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# Ch - 3
## Rotation and Revolution

Important terms -

a) Rotation - Spinning of the earth around the sun on its axis from west to east once in 24 hrs.

b) Revolution - Movement of earth around the sun in its orbit in an anticlockwise direction in 365 days and 6 hrs.

c) Axis - It is an imaginary line passing through the centre of the earth on which it rotates.

d) Equinox (Equal + Night) - These are the two days in a year when sunrays fall vertically at the equator (21st March and 23rd September) Days and nights are equal all over the world.

e) Solstice (sun is still) - These are the two days when sunrays fall vertically at either of the tropics.
21st June → Summer Solstice → Tropic of cancer
22nd (DEC) June → Winter Solstice → Tropic of capricorn

f) Circle of illumination - It is the circle of light that divides the earth into lighted and darkened halves.

g) Coriolis effect - Force generated by rotation of

earth which causes deflection of winds and ocean currents in a direction opposite to the earth's rotation.

f) Centrifugal force - force directed outwards from a rotating object away from the axis of rotation. The speed of rotation creates the centrifugal force giving earth its shape OBLATE SPHEROID i.e. bulge at equator and flattening of poles.

g) Midnight sun - On 21st June, during summer for the northern hemisphere, the region beyond the arctic circle experiences 24 hours of daylight although the sun is visible at a very low altitude (just above the horizon). This phenomena has resulted due to inclination of earth's axis.
Since this phenomena can be observed from Norway where many tourists flock to witness it, nowdays it is called the 'the land of midnight sun'.

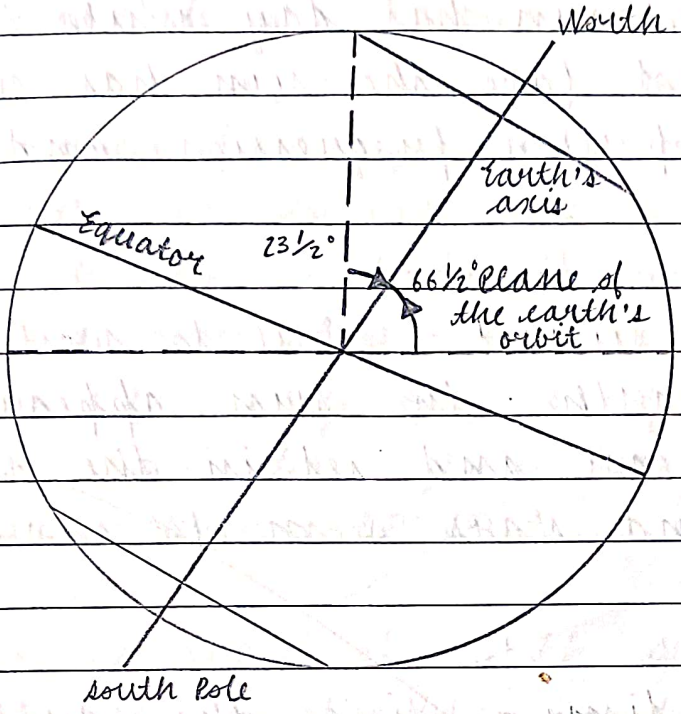
h) Inclination of earth's axis - The earth's axis is not straight. It is inclined by 23 1/2° from vertical and 66 1/2° from the orbital plane. This is called 'Inclination of Earth's Axis'
The two effects of inclined axis are:
i) seasonal changes
ii) varying length of days and nights

If the axis of earth was vertical instead of inclined →

2 consequences -

i) No change of seasons

ii) Days and night would have been of equal length through the year.




Inclination of the earth's axis

Characteristics of Rotation -

1. The earth spins on its axis from west to east with the axis remains inclined in the same direction throughout the year.
2. The time taken by earth to complete one rotation in 23 hours 56 minutes, 4.09 seconds (24 hrs approx.)
3. The speed of earths rotation is maximum at the equator i.e. 1670 km per hour. The speed decreases towards the poles.

## Effects of rotation -

1. Occurence of day and night - The shape of earth is spherical and it receives light from sun. During rotation the part of earth that faces the sun has day while the part which does not face the sun has night. It occurs in proportion progression and not suddenly.

2. Sunrise and sunset - Due to west to east rotation of earth, the sun appears to rise in the east and set in the west. Also the moon and stars seem to move from east to west.

