TENDER HEART HIGH SCHOOL
SECTOR 33 B CHANDIGARH

CLASS: IX

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SUBJECT: Geography

Chapter 3
Rotation and Revolution

Good Morning Students

This is the lesson of Class IX Geography. In this lesson we will study about Movements of Earth, Rotation of Earth and Alteration of Day and Night, Effects of Earth's rotational speed, Effects of Rotation, Coriolis Effect, centrifugal and centripetal force, Effects of Inclination of Earth's Axis, Seasonal Change.

1) Introduction:

→ The movement of all celestial bodies gives us an impression that all of them are moving while we are not moving.

→ The Sun and other celestial bodies appear to move on account of relativity of motion between the Sun and Earth.

→ Thus, all the heavenly bodies are in constant motion, but they are held together in space due to Gravitational Force of one with respect to other.

→ Hence, the Gravitational Force of Earth holds the moon and their Artificial Satellites in their respective Orbits.

2) Movements of Earth:

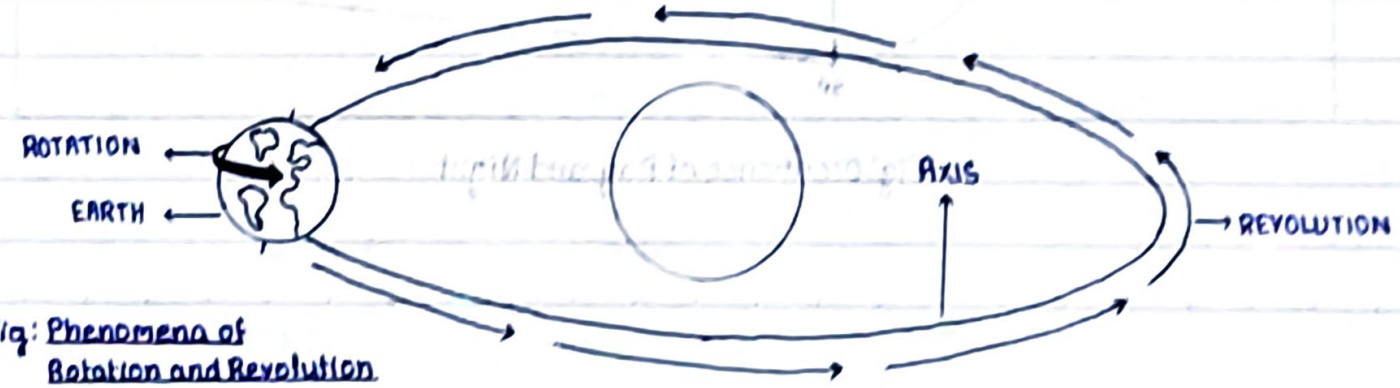

Fig: Phenomena of Rotation and Revolution

(A) Rotation

→ The spinning of Earth on its polar Axis from West to East is referred as Rotation.
→ Earth takes 23 hours 56 minutes and 4.09 seconds to complete one Rotation.
→ This period is known as Sidereal Day.

(B) Revolution

→ The motion of the Earth along its elliptical orbit around the Sun is referred as Revolution.
→ The Earth takes 365 1/4 Days or 365 Days 6 hours to complete one Revolution.
→ In a Leap Year, Earth takes 366 Days to complete one Revolution.

Rotation of Earth and Alternation of Day and Night

→ The difference in length of Day and Night is directly related to the rotation of Earth on its Axis once in 24 hours.
→ While Rotating, the part of Earth that faces the Sun experiences day. On the contrary, the other part experiences night.
→ The imaginary line that shows clear demarcation between the phenomena of day and night is referred as Circle of Illumination.

