EDEN IAS - GEOGRAPHY CLASS NOTES

EDEN IAS MISSION PRELIMS 2021

GEOGRAPHY CLASS - 1

Basics of Geography

Geography as a Discipline

- The word 'Geography' is derived from two Greek words viz. "Geo" meaning "earth" and "graphy" meaning "to describe." Therefore, Geography is the science that deals with the description of the Earth's surface.
- The first person to use the word geography was Eratosthenes (276–194 BC).
- Geography as a discipline is concerned with three sets of questions:
  1) What: Questions that are related to the identification of the patterns of natural and cultural features as found over the surface of the earth. These are the questions about
  2) Where: Questions that are related to the distribution of the natural and human/ cultural features over the surface of the earth. These are the questions about
  3) Why: The third question is related to the explanation or the causal relationships between features and the processes and phenomena. This aspect of geography is related to the question,

Taken together, the first two questions take care of distributional and locational aspects of the natural and cultural features. These questions provided inventoried information of what features and where located. It was a very popular approach during the colonial period. These two questions did not make geography a scientific discipline till the third question was added.

Ptolemy's World Map

Magellen's Voyage around the World

NOTES

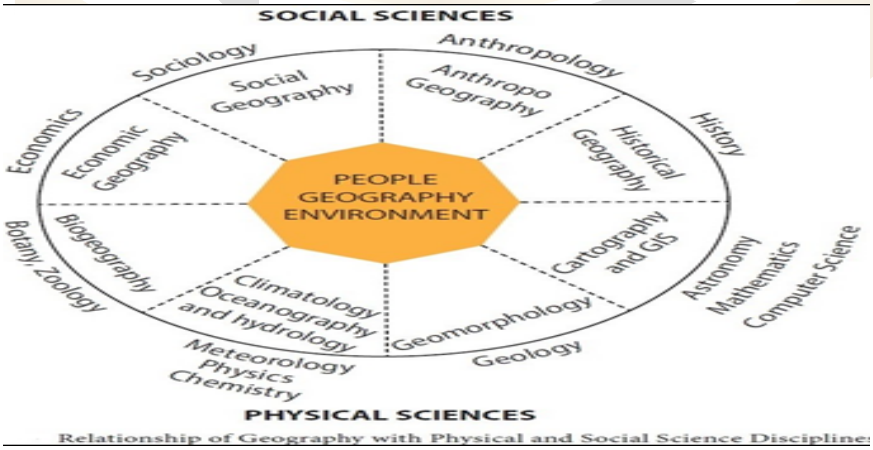
Geography as an Integrating discipline

A) Relations with Physical Sciences

- Astronomy, Mathematics, Computer Science and Geography: Following topics various disciplines are covered under geography also-
  - Astronomy-deals with the celestial bodies including stars, planets, satellites, their motions, constellation etc.
  - Mathematics-The precise location, nature of movements, form and size of celestial bodies, including those of the solar system, have been accurately measured with the help of mathematics.
  - Computer Science-The interaction of astronomy, mathematics and computer science with geography has paved way for the development of modern cartography and GIS.
- **Geology and Geography:** Interaction between geology and geography leads to formation of the new branch of study called geomorphology, the study of landforms.
- **Physics, Chemistry and Geography**
  - **Physics:** The dynamic mechanism of the phenomena on the earth surface, climatology and the physics of hydrosphere through oceanography etc.
  - **Chemistry:** The chemical contents of rocks, soil, surface and groundwater, atmosphere are the interests of the geographers.
  - **Biology:** They study how the physical and chemical contents are disturbed by human activities and vice versa.
- **Botany, Zoology and Geography**
  - Classification and description of various kinds of species on the earth's surface. Geography, being the study of the spatial section of earth's surface, attempts to study the distributional aspects of flora and fauna especially with reference to climate and relief.
  - The integration among these subjects has given birth to biogeography.

B) Relationship with Social Sciences

- **Economics and Geography:**
  - Economics is concerned with how human needs and wants are satisfied with the available resources, resources endowment and patterns of utilisation, agriculture, fishing, forestry, industries, trade and transport are studied in this branch.
  - The economic activities are highly influenced by the relief and climatic factors of the region or the country.
- **Sociology and Geography:**
  - A number of investigations including social behaviour, movement of people between rural-urban areas, spatial interactions between social groups, the relations between innovation and tradition in rural and urban areas etc.
  - Social geography is the logical expression of the interaction between sociology and geography as it studies social phenomena in spatial context.



Relationship of Geography with Physical and Social Science Discipline

NOTES

- **Anthropology and Geography:**
    - Anthropology attempts to study human races and their classification.
- **History and Geography:**
    - Anyone who attempts to study any historical events of India should always integrate the temporal and the spatial phenomena of that period together to arrive at a conclusion.
- **Tamil Rulers and Geographic Knowledge**
    - History reveals to us that how the Great rulers like Raja Raja Chola or Rajendra Chola had trade relations with other countries of the world, especially South Asian countries by understanding the relief, seasons, ocean current movements etc.,
    - The sailors would have been experts in every aspect of geography to move their troops, sail overseas and trade with all known nations of that time.
    - They also utilised the ocean currents to transport teak and other valuable timbers from Indonesia, Myanmar, and other countries to South India.

Major approaches to study geography

There are two distinct approaches or methods to study geography. They are:

1. Systematic approach and
2. Regional approach

1) Systematic Approach:

- Systematic or nomothetic approach was introduced by Alexander Von Humbolt, a German geographer (1769-1859).
- The study of specific natural or human phenomenon that gives rise to certain spatial patterns and structures on the earth surface is called systematic study.
- Generally, systematic geography is divided into four main branches.

a) **Physical Geography:** Study of various elements of earth systems like atmosphere (air), hydrosphere (water), lithosphere (rock) and biosphere (life) and their distributions.

b) **Biogeography, including environmental geography:** It focuses on various kinds of forests, grasslands, distribution of flora and fauna, human-nature relationships, quality of the living environment and its implications for human welfare.

c) **Human Geography:** It describes the human culture, population, dynamic socio economic and political aspects.

d) **Geographical methods and techniques:** It is concerned with methods and techniques for field studies, qualitative, quantitative and cartographic analysis.

2) Regional Approach:

- It is otherwise called as ideographical approach. It was developed by Carl Ritter (1779 – 1859), a contemporary of Humbolt.
- The regions could be classified based on a single factor like relief, rainfall, vegetation, per capita income or there could also be multi-factor regions formed by the association of two or more factors.
- Administrative units like states, districts and taluks can also be treated as regions.
- The main sub branches of regional geography are:
    a) Regional studies
    b) Regional analysis
    c) Regional development and
    d) Regional planning

NOTES

Branches of Geography

A) Branches of Geography (Based on Systematic Approach)

1) Physical Geography

- **Geomorphology** is devoted to the study of landforms, their evolution and related processes.
- **Climatology** encompasses the study of structure of atmosphere and elements of weather and cli¬mates and climatic types and regions.
- **Hydrology** studies the realm of water over the surface of the earth including oceans, lakes, rivers and other water bodies and its effect on different life forms including human life and their activi¬ties.
- **Pedology** is devoted to study the processes of soil formation, soil types, their fertility status, distribution and use.

2. Human Geography

- **Social/Cultural Geography** encompasses the study of society and its spatial dynamics as well as the cultural elements contributed by the society.
- **Population Geography** studies population growth, distribution, density, sex ratio, migration and occupational structure etc.
- **Settlement Geography (Rural and Urban)** studies the characteristics of rural and urban settle¬ments.
- **Economic Geography** studies economic activities of the people including agriculture, industry, tourism, trade, and transport, infrastructure and services, etc.
- **Historical Geography** studies the historical processes through which the space gets organised.
    - Every region has undergone some historical experiences before attaining the present-day status. The geographical features also experience temporal changes and these form the concerns of his¬torical geography.

Note- The interface between physical geography and human geography has lead to the development of Biogeography which includes:

- **Plant Geography** which studies the spatial pattern of natural vegetation in their habitats.
- **Zoo Geography** which studies the spatial patterns and geographic characteristics of animals and their habitats.
- **Ecology /Ecosystem** deals with the scientific study of the habitats characteristic of species.
- **Environmental Geography** concerns world over leading to the realisation of environmental prob¬lems such as land gradation, pollution and concerns for conservation has resulted in the introduc¬tion of this new branch in geography.

B) Branches of Geography (Based on Regional Approach)

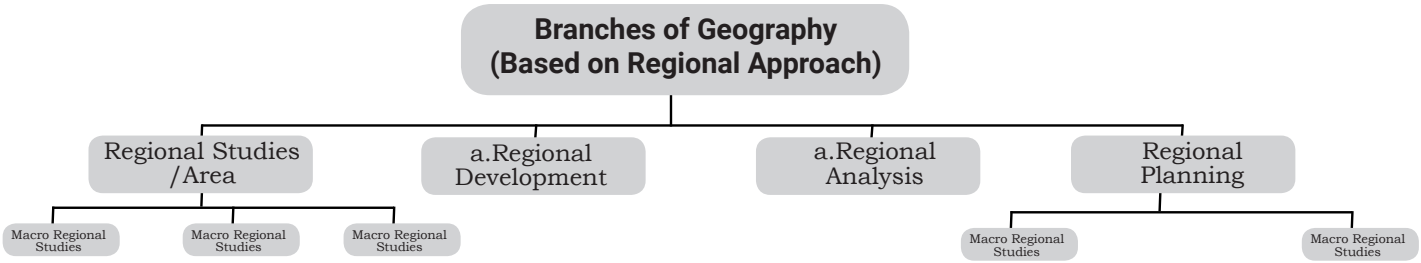
a) Regional Studies/Area Studies Comprising Macro, Meso and Micro Regional Studies

b) Regional Planning Comprising Country/Rural and Town/Urban Planning

c) Regional Development

d) Regional Analysis

NOTES



Methods and Techniques used in Geography

Major Methods and Techniques used in Geography include

- Cartography including Computer Cartography
- Quantitative Techniques/Statistical Techniques
- Field Survey Methods
- Geo-informatics comprising techniques such as Remote Sensing, GIS, GPS, etc.

