**1.BRIEFLY DESCRIBE THE ROCK CYCLE; BE SURE TO DEFINE EACH ROCK TYPE (IGNEOUS, SEDIMENTARY, METAMORPHIC) AND BRIEFLY DISCUSS THE FORMATION THAT LEADS TO EACH**

The rock cycle is a model that describes the formation, breakdown and reformation of a rock a result of sedimentary, igneous and metamorphic processes. The rock cycle can also be defined as a series of processes that create and transform the types of rocks on earths crust. There are three major types of rocks:

* IGNEOUS
* SEDIMENTARY
* METAMORPHIC
1. **IGNEOUS ROCK**

The word igneous derives from ignis the Latin word for “fire”. An igneous rock is a rock that is formed when magma is trapped deep inside the earth. An igneous rock is fire born meaning that it is formed from the cooling and solidification of molten rock, as hot, molten rock rises to the surface, it undergoes changes in temperature and pressure that cause it to cool, solidify and crystallize.

1. **SEDIMENTARY**

Sedimentary rocks are rocks that are formed from deposits of preexisting rocks or pieces of once living organism that accumulate on the earth’s surface. During the process of forming sedimentary rocks, pieces of rocks are loosened by weathering, then transported to some basin or depression where sediment is trapped and If the sediment is buried deeply, it becomes compacted and cemented, to form sedimentary rocks.

1. **METAMORPHIC**

Metamorphic rocks, are rocks formed when, rocks are subjected to high heat, high

pressure, hot Mineral- rich fluids or some combination of these factors.

Metamorphic rocks start as one type of rock and with pressure, heat and time

gradually change into a new type of rock.

**2. IGNEOUS ROCKS ARE CLASSIFIED BASED ON THEIR TEXTURE**

**AND COMPOSITION. DEFINE TEXTURE AND COMPOSITION.**

**Texture** describes the physical characteristics of the minerals; such as grain size. This relates to

the cooling history of the molten magma from which it came. **Composition** refers to the rock’s

specific mineralogy and chemical composition. Cooling history is also related to changes that can

occur to the composition of igneous rocks.

**3.DEFINE THE FOLLOWING IGNEOUS ROCK TEXTURES, APHANITIC,**

**PHANELITIC, PORPHYRITIC, VESICULAR, GLASSY AND**

**PEGMATITIC.**

1. **APHANITIC**

 Aphanitic (a = not, phnaner = visible) rocks, in contrast to phaneritic rocks, typically form from [lava](https://en.wikipedia.org/wiki/Lava) which crystallize rapidly on or near Earth's surface. When extrusive rocks make contact with the [atmosphere](https://en.wikipedia.org/wiki/Atmosphere) they cool quickly, so the minerals do not have time to form large crystals. The individual crystals in an aphanitic igneous rock are not distinguishable to the naked eye. Examples of aphanitic igneous rock include [basalt](https://en.wikipedia.org/wiki/Basalt), [andesite](https://en.wikipedia.org/wiki/Andesite), and [rhyolite](https://en.wikipedia.org/wiki/Rhyolite)

1. **PHANERITIC**

Phaneritic (phaner = visible) textures are typical of intrusive igneous rocks, these rocks crystallized slowly below Earth's surface. As [magma](https://en.wikipedia.org/wiki/Magma) cools slowly the [minerals](https://en.wikipedia.org/wiki/Mineral) have time to grow and form large crystals. The minerals in a phaneritic igneous rock are sufficiently large to see each individual [crystal](https://en.wikipedia.org/wiki/Crystal) with the [naked eye](https://en.wikipedia.org/wiki/Naked_eye). Examples of phaneritic igneous rocks are [gabbro](https://en.wikipedia.org/wiki/Gabbro), [diorite](https://en.wikipedia.org/wiki/Diorite), and [granite](https://en.wikipedia.org/wiki/Granite).

1. **PORPHYLITIC**

 [Porphyritic](https://en.wikipedia.org/wiki/Porphyritic) textures develop when conditions during the cooling of magma change relatively quickly. The earlier formed minerals will have formed slowly and remain as large crystals, whereas, sudden cooling causes the rapid crystallization of the remainder of the melt into a fine-grained (aphanitic) [matrix](https://en.wikipedia.org/wiki/Matrix_%28geology%29). The result is an aphanitic rock with some larger crystals ([phenocrysts](https://en.wikipedia.org/wiki/Phenocryst)) embedded within its matrix. Porphyritic texture also occurs when magma crystallizes below a [volcano](https://en.wikipedia.org/wiki/Volcano) but is erupted before completing crystallization thus forcing the remaining lava to crystallize more rapidly with much smaller crystals.

