CGR4M0 Grade 12 Environmental and Resource Management

The Lithosphere

The earth consists of five layers: the crust, upper mantle, mantle, and inner and outer core. The lithosphere includes the crust and part of the upper mantle where the asthenosphere is located. The continental plates of the crust move on this "plastic" layer of the upper mantle. It is below this area that convection currents are created by the earth's internal heat to move the plates. The crust varies in thickness from the continental areas (35-40km) to the areas below the oceans (7-10 km). The density and composition of the crust of these two areas are also different. The continental crust is made from a less dense granitic rock whereas the rock of the oceanic crust is basaltic in nature.

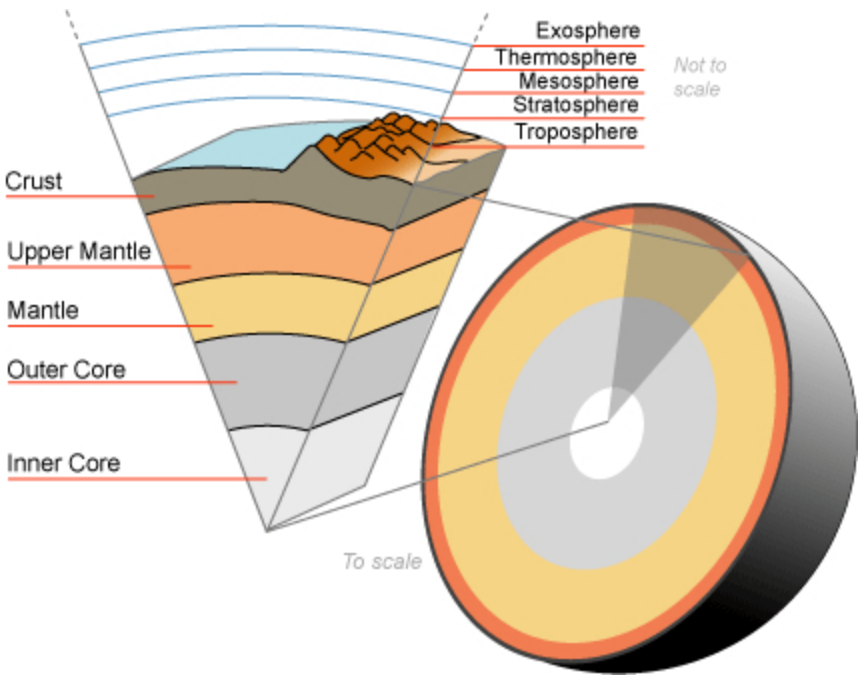


Plate Tectonics

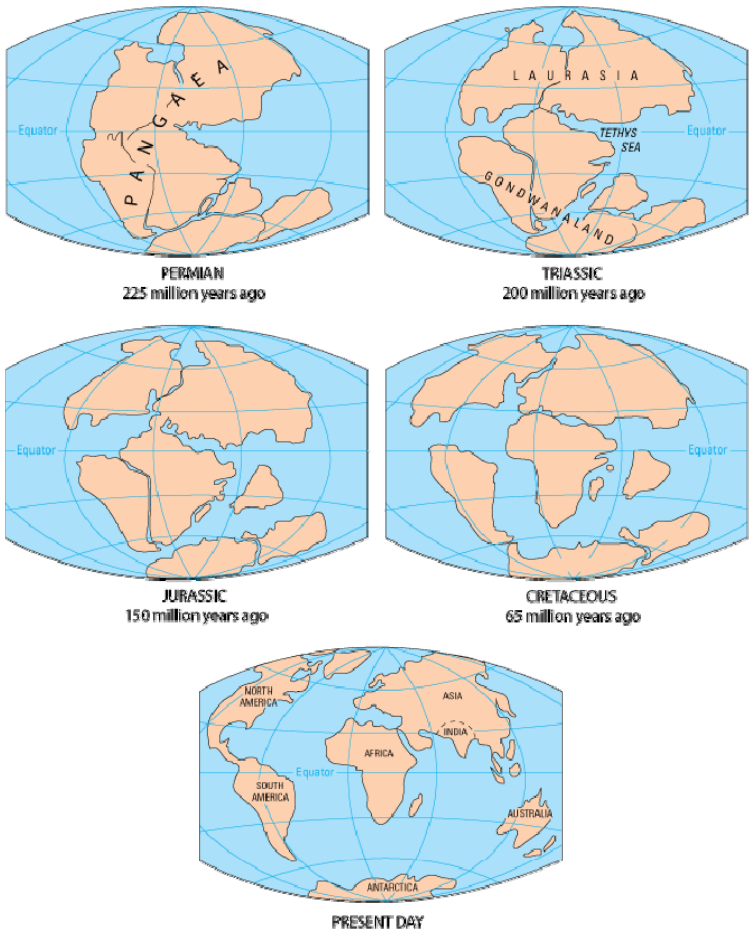
Continental Drift Theory

German geologist, Alfred Wegener in 1912, developed the theory of continental drift. In his book *Origin of Continents and Oceans* he suggested that about 200 million years ago all continents were combined in one large land mass that he named Pangaea. At that time this large continent began to move and separate. The result is what we see on the globe today. The map on the following page shows you how the earth's land looked all the way back to the Permian period.