3. Difference in time - Since the earth completes one rotation of its 360° of longitudes in 24 hours, each degree of longitude has a difference of 4 minutes. Earth is divived into 24 times zones to avoid confusion, the place in the east are ahead in time than places in the west.

4. Coriolis effect -
5. Centrifugal force -

} Already done

## Characteristics of revolution -

1. The earth moves around the sun in its elliptical orbit in an anti-clockwise

direction having its axis always inclined in the same direction.

2. The time taken by earth to complete one revolution is 365 days, 5 hrs, 48 minutes, 45 sec, which is taken as 365 days and 6 hrs.
[The length of a year is taken as 365 days. The extra six hours are added for 4 years (6 x 4 = 24 hrs i.e. 1 day].
This extra one day is added to the month of February every fourth year. February has 29 days and the year has 366 days. Such a year is called LEAP YEAR.

3. The average speed of earth around the sun is 29.8 km/sec or 100000 km/hr. The speed of revolution is not uniform

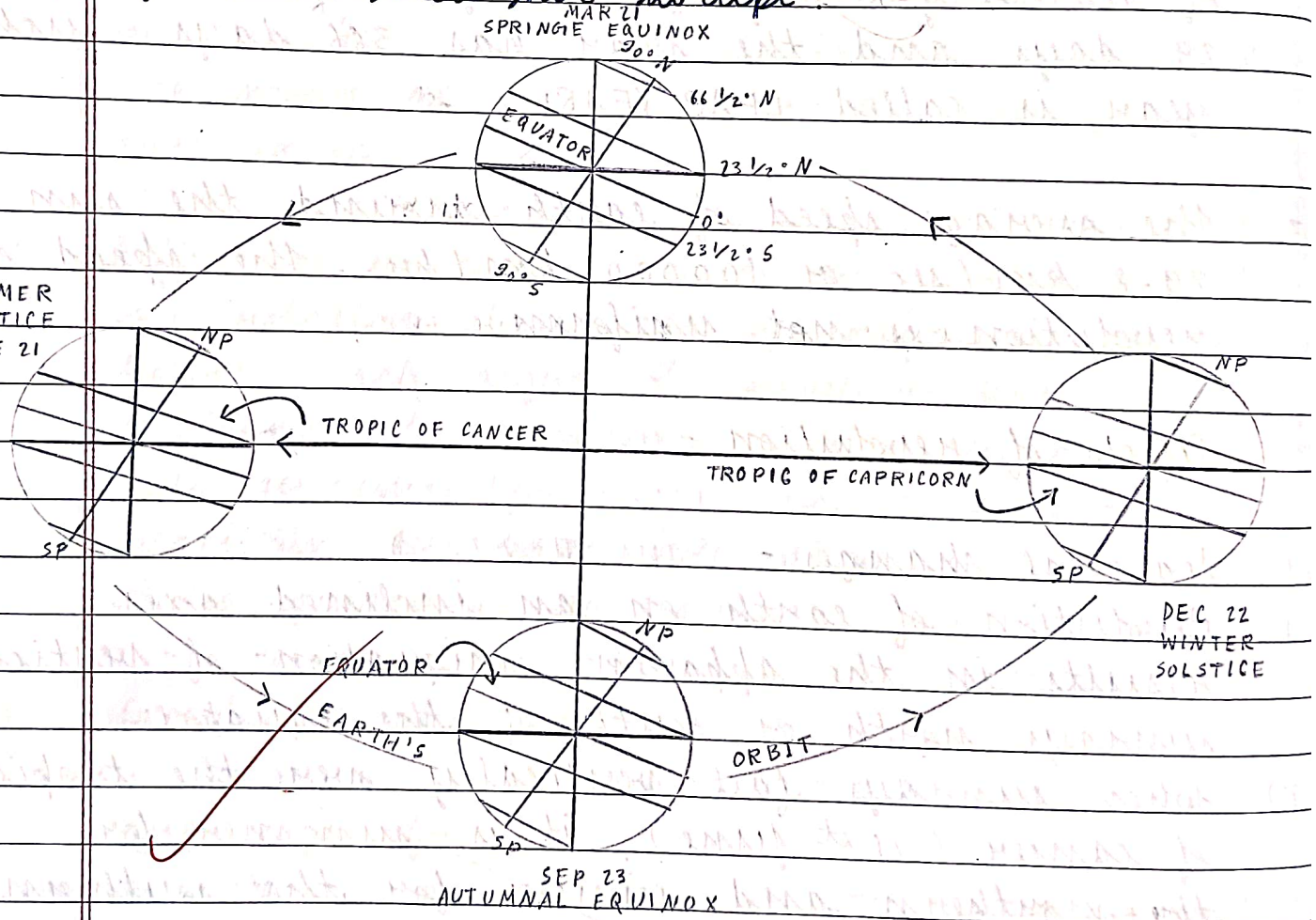
Effects of revolution -

1. Seasonal changes - (ans III-2 (b))