1. **VESICULAR**

Vesicular texture is a [volcanic](https://en.wikipedia.org/wiki/Volcanic) [rock](https://en.wikipedia.org/wiki/Rock_%28geology%29) texture characterized by a rock being pitted with many cavities (known as vesicles) at its surface and inside. [[1]](https://en.wikipedia.org/wiki/Vesicular_texture#cite_note-1) This texture is common in [aphanitic](https://en.wikipedia.org/wiki/Aphanite), or glassy, [igneous rocks](https://en.wikipedia.org/wiki/Igneous_rock) that have come to the surface of the earth, a process known as [extrusion](https://en.wikipedia.org/wiki/Extrusive_rock). As [magma](https://en.wikipedia.org/wiki/Magma) rises to the surface the pressure on it decreases. When this happens gasses dissolved in the magma are able to come out of solution, forming gas bubbles (the cavities) inside it. When the magma finally reaches the surface as lava and cools, the rock solidifies around the gas bubbles and traps them inside, preserving them as holes filled with gas called vesicles.

1. **GLASSY**

Glassy or vitreous textures occur during some volcanic eruptions when the lava is quenched so rapidly that crystallization cannot occur. The result is a natural amorphous glass with few or no crystals. Examples include [obsidian](https://en.wikipedia.org/wiki/Obsidian).

1. **PEGMATITIC**

Pegmatite texture occurs during magma cooling when some minerals may grow so large that they become massive (the size ranges from a few centimeters to several meters). This is typical of [pegmatite](https://en.wikipedia.org/wiki/Pegmatite). Pegmatite’s are most commonly formed as coarse-grained igneous rocks of granitic composition, containing large clasts of gemstones such as [amazonite](https://en.wikipedia.org/wiki/Amazonite), [garnet](https://en.wikipedia.org/wiki/Garnet), and [topaz](https://en.wikipedia.org/wiki/Topaz).

**4.LIST THE COMMON IGNEOUS ROCK- FORMING MINERALS AND GIVE THEIR FORMULAS.**

Rocks are composed of minerals. A mineral is a naturally occurring substance which is usually solid, crystalline, stable at room temperature and inorganic.

The various igneous rock forming minerals include:

1. **FELDSPARS**

Feldspars are solid solution minerals and have the general formula:

 (Ca, Na, K) (Si, Al)4O8

1. **QUARTZ**

Quartz is a hard, crystalline mineral composed of silica (silicon dioxide). It has the general formula: SiO2

1. **AMPHIBOLES**

The general formula is: R14[(OH)4Si16O44]

1. **MICAS**

It is a type of phyllosilicate, exhibiting a two dimensional sheet or layer structure. The general formula is:

1. **OLIVINE**

It is a magnesium iron silicate. It has the general formula: (Mg, Fe)2SiO4.

1. **GARNET**

Garnet have the general formula A3B2Si3O12,

1. **CALCITE**

Calcite is a rock forming mineral with a chemical formula of CaCO3

1. **PYROXENES**

Pyroxenes have the general formula: XY (Si, Al)2O6,

**5.DEFINE UTRAMAFIC, MAFIC, INTERMIDIATE AND FELSIC.**

* UTRAMAFIC

Ultramafic rocks (also referred to as ultrabasic rocks, although the terms are not wholly equivalent) are [igneous](https://en.wikipedia.org/wiki/Igneous_rocks) and [meta](https://en.wikipedia.org/wiki/Metamorphic_rocks)-igneous rocks with a very low [silica](https://en.wikipedia.org/wiki/Silica) content (less than 45%), generally >18% [MgO](https://en.wikipedia.org/wiki/Magnesium_oxide), high [FeO](https://en.wikipedia.org/wiki/Iron%28II%29_oxide), low [potassium](https://en.wikipedia.org/wiki/Potassium), and are composed of usually greater than 90% [mafic](https://en.wikipedia.org/wiki/Mafic) [minerals](https://en.wikipedia.org/wiki/Mineral) (dark colored, high [magnesium](https://en.wikipedia.org/wiki/Magnesium) and [iron](https://en.wikipedia.org/wiki/Iron) content). The [Earth's mantle](https://en.wikipedia.org/wiki/Mantle_%28geology%29) is composed of ultramafic rocks. Ultrabasic is a more inclusive term that includes igneous rocks with low silica content that may not be extremely enriched in Fe and Mg, such as [carbonatites](https://en.wikipedia.org/wiki/Carbonatites) and [ultrapotassic igneous rocks](https://en.wikipedia.org/wiki/Ultrapotassic_igneous_rocks).