To provide evidence for his theory, Wegener studied certain aspects of the lithosphere, hydrosphere and biosphere. Specifically, he studied mountain ranges, ice flow and plant life.

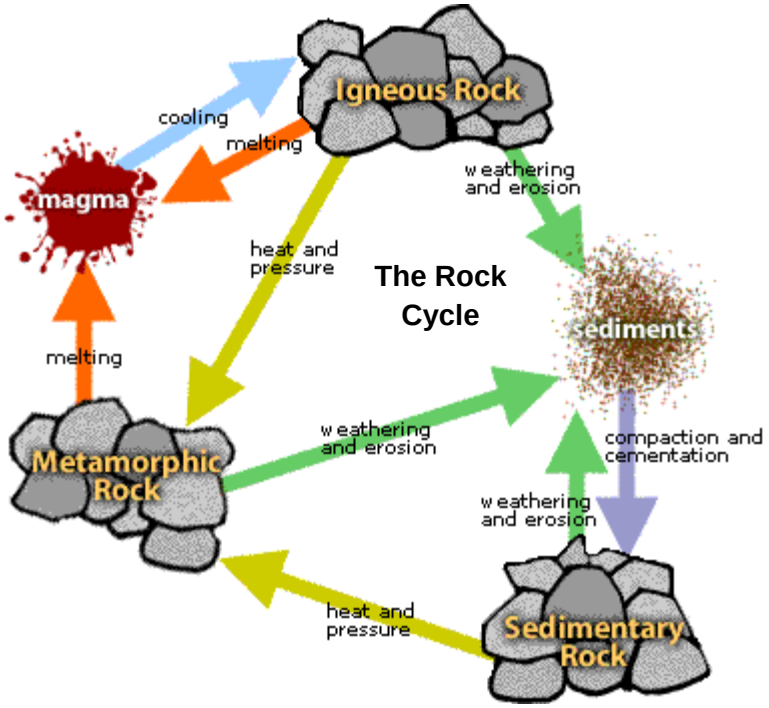
Mountain Building

Most of the earth's mountain building activities occur along the contact points of the continental plates. Mountains rise where the plates collide or override each other and volcanoes erupt in weak spots and openings in the crust. The folding or faulting of the earth is the result of tremendous tectonic forces that exist below the surface of the Earth. It is these processes that move the continents.



The Rock Cycle

The three types of rock, igneous, sedimentary, and metamorphic are exposed to various forces that include heat and pressure as well as weathering and erosion. It is through these forces that the rocks will change in form and composition. Igneous rock, for example, will cool from magma to form granite. This rock could then be exposed to internal heat and pressure and change into the metamorphic rock, gneiss. That same granitic rock could have been weathered and eroded and deposited in the ocean where it formed sedimentary rock such as sandstone. With subsequent heating and pressure in the earth's crust, this sandstone will turn into quartzite, a hard metamorphic rock. The final step in the cycle of these rocks is when the rocks are heated to a point of melting and return to a state of magma.



Mass Wasting

Mass wasting is a geomorphic process that causes surface materials on the earth, with the assistance of gravity, to move down slope. The type of mass wasting depends on local topographic and hydrographic conditions, such as the degree of slope and the amount of moisture. Types of wasting are classified as either rapid or slow moving.

a. Rapid movement
    i. Rock Fall
    ii. Slump
    iii. Rock or Debris slide
    iv. Debris or mud flow
    v. Earth Flow
b. Slow movement
    i. Creep
    ii. Solifluction

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1) Make a list of the 5 processes that are involved in the rock cycle. What is the only state that all three kinds of rocks on the cycle can become without going through another.

2) Research and define the 7 kinds of mass wasting from above.

3) What happened in Frank, Alberta on April 29, 1903. What kind of event was it? What was the result (damage, injuries, etc)

4) How would Wegener be able to use such information as mountain ranges, ice flow and plant life to support his theory that the earth's crust moves around?