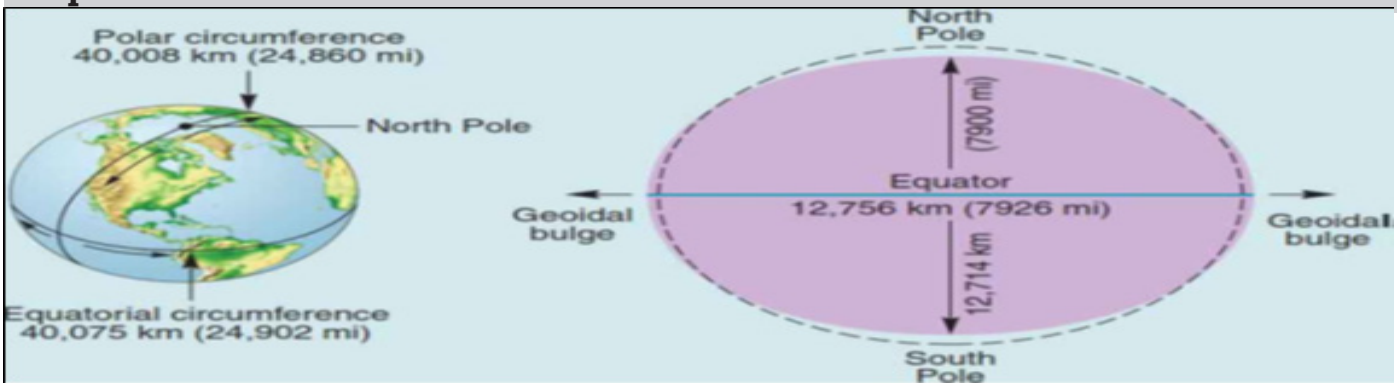
Origin and Evolution of Earth

- There are many theories supporting the origin of the earth. One of the earlier and popular arguments of the earth's origin was by a German professor Immanuel Kant.
- Mathematician Laplace revised it in 1796. It was known as Nebular Hypothesis. It considered that planets were formed out of a cloud of material associated with a youthful sun, which was slowly rotating.
- Lyttleton propounded the accretion theory of the earth's formation. According to this theory,


Milky Way Galaxy

- Approximately 4.6 billion years ago, the solar system was a cloud of dust and gas known as a solar nebula.
- As the solar nebula began to spin, the gravity collapsed the materials on itself and it formed the sun in the centre of the solar system.
- When the sun formed, the remaining materials began to clump up. Small particles drew together, bound by the force of gravity, into larger particles.
- The solar wind swept away lighter elements, such as hydrogen and helium, from the closer regions.
- It left only heavy rocky materials to create planets like the Earth. But farther away, the solar winds had less impact on lighter elements, allowing them to coalesce into gas giants. In this way, planets, moons, asteroids, comets, etc., were created.
- Earth's rocky core formed first when heavy elements collided and bound together. Dense materials sank to the center, while the lighter material created the crust. The planet's magnetic field probably formed around this time. Gravity captured some of the gases that made up the planet's early atmosphere.

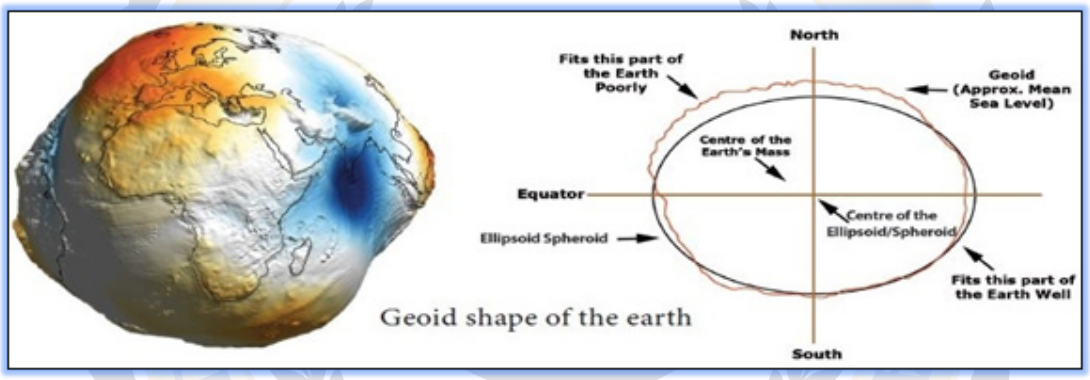
Shape and Size of the Earth



NOTES

A) Earth's Size

- Earth, with an average distance of 92,955,820 miles (149,597,890 km) from the sun, is the third planet and one of the most unique planets in the solar system.
- It was formed around 4.5 to 4.6 billion years ago and is the only planet known to sustain life. This is because of factors like its atmospheric com¬position and physical properties such as the presence of water (70.8% of the planet) which allow life to thrive. Earth is also the fifth largest planet in the entire solar system.
- As the largest of the terrestrial planets, Earth has an estimated mass of 5.9736 × 1024kg.
- Its vol¬ume is largest of all terrestrial planets at 108.321 × 1010km3.
- In addition, Earth is the densest of the terrestrial planets as it is made up of a crust, mantle, and core.
- The Earth's crust is the thinnest of these layers while the mantle comprises 84% of Earth's volume and extends 1,800 miles (2,900 km) below the surface. What makes Earth the densest of these plan¬ets; however, is its core.
- It is the only terrestrial planet with a liquid outer core that surrounds a solid, dense inner core.
- Earth's average density is 5515 × 10 kg/m3. Mars, the smallest of the terrestrial planets by density, is only around 70% as dense as Earth.
- At the equator, Earth's circumference is 24,901.55 miles (40,075.16 km). It is slightly smaller between the North and South poles at 24,859.82 miles (40,008 km).
- Earth's diameter at the poles is 7,900 miles (12,713.5 km) while it is 7,926 miles (12,756.1 km) at the equator.
- For comparison, the largest planet in Earth's solar system, Jupiter, has a diameter of 88,846 miles (142,984 km).



B) Earth's Shape

- It once was believed that the Earth was flat and that ships could sail over the edge. This view persisted even in the middle ages and was an issue in recruitment of Columbus.
- Early Greek view was that the world was surrounded by the ocean (Oceanus), origin of all rivers.
- Anaximander (600 B.C) proposed that cylindrical earth was surrounded by celestial sphere.
- Pythagoras (582-507 B.C.) believed that the Earth was a sphere, which was considered the most harmonious geometric shape.
- Aristotle (384-322 B.C.) described observations that supported the theory that the Earth was a sphere. These included the fact that the shadow of the moon is circular in lunar eclipses and constellations were higher in the sky as one traveled south.
- Eratosthenes (275-195 BCE) estimated size of earth from observations that the elevation of the sun varied with position on the Earth's surface in Egypt.
- Observations of the following suggested that the Earth is a sphere.
  - Mountain peaks lit by the Sun after sunset.
  - Ships disappear below the horizon as they sail across ocean.
  - The moon looks like a disc.
  - The Earth casts a circular shadow during lunar eclipses.

NOTES

- **Geoid:** The Earth is an oblate spheroid, bulged at the equator and flattened at the poles. It is called 'Geoid' meaning the earth is earth-shaped. The bulge at the equator is caused by the centrifugal force of the Earth's rotation. The gravitational pull of the earth is the strongest at the flattened poles and it is weaker towards the equator.

- **Implications:**
  - The equatorial bulge at Earth's equator is measured at 26.5 miles (42.72 km) and is caused by the planet's rotation and gravity.
  - Gravity itself causes planets and other celestial bodies to contract and form a sphere. This is because it pulls all the mass of an object as close to the center of gravity (the Earth's core in this case) as possible.
  - Because Earth rotates, this sphere is distorted by the centrifugal force. This is the force that causes objects to move outward away from the center of gravity. Therefore, as the Earth rotates, centrif¬ugal force is greatest at the equator so it causes a slight outward bulge there, giving that region a larger circumference and diameter.
  - Local topography also plays a role in the Earth's shape, but on a global scale, its role is very small. The largest differences in local topography across the globe are Mount Everest, the highest point above sea level at 29,035 ft (8,848 m), and the Mariana Trench, the lowest point below sea level at 35,840 ft (10,924 m).

