Atika School
Free Online Academy

GEOGRAPHY NOTES FORM 1

Minerals & Rocks

Specific Objectives

By the end of the topic, the learner should be able to:

a) define minerals and rocks
b) state the characteristics of minerals
c) classify rocks according to mode of formation
d) state the characteristics of rocks
e) account for the distribution of major types of rocks in Kenya
f) explain the significance of rocks and minerals
g) identify major types of rocks and their uses within the local environment.

MINERALS AND ROCKS

Minerals

Inorganic substances occurring naturally at or below the earth's surface.

Characteristics of Minerals

1. Different degrees of hardness e.g. some are very hard e.g. diamond while others are very soft e.g. talc.
2. Some have atoms arranged in an orderly manner to form crystals e.g. quartz form a 6- sided prism.
3. Varying number of elements e.g. gold has one (Av) while quartz has 2 (SiO_2).
4. Different abilities to allow light to pass through e.g. some are transparent, opaque or translucent.
5. Specific colours e.g. gold is shiny yellow while copper is brown.
6. Have specific surface appearance (lustre) when they reflect light i.e. metallic (shiny) or non-metallic (glass like).
7. Definite chemical composition or constant ratio of elements e.g. quartz has one atom of silicon and two atoms of oxygen.
8. Tendency to break along certain lines or cleavage) e.g. flint has cleavage like that of glass.
9. Different densities e.g. some are very heavy e.g. lead while others are light e.g. silicate minerals.
10. Some minerals conduct electricity while others don't e.g. copper conducts while diamond doesn't.
11. Some can be pressed into different shapes while others can't e.g. copper is malleable while flint isn't.

Learner's Short Notes

Types of Minerals

Metallic minerals

i) **Ferrous Minerals-**limonite, magnetite, siderite and haematite.

ii) **Non-ferrous Minerals**-copper, aluminum, gold, lead, etc.

iii) **Non-metallic Minerals-**graphite, diamond, asbestos, coal, etc.

iv) **Energy minerals-**petroleum, coal and uranium.

Rocks

A consolidated material composed of grains of one or more minerals.

1. Igneous Rocks

Rocks formed when molten material from the earth's interior cools and solidifies on or beneath the earth's surface.

Types of Igneous Rocks

a) **Intrusive Igneous Rocks** -Rocks formed when magma cools and solidifies below the earth's surface e.g. granite, diorite, gabbro, peridotite.

Have coarse texture as a result of slow cooling giving minerals more time to form large crystals.

Are classified further into two:

(i) Hypabyssal rocks- intrusive igneous rocks which are near the earth's surface.

(ii) Plutonic rocks-intrusive igneous rocks which are deep below the surface.

Learner's Short Notes

b) **Extrusive Igneous Rocks -**Rocks formed when lava solidifies on the earth's surface.

Have fine texture due to fast cooling giving minerals less time to collect together to form larger crystals. They are of two types namely:

i) **Volcanic Ejecta** -Extrusive igneous rocks formed in the following ways:

- When ash and lava ejected from underground as they fall on the earth's surface e.g. pumice.
- When dust and ash ejected settle on the ground and get compressed to form a rock e.g. tuff.

ii) Lava Flows

Extrusive igneous rocks formed when basic lava flows over a considerable distance then cools and solidifies e.g. basalt and obsidian.

2. Sedimentary Rocks

Rocks formed when particles of other rocks are laid down and compressed into layers or when plant and animal remains are buried and compressed and compacted.

- When they are laid down a layer is formed.
- As deposition continues additional layers are formed which compress the lower layers into a hard mass.

Types of Sedimentary Rocks

a) Mechanically Formed

Sedimentary Rocks -Sedimentary rocks formed when weathered igneous or metamorphic rocks are deposited and compacted e.g. sandstone and shale.

b) Organically formed

Sedimentary Rocks -Sedimentary rocks formed when animal and plant or animal remains are buried, compressed and compacted.

Classification of Organically Formed Sedimentary Rocks

i) **Calcareous rocks**-rich in calcium carbonate e.g. chalk and limestone. Coral rocks are formed from remains of sea polyps which extract lime from the sea, build shells for protection, attach themselves to each other and rocks to live in colonies, then die and shells to form coral rocks.

ii) **Ferruginous Rocks-**rich in iron e.g. ironstone.

iii) **Siliceous Rocks**-rich in silica e.g. diatomite.

iv) **Carbonaceous Rocks**-rich in carbon e.g. coal.