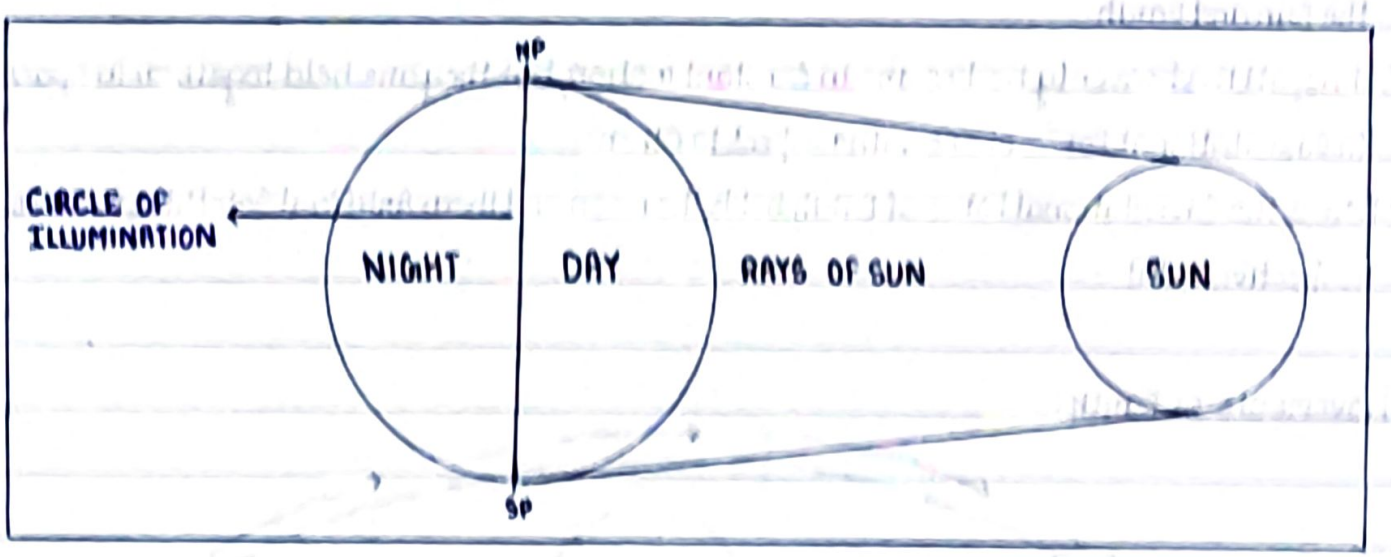

Fig: Occurrence of Day and Night

Effects of Earth's Rotational Speed

→ Rotational Speed of Earth maintains the duration of Day and Night on Earth
→ Rotational Speed of Earth deflects the ocean currents and winds towards Right in Northern Hemisphere and towards left in Southern Hemisphere.
→ Rotational Speed of Earth also deflects cyclones and thus causes Atmospheric Changes.
→ Rotational Speed of Earth also affects the Pressure Belts and Movement of Air on Earth's Surface.
→ Rotational Speed of Earth causes bulging of Air at Equator and flattening of Air at Poles.

Effects of Rotation

→ Rotation causes day and night.
→ Rotation causes variation in Temperature.
→ Rotation also causes Tides on our Earth.
→ The apparent movement of celestial Bodies is due to Rotation of Earth.
→ Rotation of Earth creates centrifugal forces due to which a bulge at the Equator is caused.

Coriolis Effect

→ Coriolis Effect was first described by a French Scientist named Gustave Coriolis.
→ According to his theory, ocean currents and winds are deflected towards right in the Northern Hemisphere and towards left in the Southern Hemisphere. It occurs due to centrifugal force that is created due to Rotation of Earth.
→ The coriolis effect is absent at Equator, but it increases at Poles.

