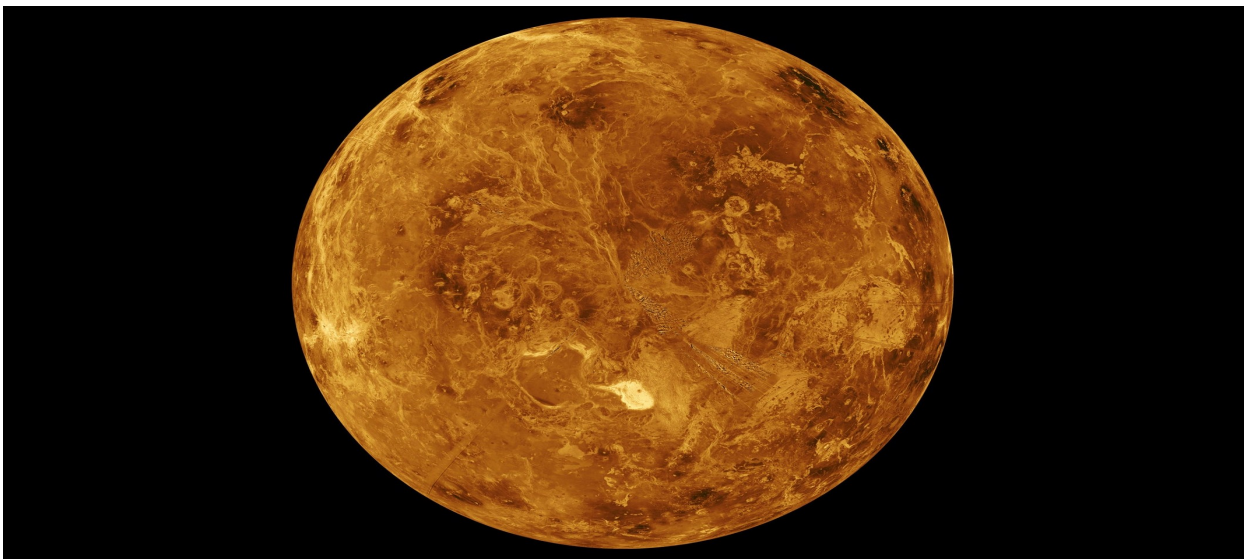




GEOGRAPHY NOTES FORM 1

EARTH AND THE SOLAR SYSTEM



Specific objectives

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

- define the solar system
- explain the origin of the earth
- explain the effects of rotation and revolution of the earth
- describe the structure of the earth.

The Earth and the Solar System

Solar system is the group of heavenly bodies comprising the sun and the nine planets.

The origin of the Solar System.

Theories

A theory is a set of reasoned ideas intended to explain facts or events

1. Passing Star Theory

A star with a greater gravitational pull passed near the sun, it attracted large quantities of gaseous materials from the sun, and the materials split, cooled and condensed to form planets, the planets were set in orbit by the passing star

Weaknesses

- i) Doesn't explain the origin of the sun and star.
- ii) Minimal chance of a star approaching another
- iii) High temperature, gaseous material drawn from the sun would disperse than condense
- iv) The gases should have followed the star since it had a greater gravitational pull.

2. Nebula Cloud Theory

There was a slowly rotating cloud of dust and gas called Nebula, As the nebula rotated it flattened into a disc with high concentration of materials at the center, The high concentration of material at the center condensed to form the sun. Gases such as ammonia and methane condense to form larger planets that is Jupiter, Saturn, Uranus and Neptune. Closer to the center of Nebula, particles of dust and gas bumping into each other formed the inner smaller planets.

Evidence

Rotation and revolution of planets in anticlockwise direction

Weakness

- i) The origin of nebular is not explained.
- ii) Cause of rotation is not mentioned.
- iii) All planet should rotate in the direction of the rotation of the nebula that is west to east but Venus and Uranus rotates from west to east.

Learner's Short Notes

3. Collision Theory

Star with greater gravitational pull passed near the sun. It attracted large quantities of gaseous materials. The materials split into portions. Large portions collided with smaller ones and swept them to form planets. The weaknesses are the same as the passing star's Theory

4.Supernova/explosion Theory

There was a violent explosion of a star. A cloud of dust (nebular) remained from the star. There was fast movement of the cloud due to the force of explosion. Rotation speed increased due to gravitational attraction. The cloud flattened into a disc. The matter began to accumulate towards the center to form a proto-sun which later began to shine. The rest of the cloud collapsed to form planets.

Weaknesses

- i) Doesn't explain the origin of the star
- ii) Doesn't explain the cause of explosion

“FIRST OF ALL, THE BIG BANG WASN'T VERY BIG. SECOND OF ALL, THERE WAS NO BANG. THIRD, BIG BANG THEORY DOESN'T TELL YOU WHAT BANGED, WHEN IT BANGED, HOW IT BANGED. IT JUST SAID IT DID BANG. SO THE BIG BANG THEORY IN SOME SENSE IS A TOTAL MISNOMER.” ~ MICHIO KAKU

Composition of the Solar System

1.The Sun

It's the center of the universe.

Characteristics

- i) It's a star - A star is a heavenly possessing its own light which it transmits.
- ii) Nebula/galaxy is a cluster of stars.
- iii) The earth is in a galaxy called The Milky Way.

Learner's Short Notes

- iv) It's made of very hot gases mainly hydrogen (70%) and helium (30%).
- v) Has a diameter of 1,392,000km.
- vi) Surrounded by a layer of gas which has boiled from its surface which is called corona.
- vii) Rotates on its own axis in anticlockwise direction.
- viii) Has gravitational pull which holds all the planets in orbit around it.
- ix) An orbit is a path which a planet or a satellite follows around a star or a planet.
- x) Temperature at its center is $15\text{m}^\circ\text{c}$ and at the surface is 5500°c .
- xi) Radiates solar energy which is very important for all forms of life on the earth.

2.The Planets

Planets are large spherical celestial/heavenly bodies in space.

There are 9 planets in our solar system.

Characteristics

- i) Spherical in shape
- ii) Don't have their own light but reflect it from the sun.
- iii) Revolve around the sun in anticlockwise direction.
- iv) Have their own force of gravity
- v) Only one is known to support life.
- vi) The following are the planets arranged in order from the one nearest to the sun.

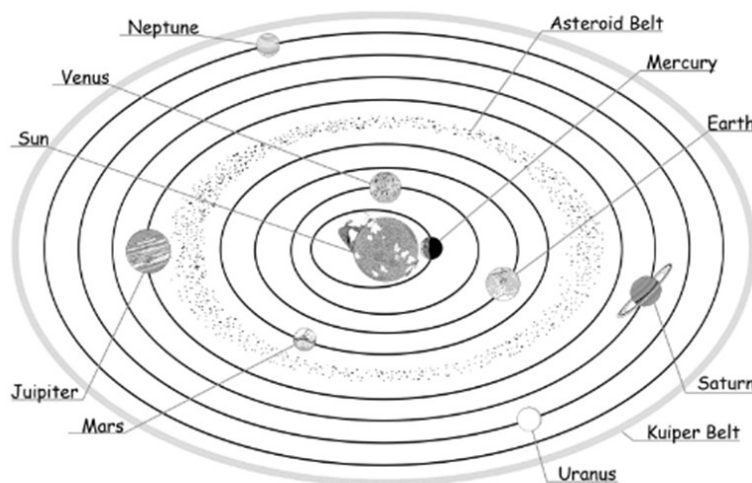


FIGURE 1: SOLAR SYSTEM

Learner's Short Notes

a) Mercury

- i) Nearest from the sun
- ii) Its 58m km from the sun
- iii) Has no satellites
- iv) Takes approximately 88 earth days to revolve around the sun

b) Venus

- i) 2nd planet from the sun
- ii) It's 108m km from the sun
- iii) One of the brightest planets
- iv) Can be seen clearly with naked eyes
- v) Takes approximately 225 earth days to revolve around the sun
- vi) Slightly smaller than the earth
- vii) Has no satellites
- viii) Together with the earth they are called twin planets due to having many similarities

