

Concept 1: The Earth – Shape, Structure and Motions

Definition

Earth is the third planet from the Sun and the only known planet that supports life.

Shape of the Earth

Earth is spherical in shape.

It is slightly flattened at the poles and bulged at the equator.

This shape is called geoid.

Proofs of Earth's Shape

Ships disappear gradually from bottom to top on horizon.

Photographs from space show spherical shape.

Shadow of Earth on Moon during lunar eclipse is circular.

Structure of the Earth

Three Main Layers

Crust

Outermost layer.

Thin and solid.

Where we live.

Mantle

Layer below crust.

Very thick.

Contains semi-molten material.

Core

Innermost layer.

Very hot.

Contains iron and nickel.

Types of Crust

Continental crust

Forms landmasses.

Oceanic crust

Forms ocean floor.

Motions of the Earth

1. Rotation

Definition

Spinning of Earth on its axis.

Time taken

24 hours.

Effect

Causes day and night.

Direction

West to east.

2. Revolution

Definition

Movement of Earth around the Sun.

Time taken

365 days and 6 hours.

Effect

Causes seasons.

Leap Year

Extra 6 hours each year accumulate.

After four years, one extra day added in February.

Year with 366 days is leap year.

Axis of Earth

Imaginary line passing through North and South Poles.

Tilted at about 23.5 degrees.

Effect of Tilt

Causes unequal heating of Earth.

Leads to seasons.

Seasons

Summer

Winter

Spring

Autumn

Day and Night

When part of Earth faces Sun, it experiences day.

Opposite side experiences night.

Common Examination Traps

Earth rotates around Sun. Incorrect. It revolves around Sun and rotates on its axis.

Revolution causes day and night. Incorrect. Rotation causes day and night.

Earth's core is cold. Incorrect. It is extremely hot.

Advanced Understanding

Inner core is solid due to high pressure.

Outer core is liquid.

Magnetic field of Earth is generated in core.

Concept Linkage

Rotation affects time measurement.

Revolution and tilt affect climate and seasons.

Concept 2: Our Solar System

Definition

The Solar System consists of the Sun and all celestial bodies that revolve around it.

Central Body

Sun

A star.

Source of light and heat energy.

Made mainly of hydrogen and helium gases.

Members of Solar System

Eight Planets

Dwarf planets

Asteroids

Comets

Meteoroids

Natural satellites

Order of Planets from the Sun

Mercury

Venus

Earth

Mars

Jupiter

Saturn

Uranus

Neptune

Inner Planets

Mercury

Venus

Earth

Mars

Characteristics

Rocky surface.

Closer to Sun.

Smaller in size.

Outer Planets

Jupiter

Saturn

Uranus

Neptune

Characteristics

Gas giants.

Larger in size.

Have rings (especially Saturn).

Special Features of Planets

Mercury

Closest to Sun.

No atmosphere.

Extreme temperature difference.

Venus

Hottest planet.

Thick carbon dioxide atmosphere.

Earth

Only known planet with life.

Has water and oxygen.

Mars

Called red planet.

Has iron oxide on surface.

Jupiter

Largest planet.

Has Great Red Spot storm.

Saturn

Known for prominent rings.

Uranus

Rotates on its side.

Neptune

Farthest planet from Sun.

Very strong winds.

Rotation and Revolution

Rotation

Spinning of planet on its axis.

Revolution

Movement of planet around Sun.

Revolution Period

Time taken by planet to complete one orbit around Sun.

Planet closer to Sun

Shorter revolution period.

Planet farther from Sun

Longer revolution period.

Natural Satellite

Definition

A celestial body that revolves around a planet.

Example

Moon is Earth's natural satellite.

Asteroids

Small rocky bodies found mainly between Mars and Jupiter.

Region called asteroid belt.

Comets

Made of ice and dust.

Have long tail when near Sun.

Meteoroids

Small rocky fragments in space.

When they enter Earth's atmosphere, they burn and form meteors.

Constellations

Group of stars forming patterns in sky.

Examples

Ursa Major

Orion

Cassiopeia

Stars

Self-luminous celestial bodies.

Produce their own light.

Planets

Do not produce their own light.

Reflect sunlight.

Common Examination Traps

Sun is a planet. Incorrect. It is a star.

Venus is coldest planet. Incorrect. It is hottest.

Asteroids revolve around Earth. Incorrect. They revolve around Sun.