Effects of the spherical shape of the earth

i) Variation in the amount of solar radiation received:

- If the earth were a flat surface, oriented at right angle to the sun, all the places on the earth would have received the same amount of radiation.
- But the earth is spherical/ geoid. Hence the sunrays do not heat the higher latitudes of the earth as much as the tropics.
- On any given day only the places located at particular latitude receive vertical rays from the sun. As we move north or south of this location, the sun's rays strike at decreasing angles.
- The yearly fluctuations in the angle of the sun's rays and the length of the days change with the continual change of the earth's position in its orbit around the sun at an inclination of 66½ to the orbital plane.

ii) Difference in the angle of the sun's rays striking different parts of the earth.

- Away from the equator, the sun's rays strike the earth's surface at particular angle.
- The slanting rays are spread over a large area and do not heat with the same intensity as the direct rays.
- As we go pole wards, the rays spread over the regions beyond the Arctic and the Antarctic circles in an extremely slanting manner. This is how we get the various temperature zones.
- Lower the degree of latitude; higher the temperature.
- Not only that, the rays striking at a low angle must travel through a greater thickness of the atmosphere than the rays striking at a higher angle.
- The rays striking at a lower angle are subject to greater depletion by reflection and absorption by the atmosphere.

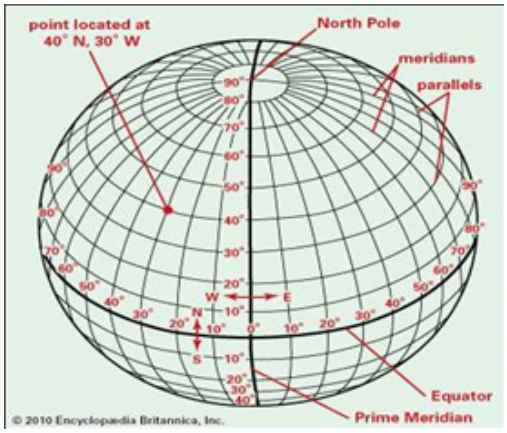
Latitude and Longitude

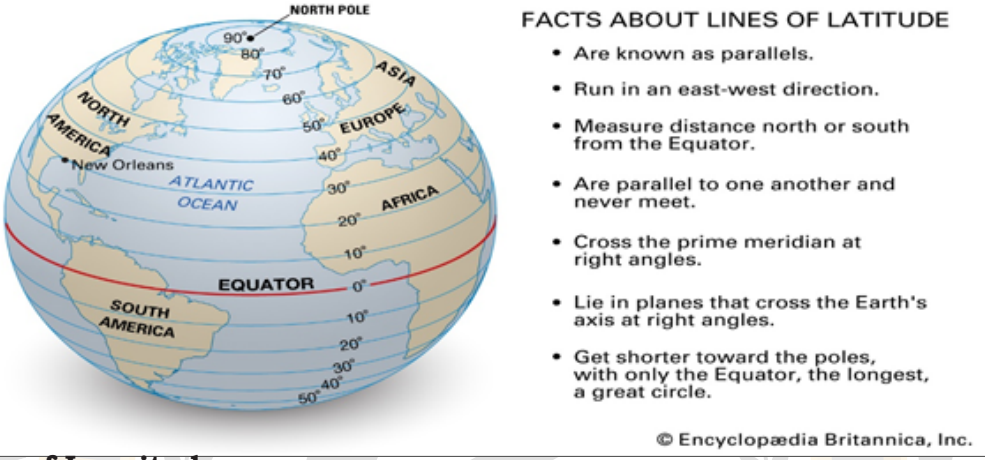
The lines that run east-west on map or globe are known as Parallels of latitude. The lines running north-south are known as Meridians of longitude.

A) Parallels of Latitude

- While lines of latitude run across a map east-west, the point of latitude makes the north-south position of a point on earth.
- Lines of latitude **start at 0 degrees** at the equator and **end at 90 degrees** at the North and South Poles.

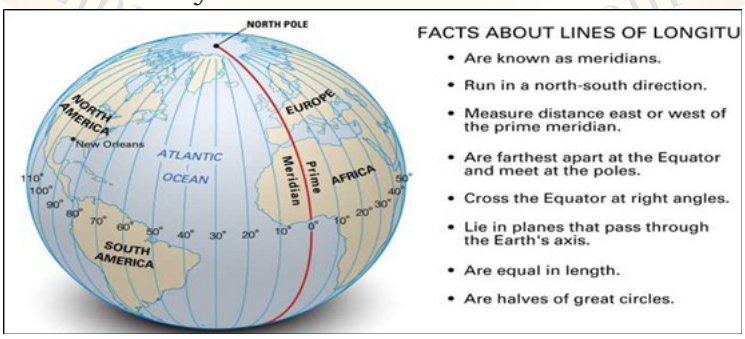
- Everything north of the equator is known as the **Northern Hemisphere** and everything south of the equator is known as the **Southern Hemisphere**.
- Lines of latitude are called **parallels** and in total there are 180 degrees of latitude (90 degree north and south of the equator respectively).
- **The distance** between each degree of latitude is about 69 miles (110 kilometers).
- **The five major parallels** of latitudes from north to south are called:
  - o Arctic Circle,
  - o Tropic of Cancer,
  - o Equator,
  - o Tropic of Capricorn, and
  - o the Antarctic Circle



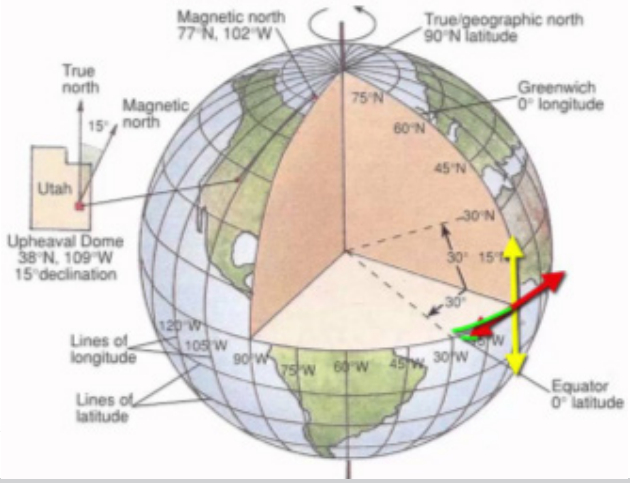


B) Meridians of Longitude

- Longitude lines run north-south and mark the position east-west of a point. Lines of longitude are known as meridians.
- These lines run from pole to pole, crossing the equator at right angles.
- There are 360 degrees of longitude and the longitude line of 0 degree is known as the Prime Meridian and it divides the world into the Eastern Hemisphere and the Western Hemisphere (-180 degrees of longitude west and 180 degrees of longitude east).
- The distance between longitudes narrows away from the equator.
- The distance between longi¬tudes at the equator is the same as latitude, roughly 69 miles.
- At 45 degrees north or south, the distance between is about 49 miles (79 km). The distance between longitudes reaches zero at the poles as all the lines of meridian converge at that point.
- In the Northern Hemisphere, the Prime Meridian passes through the UK, France and Spain in Europe; Algeria, Mali, Burkina, Faso, Tongo and Ghana in Africa.
- The only landmass crossed by the Meridi¬an in the Southern Hemisphere is Antarctica.



- The combination of meridians of longitude and parallels of latitude establishes a framework or grid by means of which exact positions can be determined in reference to the prime meridian and the Equator: a point described as 40° N, 30° W, for example, is located 40° of arc north of the Equator and 30° of arc west of the Greenwich meridian.



Motions of earth-rotation, revolution and their effects

The earth has two basic movements:

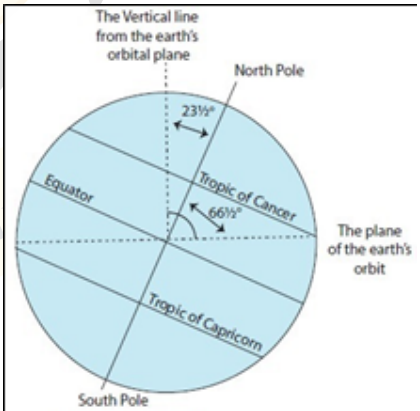
1. Rotation
2. Revolution

Difference between Rotation and Revolution

Rotation	Revolution
Spinning of the earth from west to east on its axis.	Movement of the earth around the sun in its elliptical orbit.
It takes 24 hours to complete a rotation (or a day)	It takes 365¼ days to complete one revolution (or a year)
It is known as the daily or diurnal movement.	It is known as the annual movement of the earth.
Rotation causes days and nights to alternate, tides, deflection of winds and ocean currents and also gives the earth its shape.	Revolution results in the varying lengths of day and night, changes in the altitude of the midday sun and change of seasons.

1. Rotation:

- The spinning of the earth around its axis is called the rotation of the earth. The axis is the imaginary line passing through the centre of the earth. The earth completes one rotation in 23 hours, 56 minutes and 4.09 seconds.
- It rotates in an eastward direction opposite to the apparent movement of the sun. The earth's axis is inclined at an angle of 66½q to the orbital plane as it moves around the sun. We can say, the earth's axis is tilted at an angle of 23½q from a perpendicular to the elliptic plane.
- The velocity of earth's rotation varies depending on the distance of a given place from the equator.
- The **rotational velocity** at the poles is nearly zero.
- The **greatest velocity** of the rotation is found at the equator.
- The **velocity of rotation** at the equator is 1,670 km per hour.