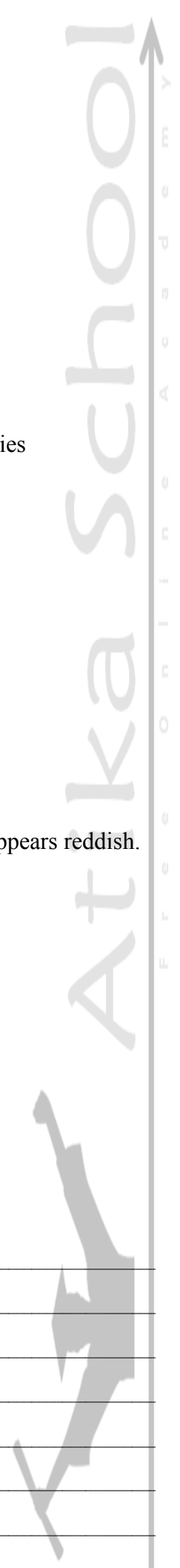
c) Earth

- i) The 3rd planet from the sun
- ii) The earth and the heavenly bodies make the universe
- iii) The only planet that supports life
- iv) The home of man
- v) Approximately 149m km from the sun
- vi) Takes 365 $\frac{1}{4}$ days to revolve around the sun
- vii) Has one satellite, the moon

d) Mars

- i) Also called The Red Planet because when it's observed through a telescope it appears reddish.
- ii) The 4th from the sun
- iii) Slightly smaller than the earth
- iv) Approximately 228m km from the sun
- v) Takes 687 earth days to revolve around the sun
- vi) Between Mass and Jupiter there are small celestial bodies called planetoids.
- vii) Has no satellite.

Learner's Short Notes



e) Jupiter

- i) 5th planet from the sun
- ii) Approximately 778m km from the sun
- iii) Largest in the universe
- iv) Rotates on its own axis at very fast speed
- v) Has flattened poles due to its fast speed of rotation
- vi) Has very thick layers of ice on its surface takes 12 earth years to revolve around te sun
- vii) Has 16 satellites

f) Saturn

- i) 6th planet from the sun
- ii) Second largest planet
- iii) Approximately 1427m km from the sun
- iv) Takes 29 ½ earth years to revolve around the sun
- v) Has a ring around it
- vi) Has 18 satellites

g) Uranus

- i) 7th planet from the sun
- ii) About 4 times bigger than the earth
- iii) Approximately 2870m km from the sun
- iv) Also rotates very fast
- v) Also has flattened poles due to fast speed of rotation
- vi) It appears greenish foe being surrounded by methane gas
- vii) Has 8 satellites
- viii) Takes 84 earth years to revolve around the sun

h) Neptune

- i) One of the farthest from the sun
- ii) 8th planet from the sun
- iii) Approximately 4497m km from the sun
- iv) Has 8 satellites
- v) Takes 165 earth years to revolve around the sun
- vi) Very similar in size, color and character with Uranus

Learner's Short Notes



i) Pluto

- i) 9th planet from the earth
- ii) Farthest from the sun
- iii) The smallest
- iv) 1/6 the size of the earth
- v) Approximately 5900m km from
- vi) Takes 248 earth years to revolve
- vii) Has one satellite
- viii) Very little is known about it

Other Celestial Bodies

Natural Satellites

- Any natural heavenly body that orbits around a planet e.g. moon for earth, tritan for Saturn and Triton for Neptune.

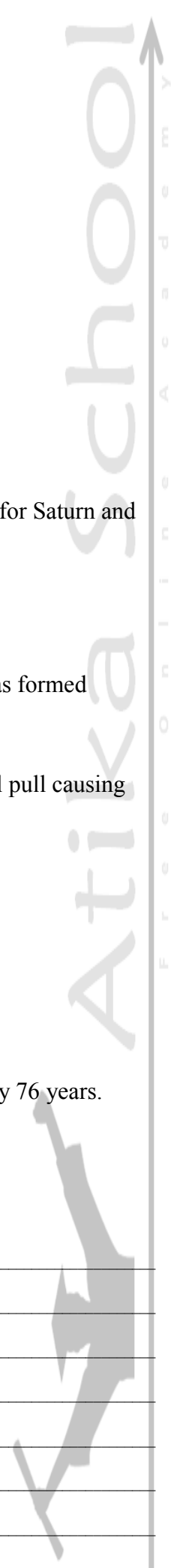
Asteroids/Planetoids

- Also called minor planets.
- Are small fragments of rocks left going around the sun when the solar system was formed
- Found between Mass and Jupiter
- They are 1500 in number
- They sometimes collide with each other and planets due to Jupiter's gravitational pull causing them to move in erratic orbits.

Comets

- Heavenly bodies which appear to have a head and a long tail
- Made of ice, dust and frozen gas
- The head is made of many particles of dust, rock and frozen gases.
- Their tail is made of gases and points away from the sun.
- Move around the sun in extremely long and oval orbits
- Their orbits cross the earth's orbits e.g. Halley's Comet which appears after every 76 years.

Learner's Short Notes



Meteoroid

- Small heavenly body which strays from its orbit in the solar system and enters the earth's atmosphere at very high speed.

Meteor

- A meteoroid which is burning out due to friction after entering the earth's atmosphere.

Meteorite

- Remains of a meteoroid which have reached the earth's surface or incompletely burnt up meteoroid.
- When they fall they sink into the ground forming craters
- They are rich in iron

The Moon

- A natural satellite
- Receives its light from the sun and reflects it onto the earth.
- It revolves around the earth
- Takes 29.5 days to complete one revolution around the earth
- Its orbit is almost circular
- As it revolves around the sun it appears in various shapes ranging from crescent/new moon, half moon, gibbons moon and full moon.
- Has gravitational pull which causes the rising and falling of the ocean level
- As the moon orbits around the earth it creates an event called eclipse.

Eclipse

Phenomenon occurring when the rays of the sun are blocked from reaching the earth or the moon.

Learner's Short Notes

Solar/Sun Eclipse

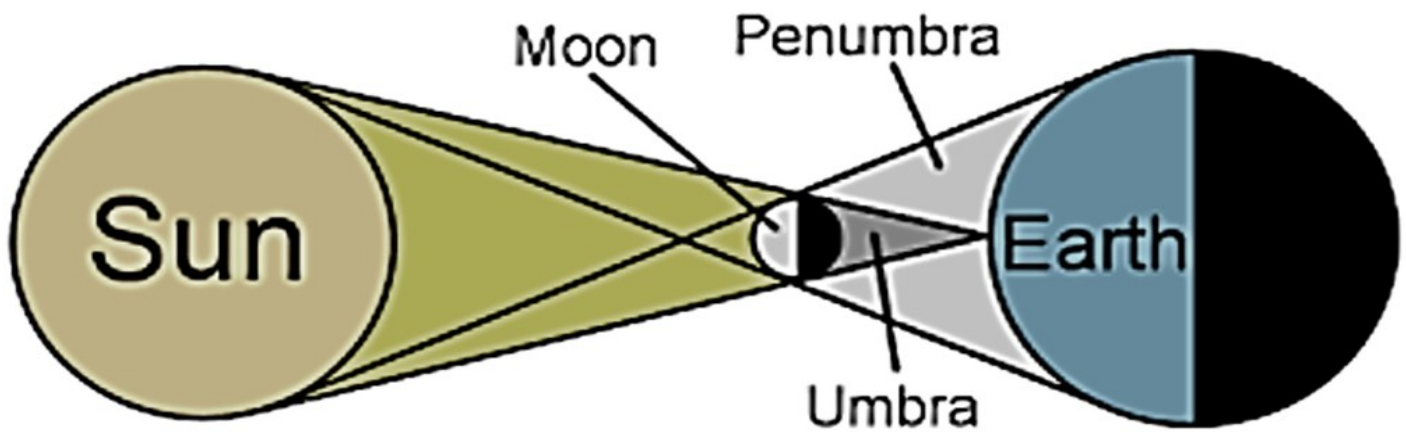


FIGURE 2: SOLAR ECLIPSE

- The moon comes between the earth and the sun
- The moon's shadow is cast on the earth
- The sun appears to be covered by darkness

Lunar/moon Eclipse

- The earth comes between the moon and the sun
- The earth's shadow is cast on the moon
- The moon appears to be covered by darkness