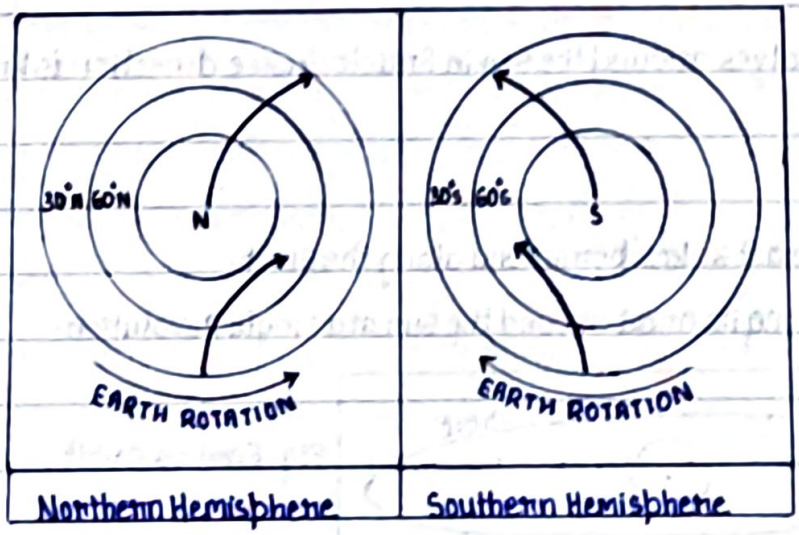

Fig: Coriolis Effect

Centrifugal Force

→ Centrifugal Force is a force that is directed away from the axis of Rotation and appears to act on all the rotating objects.

→ As the Earth rotates on its axis, it experiences Centrifugal Force that is directed away from its axis of Rotation, that ultimately causes Bulge at Equator.

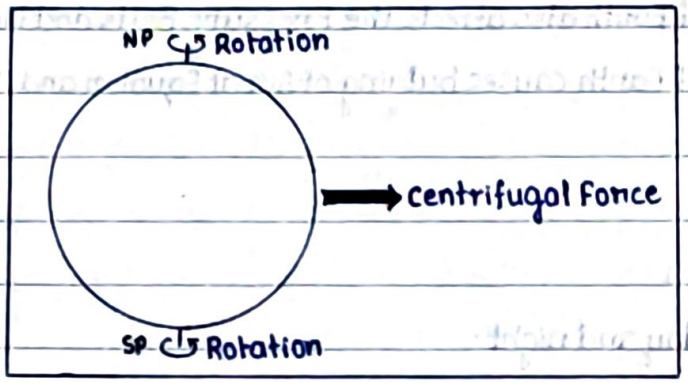

Fig: Centrifugal Force

Centripetal Force

→ Centripetal Force is directed towards the centre of Earth along its radius.

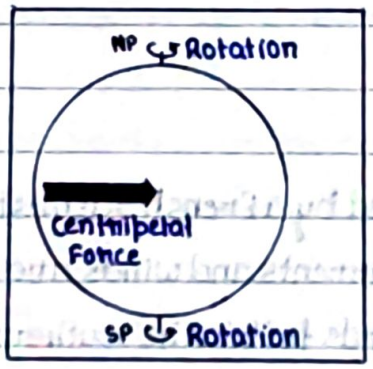

Fig: Centripetal Force

Orbit

→ The Path along which the Earth revolves around the Sun in Anticlockwise direction is known as Orbit.

→ The Orbit is Elliptical in shape.

→ The Earth moves with a speed of almost 30 kms per second along the Orbit.

→ Earth also travels 940 million kms along its orbit around the Sun in a single Revolution.

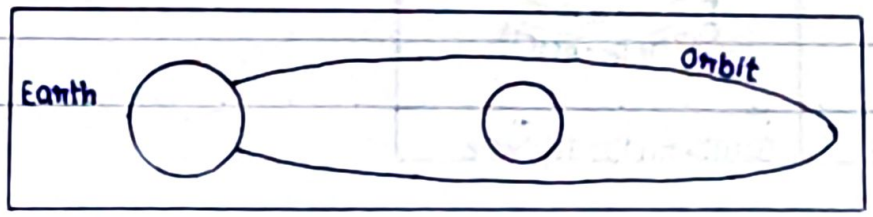

Fig: Earth's Orbit

Perihelion and Aphelion

PERIHELION	APHELION
→ On 3rd of January, when Earth is closer to Sun, it is said to be in Perihelion.	→ On 4th of July, when Earth is far from Sun, it is said to be in Aphelion.
→ According to kepler's law of Planetary motion Earth moves fastest in Perihelion.	→ According to kepler's law of Planetary motion, Earth moves slowest in Aphelion.

