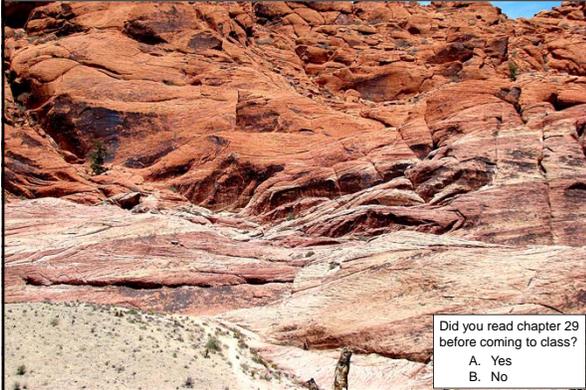


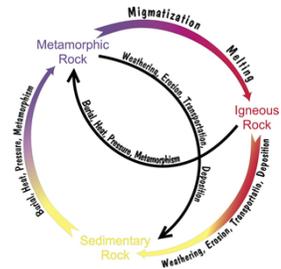
Chapter 29 (New): Rocks



Did you read chapter 29 before coming to class?
 A. Yes
 B. No

The main types of rocks

- IGNEOUS ROCKS**
 - Form from hot, liquid magma
 - Plutonic: Cools below surface
 - Volcanic: Cools on surface
- SEDIMENTARY ROCKS**
 - Form as layered deposits in oceans, lakes, and on land
- METAMORPHIC ROCKS**
 - Form when pressures, temperatures and fluids change rocks in the solid state



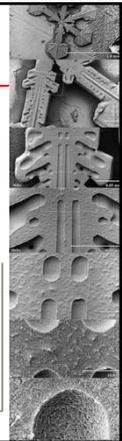
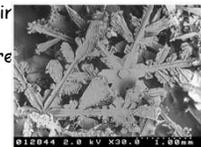
Rocks are made from Minerals

- A mineral:**
 - Is Naturally occurring
 - Is an inorganic solid
 - Has a fixed or narrowly limited chemical composition
 - Has a definite internal crystal structure
 - Has limited stability in the face of varying pressure, temperature, or in the presence of water



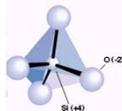
Water as a mineral

- Is Naturally occurring
- Is an inorganic solid
- Has a fixed or narrowly limited chemical composition
- Has a definite internal crystal structure
- Has limited stability in the face of varying pressure, temperature or in the presence of water



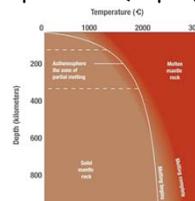
Silicates

- Comprise most of the rocky material on earth
- Depending on which metals/ions it combines with it can form a variety of minerals



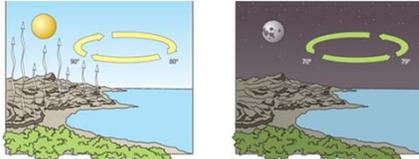
Igneous Rocks

- Begin as molten rock, or magma
- Melting depends on temperature and pressure (depth)



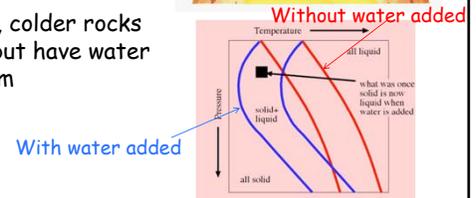
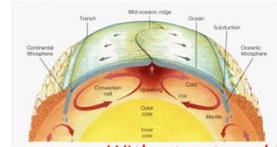
Convection

- cold (high density) fluids sink
- warm (low density) fluids rise
- this creates circulating currents



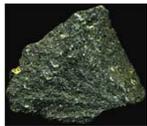
Convection in the mantle

- Warmer magma expands and becomes less dense
- The buoyant force causes it to rise
- Older, colder rocks sink, but have water in them



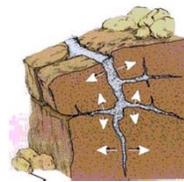
Crystal size is determined by the rate of cooling

- Once minerals cool below a certain temperature, the mineral components are no longer free to move



Weathering changes rock

- Physical weathering is caused by water and living activity

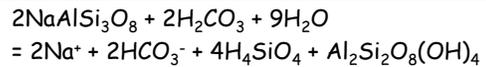


Chemical weathering

- Water and carbon-dioxide make acid
 - $H_2O + CO_2 = H_2CO_3$
- Acid dissolves calcite
 - $CaCO_3 + H_2CO_3 = Ca^{2+} + 2HCO_3^{-1}$



Chemical weathering of Plagioclase



Rock + Acid + Water = Dissolved Ions + Clay



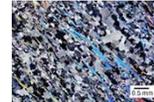
Sedimentary rocks

- Limestone
- Gypsum
- sandstone
- Etc.



Metemorphic rock

- High temperatures and pressures cause the rocks to change (meta) form (morph)
- Most rocks are metamorphic, since they form at high temperature and pressure, but we don't see them at the surface
 - Marble is changed limestone
- Foliation (Layering) can occur when non-uniform forces are present when the rock forms



The rock cycle again