Learner's Short Notes



Atika School



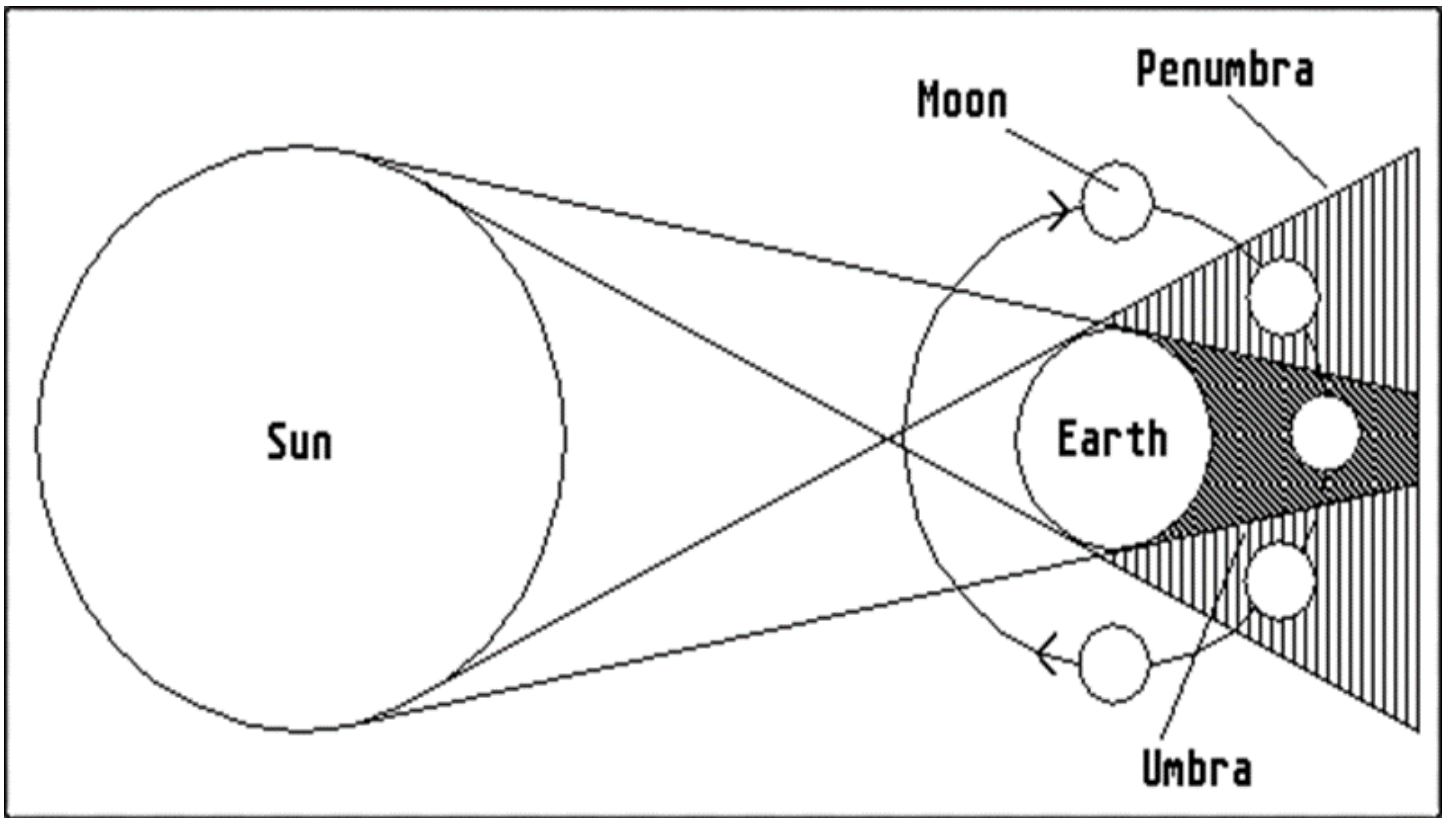


FIGURE 3: LUNAR ECLIPSE

The Origin of the earth

- A star with a greater gravitational pull passed near the sun
- It attracted large quantities of gaseous materials from the sun
- The materials split, cooled and condensed
- Heavier materials collected at the center to form the core
- Less dense materials collected around the core to form the mantle
- The lightest materials formed the crust

Learner's Short Notes

The shape of the earth

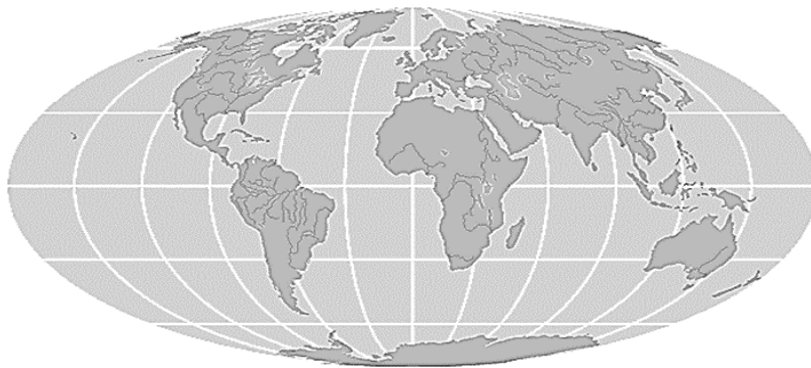


FIGURE 4: SHAPE OF THE EARTH

The shape of the earth is called geoid/ovoid/oblate spheroid due to being an imperfect sphere by being wide at the equator and flat at the poles.

Proofs/Evidence That the Earth Is Spherical

1. If one moves towards the east in a straight line he will end up where he started.
2. Satellite photographs taken from space show that the earth is like a sphere.
3. Places in the east see the sun earlier than those in the west.
4. When a ship is approaching the smoke is seen first, then the mast and finally the whole ship.
5. All the planets are spherical so the earth being one of them is also spherical.
6. During the moon eclipse the earth casts a spherical shadow on the moon.
7. The earth's horizon appears curved when observed from a very high point like a tower.

The size of the earth

- Equatorial diameter-12756km
- Equatorial circumference-40085km
- Polar diameter-39995km
- Surface area of the earth- $510 \times 10^6 \text{ km}^2$
- Water surface — 73%.

Learner's Short Notes

The Movement of the Earth

- There are 2 movements of the earth namely:
- Rotation of the earth on its axis
- Revolution of the earth around the sun

Rotation of the Earth

- Movement of the earth on its own axis (imaginary line through the centre from N pole to S pole).
- Rotates through 360° .
- Takes 24 hours (day) to complete 1 rotation.
- Rotates in an anticlockwise direction (west to east).

Effects of Rotation of the Earth

1. Creates day and night because at any one time one side of the earth faces the sun (day) and the other remains in darkness (night).
2. Causes deflection of winds and ocean currents in the N hemisphere to the left and in the S hemisphere to the right.
3. It causes rising and falling of ocean tides.
4. Causes time difference between longitudes.
 - i) Takes one hour to go through 15° .
 - ii) 4 min to go through 1° .

Calculation of Local Time

The time recorded in places within the same longitude. A longitude is an imaginary line running from N to S which shows how far E or W a place is from the prime meridian. Greenwich Meridian (0°) longitude is the point of reference when calculating time. Time is gained towards the E and lost towards the W.

Learner's Short Notes

Examples

Suppose the time at GWM is 12 noon what is the local time at Watamu 40°E?

$$\text{Time gained} = 40 \times 4 = 160\text{min} = 2 \text{ hours } 40\text{min}$$

$$\text{Local time at Watamu is } 12.00 + 2.40 = 14.40 - 1200 = 2.40\text{pm.}$$

At Dar-el-Salaam 40°E time is 12pm what is the time at Ecuador 40°E?

$$40^{\circ} + 20^{\circ} = 60^{\circ}$$

$$60 \times 4 = 240\text{min} = 4 \text{ hours}$$

$$\text{Ecuador is behind in time} = 12.00 - 4 = 8 \text{ am.}$$

If the places are on the same side subtract the degrees to get the difference and add or subtract from the reference time depending on which side the place is.