Learner's Short Notes

c) Chemically formed Sedimentary Rocks

Sedimentary rocks formed when materials dissolved in water chemically react forming new substances then water evaporated leaving layers of those salts.

Classification of Chemically Formed Sedimentary Rocks

(i) **Carbonates** e.g. trona and dolomite

(ii) **Sulphates-**sulphate compounds

(iii)**Chlorides** e.g. halite **(iv) Silicates** e.g. flint

(iv) **Iron stones** e.g. haematite and limonite.

3. Metamorphic Rocks

Rocks which have changed their physical appearance and chemical properties as a result of subjection to great heat and pressure e.g. Gneiss from granite

- Slate from clay
- Marble from limestone
- Quartzite from sandstones

Distribution of Major Rocks in Kenya

Eastern Kenya region

- The major rocks are metamorphic rocks e.g. marble in parts of Machakos and schist and gneiss in parts of Kitui.
- Volcanic rocks in Yatta plateau and Kapiti plans.
- Sedimentary rocks e.g. limestone rocks used in Bamburi for cement manufacturing.

Learner's Short Notes

Coastal Region

- Major rocks are sedimentary rocks e.g. limestone used in Bamburi for cement manufacture.
- There are volcanic rocks in Tsavo rich in ground water resources. **Northern and N.E Region** Dominated by sedimentary sands.
- There are volcanic rocks in Mt. Marsabit and around Rift Valley. **Rift Valley and Kenya Highlands**
- Dominated by volcanic rocks
- There are metamorphic rocks which have resulted from changing of igneous rocks.

L. Victoria Basin

- Granite and gneiss dominate Western Kenya where they form high rocky hills called granitic tors common in Kisii, Maragoli and Bunyore areas.
- Sedimentary rocks deposited by rivers e.g. Nyando, Nzoia, Yala and Sondu.

Significance of Rocks

1. Rocks weather to form soil which is important in agriculture.
2. Form aquifers which store ground water which forms springs which form rivers and wells which provide water for domestic and industrial use.
3. Some rocks are sources of building materials e.g. igneous rocks are used to make ballast and limestone rocks are used as building blocks and raw material in cement manufacturing.
4. Phosphate and nitrate rocks are used to make fertilizer used in agriculture.
5. Granitic tors of W. Kenya and high volcanic peaks such as those of Mt. Kenya are a tourist attraction which brings foreign exchange.
6. Pumice is used as a scrubbing stone.
7. A rock such as coal is used as fuel for heating, smelting of iron and thermal electricity generation.

Field-work

Identification of major types of rocks and their uses within the local environment.

Learner's Short Notes

ROCKS AND MINERALS

PAST KCSE QUESTIONS.

1. (a) Describe the following characteristics of minerals

(i) Colour (2mks)

(ii) Cleavage (2mks)

(iii) Hardness (2mks)

(b)

(i) Give two types of igneous rocks (2mks)

(ii) Explain three conditions necessary for the growth of coral polyps (6mks)

(c) State four uses of rocks (4mks)

(d) You are planning to carry out a field study on the rocks within your school environment

(i) Give two secondary sources of information you would use to prepare for the field study (2mks)

(ii) State why you would need the following items during the field study:

- A fork jembe (1mk)
- A polythene bag (1mk)

(iii) Suppose during the field study you collected marble, sandstone and granite, classify each of these samples according to its mode of formation (3mks)

2. (a) State two characteristics of sedimentary rocks (2mks)

(b) Give two examples of chemically formed sedimentary rocks (2mks)

3. a) Name the type of rocks which results from the metamorphism of:

(i) Granite

(ii) Clay (2mks)

b) Give two reasons why sedimentary rocks are widespread in the coastal plain of Kenya. (2mks)

4. (a) (i) What is a rock? (2mks)

(ii) Describe three ways through which sedimentary rocks are formed

- Mechanically formed

- Organically formed

- Chemically formed (6mks)