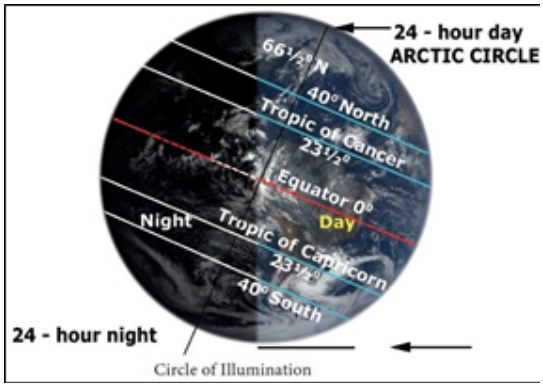


Tilt of the Earth's axis

NOTES

Effects of earth's rotation: The rotation of the earth causes the following effects:

- The apparent rising and setting of the sun is actually caused by the earth's rotation which results in the alternate occurrence of day and night everywhere on the earth's surface.
- Rotation of the earth is also responsible for the difference in time between different places on the earth. A 24-hour period divided by 360 degrees gives a difference of 4 minutes for every degree of longitude that passes the sun. The hour (60 minutes) is thus 1/24 of a day.
- When you observe through a moving train, trees, houses and fields on the other side of the track appear to move in the direction opposite to that of the speeding train. The apparent movement of the sun and the other heavenly bodies in relation to the rotating earth is similar. As the earth rotates from west to east, the sun, moon, planets and stars appear to rise in the east and set in the west.



- Rotation causes the working of the Coriolis force which results in the deflection of the winds and the ocean currents from their normal path.
- Tide is caused by the rotation of the earth apart from the gravitational pull of the sun and the moon.
- Rotation causes a flattening of Earth at the two poles and bulging at the Equator. Hence, there is a difference in diameter at the poles and equator.

Circle of Illumination: The line around the earth separating the light and dark is known as the circle of illumination:

- It passes through the poles and allows the entire earth to have an equal amount of time during the daylight and night time hours. This line can be seen from space, and the exact location of the line is dependent on the various seasons.

2. Revolution of the Earth

- The movement of the earth in its orbit around the sun in an anti-clockwise direction, that is, from west to east is called revolution of the earth. The earth revolves in an orbit at an average distance of 150 million km.
- The distance of the earth from sun varies time to time due to the elliptical shape of the orbit. About January 3rd the earth is closest to the sun and it is said to be at Perihelion ('peri' means close to and Helios means sun). At Perihelion, the distance is 147 million km.
- Around July 4th the earth is farthest from the sun and it is said to be at Aphelion (Ap means away and Helios means sun). At Aphelion the distance of the earth is 152 million km away from the sun.
- The period taken by the earth to complete one revolution around the sun is 365 days and 6 hours (5 hours, 48 minutes and 45 seconds) or 365¼ days. The speed of the revolution is 1,07,000 km per hour. The speed is 30 km per second. The bullet from a gun travels with a speed of 9 km per second.

Period of Revolution and Leap year

- The period of time the earth takes to make one revolution around the sun determines the length of one year.
- The earth takes 365 days and 6 hours to complete one revolution. Earth takes 365.25 days to complete one trip around the Sun. That extra quarter of a day presents a challenge to our calendar system, which has one year as 365 days.
- To keep our yearly calendars consistent with our orbit around the Sun once in, every four years we add one day.

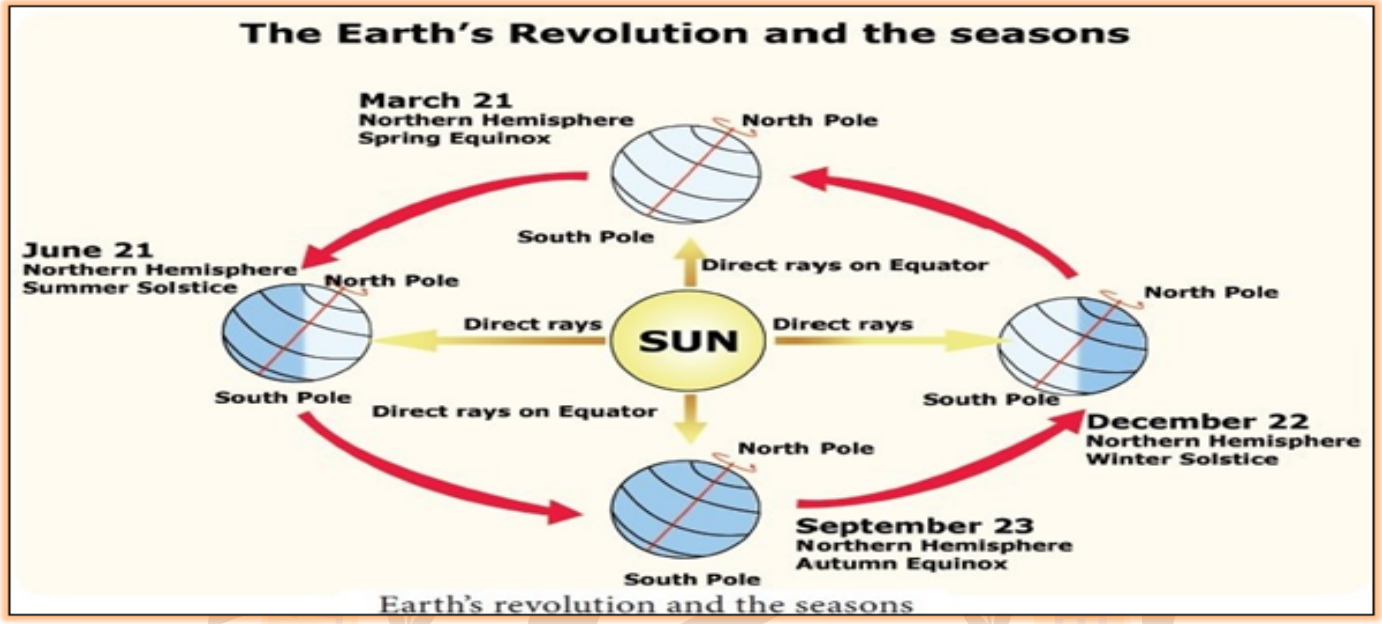
NOTES

- The extra day added to is called a leap day, and the year the extra day is added to is called a leap year. The extra day is added to the month of February which has 29 days in a leap year.

Effects of revolution of the earth

The revolution of the earth around the sun results in the following

- Cycle of seasons
- Variation in length of days and nights
- Variation in distribution of solar energy over the earth and the temperature zones.



Earth's revolution and the seasons

Variation in the length of day time

Latitude	Summer Solstice	Winter Solstice	Equinoxes
0°	12 hrs	12 hrs	12hrs
10°	12hrs 35 min	11hrs 25 min	12hrs
20°	13hrs 12min	10hrs 48min	12hrs
30°	13hrs 56min	10hrs 4 min	12hrs
40°	14hrs 52 min	9 hrs 8 min	12hrs
50°	16hrs 18min	7 hrs 42 min	12hrs
60°	18hrs 27min	5 hrs 33min	12hrs
70°	24 hrs (for 2 months)	0 hrs 00 min	12hrs
80°	24 hrs (for 4 months)	0 hrs 00 min	12hrs
90°	24 hrs (for 6 months)	0 hrs 00 min	12hrs

Temperature zones

- The spherical shape of the earth along with its movement around the sun causes differences in the angles at which the sun's rays fall on the earth's surface. This causes a difference in the distribution of heat on the earth's surface.
- As a result, the world has been divided into three distinct heat zones or temperature zones. They are the Torrid zone, Temperate zone and Frigid zone. You will learn more about it under the unit atmosphere.

NOTES

Solar and Lunar Eclipses

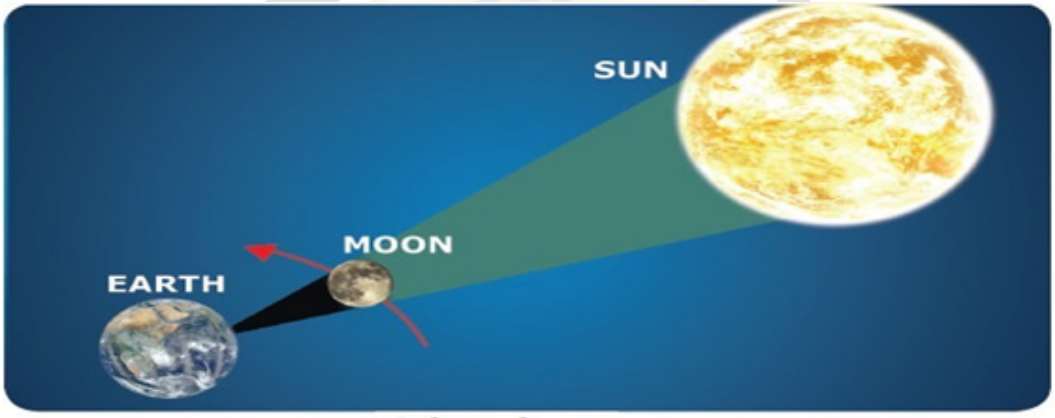
Eclipses

Let us understand the effect of the revolution of the earth on the length of the days and the nights. The duration of the daylight varies with latitude and seasons.