Calculation of Longitude

What is the longitude of place x whose local time is 8 am when local time at GWM is noon?

$$\text{Time difference} = 12.00 - 8 = 4 \text{ hours}$$

$$\text{Degrees} = 4 \times 15 = 60^{\circ}$$

Since x is behind in time its then 60°W.

Learner's Short Notes

Standard Time and Zones

Standard time is time recorded by countries within the same time zone.

Standard time was come up with due to confusion resulting from time changing at every longitude.

The world has 24 time zones.

The International Date Line

It's the 180° longitude.

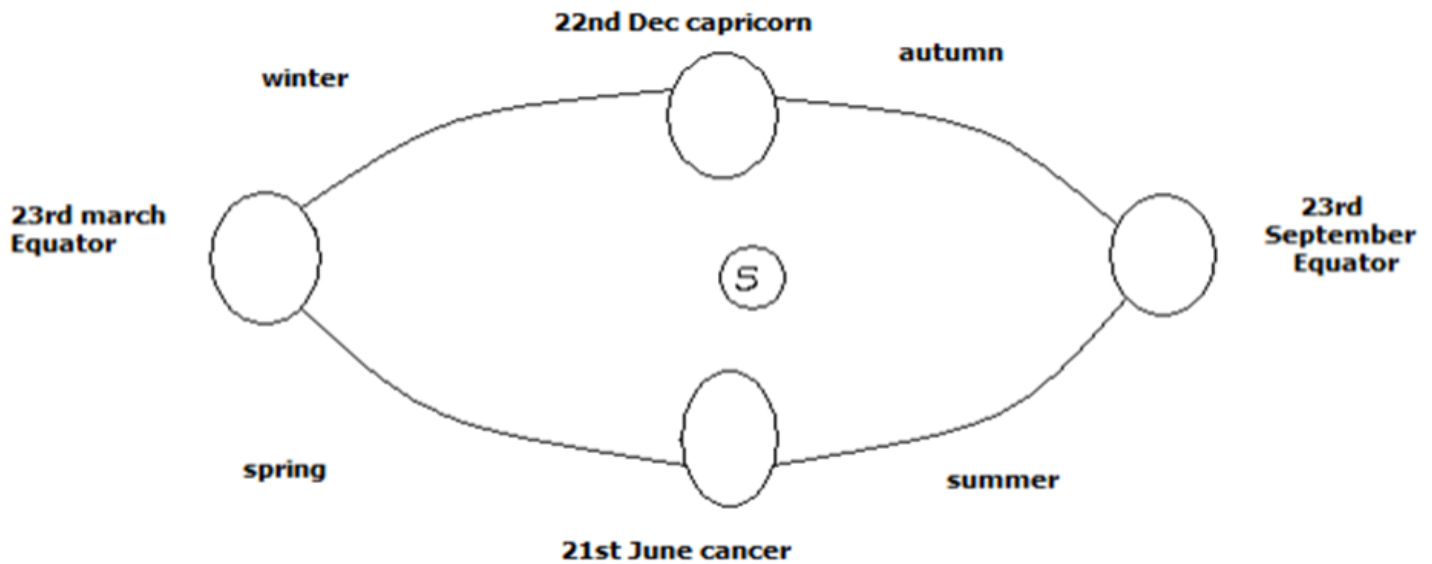
Effects of Crossing It

- One gains time when he crosses it from W to E and has to adjust the clock ahead by 24 hours.
- One loses time when he crosses it from E to W and has to adjust the clock backwards by 24 hours.

Revolution of the Earth

- Movement of the earth in its orbit around the sun.
- It's in anticlockwise direction.
- The orbit of the earth's revolution is elliptical.
- Takes $365 \frac{1}{4}$ days in a year or 366 days in a leap year (every 4 years).
- The sun moves from the tropic of cancer to the equator and then towards tropic of Capricorn and back to the tropic of cancer.
- 21st march and 23rd September are called **equinoxes** because the length of day and night is equal. The sun is vertically overhead at noon at the equator.
- 21st June is called **summer solstice** because its summer in the N hemisphere. The sun is vertically overhead at noon at the tropic of cancer.
- 22nd December is called winter solstice because its winter in the S. hemisphere. The sun is vertically overhead at noon at noon at the tropic of Capricorn.
- Solstice is the period of maximum tilting of the earth towards the sun.

Learner's Short Notes



Effects of the Revolution of the earth

1. Causes the four seasons summer, autumn, winter and spring due to the movement of overhead sun causing changes in the heat belt.
2. Causes variation of day and night's lengths due to the earth's axis being inclined to the path of revolution at an angle of 60° .
 - Equinoxes have equal lengths of day and night.
 - Summers have longer days and shorter nights.
 - Winters have longer nights and shorter days.

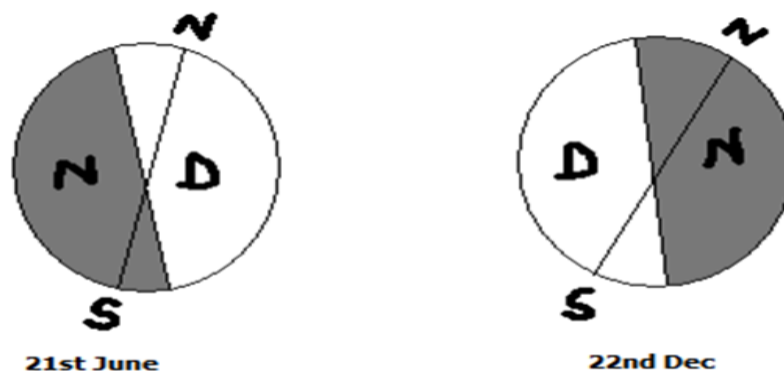


FIGURE 6: EFFECTS OF EARTH REVOLUTION

Learner's Short Notes

3. Causes changes in the altitude of the midday sun due to the earth's orbit being elliptical.
 - Highest altitude during equinox
 - Lowest altitude during solstices
4. Causes lunar eclipse due to revolution bringing the earth in line with the sun and the moon.

