1.Briefly describe the rock cycle, be sure to define each rock type,(igneous, sedimentary and metamorphic) and briefly discuss the processes that lead to formation of each.

The onset or the termination of the process of rock cycle is not certain, in that we cannot ascertain its beginning or end. The process takes place over a long period of time which may range even up to millions of years. The cycle involves various processes that transform the initial rock into another rock. These transformations may occur either under or even above the earth’s surface. The three main processes of rock cycle are

* Cooling and crystallization

Deep into the earth’s crust, the temperatures are extremely high, so high to a point that rocks can be molten to form larva. As this larva cools, there is growth of crystals which in turn form an igneous rock. If the magma cools slowly the crystals grow larger. On the contrary, if the magma cools slowly, the crystals are very small. This process of Crystals forming from magma is called crystallization

* Weathering and erosion

Plants and animals, Water, wind and ice all act to break down rocks. Over time under their influence, large rocks may be broken down into small sediments. The process by which rocks are broken down is called weathering. Wind, moving water and glacier then carry these sediments from one place to another through a process called erosion. Eventually, these sediments are deposited or dropped to some place through a process called sedimentation. Overtime these sediments are compacted and cemented together. A sedimentary rock is thus formed. The process takes thousands of years.

* Metamorphism

This means a change from the original form. When a rock is exposed to heat or pressure within the earths crust, The rock undergoes the process of metamorphism. This however does not necessarily mean the rock melts completely, but undergoes some changes due to heat and pressure. The newly formed rock may have a new mineral make up or texture or even both

The various types of rocks are:

1. Igneous rocks

Their formation is from mantles molten rocks or the crust of the earth. Igneous rock cycle involves two types which are:

* Intrusive

These rocks are formed when molten magma is entangled deep inside the vent below the earth’s surface, cools and solidifies to form a rock, this process of cooling and solidification takes a long period of time some examples are diobase, diorite, gabbro, granite, peridotite etc

* extrusive

These rocks are formed when molten larva if extruded from deep into the earth crust, reaches the earth’s surface and then cools and solidifies to form a rock. Some examples are Basalt, Andesite, Rhyolite etc

b) sedimentary rocks

These rocks are formed on or near the earth’s surface through the processes of erosion, weathering, lithification, precipitation and dissolution. In precipitation, new rocks and minerals are formed from chemicals that precipitate from water. In lithification, sand, clay and other debris on the bottom of water bodies are slowly compacted to rocks. Wind and rain contribute to weathering and erosion, this breaks small debris from large rocks. Sedimentary rocks are classified as below

* Chemically formed sedimentary rocks

These are formed as a result of precipitation and dissolution of minerals. These rocks are found in many places from caves to deserts to oceans. For example, as a result of precipitation, most limestone will form at the bottom of the ocean due to precipitation of calcium carbonate and remains of ocean animals within shells. Stalactites and stalagmites forms when water sips through bedrocks and dissolves calcium and carbonate ions. as the water drops from the roof of the cave, it evaporates depositing the calcium carbonate on the roof forming a stalactite. If the water evaporates upon reaching the floor of the cave it forms a stalagmite.

* Detrital rock

Results from erosion and accumulation of particles or other materials. Detritus may be organic or inorganic. The organic ones are formed from vegetative or animal decay on the ground that are occasionally compressed to rocks. Inorganic rocks are built up from debris of other rocks. These rocks are also known as clastic sedimentary rocks.

c) Metamorphic rocks

These rocks may either start as sedimentary rocks or igneous rocks but as a result of time, pressure and heat, they eventually change into a new type of rock

2.Igneous rocks can either be classified based on their texture and composition

TEXTURE; explains the physical characteristics of the mineral for example grain size which is as a result of the cooling process from where it was formed. Arrangement of particles in a rock contributes to its texture. Texture may be smooth, rough, coarse

COMPOSITION: involves the mineral elements making up the rock that is, what the rock is made of

3.Define the following igneous rock textures

* Aphanitic

Aphanitic simply put means “not visible”. These rocks arise from larva that has rapidly crystalized upon reaching the surface of the earth, therefore the minerals lack sufficient time to form large crystals, as a result the crystals are not separable to the naked eye. Examples are, basalt, andesite and rhyolite

* Phaneritic

Contrary to aphanitic, Phaneritic means “visible”. These rocks are formed when larva crystalizes slowly under the earth’s surface, this gives the minerals adequate time to form large crystals which are easily distinguishable to the naked eye. Examples include gabbro, diorite and granite, The rocks composition is mostly ground mass which contains particles of about one millimeter

* Porphyritic

When conditions during the magma cooling change relatively fast, this texture develops, the minerals formed earlier remain as large crystals since they were slowly formed, the remainder crystalizes rapidly as a result of sudden cooling. This results to aphanitic rock with numerous large crystals within itself. It may also occur as a result of magma crystalizing below a volcano but eruption occurs before crystallization is complete thus the remaining larva is forced to crystalize more rapidly. This texture is also called coarse grained texture and is present in plutonic rocks like gabbro, granite or diorite

* Vesicular

This texture is created in volcanic rocks. As the larva rises to the surface, its pressure reduces making the gasses that are dissolved in the magma to come out and form bubbles. Eventually when the magma reaches the surface of the crust, as it cools the rock solidifies around the gas bubbles tapping them inside in that they are preserved as holes filled with gas and they are called vesicles. This texture bis present in igneous rocks.

