Geology

= is the science which deals with the origin, structure, composition, and history of the earth.

Dimensions of the Earth

- Diameter of the earth (equatorial) - 6 371 km
- The length of the Equator - 40 076 km
- The length of meridians - 40 008 km
- The weight of the Earth - 5 977.10^{24} kg
- The volume of the Earth - 1 083 320.10^{6} km^3
- The surface of the Earth - 510 100 993 km^2

The crust

= the outermost thin and rigid layer which floats on the semi-molten rock mantle.

- **Oceanic crust** - located at the oceanic bottom, thinner than continental (5 - 10 km), compact (compressed by oceanic water pressure), mostly heavier rock types such as basalt
- **Continental crust** - creates the continents and continental shelves, relatively thick (20 - 65 km), lighter rock types such as granite

The mantle

= consists of semi-molten rocks with prevailing siliceous content which is commonly referred to as magma.

- density 4,33 g/cm^3 to 5,53 g/cm^3

The core

= the most inner part of the planet

Outer core - semi-molten, mostly composed of molten Fe,
- from the depth of 2900 km to 5150 km
- circulatory movement of the molten ferritic rock with electronically charged particles creates the magnetic field of the earth
- density 10 to 12,3 g/cm^3
- 4000°C

Inner core - solid, consists of Ni and Fe,
- density 13,3 to 13,63 g/cm^3
- 5150 km and deeper

The boundary separating the material of lower mantle and outer core is called **Gutenberg discontinuity**.
Discontinuity between the crust and the upper mantle is called **Mohorovicic discontinuity**, or simply **Moho.**

Tectonic plates - the crust is created from several separated tectonic plates which exhibit movement called continental drift Its origin is to be found on the base of the convectional currents within the mantle (decay in the core as the source of the heat). As the semi molten rock moves so do the tectonic plates. This has caused the process of changing of the position and the size of the continents. As the plates move, their edges either collide, or become even more separated.
Main tectonic plates: Eurasian plate, African plate, American plate, Caribbean plate, Nazca plate, Pacific plate, Antarctic plate, Indo-Australian plate

The line across which the tectonic plates meet is called a boundary. We differentiate several types of boundaries.

Constructive boundaries (divergent boundaries) - two plates move away from each other (divergence), the fracture created by the dragging away is filled by the material brought by the convectional current of the mantle, magma changes to lava which solidifies to form a new rock. A ridge similar to Atlantic ridge is likely to be crated.
Examples: American and Eurasian plate boundary (Atlantic ridge), American and African plates boundary

Destructive boundaries (convergent boundaries) - heavy oceanic plate with higher density is subducted under the lighter continental plate (usually under 45° angle) and is subsequently (trench is likely to be created) molten in the depth of 600 km within the semi-molten mantle, molten rock then rises through the fractures within the continental crust to be ejected from one of the many volcanoes
Examples: Nazca and Pacific plate boundaries, Eurasian and Pacific plate boundary

Slipping boundaries - can be observed while the plates are moving past each other, earthquakes are likely to be developed as the stress builds up in consequence to the movement
Example: Pacific and American plate boundary (lineament San Andreas)

Earthquakes
- is described as a process of sudden release of the energy within the Earth's crust accompanied by the violent and often repeated earth tremor
- the place within the crust where the energy is released is called focus of the earthquake
- the place located perpendicular above the focus and on the surface is called epicentre

Energy released is transferred in a form of ways. Several types of the earthquake (seismic) waves are differentiated

Primary waves (P waves) - are transverse waves (pressure expansive),
- oscillate in the direction of spreading
- are the fastest waves (5,5 - 13 km/s)
- can penetrate both liquid and solid matter

Secondary waves (S waves) - are longitudinal waves
- sideways oscillation
- less speedy (3 - 7,5 km/s)
- can only penetrate solid matter, don´t spread through liquids

Longitudinal waves (L waves) - are longitudinal waves
- sideways oscillation
- the least speedy (3,8 km/s)
- carry most energy
- are superficially spread (not through within the crust)

The device set up to record the earthquake (seismic) waves is called **seismogram** (the base shakes with the earth while the pen attached to a weight records the tremors). The recorded graph is called **seismograph**.
Earthquakes are measured in two international scales.
Richter scale - measures the intensity of the earthquake (seismic) waves, 9 degrees (1 the lowest, 9 the highest intensity)
Mercalli scale - classifies earthquakes according their strength and impact on human environment including buildings…, 12 degrees

The rock cycle

- is the continual process of rock creation, change and destruction
- works on a base of closed system

1. rocks are worn and weathered; broke-down particles are easy to be transported by water or wind
2. transportation of the particles occur
3. deposition occurs, deposits are compressed, more and more particles are added, **Sedimentary rock type** (sandstone, limestone)
4. Rocks are buried deeper, pressure and temperature increase, **Metamorphic rock type** (gneiss)
5. Rocks may be molten again to magma
6. Magma is ejected as lava to the surface, solidification - new rock is created, **Igneous rock type** (basalt, tuff, gabbro)
7. Rocks are weathered and worn…

Geological time scale

Archeozoic	
Precambrian	
Palaeozoic	**Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian**
Mesozoic	**Triassic, Jurassic, Cretaceous**
Tertiary	**Palaeocene, Neocene**
Quaternary	**Pleistocene, Holocene**