

Explain the formation of igneous rocks with reference to Irish landscapes

(30 marks)

Igneous rocks are formed when magma cools and solidifies on, or beneath, the earth's surface. Depending on where the magma/lava cools affects the type of igneous rock which forms.

Intrusive or *plutonic* igneous rocks are formed deep beneath the surface of the earth. For this to occur plumes of magma rise from a melting subducting plate, and inject themselves into the rocks above (into the upfold). This may be the case if an oceanic plate is being subducted under a continental plate. Here, in the heart of fold mountains, the magma cools slowly as it is surrounded by a mass of insulating sedimentary rock. As a result, large crystals have time to form, e.g. Quartz. Granite is an example of a plutonic igneous rock formed at destructive plate boundaries. Granite is grey in colour, containing quartz, feldspar and mica. Granite can be seen in the Leinster Batholith which formed 450 million year ago under the process just explained above, when the North American and Eurasian plates collided. The molten magma intruded into the folds in the Wicklow mountains and cooled slowly to form masses of granite. Weathering of this region has now exposed the mass of granite, while the surrounding insulating rock (which was sandstone) was changed into metamorphic Quartzite (through a process known as thermal metamorphism) as seen in the sugar loaf.

Extrusive or volcanic rock forms when lava pours out onto the surface of the earth and cools and solidifies quickly, as a result of meeting the air or water. Basalt is an example of an extrusive igneous rock that forms at constructive plate boundaries. This has led to all of our sea beds being made of Basalt, which is dark brown or black in colour. The lava cools so quickly that crystals of mica, feldspar and quartz do not have time to develop and are therefore, microscopic. The lava reaches the surface usually through a fissure or tear in the crust, but can also pass through a vent, for example Mt. Helka in Iceland. Basalt can be found on the Antrim Derry plateau (The Giant's Causeway) which was formed over 65 million years ago when the Eurasian and American plates began to separate as Laurasia (top half of Pangea) broke up and lava poured out of this fissure.