An eclipse is a complete or partial obscuration of light from a celestial body and it passes through the shadow of another celestial body. The eclipses are of two types. They are:

A) Solar Eclipse

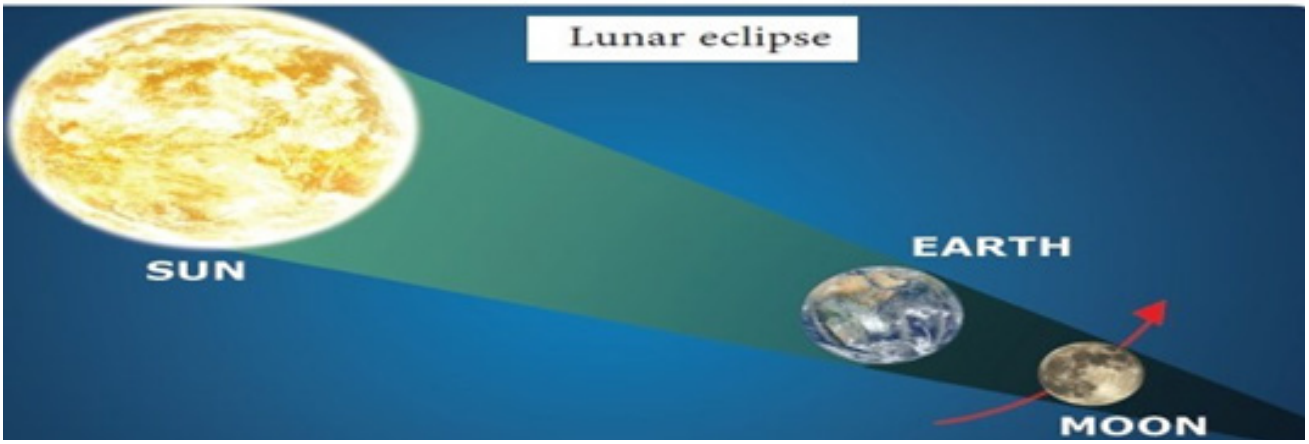
- It occurs on New Moon days, when the moon is between the Sun and the Earth. Thus it obscures a part of the Sun viewed from the Earth, but only from a small area of the world.
- It lasts only for a few minutes.
- **A partial solar eclipse** (Figure 2.14) happens when the moon partially covers the disc of the sun.
- **An annular solar eclipse** occurs when the moon passes centrally across the solar disc.
- During a **total solar eclipse,** the moon's shadow is short enough to cover the whole sun.
- The outer regions still glow and look bright as a ring. Such a phenomenon is called **Diamond Ring.**



Solar eclipse

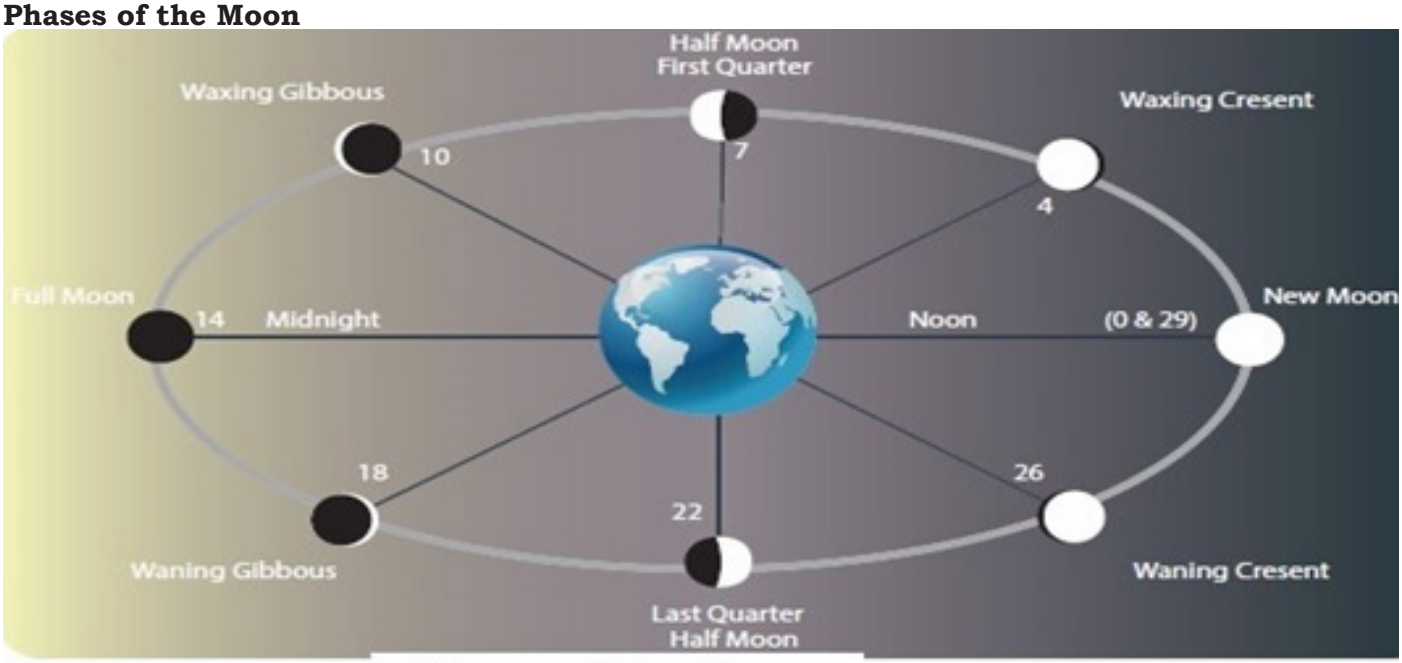
B) Lunar Eclipse

- It occurs on a Full Moon position when the earth is between the sun and the moon. The earth's shadow obscures the moon as viewed from the earth.
- A partial lunar eclipse can be observed when only a part of the moon's surface is obscured by earth's umbra.
- A penumbral lunar eclipse happens when the moon travels through the faint penumbral portion of the earth's shadow.
- A total lunar eclipse occurs when the earth umbra obscures the entire the moon's surface. Lunar eclipse can be seen from anywhere on the night side of the Earth. It lasts for a few hours due to the smaller size of the moon.



NOTES

Phases of the Moon



Phases of the Moon

- The changing angles between the earth, the sun and the moon determine the phases of the moon.
- Phases of the moon start from the 'New Moon' every month. Then, only a part of the Moon is seen bright called 'Crescent', which develops into the 'first quarter'.
- With the increasing brightness it turns into three quarters known as 'Gibbous' and then it becomes a 'Full Moon'.
- These stages are the waxing moon. After the full moon, the moon starts waning or receding through the stages of Gibbous, last quarter, crescent, and finally becomes invisible as dark New Moon.

Local Time and Standard Time

- Local time implies the time of a particular country, as regards the meridian running through it. On the contrary, **standard time** is referred as the official local time of a region ascertained by the distance from the Prime Meridian of the meridian running through the area.
- Earth rotates on its axis, leading to sun rise and sun set in different parts of the world, different parts of the earth receive daylight at different times.
- Due to this, the earth is divided into sections called as time zones. The earth completes one rotation of 360 degrees in 24 hours, i.e. it moves about 15 degrees in every hour. Therefore, the earth is **parted into 24 time zones and each time zone is 15 degrees longitude wide, i.e., each time zone is one hour apart from the other.** These time zones play a significant role in determining the standard time and local time of a place.

About Local Time

- Local time, as the name suggest is the time in a specific region, which is expressed in relation to the line of longitude passing through it. It is the time, reckoned on the basis of the meridian run¬ning through a particular place.
- Local time is determined by the sun's position in the sky, i.e. the shadow cast by the sun, which is shortest in the middle of the day, i.e. noon and longest at the sunrise and sunset.
- When the sun is exactly over the head, it is noon at that place. Noon occurs at different times in different meridians. Hence local time varies from region to region.

About Standard Time

- Standard time indicates the reference time for a particular area. It is the local time of the standard meridi¬an passing through the region or country.

NOTES

- Standard time is the official time, set up for the country by law, which is actually the time of a specific meridian running through the region. It is reckoned by the distance, east or west from the Prime Meridian at Greenwich.

Indian Standard Time (IST)

- Indian Standard Time (IST) represents the time observed throughout India, with a time offset of GMT+5:30.
- India opted out of observing daylight saving time, (DST) or other seasonal adjustments, although briefly using DST during the Sino–Indian War of 1962 and the Indo–Pakistani Wars of 1965 and 1971. In military and aviation time, E* ("Echo-Star") designates IST.
- Indian Standard Time is calculated on the basis of 82.5° E longitude, close to the town of Mirzapur, near Allahabad in the state of Uttar Pradesh.
- The longitude difference between IST (Mirzapur) and the United Kingdom's Royal Observatory at Greenwich translate to an exact time difference of 5 hours 30 minutes.
- A clock tower at the Allahabad Observatory (25.15° N 82.5° E) calculates local time, though the Na¬tional Physical Laboratory, in New Delhi has been entrusted with the official time-keeping devices.

