formations

- When highly viscous, silica-rich magma cools rapidly, the resulting rock has no crystals
  - Example: _____
- When magma that contains a large portion of dissolved _____ cools rapidly, the gases may become trapped in the rock
  - Examples: Pumice, Scoria

Igneous Composition

- Three Groups:
  1. Felsic – high in silica
     - _____ in color
     - Examples: (coarse) Granite, (fine) Rhyolite, Obsidian
  2. Mafic – high in iron and magnesium
     - _____ in color
     - Examples: (coarse) Gabbro, (fine) Basalt
  3. Intermediate
     - medium-colored rocks
     - Examples: (coarse) Diorite, (fine) _____
- If you know that an igneous rock has a coarse-grained texture, can you identify the group that it is in? Why?

_____

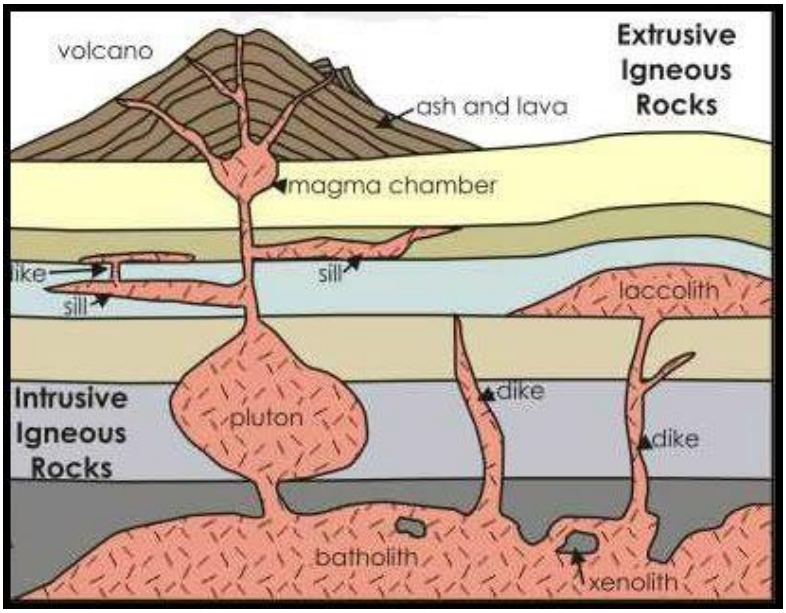


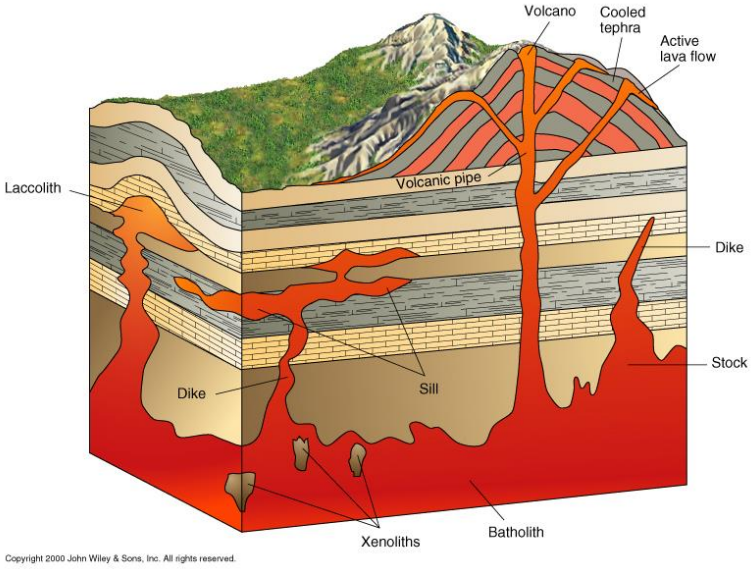
- Bowen's Reaction Series compares the different _____ stages of common rock-forming minerals.

Igneous Rock Structures

- **intrusions** – igneous rock masses that form _____
  - **batholiths** – the _____ of intrusions (100km^2+)
    - Form the cores of many major mountain ranges like the Sierra Nevada Range in _____
  - **stocks** – an intrusion less than 100km^2
  - **laccolith** – flat-bottomed intrusion that _____ over-lying rock layers into an arc
    - Often found in groups
    - Forms small dome-shaped mountains like those found in the Black Hills of _____ Dakota
  - **sill** – _____of hardened magma that forms between and parallel to layers of rock
    - Vary in thickness (couple cm to hundreds of meters)
    - Big Bend National Park in _____ has many sills
  - **dike** – igneous rock intrusion that cuts _____rock layers
    - Common in areas of volcanic activity
- **extrusions** – igneous rock masses that form _____ earth's surface
  - volcano
  - **volcanic neck** – solidified central _____ of a volcano
    - <u>Example:</u> Shiprock, New Mexico

