

## Student Notes: Unit 3- The Structure of the Earth

### Part 2 – The Earth's Crust

#### Earth's Layers Review:

- The layers of the Earth are as follows from inside, out:
  - Inner Core
  - Outer Core
  - Mantle
  - Earth's Crust
- Earth's near surface layers are also called the following:
  - Lithosphere = crust and uppermost portion of the mantle.
  - Asthenosphere = thin slush-like layer of the mantle; the lithosphere floats on this.

#### Uncovering the Earth's Interior:

- We know more about stars and distant galaxies than our own Earth's interior.
- It has been studied by investigating direct and indirect sources.

##### Direct Source:

- Parts of the mantle have been pushed up through the surface during movements of the ocean floor (plate tectonics).
  - Ex: Grouse Mourn National park, NFLD

##### Indirect Sources:

- Studying Meteorites
  - Meteorite = fragments of asteroids and small early planets that broke upon impact with other bodies in space.
  - It is believed meteorites were formed the same way and are made from similar materials as Earth.
  - There are two kinds:
    1. iron-nickel meteorites = similar to Earth's core
    2. stony meteorites = similar to Earth's mantle
- Science of Seismology
  - seismology = the scientific study of earthquakes. Seismic waves generate waves as they pass through earth's layers.
  - They allow us to know the density of different layers of earth.
  - Earthquakes make 2 types of waves:
    1. P (Primary) Waves = travels through both solids and liquids and penetrates the Earth's interior. They are the fastest.
    2. S (Secondary) Waves = the only waves to travel through solids and moves the earth's crust from side to side. They are slower.
- Seismic Tomography
  - seismic tomography = the latest technique to get information about the variations in the density and temperatures of the upper and lower mantle.
  - uses instruments that identify plate movement sometimes less than the width of a human hair.
  - Can point out hot spots (volcano areas) in the mantle and also cool denser parts of the mantle.

#### Importance of the Earth's Interior:

- Magnetic Field
  - generated by movements of the molten iron and nickel layer in the outer core
  - the convection currents generate and maintain the magnetic field
- Heat generated by radioactive material
  - causes currents in the asthenosphere and mantle which cause movements in the lithosphere
  - movements are responsible for the formation of mountain ranges, deep sea trenches, volcanic belts, and earthquake zones.

## What is a mineral?

- Mineral = naturally occurring inorganic solids with a distinct chemical composition and structure
- most minerals found are compounds made of one or more elements
- some however consist of single elements such as silver (Ag), copper (Cu), sulfur (S), and diamond (C)
- Minerals are formed by the following processes:
  - The magma process
  - The pressure Process
  - The evaporation process

## What is a rock?

- A rock is made up of a group of minerals bound together chemically.
  - Ex: Granite is made up of the minerals feldspar, mica and quartz
- Because of the process for forming rocks, minerals will look different within a rock compared to their basic state.
- There are 3 types of rocks:
  1. Igneous = formed by the cooling and hardening of hot, molten rock or magma from inside the earth. Are known as “fire” rocks and make up 64.7% of Earth’s crust.
  2. Sedimentary = formed by the compacting and cementing of layers of sediment. Are known as “water” rocks and makes up 7.9% of Earth’s crust..
  3. Metamorphic = formed by the effect of heat and pressure on other rocks. Are known as “stress” rocks and make up 27.4% of Earth’s crust.

## Rock Cycle:

- As scientists began to study rocks they realized that the rocks they saw were not as old as the Earth itself. This told them that rocks had to have gone somewhere and new ones had to have been created.
- The answer for this has been defined as the rock cycle.
- Magma from the mantle is the source of all Earth’s rocks.
- Rocks form from other rocks as they gradually and continually change from one time of rock to another.
- This cycle is not a one way cycle as rocks do not necessarily change from one rock to another in a sequence but rather can witch between igneous, sedimentary and metamorphic in any given order.

## Igneous Rocks

- See Chart!

## Sedimentary Rocks

- See Chart and Worksheet on Features of Sedimentary Rocks!

## Metamorphic Rocks

- See Chart!

## Characteristics of Rocks

- Rocks can be identified by looking at the following items:
  1. Acid Reaction – looks to see if a rock bubbles or not, if it does it is either marble or limestone
  2. Composition – grains interlock or are non-interlocking colour
    - If non-interlocking grains, not blended together, shows particles it is sedimentary
    - If interlocking grains, parts are blended and no particles showing it is igneous or metamorphic
  3. Texture – alignment of grains
    - Speckled, no bands it is igneous
    - Easily split layers, narrow bands of light and dark minerals it is metamorphic
  4. Some additional things to notice:

- Fragments of rocks or fossils are sedimentary rocks
- If it is speckled or layered or looks like there are glued particles it is sedimentary.
- If the rock is glassy or porous it is igneous
- If the rock looks homogeneous it is metamorphic.