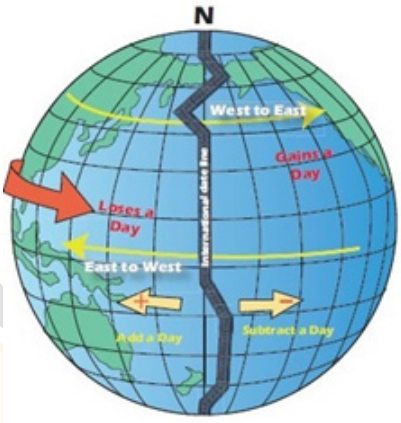
NOTES

The International Date Line

- The International Date Line, established in 1884, passes through the mid-Pacific Ocean and roughly follows a 180 degrees longitude north-south line on the Earth. It is located halfway round the world from the prime meridian—the zero degrees longitude established in Greenwich, England, in 1852.
- The IDL is not a straight Line. The dateline runs from the North Pole to the South Pole and marks the divide be¬tween the Western and Eastern Hemisphere.
- It is not straight but zigzags to avoid political and country borders and to not cut some countries in half.

What happens when you cross the IDL?

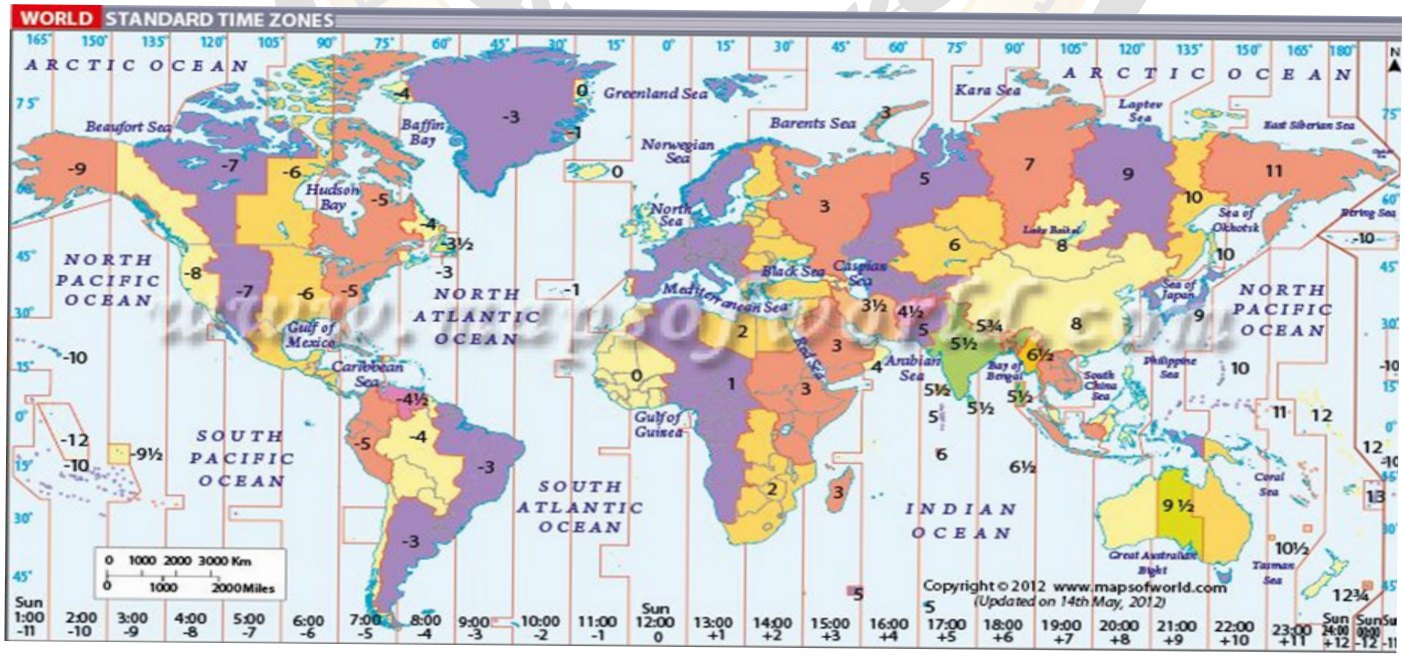
- When you cross the International Date Line from west to east, you subtract a day, and if you cross the line from east to west, you add a day. In other words a traveler crossing the date line from east to west loses a day and while crossing the dateline from west to east he gains a day.
- Despite its name, the International Date Line has no legal international status and countries are free to choose the dates that they observe.
- The 180° meridian was selected as the International Date Line because it mostly runs through the sparsely populated Central Pacific Ocean.
- It was decided at the International Meridian Conference in 1884 in Washington, D.C. where 26 countries attended.



International date line

Miscellaneous

- It is for this reason; time is an integral part of geographical studies as the fourth dimension.
- A traveller crossing the dateline from west to east gains a day and while crossing from east to west loses a day.
- Daylight Saving Time (DST) is the practice of turning the clock ahead as warmer weather approaches and back as it becomes colder again.
- The purpose of doing so is that people will have one more hour of daylight in the afternoon and evening during the warmer season of the year.
- The daylight-saving time is followed in over 70 countries on various dates.
- India does not follow daylight saving time; countries near the Equator do not experience high variations in daytime hours between seasons.



NOTES

Endogenetic and Exogenetic Forces

Factors Affecting Evolution of Landforms

- Landform, whether large or small result from the interaction of certain forces, they accomplish their work by various means of processes, which may be described as geologic, climatic and biologic and these pro¬cesses bring about the changes in the Earth's surface which may be Classified as

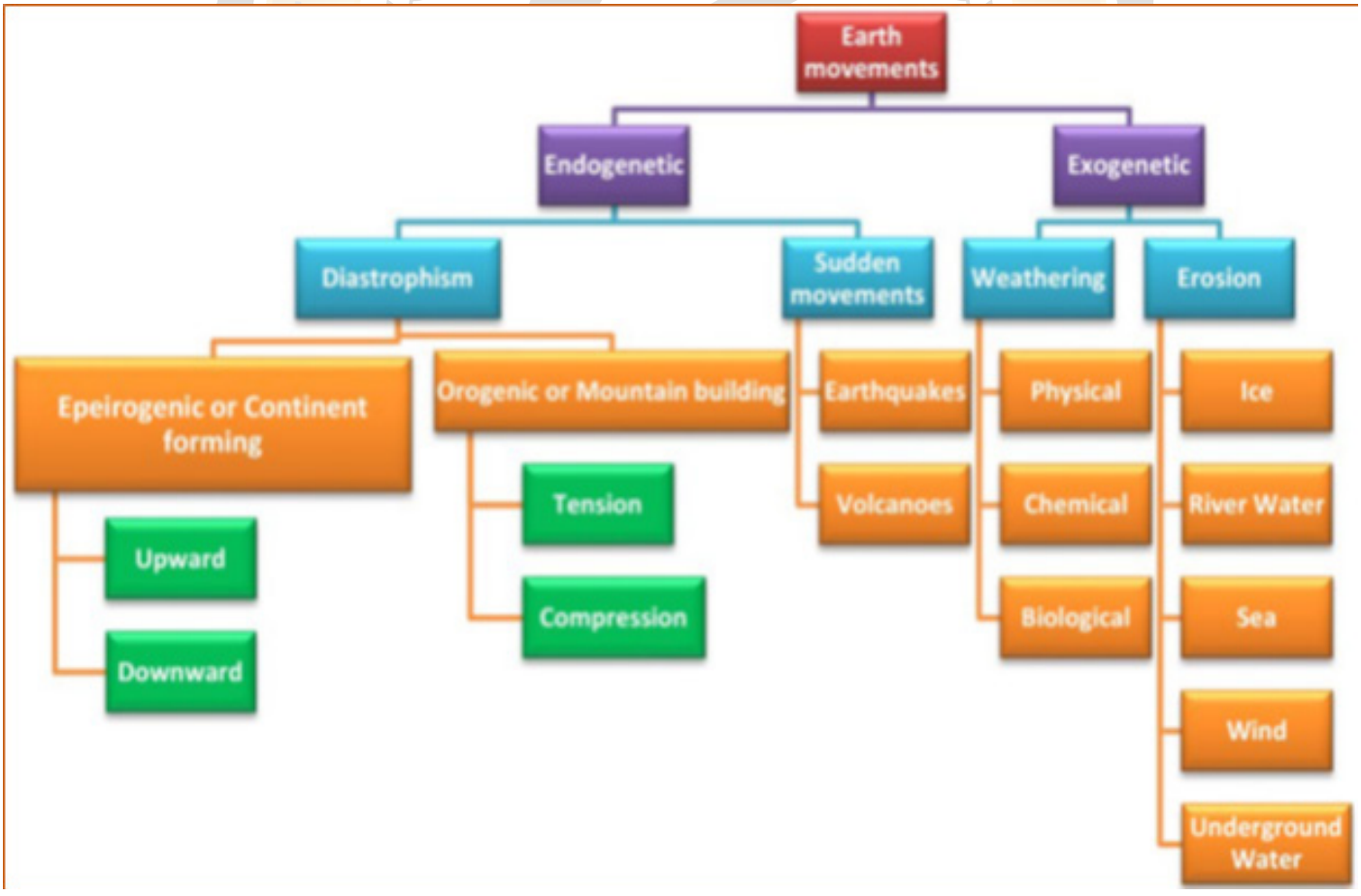
(I) Long Period Chang¬es (which man finds hard to appreciate during his life time)

(II) Short period Changes (which happen in days, weeks, months or years; easily recognizable by man).

