

# GCSE Geology - 1.2 Igneous rocks and processes

Igneous rocks form by the cooling, crystallisation and solidification of molten magma or lava. They are formed of interlocking crystals and make up 85% of the crust.

Rapid cooling produces small crystals. Slow cooling produces large crystals.

**Phenocryst** - a large well-formed crystal with straight edges.

**Groundmass** - the smaller, more irregular shaped crystals that surround the phenocrysts.

**Porphyritic** - an igneous texture that comprises large phenocrysts surrounded by a finer groundmass. It is formed by a two-stage cooling process, which is slow at first to form the phenocrysts then more rapid to form the groundmass.

**Equicrystalline** - an igneous texture where all the crystals are roughly the same size. It is formed by one steady, continuous, and even cooling rate.

Igneous rocks are classified based on the texture (size and orientation of crystals) and mineralogy (the types of minerals found in each rock).

Rock	Texture	Crystal Size	Minerals	Location
Basalt	Fine	<1mm	Feldspar, augite	Oceanic crust
Andesite	Fine	<1mm	Feldspar, mica, quartz, augite	Continental crust
Granite	Coarse	>3mm	Feldspar, quartz, mica	Continental crust
Peridotite	Coarse	>3mm	Olivine, augite	Mantle

Volcanoes	Fissure eruption	Central vent
Magma type	Basaltic	Andesitic
Silica content	Low	High
Viscosity	Low/runny	High/sticky
Width of base	10-50 km	1-5 km
Angle of slope	5-15°	16-30°
Products	Lava flows	Lava flows, ash, pyroclastic flows
Eruption type	Passive	Explosive
Eruption frequency	Frequent	Infrequent
Location	Divergent boundary	Convergent oceanic-oceanic, and oceanic-continental boundary

## Igneous structures

- **Lava flow** - a sheet-like body of igneous rock formed by magma being extruded onto the Earth's surface. Its surface is often irregular and weathered, and there will be one baked margin beneath.
- **Pillow lava** - rounded, pillow-shaped structures 0.5 - 2.0 metres in diameter that are formed by basalt lava erupting beneath the sea.
- **Columnar jointing** - formed in thick lava flows and intrusions when the interior cools slowly. It results in polygonal columns with four to seven sides as localised cooling centres develop at right angles to the cooling surfaces and contraction occurs towards the cooling centres.
- **Sill** - a sheet-like body of igneous rock that is intruded between layers of sedimentary rock parallel to the bedding planes, often termed concordant. There will be baked margins above and below the sill.
- **Dyke** - a sheet-like body of igneous rock that is intruded through and across the layers of sedimentary rock at an angle to the bedding planes, often termed discordant. Baked margins occur on both sides of the dyke.
- **Pluton** - a large-scale igneous intrusion typically circular or elliptical in shape and kilometres in diameter. It is intruded at depth (5-8 km) in the Earth's crust resulting in a coarse texture (crystals over 3mm) due to slow cooling. Plutons have a zone of recrystallised (metamorphic) rock parallel to their margins known as a metamorphic aureole.