THE EARTH AND ITS MOVEMENTS.

Competency: The learner understands the relationship between the Earth and the sun and the effects these have on our lives.

LEARNING OUTCOMES

The learner should be able to:

A. Understand the relationship between the Earth and the sun and how this affects Temperatures and seasons (u)

b. draw diagrams to show the relationship between the Earth and the sun's rays and the causes of temperature variations and use these to show why the Earth can be divided into tropical, temperate and polar regions (s)

c. understand how the rotation causes day and night (u)

d. know how we can locate places on a globe by using a grid including the use of latitude and longitude. (u)

e. use and measure latitude and longitude (s)

f. calculate time using longitude (s)

g. appreciate how the movement of the

Earth in relation to the Sun affects the way

People live: the effect of temperatures And seasons, length of days.

The earth is a planet in the solar system that supports life.This is because it has enough water and oxygen supply which is needed for life. Its position from the sun ie neither too close nor too far away from the sun gives it moderate temperatures that are neither too hot nor too cold hence supporting life.

It is the third planet from the sun and just as the other planets, it moves around the sun which affects time, temperature, seasons (climate) and people's ways of the life in the different parts of the world.

THE SOLAR SYSTEM.

Solar system refers to the sun and anything related to it.

It also refers to a group of heavenly bodies comprising of the sun and the eight planets.

The earth, the heavenly bodies and the sky make up what is known as the Universe.

COMPOSITION OF THE SOLAR SYSTEM.

1. SUN

It is a star which is the center of the universe.

A star is a heavenly body possessing its own light which it transmits.

A cluster of stars is known as a galaxy or nebula.

Earth is in a galaxy called Milky Way which contains 100 billion stars.

Characteristics of the sun.

- It radiates solar energy which is a source of heat to all the planets.
- It is surrounded by a layer of gas which has boiled due to its hot surface which is called corona.
- It has a diameter of 1392000km.

ILLUSTRATION OF THE SOLAR SYSTEM.

2. PLANETS.

Planets are large and spherical celestial bodies in space which move around a star called the sun.

The word ‘Planet’ has its origin from a Greek word ‘Planetes’ which means ‘wanderer’ or one who is on the move.

All the planets in the solar system move around the sun following a particular path called an elliptical orbit.

Therefore an orbit is a path in space which a planet follows as it moves around the sun.

No planet enters the orbit of another planet to avoid collision.

PLANETS IN THE SOLAR SYSTEM.

There are eight planets in the solar system which are arranged depending on the distance from the sun starting from the closest to the sun to the furthest from the sun.

Planets are subdivided into three categories;

a) Terrestrial planets

These are also known as rocky planets or inner planets composed of primarily silicate rocks or metals which forms a rocky surface and they are four closest planets to the sun.

These planets have few moons or no moons and are relatively small. These include;

- Mercury
- Venus
- Earth
- Mars

b) Jovian planets
These have multiple moons, no solid surface, support ring systems and are large in size. They are subdivided into the following;

- Gas giants.

These a planets mainly composed of mainly hydrogen and helium. They contain some basic elements of as a star. These include:

- Jupiter
- Saturn
    - Ice giants

These are planets composed of elements heavier than hydrogen and helium e.g oxygen, carbon, nitrogen and sulfur. They contain rock, ice and mixture of water, methane and ammonia. They are the furthest from the sun. These include;

- Uranus
- Neptune

ORIGIN THE SOLAR SYSTEM.

Learners make research about,

a) PASSING STAR THEORY.
b) NEBULA CLOUD THEORY
c) SUPERNOVA/ EXPLOSION THEORY

SIZE OF THE EARTH.

The size of the earth is much smaller compared to other planets. It flattens at the poles and widens or bulges at the equator giving it a small polar diameter and larger equatorial diameter. The size is as follows;

- Equatorial diameter is 12756km
- Equatorial circumference is 40085km

- Polar diameter is 12714km
- Polar circumference is 39995km
- Surface area of the earth is 510×10^6 km2

THE SHAPE OF THE EARTH.

The shape of the earth is called a geoid or oblate spheroid.

The earth is an imperfect sphere since it is wide at the equator and flat at the poles.

ILLUSTRATION OF THE SHAPE OF THE EARTH.

MOVEMENTS OF THE EARTH.

(Longhorn comprehensive secondary school atlas, certificate geography book 1, fountain Atlas)

The earth makes two types of movements;

1. The rotation of the earth.
2. The revolution of the earth.

ROTATION OF THE EARTH ON ITS AXIS.

- This is when the earth spins or moves on its axis from the west to the east through 360°.
- An axis is an imaginary line through the center of the earth form the North Pole to the South Pole.
- The axis is tilted at an angle of 23½° away from vertical or perpendicular plane and 66½° to its orbit or horizontal plane.
- The earth rotates in an anticlockwise direction.

ILLUSTRATION OF THE ROTATION OF THE EARTH.

The earth takes 24 hours to make a complete rotation.

Therefore; the earth takes 1 hour for every 15˚ of rotation.

It takes 4 minutes for every 1˚ of rotation.

EFFECTS OF THE ROTATION OF THE EARTH.

1. Day and night.

As the earth rotates, it exposes half of itself to the sun while the rest is in darkness.

The side/part/ region facing the sun experiences day time whereas the part facing away from the sun experiences night time.

ILLUSTRATION.

2. It causes sunrise and sunset.

The rotation of the earth from the west to the east anti clockwise direction makes the sun to rise from the east and set in the west.

This means the east gets sunlight before the west.

ILLUSTRATION.