(b) Describe two process through which sedimentary rocks changer into metamorphic rocks

(c) Give an example of each of the following types of igneous rocks

(i) Plutonic rocks (1mks)

(ii) Hypabyssal rocks (1mks)

(iii) Volcanic rocks (1mks)

(d) Suppose you were to carry out a field study of rocks within the vicinity of your school

(i) Name three secondary sources of information you would use to prepare for the field study (3mks)

(ii) State four activities you would carry during the filed study (3mks)

(iii) State three problems you are likely to experience during the field study (3mks)

5. (a) Differentiate between plutonic rocks and volcanic rocks

(b) Describe how lava plateau is formed

(c) (i) Name three volcanic features found in the rift valley of Kenya

(ii) Explain four negative effects of vulcanicity in Kenya

(d) You intend to carry out a field study of a volcanic landscape

(i) State four reasons why it is necessary to conduct a reconnaissance of the area of study.

(ii) During your field work, you intend to study volcanic rocks, state why you would need the following items

6. (a) State two main conditions that influence the characteristics of igneous rocks. (2mks)

(b) Write down three characteristics of sedimentary rocks. (3mks)

(c) Name two examples of organic sedimentary rocks and where found in Kenya. (2mks)

(d) Name four examples of metamorphic rocks and state the original rock from which each was formed. (4mks)

(e) Describe the importance of rocks to human activities. (5mks)

7. (a) State with examples three classes of mechanically formed sedimentary rocks. (6mks)

(b) Differentiate between regional metamorphism and contact metamorphism. (4mks)

8. (a) List two examples of extrusive igneous rocks. (2mks)

(b) Differentiate between extrusive and intrusive rocks giving an example in each case. (2mks)

9. What is a rock? (2mks)

10. What is a mineral? (2mks)

11. Describe changes that occur in sedimentary rocks when they are subjected to high heat and pressure. (4mks)

12. Describe calcareous rocks. (2mks)

13. Describe carbonaceous rocks. (2mks)

14. Give examples of chemically formed sedimentary rocks. (2mks)

15. How are coral rock formed? (3mks)

16. How do rocks become metamorphic? (3mks)

MARKING SCHEME

1. (a) (i) **Colour** Distinct appearance by colour used to identify specific minerals eg. Gold is yellow.

(ii) **Cleavage** Tendency of mineral to break in certain direction.

Some minerals break along planes on which atomic bonds are relatively weak.

(iii) **Hardness** Ability to resist scratching. Various minerals have varying degree of hardness eg. Talc is softest while Diamond is hardest.

(b) (i) **Hypabyssal rocks**

- Volcanic rocks\extrusive igneous rock.

- Plutonic rocks/intrusive igneous rocks.

(ii)

- The water should be salty
- Water should be clear free from silt.
- Sea water should be warm with temperatures between 20°C to 29°C
- Shallow water with depth not exceeding 60m.
- Polyps must be in submerged condition.
- Water should be well oxygenated.

(c) • Some unique rocks e.g. crying stone of Kakamega present spectacular scenery for tourist attraction which helps earn the country some foreign exchange.

• Rocks are parent material for soil formation exploited in agricultural activities.

• Valuable rocks and minerals such as gemstones and diamond are exploited to generate income.

• Rocks provide building and construction materials e.g. marble, ballast and sand used in construction of houses.

• Rocks are useful as raw materials in construction industry e.g. The coral rocks and coral limestone are used in manufacture of cement.

(d) • A folk jembe- excavating rocks for closer examination.

- A polythene bag -for carrying rocks samples for subsequent studies.

2. (a) The rocks are formed from sediments of preexisting rocks.

- Rock sediments are arranged in layers.
- Processes involved act at ordinary temperatures
- Sediments are non-crystalline
- Some sediments contain fossils
- Sediments are compressed, hardened and consolidated by cementing material to form sedimentary rock.

(b) Give two examples of chemically formed sedimentary rocks.

Trona, gypsum, flint, rock salt

3. (a) In each case name the type of rock which results from the metamorphism of:

(i) Granite

(ii) Clay

Granite → Gness

Clay → slate

4. (a) (i) Rocks are naturally occurring agglomerations of mineral particles forming part of the earth crust.