The Structure of the Earth

Internal Structure of the Earth

The evidence used to study the earth's interior are

- a. mining
- b. drilling
- c. quarrying/excavation

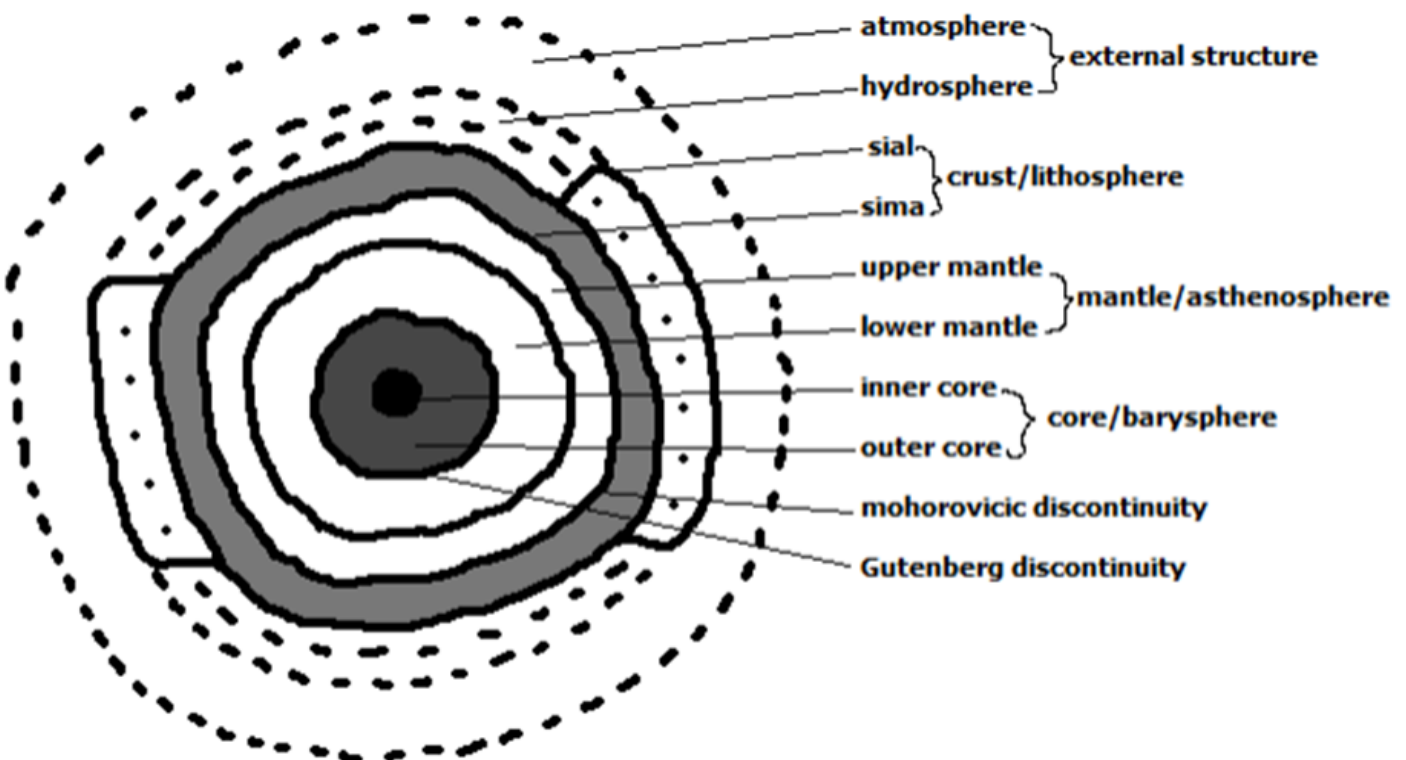


FIGURE 7: THE STRUCTURE OF THE EARTH

Learner's Short Notes



A. Crust/Lithosphere

- Outermost layer of the earth
- Made of soils and other loose deposits of sand
- The dominant rocks are granites.
- Extends 0-50km
- Has 2 layers

Sial

- Also called continental crust
- Made of light coloured rocks
- Called sial because it's made up of silica and aluminium.

Sima

- Also called oceanic crust
- Mainly made of basaltic rocks which are brittle.
- Called sima because it is made of silica magnesium and iron.

Mohorovicic Discontinuity (Moho)

- A definite zone of discontinuity between the crust and the mantle.
- Was discovered by Dr. Andrija Mohorovicic in 1909.

B. The Mantle/Asthenosphere

- Layer lying between the crust and the core
- Made of iron and magnesium
- Has two layers

Upper mantle

- Rocks are more elastic than those of sima.
- Temperature is about 1000⁰c.

Lower mantle

- Rocks are like very viscous liquid.
- Temperature ranges between 1000⁰c to 3000⁰c.

Learner's Short Notes



Why the Interior of Earth Is Very Hot

- i) Due radio-active decay causing most of the heating.
- ii) Due to great pressure as a result of overlying crustal materials.
- iii) The original heat resulting from slow cooling of the materials which were pulled off the sun

Gutenberg Discontinuity

- A definite zone of discontinuity between mantle and core.

C. Core/bar sphere/Centrosphere

- The innermost/central layer of the earth.
- Has 2 layers

Outer Core

- Composed of very dense rocks
- Made up of nickel and iron
- Temperatures are up to 3700°C .

Inner Core

- A solid mass of mainly iron
- Temperatures are estimated to be 4500°C to 5000°C

Learner's Short Notes

External Structure of the Earth

a) The Atmosphere

- Layer of gases surrounding the earth.
- The earth revolves with it because it's held onto it by gravity
- It's about 330km thick.

Composition of the Atmosphere

- Gases-exist as a mixture
- Smoke particles
- Dust particles
- Water vapour

The structure of the Atmosphere

It's divided into 4 layers/zones namely:

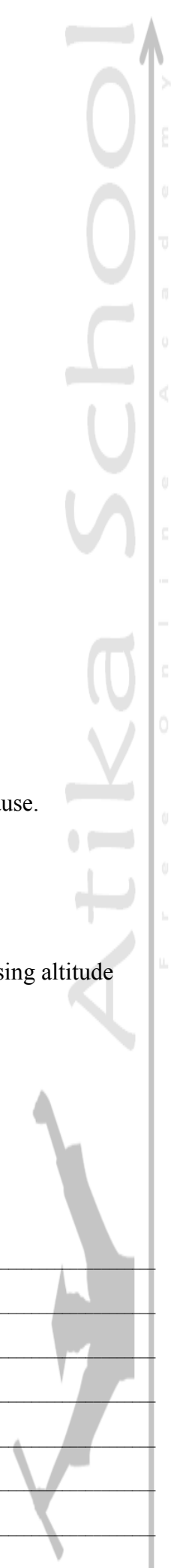
1. Troposphere

- Lowest layer of the atmosphere
- Contains 90% of water vapour
- Rainfall is got from it
- Temperature decreases with increase in altitude (lapse rate)
- Air is turbulent due to mixing of air
- Contains dust particles
- There is a zone of transition between troposphere and stratosphere called tropopause.

2. Stratosphere/ozonosphere

- Layer lying next to troposphere
- Has layers
- Lower isothermal layer in which temperature is constant
- Upper layer of temperature inversion in which temperature increases with increasing altitude
- Has ozone layer which absorbs harmful ultraviolet radiation.
- Air is calm so it's used by passenger jets

Learner's Short Notes



- Limited amounts of water vapour
- There is a zone of transition between stratosphere and mesosphere called stratopause.

3. Mesosphere

- Middle layer of the atmosphere.
- Temperature decreases with increasing altitude.
- There is a zone of transition between mesosphere and thermosphere called mesopause which is an inversion layer.

4. Thermosphere/ionosphere

- High radiation is present.
- The pressure is very low.
- Gases and molecules in this layer exist as ions due to high radiation.
- Has no definite top but merges gradually into the outermost part of the atmosphere called exosphere.
- Exosphere consists of rare gases like hydrogen and helium.
- Beyond the atmosphere there is the outer space.
- Outer space is the universe beyond the atmosphere in which other planets and stars exist.

Significance of Atmosphere

- Animals and plants breathe in from it oxygen for respiration.
- Plants use carbon dioxide from it for photosynthesis.
- Water vapour in the atmosphere condenses to form clouds which give us rain.
- Ozone layer in the stratosphere shields us from ultraviolet radiation which may cause cancers.
- Carbon dioxide and methane in the atmosphere cause global warming through the green house effect.

5. The Hydrosphere

- Part of the earth's surface covered by water masses e.g. oceans, seas, lakes, rivers and even underground water.
- It comprises 73% of the earth's surface area.
- The atmosphere and hydrosphere are related in that atmospheric gases penetrate to the ocean depth in solution form.
- The lower atmosphere, hydrosphere and the upper part of the earth's crust are called biosphere meaning the sphere of the earth in which organic life exists.

Learner's Short Notes

Additional Notes

Earth's crust; The crust ranges from 5-70km in depth and is the outermost layer.

There are two different types of crust;

- a) The thin **oceanic crust**, which underlines the ocean basins (5-10km). It mainly consists of *silica* and *magnesium*; it is therefore called **sima** (si-silica and ma-magnesium).
- b) The thicker; **continental crust**, underlying the continents and is less dense. The main mineral constituents of the continental mass are silica and alumina; it is thus called **sial** (si-silica, 65-75% and al-alumina).

NB; The uppermost mantle together with the crust constitutes the **lithosphere**.

The crust-mantle boundary occurs as the **Mohorovicic discontinuity or moho**.

Mantle

- Earth's Mantle extended to a depth of 2,890km, and is the thickest layer of the earth. The mantle is mainly composed of *olivine-rich rock*
- the temperature of the mantle increases with depth. This steady increase of temperature with depth is known as the **geothermal gradient**.
- Rocks in the upper mantle are cool and brittle enough to break under stress and *produce earthquakes*, while rocks in the lower mantle are hot and soft (but not molten) and flow when subjected to force instead of breaking.
- *Convection currents* exist in the mantle and cause motions of the **tectonic plates**.