- The forces which affect the crust of the earth are broadly classified in two types viz. Endogenetic and Exogenetic Forces

Endogenetic Forces (Creators)

- The forces coming from within the earth are called as Endogenetic forces which causes two types of movement in the earth viz (I) Horizontal movements (II) Vertical movements.
- These forces derive their energy from changes such as radioactivity, chemical recombination, expansion or contraction or displacement of molten materials which occurs in the interior of the earth.
- On the basis of intensity the Endogenetic forces and movements are divided in to two major Categories viz. Diastrophic Forces and Sudden Forces.
- Diastrophism refers to deformation of the Earth's crust, and more especially to folding and faulting. Diastrophic forces are slow forces that bring change in the earth's crust over a very long period of time.
- They are further subdivided as radial (or epeirogenic) forces and tangential (or orogenic) forces. Sudden forces, also known as cata¬strophic forces, bring abrupt disruptions in relief which can be easily recognizable by an observer during his lifetime (e.g. Volcanism and Earthquakes)



NOTES

Exogenetic Forces (Destroyers)

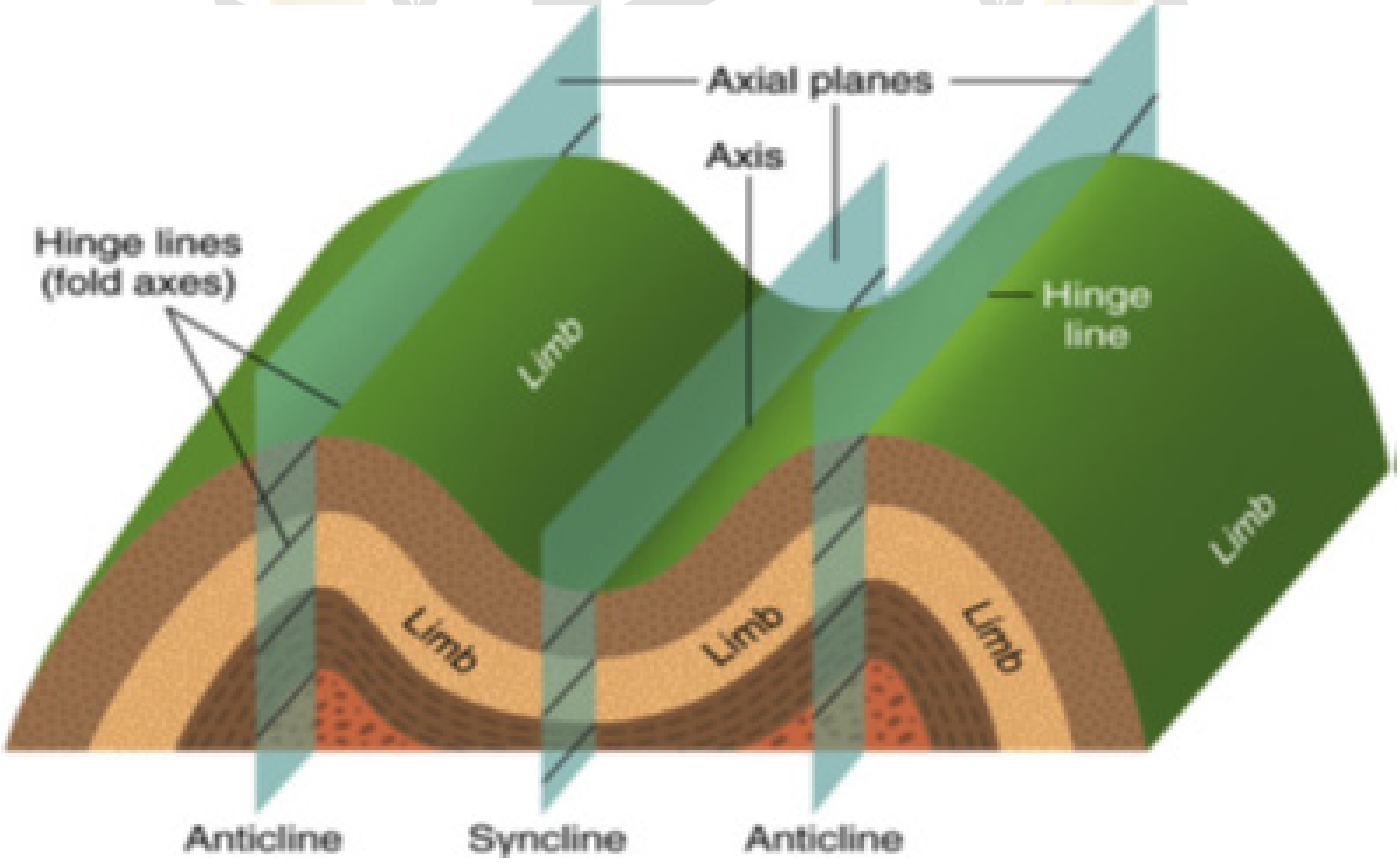
- The Exogenetic forces or processes, also called as denudational processes, or 'destructional forces or processes' originate from the atmosphere (The Sun being the ultimate source of energy).
- These forces are continuously engaged in the destruction of the relief features created by Endogenetic forces through their weathering, erosional and depositional activities.
- Denudation includes both weathering and erosion where weathering being a static process includes the disintegration and decomposition of rocks in situ whereas erosion is a dynamic process which in¬cludes both, removal of materials and their transportation to different destinations.
- The major Exoge¬netic forces are Running Water, Glaciers, Sea Waves, Wind and Underground Water. The Exogenet¬ic forces are also known as geomorphic agents.

Folds, Warps, Joints and Faults

- Folds- Wave like bends are formed in crustal rocks due to the tangential compressive force resulting from horizontal movement caused by the Endogenetic force originating deep within the earth. Such bends are Called 'folds' wherein some parts are bent up and some parts are bent down.

Major Components of a Fold

- The up folded rock strata in arch-like form are called 'anticlines' while the down folded feature forming trough-like feature is called 'synclines'.
- The two sides of the fold are called limbs of the fold. The limb which is shared between an anticline and its companion syncline is called middle limb.
- The Plane which bisects the angle between the two limbs of the anticline or middle limb of like syncline is called the axis of fold or axial plane.
- On the basis of anticline and syncline these axial planes are called as axis of anticline and axis of syncline respectively.
- The inclination of the rock beds with respect to the horizontal Plane is termed as 'dip'. The line drawn perpendicular to dip is known as 'Strike' of the fold.



NOTES

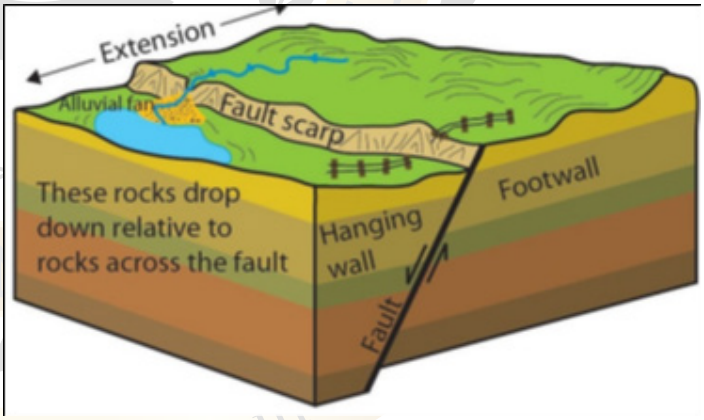
Types of folds

The Nature of the folds depends on various factors such as the nature of rocks, the nature and the inten¬sity of compressive forces, duration of the operation of the compressive forces etc. Based on the inclina¬tions of the limbs the folds are classified in to the following types.

- **Symmetrical folds-** If both the limbs incline uniformly then they are called as symmetrical folds. These folds are an example of open folds and are formed when Compressive forces work regularly but with moderate intensity.
- **Asymmetrical folds-** These are characterized by unequal irregular limbs which incline at differ¬ent angles. One limb is relatively larger and the inclination is moderate and regular while the other limb is relatively shorter with steep inclination.
- **Monoclinal folds-** These are the folds in which one limb inclines moderately with regular slope while the other limb inclines steeply at right angle and the slope is almost vertical.
- **Isoclinal folds-**These folds are formed when the compressive forces are so strong that both the limbs of the fold become parallel but not horizontal.
- **Recumbent folds-**These folds are formed when compressive forces are so strong that both the limbs of the folds become parallel as well as horizontal.
- **Overturned folds-**The fold in which one limb of the fold is thrust upon the other limb due to in¬tense compressive forces.
- **Plunge folds-**When the axis of the fold instead of being parallel to the horizontal plane becomes tilted and forms plunge angle which is the angle between the axis and the horizontal plane.
- **Fan folds-** They represent an extensive broad fold consisting of several minor anticlines and syn¬clines which resembles a fan. Such feature also called as Anticlinorium and Synclinorium.
- **Open folds-** The folds in which the angle between the two limbs of the fold is more than 90° but less than 180° (obtuse angle). These open folds are formed due to moderate nature compressive forces.
- **Closed folds-** The folds in which the angle between the limbs is acute are called as closed folds and are formed due to intense Compressive forces

Warping – Joints - Faults

- **Warping-** The process of crustal warping affects larger areas of the crust where in crustal parts are warped upward or downward.
- The upward rise of the crustal part due to the compressive force resulting in the Convergent horizontal movement is called UPWARPING while bending of the Crustal parts down¬ward in the form of a basin or depression is called DOWNWARPING.
- When the process of up warping and down warping affects larger areas, the resultant mechanism is called BROADWARPING.
- In simple words warping is extensive or large-scale folding. Though distinct both the words are often used interchange¬ably.