i) Revolution of earth on an inclined axis results in the apparent migration of vertical sunrays north or south of the equator.
ii) When sunrays fall vertically over the tropic of cancer (21st June), it is summer for the northern and winter for the southern hemisphere.
iii) When vertical sunrays sunrays fall over the tropic of capricorn (22nd December) it is summe for the southern and winter for the northern

hemisphere.

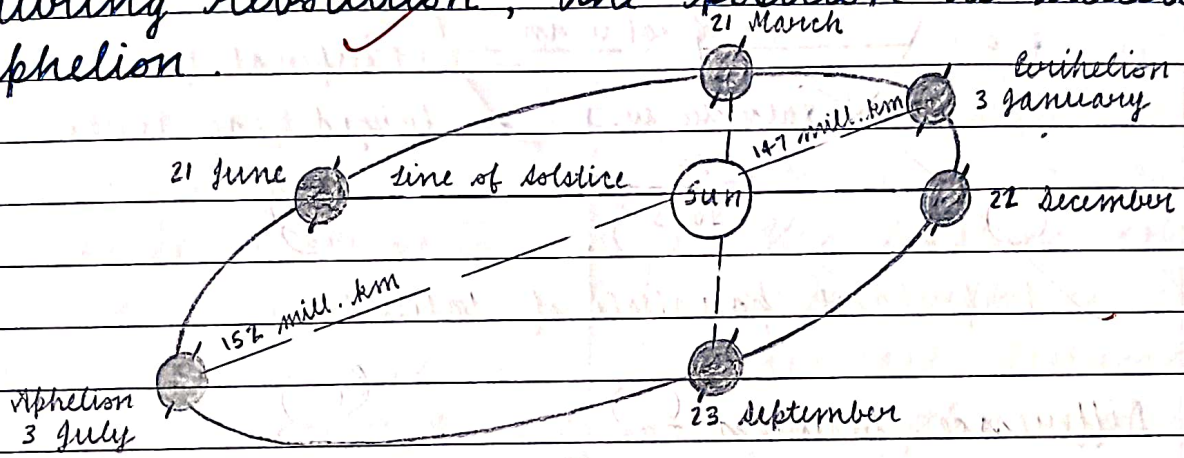
iv) During this migration between the tropics, twice the sunrays fall vertically at the equator, 21st March is Spring equinox and 23rd September is Autumn equinox for the northern hemisphere where as these seasons are opposite in the southern hemisphere.
(21st March → Autumn / 23rd September → Spring equinox).

v) Due to inclined axis seasonal changes are gradual and not abrupt.




Revolution of the Earth

2. Perihelion and aphelion position -
Earth's orbit is the elliptical path along which the earth travels around the sun. Due to its elliptical shape, the distance between the sun and the earth varies.
i) When the earth is at closest to the sun, the position is called perihelion
ii) When the earth is farthest from the sun, during revolution, the position is called aphelion.