Core

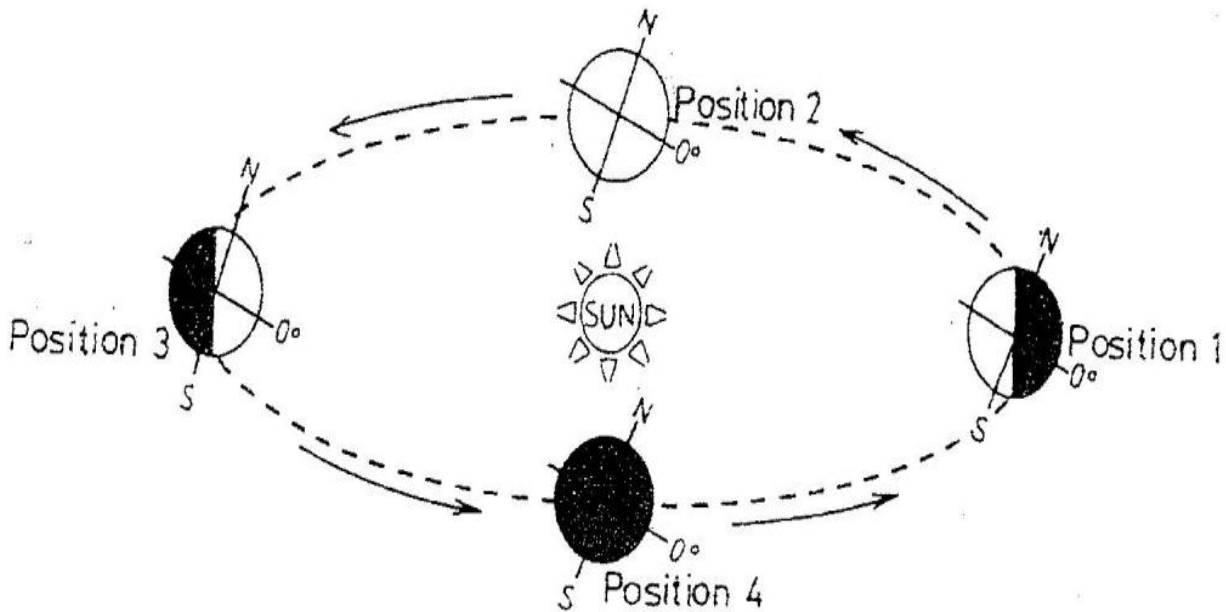
- Earth's core is thought to be composed mainly of *iron (80%)*, and nickel alloy and one or more light elements. Many meteorites (which are thought to be portions of the interior of a planetary body) are iron-nickel alloys.
- Seismic measurements show that the core is divided into two parts;
 - a) A *liquid outer core* extending to a radius of ~3,400km. the temperatures there are adequate to melt the iron-nickel alloy. It surrounds the inner core.
 - b) A *solid inner core* with a radius of ~ 1,220km. though its temperature is higher than the outer core, tremendous pressure, produced by the weight of the overlying rocks is strong enough to crowd the atoms tightly together and prevents the liquid state. The inner core rotates slightly faster than the rest of the planet.

Sources of information on the internal structure of the earth.

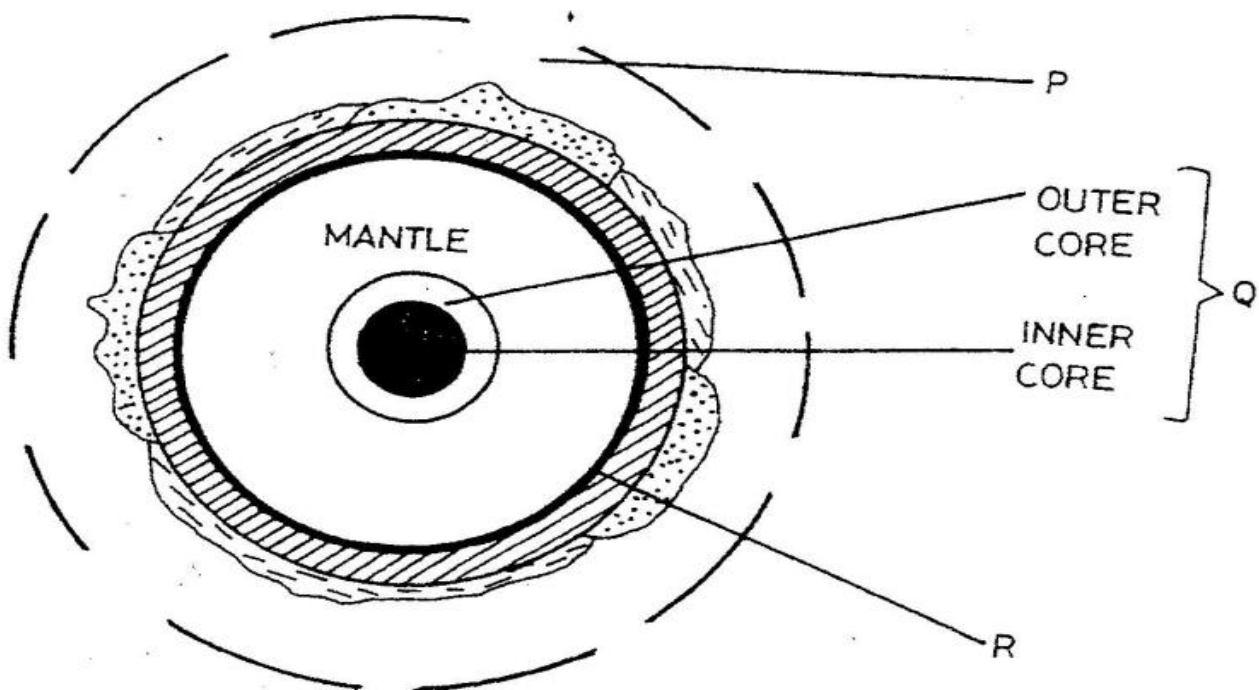
- a. Observations of topography and bathymetry.
- b. Observations of rock in outcrop samples brought to the surface from greater depths by volcanic activity.
- c. Analysis of the seismic waves that pass through the earth.
- d. Measurements of the gravity field of the Earth.
- e. Experiments with crystalline solids at pressures and temperatures characteristics of the Earth's deep interior.

THE EARTH AND THE SOLAR SYSTEM.
PAST KCSE QUESTIONS ON THE TOPIC

1. (a) State two effects of the rotation of the earth (2mks)
- (b) Study the diagram below and answer the questions that follow



- (i) Which movement of the earth is represented by the diagram? (1mk)
- (ii) Give two effects of the movement represented by the diagram (2mks)
2. The diagram below represents the structure of the earth. Use it to answer question



