EXAM REVIEW SHEET

What is a mineral?

-To be considered a mineral, the substance in question must meet the following criteria:

- Naturally occurring (not man-made)
- Solid (not a liquid or a gas)
- Inorganic (not from living organisms)
- Definite chemical composition (specific chemical make-up)
- Definite crystalline structure (specific arrangement of atoms)

How do we identify minerals?

- **COLOR**- Most visible characteristic, but unreliable because many minerals share the same color and many minerals exist in different colors.
- **STREAK**- The color of the mineral in powdered form (use a "streak plate"). Very reliable tool for identifying samples. Note: the color of the powdered form is often different form the color of the solid form.
- **FRACTURE/ CLEAVAGE**- **Cleavage** is the tendency of a mineral to split along one or more smooth, flat surfaces. If a mineral does not display cleavage, it is said to have **fracture**, which means it breaks unevenly.
- **HARDNESS**- The mineral's resistance to being scratched. Minerals are compared to the ten minerals on the "Moh's Scale of Hardness". Minerals are often compared to glass (hardness: 5.5).
- **LUSTER**- Either **metallic** (shiny, like a polished metal) or **nonmetallic** (dull, with no shine). Types of nonmetallic luster include glossy, pearly, greasy, earthy, etc.
- Other characteristics that can be tested include: magnetism, reaction with chemicals, taste, specific gravity, crystal form, fluorescence, optics.

ALL PHYSICAL CHARACTERISTICS ARE A RESULT OF THE MINERAL'S INTERNAL ARRANGEMENT OF ATOMS.

What does Earth's Interior look like?

-Our model of the Earth's interior is based on the study of seismic waves.

- **CRUST** (solid, rocky surface)
  - **Continental crust is thick, low density, and composed of granite**
  - **Oceanic crust is thin, high density, and composed of basalt**
- **MANTLE** (From top to bottom; rigid mantle, plastic mantle, stiffer mantle)
  - The Crust and the Rigid Mantle make up the **lithosphere**
  - The **Moho** is the boundary between the crust and the rigid mantle
  - The Plastic Mantle is partially melted and known as the **asthenosphere**
- **OUTER CORE** (liquid iron)
- **INNER CORE** (solid iron and nickel)

-As depth increased, density, pressure, and temperature increase.

What is the Theory of Continental Drift?

-In the early 1900's, German Meteorologist Alfred Wegener theorized that the continents were once connected in a super-continent and they have been drifting across the Earth's surface ever since.

-Wegener's super-continent was named "Pangea" and is thought to have existed about 250 million years ago.

-Wegener had four major pieces of evidence supporting his theory:

- **THE APPARENT FIT** (South America and Africa appear to fit together like puzzle pieces)
- **FOSSIL CORRELATION** (The same exact fossils are found on opposite sides of the Atlantic ocean)
- **ROCK CORRELATION** (The same exact rocks/mountains are found on opposite sides of the Atlantic ocean)
- **PAST CLIMATE DATA** (There is evidence of glaciers in tropical locations, and deposits of coal in Antarctica)

-The theory of Continental Drift was not accepted because it failed to explain what was causing the continents to move (no mechanism).

What is the Theory of Plate Tectonics?

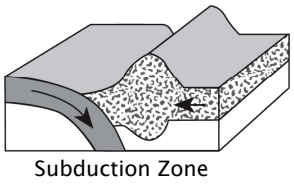
-In the mid-1900's, scientists built upon Wegener's theory, eventually formulating the theory of Plate Tectonic

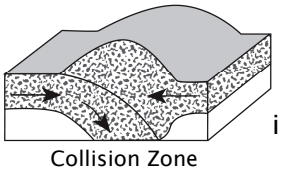
-This theory says that;

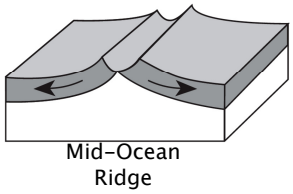
- The lithosphere is broken into plates...
- These plates "float" on the plastic asthenosphere beneath...
- Along plate boundaries, the plates interact.
- **All seismic activity is found along plate boundaries.**
- Plate motion is driven by mantle **convection**.
  - Heat lowers density causing a substance to rise where it cools, becomes more dense and sinks
  - This motion of the asthenosphere moves the overlying plates around

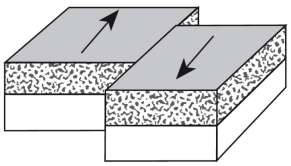
-There are three types of Plate Boundaries