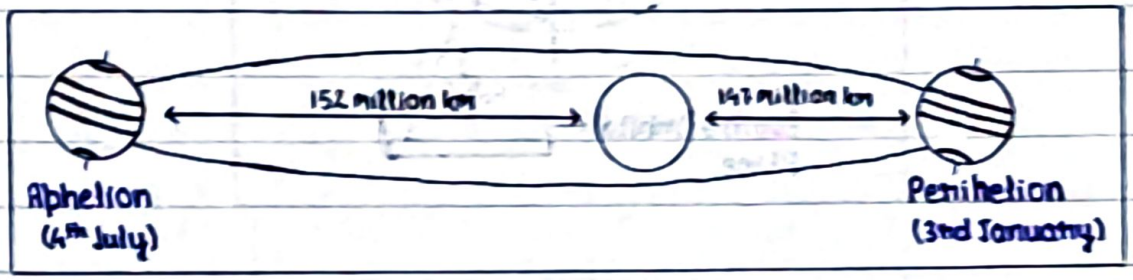

Fig: Perihelion and Aphelion

Revolutional Speed of Earth

→ The mean velocity of Earthrs speed is 107000 km/hr or 30 km/sec.
→ This speed varies according to the path of the orbit that is occupied.
→ The velocity of Earth is more at Perihelion and less at Aphelion.
→ If the movement of the Earth is observed from space, it looks like Earth is travelling Anti-clockwise around the Sun.

Inclination of Earth's Axis

→ The axis of the Earth is an imaginary line passing through the centre of the Earth.
→ The Earth takes 23 hours 56 minutes 4.09 seconds to complete one rotation on its own Axis.
→ The North Pole and South Pole makes the two ends of the Axis.
→ The Axis of the Earth makes an angle of 23½° with respect to vertical Plane and 66½° with respect to Orbital Plane.
→ This angle of Earth is known as Tilt or Inclination of Axis.
→ This inclination or Axis is always pointed towards the Pole Star during Revolution.

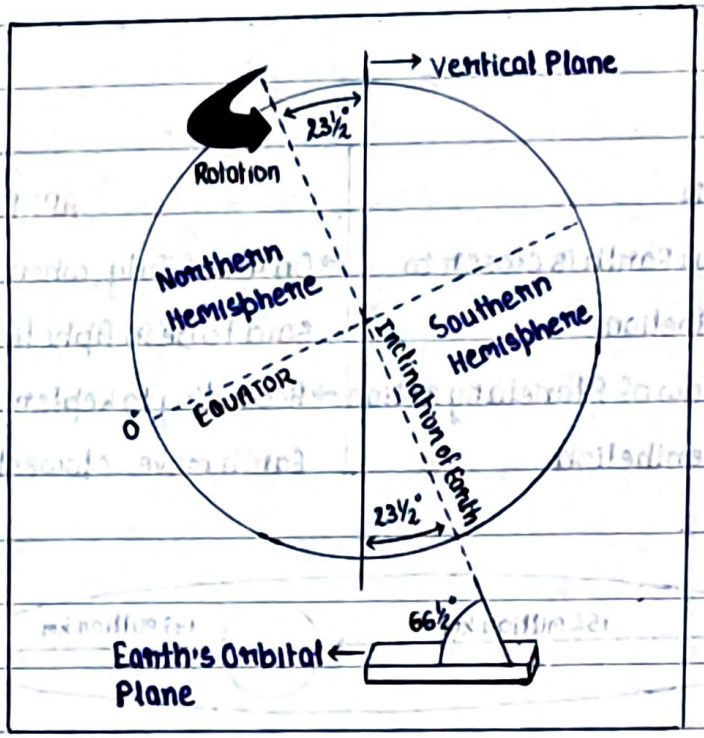

Fig: Inclination of Earth's Axis

Parallelism of Earth's Axis

→ The Earth's Axis is inclined by 23½° with respect to Vertical Plane and 66½° with respect to Orbital Plane.

