**ROCK CYCLE AND IGNEOUS ROCKS**

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ROCK CYCLE

The rock cycle is a geological concept that describes transition through geological time among the three main types of rocks: sedimentary, metamorphic and igneous. Each rock type is altered when it is forced out of its equilibrium conditions.

The rock cycle is driven by earth’s internal heat, pressure from tectonic processes, and the effects of water, wind, gravity and biological activities, temperature, heat and finally pressure.

ROCK TYPES

1. Igneous rocks

Igneous rocks are formed when molten magma from the interior of the earth cools and solidifies. The magma may solidify within the earth’s crust or on reaching the surface of the earth. As the molten magma cools, crystals are formed. Rocks which are formed this way are said to be crystalline because they contain crystals. Some igneous rocks such as granite cool slowly and contain large crystals. Others such as basalt cool rapidly and contain small crystals

1. Sedimentary rocks

These types of rocks are formed from the deposits of sediments or particles of other rocks which have been laid down in layers either in water or on land. The process where sediments or rock particles are deposited by water, wind or moving ice is called sedimentation. After a long period of time, the deposited materials become compact and hard due to pressure from the overlying materials. This results in the formation of sedimentary rocks

1. Metamorphic rocks

These are rocks that have been subjected to great heat and pressure, hence they have changed in both appearance and character. The process of metamorphism occurs particularly during earth movements. During this time some rocks are subjected to great heat and pressure. The pressure is caused by great compressional forces within the earth’s crust. The pressure and heat produce physical and chemical changes in the original rock

DEFINITION OF TEXTURE AND COMPOSITION ACCORDING TO CLASSIFICATION IN IGNEOUS ROCKS

Igneous rocks are classified based on texture and composition

Texture: it describes the physical characteristics of the minerals such as the grain size. This relates to cooling history of the molten magma from which it came

Composition: this refers to the rocks specific mineralogy and chemical composition. Cooling history is also related to changes that can occur to the composition of igneous rocks.

DEFINITIONS OF IGNEOUS ROCK TEXTURE

1. Aphanitic-these are igneous rocks with such fine-grained textures that their mineral crystals are not visible to the naked eye. They form when lava cools rapidly in volcanic or shallow subsurface environment
2. Phaneritc –these are igneous rocks with large, visible crystals because the rock formed slowly in an underground magma chamber
3. Porphyritic –this is a texture in igneous rocks that is characterized by large crystals called phenocrysts, embedded in a finer-grained groundmass
4. Vesicular –this describes a rock with holes created by gas escaping from cooling lava. This texture is common in igneous rocks that have reached the earth surface, such as pumice and scoria
5. Glassy – a glassy texture suggests that cooling that was so extremely fast that no crystals could form.
6. Pegmatitic –this texture is a coarse grained appearance in rocks that results from the presence of very large crystals typically over 1centimeter in size. Their mineral grains are exceptionally large.

COMMON IGNEOUS ROCK FORMING MINERALS

* Quartz – SiO2
* Feldspar –KalSi3O8, NaAlSi3O8, CaAl2Si2O8
* Mica –Kal2(AlSi3O10)(F,OH)2, KAl2(AlSi3O10)(OH,F)2
* Amphibole –Ca2(Mg, Fe)4Al2Si7O22(OH)2
* Pyroxene –(Ca, Na)(Mg, Fe, Al)(Al, Si)2O6
* Olivine –(Mg, Fe)2SiO4
* Magnetite- Fe3O4
* Plagioclase –NaAlSi3O8, CaAl2Si2O8

DEFINE

1. Ultramafic- refers to the extremely mafic rocks composed of mostly olivine and some pyroxene which have even more magnesium and iron and even less silica
2. Mafic- refers to an abundance of ferromagnesium minerals plus plagioclase feldspar. It is mostly made of dark minerals like pyroxene and olivine, which are rich in iron and magnesium and relatively poor in silica.
3. Intermediate –this refers to a composition between felsic and mafic. It usually contains roughly equal amounts of light and dark minerals including light grains of plagioclase feldspar and dark minerals like amphibole.
4. Felsic –refers to predominance of the light coloured minerals feldspar and silica in the form of quartz. These light coloured minerals have more silica as a proportion of their overall chemical formula.

For each of the following igneous rocks, state if it is extrusive or intrusive and whether it is ultramafic, mafic, intermediate or felsic.

1. Peridotite –intrusive rock, ultramafic igneous rock
2. Basalt –extrusive rock, mafic igneous rock
3. Gabbro –intrusive rock, mafic igneous rock
4. Andesite-extrusive rock, intermediate rock
5. Diorite – intrusive rocks, intermediate rock
6. Rhyolite – extrusive rocks, felsic rock
7. Granite –intrusive rocks, felsic rock

TYPES OF VOLCANOES

1. Shield volcanoes

These are large and low lying volcanic domes with a broad base and a gentle slope. They are formed when a non-violent vent eruption leads to the outpouring of basic lava. On reaching the earth’s surface, the fluid lava flows in all directions around the vent covering a long distance before cooling and solidifying. Successive eruptions release basic lava which covers the old one. This leads to the formation of a gently sloping volcanic cone that is short and has a broad base called basic lava cone. Famous shield volcanoes include Mauna Loa and Kilauea in Hawaii, Olympus mons of Mars.

1. Composite volcanoes/ Strato-volcanoes

It is a steep volcanic cone with alternating layers of pyro clasts and lava. They are formed as a result of central volcanic eruptions. Violent eruptions forms a layer of ash. The violence ceases and lava pour out forming a layer of lava on top of the ash. Lava also escapes from the sides of the cone to form conelet. A volcanic cone made of ash and lava build up over a long period of time as a result of many eruptions. The feature formed is called composite/ strato volcano. Famous composite volcanoes include Mount Fuji in Japan, Mount Shasta and Mount Lassen in California, Mount St Helens and Mount Rainier in Washington State, Mount Hood in Oregon and Mount Etna in Italy.

1. Cinder cones

These are volcanoes built from pyroclast materials of ash, dust, cinder and small pebbles. They are formed when violent vent eruption occurs. Ash and pyroclast are emitted and thrown high. Some materials falls and settles around the vent forming a cone with concave slope called ash and cinder cones. Famous cinder cones include Paricutin in Mexico and the one in the middle of Crater Lake in Oregon

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