- **Convergent (plates move together)**
  - Subduction Zone (oceanic crust sinks beneath continental crust)
    - Earthquakes, volcanoes, trenches and mountains are common
    - Earthquakes become deeper as the oceanic plate sinks
    - **Example: Peru-Chile Trench**
  - Island Arc (oceanic crust sinks beneath oceanic crust)
    - Earthquakes, volcanoes, and trenches are common
    - Earthquakes become deeper as the oceanic plate sinks
    - **Example: Aleutian Islands**
  - Collision Zone (continental crust collides with continental crust)
    - Earthquakes and mountains are common
    - **Example: Himalayas**
- **Divergent (plates move apart)**
  - Mid-Ocean Ridge (two oceanic plates move away from one another)
    - Magma fills in the crack creating new rock
    - As you travel from the ridge to the continents, the rock increases in age
    - Earthquakes occur along the ridge
    - There are alternating bands of magnetism on either side of the ridge that match up with each other.
    - **Example: Mid-Atlantic Ridge**
- **Transform (plates slide past one another)**
  - Earthquakes are common
  - **Example: San Andreas Fault**


Subduction Zone


Collision Zone

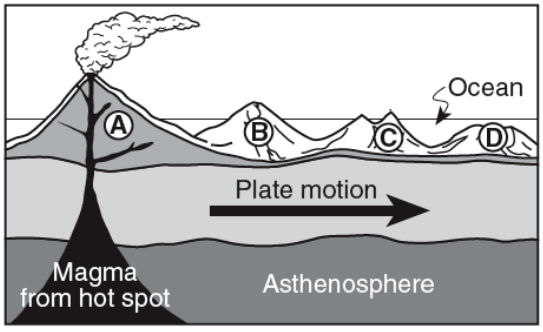

Mid-Ocean Ridge


Transform Fault

What is a Hot Spot?

-Volcanic/Earthquake activity away from a plate boundary
-A **plume of magma** rises through a crack in the lithosphere creating a volcano (along with earthquakes)
-The plate moves over the hot spot creating a chain of volcanic islands.
-Only the island over the hot spot is active

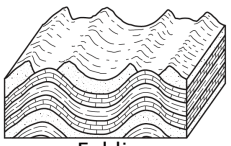
- **Example: Hawaii**



ALL PLATE MOTION IS CAUSED BY CONVECTION CURRENTS IN THE ASTHENOSPHERE.

What is Deformation?

-The heat and pressure involved in the motions of the lithospheric plates causes them to become deformed.
-All rocks on the surface are originally laid down in horizontal layers.
-Rocks observed in any other arrangement have been deformed by the motion of the plates.


Folding


Tilting and Faulting

What are igneous rocks?

-Rocks that form from hot, molten rock that has solidified.
-Hot molten rock inside the Earth is called **magma**.
-Once it reaches the surface, it is called **lava**.

How do igneous rocks form?

-Deep in the Earth, temperatures are high enough to melt rock.

-As rock rises to the surface, it cools and solidifies into rock.
-Sometimes this occurs underground, sometimes it occurs at the surface.

- **Rocks from magma…**
  - When magma cools and solidifies (**crystallizes**) while still inside the Earth, it forms an **intrusive**, or **plutonic** igneous rock.
  - Because they take longer to cool, intrusive igneous rocks have large crystals **(the longer the cooling time, the larger the crystals)**.

- **Rocks from lava…**
  - When lava cools and solidifies (**crystallizes**) after erupting onto the surface, it forms an **extrusive**, or **volcanic** igneous rock.
  - Because they cool very quickly, extrusive igneous rocks have small, or even no crystals.

Characteristics of Igneous Rocks…

-**Felsic** igneous rocks are:
  - light in color
  - contain feldspars and silicon

-**Mafic** igneous rocks are:
  - dark in color
  - contain magnesium and iron

-Igneous rocks are often described using the term **texture**.

-Common textures include:
  - **glassy** (no crystals)
  - **fine** (small crystals)
  - **coarse** (medium crystals)
  - **very coarse** (large crystals)

-Some extrusive igneous rocks cool so quickly that air becomes trapped in the rocks forming small gas bubbles. These rocks are called **vesicular**

What is a Metamorphic Rock?

-How do they form?
- When exposed to intense heat and/or pressure inside the earth, rocks (any type) will be changed (morphed) into a new rock.
- They do not melt, they **recrystallize** when exposed to heat and pressure

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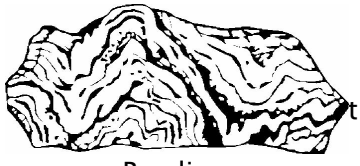
-Types of Metamorphism
- **Regional**- Occurs over large areas
  - Can happen over large areas (even hundreds of miles)
  - Caused by intense pressure involved in plate tectonics
  - Crystals are squished and altered
- **Contact**- Occurs along the edges of magma or lava
  - Can occur above or beneath ground
  - When lava or magma comes into contact with rocks, the heat alters those rocks


Banding

-Characteristics
- Foliated- banding of minerals
- Distorted due to pressure
- May have consistent color, if so, look at crystals for identification