Explain, with reference to examples you have studied, how plate tectonics helps us understand the forces at work along crustal plate boundaries.

(30 marks)

The study of plate tectonics has shown that thermal convection current are at work underneath the crust which cause the plates to move. These currents rise from the core and travel through the outer core, which consists of molten magma. Convection currents rise from deep within the mantle in one single convection cell of fluid magma. The magma flows from the core, rising to just below the crust before they cool, become dense and fall back to the core where they are reheated and the process is repeated. The asthenosphere is the area where the mantle meets the crust and these currents come in contact with the crust above. The imaginery line which divides the fluid magma from the rigid crust above is called the Mohorovic Discontinuity. The lower section of the crust is a semi-molten region which interacts with the convection currents, causing movement on the surface. This is much like the idea of drift wood travelling across oceans by the ocean current system. The lithosphere is the area where the crust becomes rigid. This process leads to Continental Drift. The earth is made up of 14 - 21 lithospheric plates which float on these currents. At the points where these plates meet, earthquakes (San Andreas Fault), fold mountains (Himalayas) and volcanoes (Mt. St. Helens) occur at regular intervals.

The three plate boundaries which are created are:

a) **Constructive Plate Boundaries** e.g. Mid Atlantic Ridge. In this example, the American plates are separating from the Eurasian/ African Plates, causing a long chain of submerged volcanic mountains to run along the bottom of the Atlantic ocean. Shallow earthquakes occur regularly but are not very powerful as there is no subduction (the sinking of one plate under another) taking place. Iceland is a volcanic island formed on this Mid-Ocean Ridge due to the seperation (or 'tension' – pulling the plates apart)

b) **Destructive Plate Boundaries** There are 3 types of destructive plate boundaries based on the type of crust that is meeting (Oceanic crust – 6 – 12 km thick but very dense and heavy, and continental crust which is 10 – 60 km thick and is less dense so lighter than oceanic crust). An example of a continental – continental plate boundary is found where the Eurasian Plate meets the Indo-Australian Plate to form the Himalayan fold mountain chain. Here no subduction takes place. If an oceanic meets a oceanic plate or meets a continental plate, subduction of the oceanic plate does take place and great pressure can build up to create destructive earthquakes (eg. The Continental South American plate is subducted by the Nazca oceanic plate forming the Andes mountain chain).

c) **Passive plate boundary** e.g. San Andreas Fault (where the N. American meets the Pacific plate). At these boundaries earthquakes are common, as fault lines develop between the two plate boundaries and huge pressures build as the plate travel in opposite directions/ slide past eachother/shearing takes place. All of this activity is caused by the previously mentioned convection currents