Saturn is only planet with rings. Incorrect. Others also have rings but less visible.

Advanced Understanding

Gravitational force of Sun keeps planets in orbit.

Planets follow elliptical paths.

Inner planets have shorter year than outer planets.

Concept Linkage

Solar system explains seasons, day-night and planetary motion.

Gravitational force governs celestial motion.

Concept 3: Moon and Its Phases

Definition

Moon is the natural satellite of the Earth.

It revolves around the Earth and reflects sunlight.

Characteristics of Moon

No atmosphere.

No water in liquid form.

Surface has craters and mountains.

No life exists.

Movement of Moon

Rotation

Moon rotates on its axis.

Revolution

Moon revolves around Earth.

Time Period

Moon takes about 27.3 days to complete one revolution around Earth.

Important Fact

Time taken for rotation and revolution is almost same.

Therefore, we see only one side of the Moon.

Phases of the Moon

Definition

Different shapes of the Moon seen from Earth are called phases of the Moon.

Cause

Relative positions of Sun, Earth and Moon.

Main Phases

New Moon

Moon is not visible.

Moon is between Sun and Earth.

Waxing Crescent

Small bright part increases.

First Quarter

Half of Moon visible.

Waxing Gibbous

More than half visible.

Full Moon

Entire illuminated side visible.

Earth is between Sun and Moon.

Waning Gibbous

Lighted part decreases.

Last Quarter

Half visible again.

Waning Crescent

Small visible part before New Moon.

Lunar Month

Time between two successive full moons.

Approximately 29.5 days.

Eclipses

Solar Eclipse

Moon comes between Sun and Earth.

Moon blocks sunlight partially or fully.

Lunar Eclipse

Earth comes between Sun and Moon.

Earth's shadow falls on Moon.

Tides

Definition

Rise and fall of sea level.

Cause

Gravitational pull of Moon and Sun.

Moon has greater effect because it is closer to Earth.

Common Examination Traps

Moon produces its own light. Incorrect. It reflects sunlight.

Moon does not rotate. Incorrect. It rotates but shows same face due to equal rotation and revolution period.

Full Moon occurs when Moon is between Sun and Earth. Incorrect. That is New Moon.

Advanced Understanding

Phases depend on angle between Sun, Earth and Moon.

Tidal forces are strongest during full moon and new moon.

Concept Linkage

Moon affects tides and Earth's rotation stability.

Phases help in calendar calculation.

Concept 4: Stars and Constellations

Definition

A star is a huge, self-luminous celestial body made of hot gases that produces its own light and heat.

Sun as a Star

Sun is the nearest star to Earth.

It appears larger because it is closer than other stars.

Characteristics of Stars

Made mainly of hydrogen and helium.

Very hot and massive.

Appear small because they are very far away.

Twinkle due to atmospheric refraction.

Twinkling of Stars

Caused by bending of light as it passes through layers of Earth's atmosphere.
Planets do not twinkle because they are closer and appear as disks.

Constellation

Definition

A group of stars forming a recognizable pattern in the sky.

Important Constellations

Ursa Major

Also called Great Bear.

Helps in locating Pole Star.

Ursa Minor

Contains Pole Star.

Orion

Also called Hunter.

Visible in winter sky.

Cassiopeia

W-shaped pattern.

Pole Star

Located in Ursa Minor.

Almost fixed position in sky.

Indicates North direction.

Movement of Constellations

Constellations appear to move from east to west.

This apparent movement is due to Earth's rotation.

Important Clarification

Stars in a constellation are not actually close to each other.

They appear grouped due to line of sight from Earth.

Light Year

Definition

Distance traveled by light in one year.

Used to measure distances between stars.

Milky Way

Galaxy in which our Solar System is located.

Contains billions of stars.

Difference Between Star and Planet

Star

Produces own light.

Twinkles.

Planet

Reflects sunlight.

Does not twinkle noticeably.

Common Examination Traps

Pole Star changes position every night. Incorrect. It appears almost fixed.

Constellations move around Earth. Incorrect. Earth's rotation causes apparent movement.

Planets are stars. Incorrect. Planets do not produce light.

Advanced Understanding

Stars undergo life cycle from nebula to red giant or supernova.

Galaxies contain billions of stars bound by gravity.

Concept Linkage

Constellations help in navigation.

Understanding stars explains structure of universe.