(ii) (a). Mechanically formed sedimentary rocks formed from deposition of sediments of other rocks in layers.

(b). Organically formed - formed from remains of dead plants and animals which are laid down to layers.

(c). Chemically formed - formed from mineral particles dissolved from tend and deposited in layers into water bodies.

(b) • Weight of overlying layers cause change in grain arrangement in dynamic metamorphism.

• Heat of magma get into contact with sedimentary rocks causing grains to crystallize or form new minerals.

• During mountain building rocks are compressed and heat generated in thermodynamic metamorphism causing changes in structure and recrystallization of minerals.

(c) i) Granite, diorite and peridotite

ii) Dolerite, porphyrite and diabase.

iii) Basalt, obsidian and pumice.

(d) i) Secondary sources

- Text books/pamphlets/journals/ periodicals/ magazines/ news papers/handouts.

- Photographs/pictures/video tapes/slides/films

- Maps/geological maps

- Tape recorded information

ii) Activities during the field study

- Drawing of sketches

- Observation

- Collecting rock samples

- Making notes

- Taking photographs

- Asking/answering question.

- Studying geological maps -

- Labelling samples

- Breaking rocks

- Digging to access rocks

- Filling in the table.

- Filling in questionnaires

- Tape recording

iii) Likely problems

- Inability to identify the rocks

Inability to access the rocks

- Accidents/slipping

- Difficulties in climbing/descending steep rocks

- Hindrance by poor weather conditions/rainy/ sunny

- Attack by wild animals.

5. (a) i) Plutonic rocks are igneous rocks which form beneath earth surface when magma cool slowly forming large crystals\course grained/course textured.

ii) Volcanic rocks are igneous rocks formed on the earth surface when lava cool rapidly forming small crystals fine grained/textured.

6. (a) Conditions influencing characteristics of igneous rocks

• Mineral composition

• Mode of formation

(b) Characteristic of sedimentary rocks

• Arranged in layers/strata

• Non- crystalline

• Have bedding planes

• Contain fossils

(c) Limestone, chalk, coral reefs, ironstone, diatomite, coal.

(d) Original rock Metamorphic rocks

Limestone -Marble

Sandstone -Slate

Coal -Graphite

Clay/shale -Stale/schist

Mudstone- Slate

Augite- Hornblend

Granite -Gneiss

(e)

• Some rocks forms uniqueness features which attracts tourists and helps to earn foreign exchange.

Rocks are parent material for soil exploited for agriculture.

• Valuable rocks and minerals are exploited to generate income.

• Provides building and construction materials e.g. sand.

• Source of raw materials for cement industry.

7. (a) Mechanically formed sedimentary rocks.

(i) Arenaceous - Sandstone and grit

(ii) Argillaceous - Shale, claystone, siltstone, loess, mudstone

(iii) Rudaceous - Congolomerate, breccia and boulder clay.

(b) Contact metamorphism is due to heat from magma which leads to changes in appearance and character while regional metamorphism is due to heat and pressure which creates changes in rock structure and minerals.

8. (a) Basalt obsidian, Pumice, tuff, ryorite, andesite.

(b)

Intrusive igneous rocks are rocks formed when magma cools and solidifies below the earth's surface while extrusive are formed on the surface of the earth when lava has solidified.

Extrusive rocks - Basalt, obsidian

Intrusive - Granite, gubbro, diorite, perdotite, dolerite,

porphyrite, diabase.

9. A rock is an aggregate of mineral particles forming part of the earth's crust,

10. A mineral occurring inorganic substances with definite chemical composition and physical properties.

11. Heat and pressure - causes re crystallization of minerals. This creates new minerals. It also alters the structure of the minerals particles.

12. Calcareous rocks are formed from shells and skeletons of marine creatures. The shells skeletons accumulate in layers and are compressed to form hard correct mass.

13. Carbonaceous rocks are formed from remains of plants which are buried by overlying materials compacting them into hard mass.

14. Coral rocks results from accumulation of skeletons of coral polyps. The skeletons accumulates in layers to form hard compact mass (coral rocks).

15.

- By being subjected to
- Pressure - dynamic metamorphism
- Heat - contact/thermal metamorphism
- Pressure and heat - thermal -dynamic metamorphism.