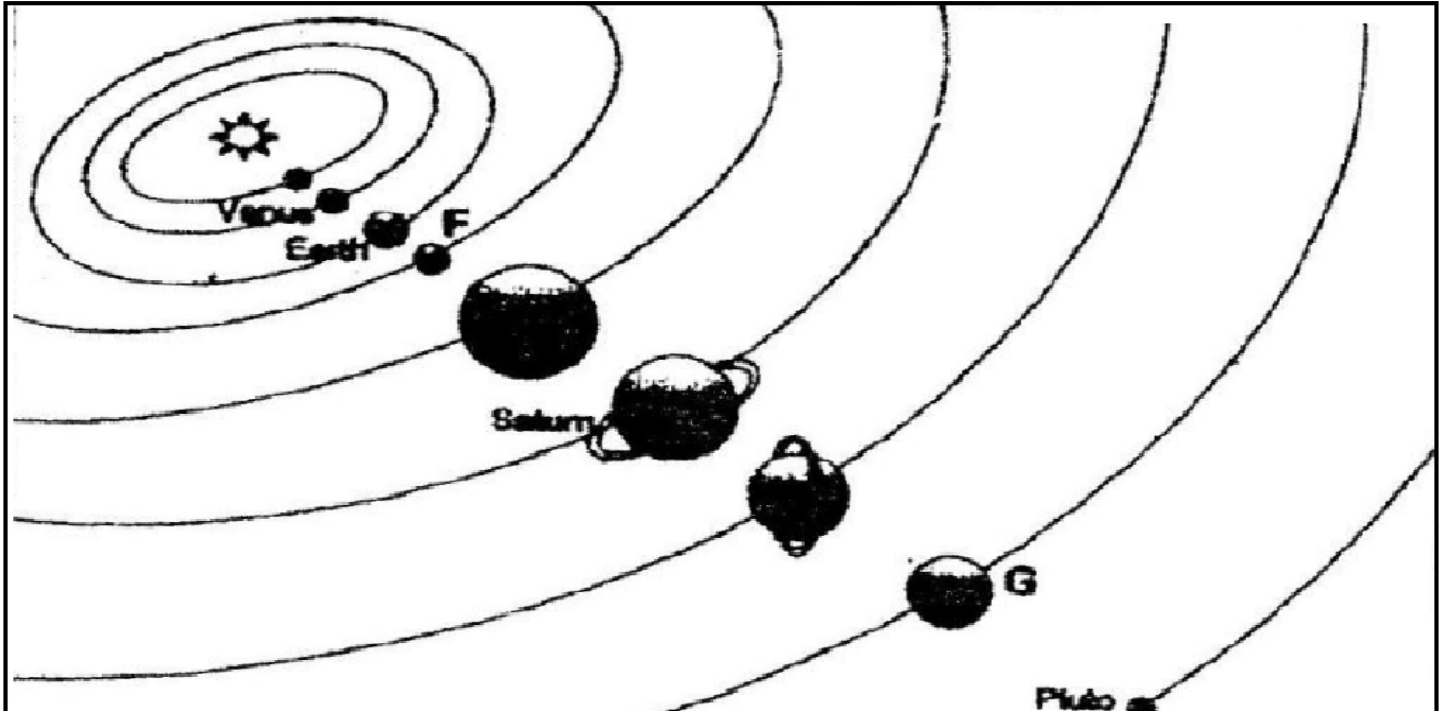
(a) Name

(i) The parts marked P and Q (2mks)

(ii) The discontinuity marked R (1mk)

(b) State three characteristics of the mantle (3mks)

3. The diagram below shows the composition of the solar system

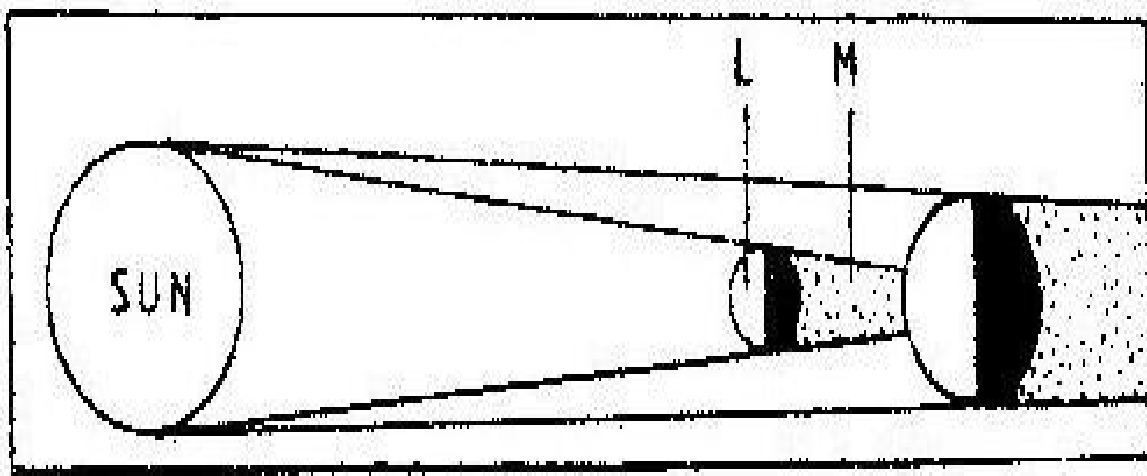


(a) Name the planets marked F and G (2mks)

(b) State three effects of the rotation of the earth on its axis (3mks)

4. a) What is the solar system?

b) Use the diagram below to answer the questions that follow.



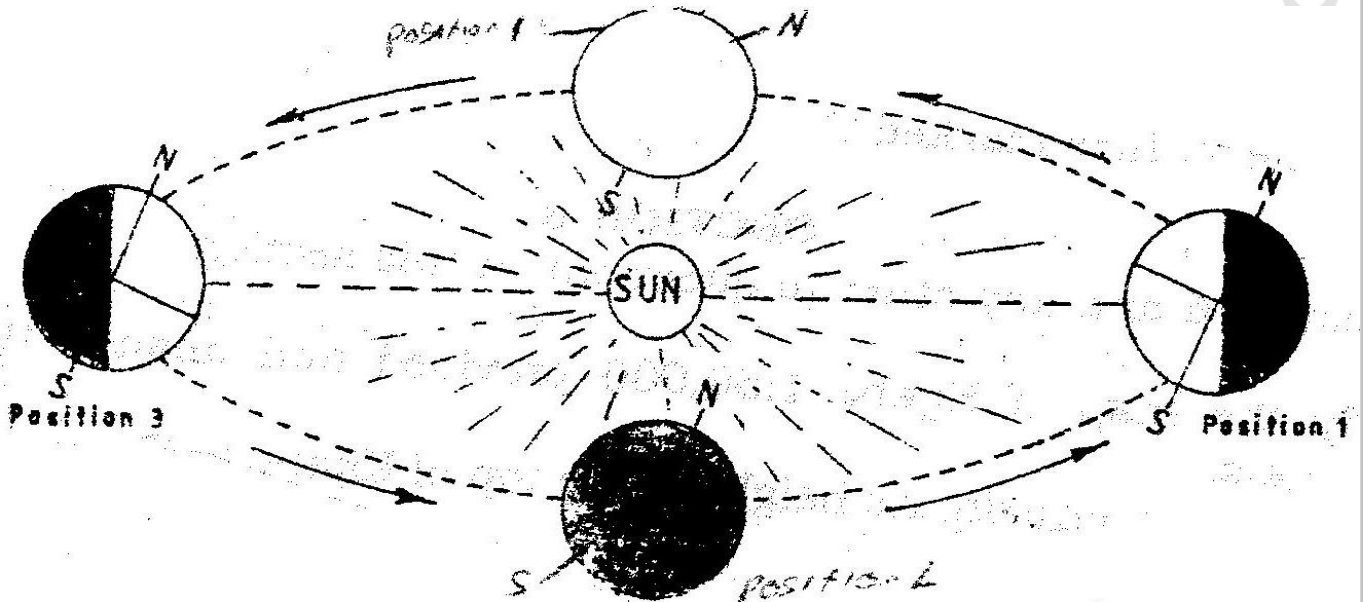
i) What type of eclipse is represented by the diagram?

ii) Name the features marked L and M

5. (a) (i) Give the two dates in a year during which the number of hours of darkness is equal in both the north and south poles.

(ii) Why do the lengths of days and nights vary from one part of the earth to another?

(b) The diagram below shows the revolution of the earth around the sun. Use it to answer the questions that follow



(i) If the earth takes 366 days to make a complete revolution during a leap year, how long will it take to move from position 1 to position 4?

(ii) What season is experienced in the southern hemisphere when the earth is in Position 1?

6. Define the following,

- i. Solar system
- ii. Galaxy
- iii. Star
- iv. Asteroids (6mks)

7. Differentiate between the following

- (a) Latitude and longitude
- (b) Dateline and international dateline
- (c) Meteors and Meteorite. (6mks)

8. State three differences between solar eclipse and lunar eclipse. (2mks)

9. State four factors that support life on planet earth. (4mks)

10.