→ The Earth's Axis never changes its direction and it always points towards the Pole Star throughout the Earth's Revolution around the Sun.

→ This is known as Parallelism of Earth's Axis.

Significance or Effects of Inclination of Earth's Axis and Revolution

→ Due to inclination of Earths Axis both the poles are alternately directed towards the Sun.

→ Due to inclination of Earth's Axis, the length of Day and Night on Earth differs from place to place.

→ The Altitude of mid day Sun also varies due to inclination of Earth's Axis and Revolution

→ Revolution causes the Phenomena of Perihelion and Aphelion.

→ Revolution causes change of seasons

→ Revolution helps in the location of Tropic of Cancer and Tropic of Capricorn due to the fact that Sun's rays falls directly here.

Seasonal Change

The movement of sun results in change in the altitude of mid day sun at different times of the year. This causes seasonal change.

This is shown below with the help of Diagram:

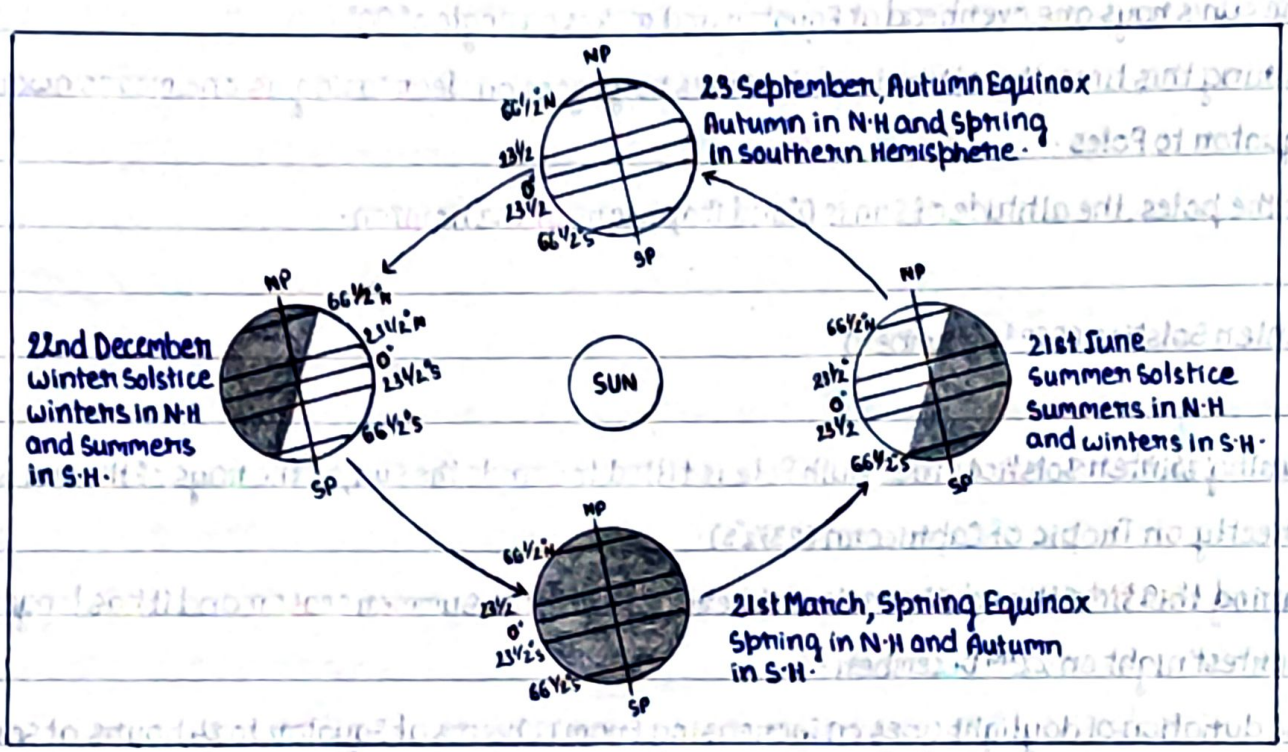

Fig: Seasonal Change

(A) Summer Solstice (21st June):

→ During Summer Solstice, the North Pole is tilted towards the Sun, due to this the rays of the Sun falls directly on Tropic of Cancer (23½°N).

→ During this time, Northern Hemisphere experiences Summer and has longest day and shortest night on 21st June.

→ The duration of Daylight goes on increasing from 12 hours at Equator to 24 hours at North Pole.

→ During this time, days are longer and nights are shorter in Northern Hemisphere.

→ On the contrary, during this time, South Pole is inclined away from the Sun, so the rays of the Sun don't cross the Antarctic Circle (66½°S).

→ During this time, it is winter in Southern Hemisphere and has shortest day and longest night on 21st June.

→ The Duration of Daylight goes on decreasing from 12 hours at Equator to Complete Darkness at South Pole. Thus, during this time, days are shorter and nights are longer in Southern Hemisphere.

(B) Autumn Equinox (23rd September)

→ On 23nd September, the Circle of illumination passes through both the poles and makes 12 hours day and 12 hours night at all places on the Earth.
→ During this time, the inclination of Earth's Axis does not have any affect on the duration of day.