* MAFIC

It is a portmanteau term that is made up of magnesium and ferric. On the basis of silica content, igneous rocks can be classified into various types. Silica is found in abundance in igneous rocks because of which is considered the basis of classification. On this basis, igneous rocks can be divided into four major types i.e. felsic, intermediate, mafic, and ultramafic (written as per the silica content in decreasing order). Mafic is a kind of igneous rock which are rich in magnesium and iron. This type of rock contains 45 to 55 % silica content and 4 mafic igneous rocks minerals are pyroxene, amphibole, olivine, and mica. Mafic word is sometimes also used as a synonym for dark colored minerals.

* INTERMIDIATE

A [volcanic rock](https://opengeology.org/textbook/glossary/extrusive/) with medium silica [composition](https://opengeology.org/textbook/glossary/composition/), equally rich in [felsic](https://opengeology.org/textbook/glossary/felsic/) [minerals](https://opengeology.org/textbook/glossary/mineral/) ([feldspar](https://opengeology.org/textbook/glossary/feldspar/)) and [mafic](https://opengeology.org/textbook/glossary/mafic/) minerals ([amphibole](https://opengeology.org/textbook/glossary/amphibole/), [biotite](https://opengeology.org/textbook/glossary/mica/), [pyroxene](https://opengeology.org/textbook/glossary/pyroxene/)). [Intermediate](https://opengeology.org/textbook/glossary/intermediate/) rocks are grey in color and contain somewhat equal amounts of minerals that are light and dark in color. Primary intermediate rocks are [andesite](https://opengeology.org/textbook/glossary/andesite/) (extrusive) and [diorite](https://opengeology.org/textbook/glossary/diorite/) ([intrusive](https://opengeology.org/textbook/glossary/intrusive/)).

* FELSIC

Felsic refers to [silicate minerals](https://en.wikipedia.org/wiki/Silicate_minerals), [magma](https://en.wikipedia.org/wiki/Magma), and [rocks](https://en.wikipedia.org/wiki/Rock_%28geology%29) which are enriched in the lighter elements such as [silicon](https://en.wikipedia.org/wiki/Silicon), [oxygen](https://en.wikipedia.org/wiki/Oxygen), [aluminum](https://en.wikipedia.org/wiki/Aluminium), [sodium](https://en.wikipedia.org/wiki/Sodium), and [potassium](https://en.wikipedia.org/wiki/Potassium). Felsic magma or lava is higher in [viscosity](https://en.wikipedia.org/wiki/Viscosity) than mafic magma/lava.

**6.FOR EACH OF THE FOLLOWING IGNEOUS ROCKS, STATE IF IT IS EXTRUSIVE OR INTRUSIVE AND WHETHER IT IS UTRAMAFIC, MAFIC, INTERMIDIATE, OR FELSIC: PERIDOTITE, BASALT, GABBRO, ANDESITE, DIORITE, RYHOLITE, GRANAITE.**

There are two main categories of igneous rocks: extrusive and intrusive.

Extrusive rocks are formed on the surface of the earth from lava, which is magma that has emerged from underground. Intrusive rocks are formed from magma that cool and solidifies within the crust of the planet.

|  |  |
| --- | --- |
| **EXTRUSIVE** | **INTRUSIVE** |
| Basalt  | Peridotite  |
| Andesite  | Gabbro  |
| Rhyolite  | Diorite  |
|  | Granite |

There are various types of extrusive and intrusive igneous rocks.

**Felsic** rocks are known to be rocks with more than 65 percent. **Intermediate** rocks are those between 55 and more than 65 percent, **mafic** are those with 45 and 55 percent silica and **ultramafic** are those with less than 45 percent silica.

There are various types of intermediate, felsic and mafic.

|  |  |  |  |
| --- | --- | --- | --- |
| **FELSIC** | **INTERMIDIATE** | **MAFIC** | **ULTRAMAFIC** |
| Granite  | Diorite  | Gabbro  | Peridotite  |
| Rhyolite  | Andesite  | Basalt  |  |

**7.LIST AND BRIEFLY DEFINE THE THREE TYPES OF VOLCANOES**

There are various types of volcanoes: cinder cone volcanoes, composite volcanoes and shield volcanoes.

* **Cinder cone volcanoes**

They are the simplest type of volcano and occur when particles and blobs of lava are ejected from a volcanic vent. The lava is blown violently into the air, and the pieces rain down around the vent. This build up a circular or over shaped cone, with a bowl shaped crater at the top

* **Composite volcanoes**

Composite volcanoes are also known as stratovolcanoes; they make up some of the World’s most memorable mountains. They have a conduit system inside that channels magma from deep within the earth to the surface.

* **Shield volcanoes**

These are large, broad volcanoes that look like shields from above hence the name.