(a) List four effects of earth rotation. (4mks)

(b) At Nairobi on longitude 37°E local time is 1 p.m. What time would it be at Sarissa on longitude 41 °E? (4mks)

11. (a) Define equinox. (2mks)

(b) State characteristics of summer solstice. (4mks)

12. The earth is inclined to the ecliptic plane at an angle of..... and the axis is also inclined at an angle to perpendicular line. (4mks)

13. Fill in the table from (a) - (f) (10mks)

| Property s/Layer | Major constituent | Thickness | Density | Temperature |
|------------------|-------------------|----------------|---------------|-------------|
| Outer crust | (a) | iii. 16-24 kms | (b) | |
| Inner crust | ii. Magnesium | S (c) | 2.8-30 gms/cc | |
| Asthenosphere | i. Iron | 2900 kms | (d) | 5000 C |
| Centrosphere | ii. Nickle | (e) | (f) | |

14. State three weaknesses of the passing star theory. (6mks)

15. Differentiate between hydrosphere and atmosphere. (4mks)

16. Planet ... 1... is seventh planet from the sun and is greenish in colour. Planet ...2... takes shortest time to revolve round the sun about 88 earth day. Planet ...3... and ...4... are referred to as twin planets. Planet ...5... takes about 11.86 earth years to revolve round the sun. All the planets have satellite orbiting round them except planet ...6... and ...7... (7mks)

17. Explain reasons for flattening and bulging of earth. (4mks)

18. State characteristics of winter solstice (4mks)

19. Differentiate between summer solstice and winter solstice. (4mks)

20. (a) What is an eclipse? (2mks)

21. Apart from planets name other heavenly bodies.

22. What is a longitude? (2mks)

23. State the effects of the elliptical shape of the earth's orbit. (6mks)

24. If the local time in Nairobi on longitude 37°E time is 10 p.m. What will the time be at Buchanan Liberia on longitude 10°W.? (4mks)

(a) What is the effect of International Date Line on crossing the line? (4mks)

(b) What is the angle of inclination of the earth axis from its orbit? (2mks)

(c) Give four proofs that the earth is spherical in shape. (8mks)

THE EARTH AND THE SOLAR SYSTEM

MARKING SCHEME

1. (a) the sun.
- Causes day and night/apparent movement of sun from east to west.
 - Causes differences in time at different longitudes.
 - Causes deflection of winds\ ocean currents.
 - Causes rising and falling of sea tides.
 - Causes variation in atmosphere pressure on the earth surface.
- (b)
- Earth revolution
 - Causes changes in position of midday sun at different times of the year.
 - Causes varying length of the days and nights in northern and southern hemisphere.
 - Causes changes in seasons; spring, summer, autumn and winter.
 - Causes lunar eclipse
2. (a)
- (i) P - Atmosphere
(ii) Q - Bar sphere/centrosphere/core
(iii) R -Mohorovicic discontinuity/moho discontinuity
- (b)
- Divided into two-upper and lower mantle
 - Mantles' main constituent minerals are ferro-magnesium and silicate.
 - Mantle is about 2, 900 km thick.
 - Upper mantle has low temperature than lower mantle.
 - Mantle has temperatures of about 1000°C.
 - Mantle is made up heavier rocks than rocks of earth crust.
 - Upper mantle is made up of an elastic solid/ semi-molten
 - Inner mantle is made up an elastic solid/semi molten basic rocks/ viscous liquid.
3. (a) The planets marked F and G is
- Mars
 - Neptune
4. (a) Solar system refers to the composition of the sun, the planets and other heavenly bodies related to
- (b) i) Solar eclipse
(ii) L - Moon
M- Shadow
5. (a)
- i) 21st March and 23rd September
ii) Due to revolution of the earth.
- (b)
- i) 274.5 days
ii) Summer season
- 6.
- i) Solar system - Organization made up of the sun with the nine planets orbiting around it and heavenly bodies,
ii) Galaxy - Group/cluster of stars in the universe.
iii) Star - Hot mass of glowing gases that transmit light to outer bodies.
iv) Asteroid - Small planet-like objects orbiting around the sun between the planets of Mars and Jupiter.
- 7.
- a. Latitude is the distance north or south of equator measured as an angle from the earth's center while longitude is the distance of the earth's surface measured east or west of prime meridian and expressed as an angle.
- b. Latitude is imaginary line running from East to West showing how far North or South a place is from Equator.
- c. Dateline is line 180° at which a day is lost or gained while international dateline is zigzag line along longitude 180° deviating land surfaces and at which day is lost or gained.
- d. Glowing objects that quickly cross the sky before they burn up and disappear while meteorites are those meteors that pass through the atmosphere brightly but do not burn up.

- 8.
- In solar eclipse moon lie between sun and earth while in lunar eclipse earth lie between moon and sun.
 - In solar eclipse shadow of moon is cast on earth while in lunar eclipse shadow of earth is cast on moon.
 - Solar eclipse occurs during the day while lunar eclipse occurs during the night.
 - Lunar eclipse is caused by earth's revolution while solar eclipse is caused by revolution of moon.
- 9.
- Presence of water that support life.
 - Presence of atmosphere with adequate O₂ and CO₂ levels that support life of animals and plants respectively.
 - Enough heat and light due to earth's favorable distance from the sun
 - Proportional gravitational force that allow objects to be upright on the earth's surface.
10. (a)
- Causes deflection of the winds
 - Causes time difference between Meridians.
 - Causes variation in speed of air masses.
 - Causes rising and falling of ocean currents.
 - Causes variation in atmospheric pressure.
- G.M East
34°E 41°E
1 p.m. ?
1° = 4 minutes
4 x 4 = 16 minutes
Local time = 1.16 p.m.
11. (a) Periods 21st March and 23rd September when the sun is overhead at midday along the equator.
- (b)
- ♦ Sun is overhead at mid-day along the tropic of cancer/Capricorn.
 - ♦ The Arctic Circle experiences 24 hrs of daylight.
 - ♦ Days are longer than nights.
 - ♦ Temperatures are high in the region experiencing summer solstice.
 - ♦ 24 hour sunshine within the circles.
12. 66 ½ °, 23 ½ °
- 13.
- Silica, aluminum
 - 2.7 gms/cc
 - 6 -10 kms
 - 3.0-3.3 gms/cc
 - 3470 kms
 - 5,500 cc
- 14.
- Chances of another star approaching the sun are minimal.
 - High temperature materials drawn from the sun would disperse rather than condense.
 - It does not explain where the sun and the star came from.
15. Hydrosphere is part of the earth surface covered by water masses e.g. oceans, seas, rivers and swamps while atmosphere refers to thin layer of gases surrounding the earth and held by earth's gravitational pull.
16. (a)
- Uranus
 - Venus
 - Earth
 - Venus
 - Jupiter
 - Venus
 - Mercury
- 17.
- Earth rotates on its own axis to make a complete turn; and its poles rotate of this axis and pulled towards each other (centripetal forces)
 - Equator covers a long distance and therefore rotates faster, with more speed causing a flinging force (centrifugal force).

18.

- Low temperatures
- Longer night times than day times at latitudes beyond equator
- The sun is overhead Tropic of Capricorn on 22nd December and its winter Solstice in the Northern Hemisphere.
- On 21st June the sun is directly overhead the Tropic of Cancer and its winter solstice is in the Southern hemisphere.
- Sun is not visible at cycles and there is darkness for 24 hrs.

19.

- Winter solstice occurs on 22nd December and 21st June when the sun is overhead at mid-day along tropic of Capricorn and Cancer respectively. At the Arctic Circle and Antarctic circles the sun is visible for only a few minutes when it appears above the southern/ Northern horizon.
- Summer solstice occurs on 21st June and 22nd December when the sun is overhead in the tropic of Cancer and Capricorn respectively. The sun rises higher in the sky and is visible for 24 hrs at the arctic and Antarctic cycles.

20.

(a) It is a shadow that is formed when rays of the sun are blocked from reaching the earth or the moon.

(b)

- Comets
- Asteroids
- Meteorites
- Satellites

21.

- It is an imaginary line running from North to South that shows how far east and West a place is from the Greenwich prime meridian.
- It refers to angular distance east or west of the Greenwich prime meridian.

22.

- It causes aphelion whereby the earth is sometimes in its farthest position from the sun.

• It causes perihelion whereby the sun is sometime at its closest position to the sun.

• It influences the occurrence of spring and neap tides.

• It changes cycle of equinoxes and solstices

• It influences occurrence of seasons

23.

$1^\circ - 4 \text{ minutes}$

$47^\circ \times 4 = 188 \text{ minutes}$

$188 \text{ minutes} = 3 \text{ hrs } 8 \text{ minutes}$

Buchanan is 3 hrs 8 minutes behind Nairobi.

Time is 6.52 a.m.

24.

(a) On crossing this longitude while going to the West, a day is gained and while crossing to the East a day is lost.

(b) $66\frac{1}{2}^\circ$

(c) Photographs taken from the outer space or satellites show the curvature of the earth.

• During eclipse of the moon, the earth casts a spherical-shaped shadow on the moon.

• Circumnavigation of the earth along a straight path will bring one back.

• Earth's horizon

• Other planets are curved and earth is one of planets.

• Different rising and setting times in different places.

• An approaching ship.