→ The sun's rays are overhead at Equator and makes an angle of 90°.
→ During this time, the altitude of the Sun's rays goes on decreasing as one moves away from Equator to Poles.
→ At the poles, the altitude of Sun is 0° and it appears at the horizon.

(C) Winter Solstice (22nd December)

→ During winter solstice, the South Pole is tilted towards the Sun, so the rays of the sun falls directly on Tropic of Capricorn (23½S).
→ During this time the southern Hemisphere experiences summer season and it has longest day and shortest night on 22nd December.
→ The duration of daylight goes on increasing from 12 hours at Equator to 24 hours at South Pole.
→ During this time, days are longer and nights are shorter in Southern Hemisphere.
→ On the contrary, during this time, North Pole is inclined away from the Sun, so sun's rays don't cross the Arctic Circle.
→ During this time, it is winter in Northern Hemisphere and it has shortest day and longest night on 22nd December.
→ The duration of daylight goes on decreasing from 12 hours at Equator to complete darkness at North Pole.
→ During this time, days are shorter and Nights are longer in Northern Hemisphere.

(D) Spring Equinox (21st March)

→ On 21st of March, the circle of illumination again passes through both the poles and makes 12 hours day and 12 hours night at all the places on Earth.
→ During this time, the inclination of Earth's Axis does not have any effect on the duration of a day.
→ The Sun's rays are overhead at Equator and makes an angle of 90°.
→ The altitude of Sun's rays decreases as one moves away from Equator to Poles.
→ At poles, sun appears at the horizon.

Land of Midnight Sun

→ At Arctic Circle (66½°N) during Summer on 21st June, Sun never sets and there is daylight for 24 hours as North Pole is inclined towards the Sun.
→ This region is referred as Land of Midnight Sun.
→ In this region, During 22nd December, Sun never rises and there is darkness for 24 hours as North Pole is away from the Sun.

I hope you all have understood the topic very well. So you all are required to read chapter 3 properly and also the question and answers of Back Exercise of the chapter.
With this I will end the interactive session.