- **Joints-** A joint is defined as a fracture in the crustal rocks wherein no appreciable movement of rocks takes place along the line or zone of fracture
- Faults- When the crustal rocks are displaced, due to tensional movement caused by the Endogenetic forces, along a plane, the resultant structure is called fault.
- The Plane along which the rock blocks are displaced is called fault plane.
- A fault Plane may be vertical, or inclined, or horizontal, or curved or of any type and form. The movement responsible for the formation of a fault may operate in vertical or horizon¬tal or in any direction.

NOTES

Major Components of a Fault

The major components of a fault include

- **Fault Plane-** The plane along which the rock blocks are displaced by tensional and Compressional forces acting vertically and horizontally to form a fault, fault plane may be vertical, inclined, hori¬zontal, curved or of any other form.
- **Fault dip-** The angle between the fault plane and the horizontal plane
- **Up thrown side-**Represents the uppermost block of a fault
- **Downthrown Side-** Represents the lowermost block of a fault
- **Hanging Wall-** The upper wall of the fault
- **Foot wall-** The lower wall of the fault
- **Fault scrap-** The steep wall like slope caused by faulting of the crustal rocks, Sometimes the fault scarp is so steep that is resembles a cliff. Scarps are not formed by faulting alone and it may form

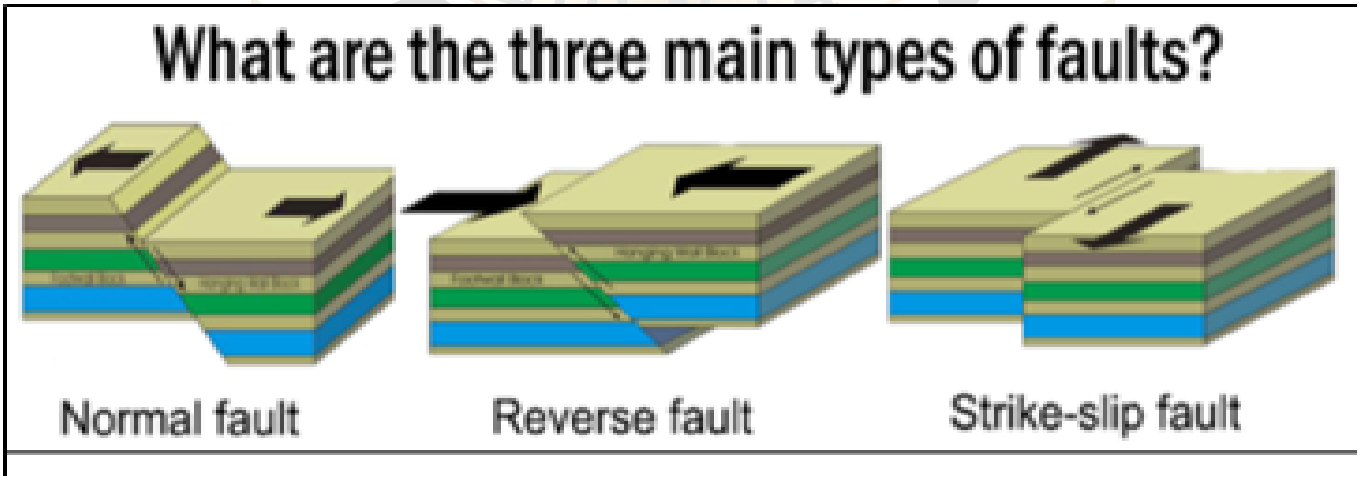
Main type of Faults

1) Normal Fault

- If the displacement of the rock blocks is down to the direction of the dip then the resultant fault is called Normal fault.
- Normal faults are formed due to the displacement of both the rock blocks in opposite directions due to tensional force. The fault plane is usually between 45° and vertical.
- The Steep scrap resulting from the normal fault is called fault-scarp or fault-line scarps the height of which ranges between a few meters to hundreds of meters.

2) Reverse Fault

- Reverse faults are formed due to the movement of both the fractured rock blocks towards each other.
- The fault Plane, in a reverse fault is usually inclined of an angle between 40° and horizontal 0°.
- The vertical Stress is minimum while the horizontal stress is maximum.
- In reverse faults the rock beds on the upper side are displaced up the fault plane relatively to the rock beds below.
- It is apparent that reverse faults result in the shortening of the faulted area while normal faults cause extension of the faulted area.
- It is thus, also obvious that some sort of compression is also involved in the formation of reverse faults.
- Reverse faults are also called of thrust faults. Since reverse faults is formed due to compressive force resulting from horizontal movement and hence this is also called as Compres¬sional fault.



NOTES

3) Lateral or Strike Strip Faults

- This type of faults is formed when the rock beds are displaced horizon¬tally along the fault plane due to horizontal movement.
- These are called left-lateral or sinistral faults when the displacement of rocks occurs to the left on the far side of the fault and right lateral or dextral faults when the displacement of rock blocks takes place to the right on the far side of the fault.

Block Mountains and Rift Valley

- A rift valley is a major relief feature resulting from faulting activities. It represents a trough, de¬pression or basin between two crustal parts.
  - o Rift valleys are formed due to displacement of crustal Parts and subsidence of middle portion between two faults by horizontal and vertical movements mo¬tored by Endogenetic forces. Rift valleys are also called as 'Graben'.
- Block mountains: The surrounding lithospheric blocks that are found on either side of a rift valley form Block Mountains (Block Mountains are also known as horst).
- A rift valley may be formed in two ways viz
  - o When the middle portion of the crust between two normal faults is dropped downward while the two blocks on the either side of the down dropped block remain stable (Tensional stress)
  - o Then the middle portion between two normal remains stable and the two side blocks on the either side of the middle position are raised upward (Compressional stress)
- Rhine rift valley is the best example rift valley. The one side of the rift valley is bounded by Vosges and Hardt mountains (block mountains-horst) while the other side is bordered by Black forest and Odenwald mountains. Some of the other rift valleys are Jordan River valley, Death Valley of southern Californian, Narmada valley and Dead Sea in Asia.
- The rift valleys are not only confined to continental crustal surfaces but they are also found on the sea floor.

Orders of Relief

The topographical features that appear on the surface of the earth are actually the products of endogenic and exogenous processes.

What is Relief?

- Relief is known as the difference between two elevation points on the surface of the earth. If a surface is relatively flat then it is considered to be having low relief, while mountainous regions are said to be having high relief.

Classification or Orders of Relief

Relief can be classified as follows:

- First order relief
- Second order relief
- Third order relief

a) First order relief

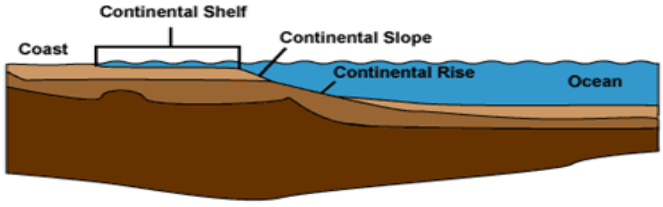
- Entire lithosphere which consists of continental crust as well as the oceanic crust comes under first order relief.
- Continental crust have lower density than the oceanic crust and is made up of granitic rock consisting of Silica and Aluminium predominantly. While oceanic crust is made up of basaltic rocks and majorly consists of Silica and Magnesium.
- First order relief basically reflects the original cooling and solidification of Earth's crust at the time of its formation. Continental shields and contracted Panthalassa (largest ocean known as Pacific) are considered to be included in first order relief.

b) Second order relief

- This type of relief basically consists of all endogenic forces which originates from within earth's crust/surface. Endogenic forces are responsible for developing variations on the surface of the earth; hence they are also known as variability developers.
- Endogenic processes are classified as follows:
  - Diastrophism aka mountain building forces is responsible for the development of block as well as fold mountains.
  - Volcanism/Earth quakes.
- Mountains are the best example of product of endogenic processes on continental crust. While submarine ridges (formed due to solidification of magma) and trenches forms the best example in oceanic crust.

c) Third order relief

- This type of relief basically consists of exogenic forces. Exogenic forces are those forces which originates on the surface of the earth.
- All exogenic forces are also known as levellers because they are responsible for levelling (bringing variations) the surface of the earth.
- The levelling process includes erosion, transportation and deposition and as a result valleys (due to erosion) and deltas (due to deposition) are formed. Following are the agents which carry out the whole levelling process:
  - Running water
  - Wind
  - Underground water
  - Glacier
  - Sea waves



- **Important note:**
  - All the above-mentioned levelling agents don't work after the shoreline. This means that third order relief is only confined to the continental crust.
  - However continental margin (consisting of continental rise, continental slope and continental shelf) may experience third order relief features because of change in mean sea level due to change in climatic conditions or region-specific endogenic modifications.

Thankyou All the best for Prelims!!!!!!

NOTES