- **lava flows** – _____ masses of rock
- **lava plateau** – raised, flat-topped area made of layers of hardened lava





SEDIMENTARY ROCK

- Most sedimentary rock is made up of accumulations of various types of _____
- Two main processes that form sedimentary rock:
  1. **Compaction** – process in which air and water are _____ out of sediments by the weight of overlying rock
  2. **Cementation** – process in which dissolved minerals left by _____ passing through sediments bind the sediments together
- Three Groups of Sedimentary Rock
  1. _____ – rock made up of fragments from pre-existing rocks (cemented together by silica, calcite, or iron oxide)
  2. _____ – rock formed from minerals that precipitate from water
  3. _____ – rock formed from the remains of organisms

Clastic Sedimentary Rock

- Classified by the size of the sediments they contain
  - Gravel sized grains
    - **Conglomerate** – sedimentary rock composed of rounded _____ or pebbles cemented together by minerals
    - **Breccia** – sedimentary rock composed of _____ fragments with sharp corners cemented together by minerals
  - Sandstones – _____-sized grains that have been cemented together
    - Main component = _____
    - Often porous – allowing liquids to move through the rock easily
  - Shale – _____-sized particles cemented and compacted under pressure
    - Flaky, usually pressed into _____ layers that easily split apart

Chemical Sedimentary Rock

- Rocks formed from _____ once dissolved in water
- Some form through precipitation due to a _____ change
    - <u>Example:</u> A type of chemical limestone forms when ocean water temps are lowered. _____ precipitates, settles, and eventually solidifies on the ocean floor.
- Some form through _____
    - Dissolved minerals left behind form rocks called **evaporites**
    - <u>Examples:</u> _____, halite
    - Bonneville Salt Flats near Great Salt Lake, Utah

Organic Sedimentary Rock

- Rocks formed from the remains of _____ things
- <u>Example:</u> coal – formed from decayed _____ remains that are buried and compacted
- <u>Example:</u> some limestones – formed when marine organisms (like coral, clams, oysters, plankton) remove aragonite from sea water to form their _____. When they die their shells become limestone.
    - _____, like that along the White Cliffs of Dover in England

Sedimentary Features

- **stratification** – _____ of sedimentary rock (occurs when there is a change in the kind of sediment being deposited)
    - Change in river current or sea _____ causes stratification
    - Water strata are laid down _____
    - Some wind strata are characterized by _____*bedding*
    - When various sizes and kinds of materials are deposited within one layer, _____*bedding* will occur. The different sizes and shapes of sediment will settle to different levels.
- **_____ marks** – formed by wind or water on sand
- **_____ cracks** – result when muddy deposits dry and shrink
    - Often found on river flood plains or dry lake beds
    - If the area is flooded again, new deposits will fill in the cracks and _____ them as the mud hardens to solid rock
- **fossils** – the remains or traces of ancient plants and animals – usually preserved in _____ rock
- **concretions** – lumps or nodules of rock with a composition _____ from that of the main rock body
    - Formed when minerals precipitated from solutions build up around an existing rock particle or inside cavities in sedimentary rock
    - Crystal cavities of quartz or calcite are called "_____"

METAMORPHIC ROCK

- The changing of one type of rock to another by heat, _____, and chemical processes is called metamorphism
- Most metamorphic rock forms deep _____ the surface of the earth
- Two Types:
    1. _____ **Metamorphism** – when hot magma pushes through existing rock, the heat from the magma can change the structure and mineral composition of the surrounding rock
    2. _____ **Metamorphism** – change that affects rocks over large areas during periods of tectonic activity
        - Movement of one plate against another creates tremendous heat and pressure in the rocks at plate edges

Metamorphic Texture

- Metamorphic rocks are classified according to _____
- Two Groups:
    1. Foliated Rocks
        - Foliated textures have parallel _____ of minerals
        - Can form two ways:
            1) Extreme _____ may flatten the mineral crystals in the original rock and push them into parallel bands
            2) As minerals of different _____ separate into bands (producing a series of light and dark bands)
        - <u>Example:</u> slate (from shale)
        - <u>Example:</u> schist (from shale)
        - <u>Example:</u> gneiss
    2. Nonfoliated Rocks
        - No _____
        - <u>Example:</u> quartzite (from sandstone)
            - Mineral grains recrystallize so there are no _____ between the grains (increasing its hardness and durability)
        - <u>Example:</u> _____ (from limestone)