3. It causes the rise and fall of ocean tides.

A tide is the alternate rise and fall of sea levels caused by the gravitational forces of the moon and the sun as the earth rotates.

One side of the sea bulges leading to the rise of sea level and the other fall in the sea level.

ILLUSTRATION.

4. It causes deflection of winds, ocean currents and objects in the northern hemisphere to the right and southern hemisphere to the left.

The inclination of the earth as it rotates limits the ocean currents, winds and objects from moving in a straight line therefore they are deflected.

ILLUSTRATION.

5. It causes time difference between longitudes.

The earth rotates around the sun through 360° of longitudes.

It takes; 24 hours to complete a full rotation.

1 hour to complete 15°

4 minutes to complete 1°

All places along the same longitudes record the same time known as local time.

Local time at Greenwich meridian also known as Longitude 0° is called Greenwich meridian Time (GMT)

The direction of movement the Greenwich meridian affects time difference whereby when one moves east, time is gained however when one moves west time is lost.

ILLUSTRATION (can use a world map from longhorn atlas page 26)

REVOLUTION OF THE EARTH.

(Longhorn comprehensive secondary school atlas, certificate geography book 1, fountain Atlas, Mk Atlas)

The movement of the earth around the sun in its orbit is referred to as revolution of the earth.

The earth moves around the sun in an anticlockwise direction at an angle of 66½° to its orbit.

It takes 365¼ days to complete a full revolution around the sun.

Therefore 365¼ days make up one year however the ¼ day is ignored in the three consecutive years hence termed as the ordinary years.

In the fourth year, the earth takes 366 days to make a complete revolution hence this is termed as a leap year.

This is why the month of February is 28 days in an ordinary year and 29 in a leap year.

EFFECTS OF THE REVOLUTION OF THE EARTH.

1. It causes the equinoxes.

Equinox refers to the period when the sun is overhead the equator.

The sun is overhead the equator twice a year ie 21st march and 23rd September.

During equinox, the sun is directly above the equator at noon because the earth's axis is not tilted towards or far away from the sun. Hence equal lengths of the day and night.

ILLUSTRATION

2. It causes summer and winter solstices.

A solstice is a period when the sun is overhead the tropics.

It occurs when the earth's axis is extremely tilted.

Summer solstice occurs on 21st June when sun is overhead the tropic of cancer. The North Pole is tilted close to the sun therefore the northern hemisphere receives the greatest solar energy.

Winter solstice occurs on 22nd December when the sun is overhead the tropic of Capricorn. The South Pole is tilted closest to the sun therefore the southern hemisphere receives the greatest solar energy.

ILLUSTRATION

3. It causes change in seasons. (Mk secondary school Atlas)

Different parts of the earth experience climatic changes due to the revolution of the earth around the sun.

The northern and the southern hemisphere experience four seasons i.e. spring, summer, autumn and winter, wet and dry seasons in the tropics and cold seasons in the polar regions.

This divides the earth into temperate, tropical and polar climatic regions.

On 21st march, the sun is overhead the equator (equinox) hence spring season in the the northern hemisphere and autumn season in the southern hemisphere.

On 21st June, the sun is overhead the tropic of cancer hence the summer season in the northern hemisphere and winter season in the southern hemisphere experiences winter

On 23rd September (equinox), the sun is overhead the equator hence the autumn season in the northern hemisphere and spring season in the southern hemisphere.

On 22nd December, the sun is over head the tropic of Capricorn hence the winter season in the northern hemisphere and summer season in the southern hemisphere.

It should be noted that the spring, summer, autumn and winter seasons are nonexistent in the equatorial regions or tropics because they are exposed to the sun throughout the year.

ILLUSTRATION

4. It causes temperature variations in different parts of the world.(Active Geography book1)

In the northern and southern hemispheres, spring season is warm, summer is hot, autumn is cool and winter is cold due to the tilted axis to the orbital plane.

The tropical regions experience warm and hot throughout the year because they receive direct sunlight all year round as the earth revolves around the sun.

The Polar Regions experience cold temperatures and sometimes permanently frozen with ice because they don't receive direct sunlight most of the year.

ILLUSTRATION

5. It causes variation or changes in the length of the day and night.

During equinox, the length of the day and night is equal in the northern and southern hemispheres. This is because both hemispheres receive equal sunlight.

Summers are characterized by long days and short nights while winters are characterized by short days and long nights.

ILLUSTRATION

6. It causes changes in the height of the midday sun due to the elliptical orbit of the earth.

The amount of sunshine and strength of sunlight received is determined by the angle at which the rays strike the earth's surface.

The highest altitude is during equinox while the lowest altitude is during solstices.

ILLUSTRATION

7. It causes lunar eclipse.

As the earth revolves around the sun, it passes between the sun and the moon hence casting the Earth's shadow is cast on the moon. This leads to dark nights.

ILLUSTRATION

LATITUDE AND LONGITUDE.

Activity

1. Find out how many degrees and hours the following cities are from the Greenwich.
   a. Cape town
   b. Santiago
   c. Abuja
   d. Beijing
2. If its is 12 noon at the Greenwich, what time is it at;
   i. 30 degrees East of the Greenwich.
   ii. 45 degrees East of the Greenwich.

   iii. 20 degrees West of the Greenwich.
   iv. 75 degrees West of the green wich.
3. A zoom meeting is to be conducted at 12 noon in Cape town which is at 0 degrees of the Greenwich. It is to be attended be James in Nairobi Kenya, Juma in Tokyo Japan and Nasuuna in Abu Dhabi. What the time will it be at James's, Juma's and Nasuuna place by the time of start of the meeting?