* Glassy

It is also referred to as vitreous texture. Occurs during some volcanic eruptions whereby the larva is forced so rapidly that crystallization does not occur this leads to formation of a natural amorphous glass with little or no crystals.

* Pegmatitic

This occurs during cooling whereby some minerals grow so large to an extend of becoming massive, their sizes may vary from centimeters to several meters. the most common formed coarse grained igneous rocks are the pegmatites, it contains large gemstone clasts like amazonite, garnet and topaz

4.list the common igneous rock forming minerals

* Olivine

Olivine is a class or group that contains the mineral olivine. Its chemical formula is (Mg,Fe)2SiO4

* Pyroxene

Pyroxene class or group consists of three minerals namely

1. Diopside, whose chemical formula is CaMgSi2O6
2. Augite, whose chemical formula is (Ca,Mg,Fe,Na)(Mg,Fe,Al)(Si,AL)2O6
3. Orthopyroxene, whose chemical formula is (Mg,Fe)2SiO4

* Amphibole

Amphibole is a group whose mineral element is hornblende

Its chemical formula is (k,Na)0-1(K,Na,Fe,Mg)2(Mg,Fe,Al)5(Si,Al)8O22(OH)2

* Mica

Mica is a group with two minerals namely:

1. Biotite, whose chemical formula is K(Mg,Fe)3(AlSi3O10(OH)2
2. Muscovite, whose chemical formula is KAl2(AlSi3O10) (OH)2

* Feldspar

This class consists of four minerals namely:

1. Orthoclase, whose chemical formula is KAlSi3O8
2. Microcline, whose chemical formula is KAlSi3O8
3. Sanidine, whose chemical formula is KAlSi3O8
4. Plagioclase, whose chemical formula is (Ca,Na)(Si,Al)4O8

* Feldspathoid

This group consists of two minerals namely:

1. Leucite, whose chemical formula is KAlSi2O6
2. Nepheline, whose chemical formula is (Na,K)AlSiO4

* Silica

This group consists of a mineral Quartz whose formula is SiO2

* Oxide

This group consists of two minerals namely:

1. Magnetite, whose chemical formula is Fe3O4
2. Ilmenite, whose chemical formula is FeTiO3

* Sulphide

This Group consist of four minerals namely:

1. Pyrite, whose chemical formula is FeS2
2. Pyrrhotite, whose chemical formula is Fe1-xS

* Others

The other four minerals are:

1. Titanite, whose chemical formula is CaTiSiO5
2. Zircon, whose chemical formula is ZrSiO4
3. Apatite, whose chemical formula is Ca5(PO4)3(OH,F,Cl)

5.Define ultramafic, mafic, intermediate, and felsic

* Ultramafic

Ultramafic may also be termed as ultrabasic. They are igneous and meta-igneous rocks with a very low silica composition, usually less than 45%. They also have a high content of mafic minerals. These rocks are found in large quantities in the mantle of the earth.

* Mafic

This rock is majorly composed of elements such as mica and amphibole just but to mention a few. These elements are in ferric oxides and magnesium. Due to this, elements the mafic rock attains its darkish in color. Examples of mafic rocks include basal and gabbro

* Intermediate

They are a type of ingenious rock. Its composition ranges between two types of rocks, acidic and basic rock hence the name ‘intermediate’. An example of this type of rock is andesite.

* Felsic

This is a term used to make reference to igneous type of rocks, magma or silicate rich minerals that have an additional composition of lighter substances which may include potassium and oxygen among many others. Felsic rocks possess a somewhat lighter shade of color. Examples of this type of rock include plagioclase feldspars, which is highly enriched with sodium, granite, orthoclase and quartz.

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

* Peridotite

This is an intrusive rock.

Its ultramafic

* Basalt

It is under extrusive rocks.

It can further be described as a mafic rock

* Gabbro

It is an intrusive rock and a mafic.

It may also be said to be an ultramafic.

* Andesite

It is classified as an extrusive rock.

This is an intermediate rock

* Diorite

It is an example of the many intrusive rocks that exist.

Similar to andesite it is an intermediate rock

* Rhyolite

Classified under extrusive rock.

It is felsic

* Granite

It is an intrusive rock

It is of the felsic type

7.List and briefly define three types of volcanos

* Cinder cones

These are also called pyroclastic cones, they are the simplest and the smallest type of volcano, they are as well the most common type of volcanos in the world. Just as the name suggests, Cinder are cone shaped hills made of igneous rocks which are ejected, they are known as the cinders.

These cones are found in many parts of the world. Some of the countries with many cider cones are Australia, Canada, Chile, Ireland, Japan, France, New Zealand, Mexico and Italy

* Shield volcano

A shield volcano is usually broad with shallow sides that are inclining. These volcanos are formed as a result of multiple magma flows of a low viscosity. The larva flows out of the vent, slides down the volcano slopes to build up the size. Its naming came from their shape that resembles a warriors shield that lies on the ground. The largest shield volcano is found on the Hawaii island and it’s called Mauna loa. Some other examples of famous shield volcanos are Wolf volcano of Galapagos Island and Nyamuragira of the Democratic Republic of Congo.

* Stratovolcanoes

These are also called composite volcanoes. They are found on the convergent plate boundaries. They represent most classic shapes associated with a volcano. They are also a very common type of volcanoes on the earth’s surface approximately accounting for sixty percent of the earth’s volcanos. A very good example is the Mt Pinatubo in the Philippines