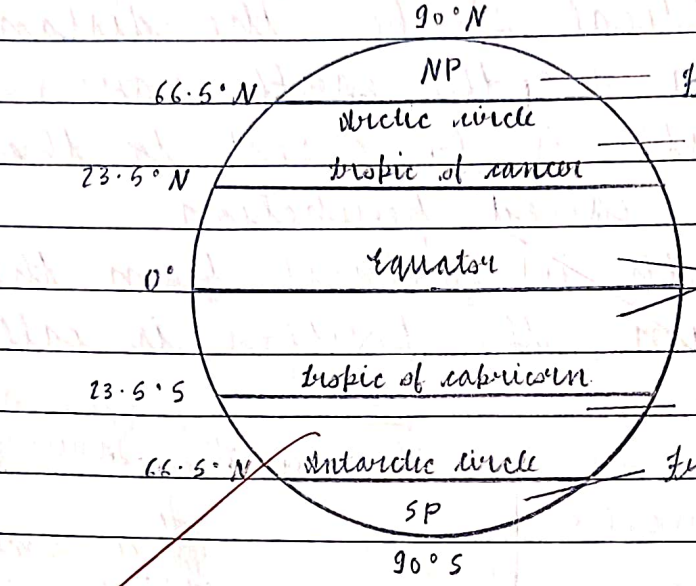

Perihelion and Aphelion positions

3. Creation of heat zones - Due to earth's spherical shape and revolution on an inclined axis, there is a difference in the angle at which the sunrays fall on the earth surface which causes difference in the distribution of heat on earth. As a result the earth is divided into three heat zones depending upon the amount of heat received.

i) Torrid zone - Between tr. of cancer and capricorn, receives direct sunray, is the hottest zone.

ii) Temperature zones - located between 23 1/2° to 66 1/2° N and S of the equator, receives slanted rays, moderate temperatures.

iii) Frigid zones - located between 66 1/2° to 90°, N and S of the equator, receives extremely slanted rays and is the coldest zone.




Important parallels of latitude

Difference between -

| I. | Solstice (sun is still) | Equinox (equal night) |
|---|---|---|
| i) | It refers to the position of earth when sunrays fall vertically over either of the tropics. | i) It refers to the position of earth when sunrays fall vertically over the equator. |
| ii) | It occurs twice in a year - 21st June - summer solstice 22nd Dec - winter solstice | ii) It occurs twice in a year - 21st March - spring equinox 23rd Sep - autumn equinox |

| | | |
|---|---|---|
| iii) | It results in un-equal day & night → longer days and shorter nights during summers. Shorter days and longer nights during winter. | iii) It results in equal day and night → i.e. 12 hours of day and 12 hours of night. |
| II. | Aphelion | Perihelion |
| i) | The position of when the earth is at its farthest distance from the sun during revolution. | i) The position when the earth is at its nearest distance from the sun. |
| ii) | It occurs on the 3/4 rth of July every year. | ii) It occurs on the 3rd of January every year. |
| iii) | The distance is 152 m. km between earth and sun. | iii) The distance is 147.3 m km between earth and sun. |
| III. | Vertical sunrays | Slanted sunrays |
| i) | These sunrays directly fall over a smaller area resulting in | i) In this the heat is distributed over a larger area, thus the amoun |

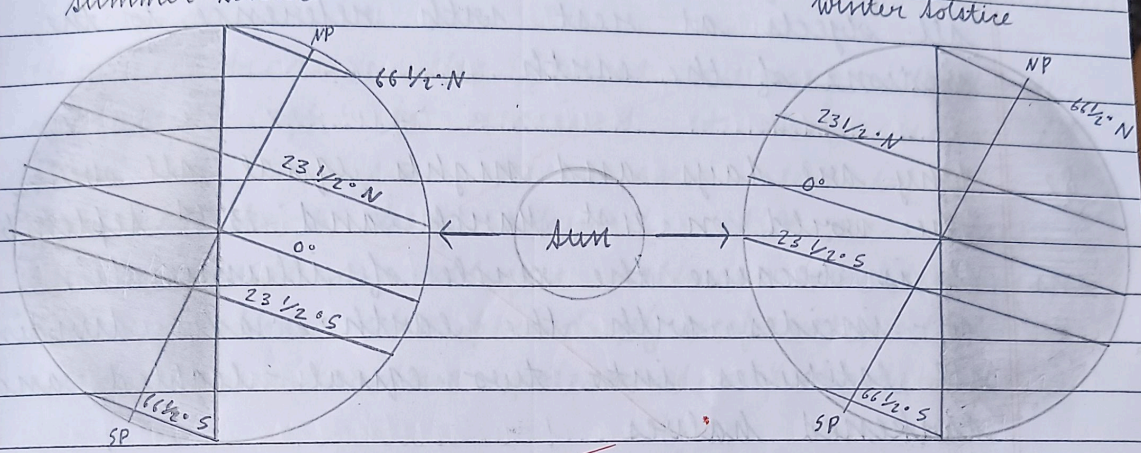
| | |
|---|---|
| concentration of heat thus the amount of heat is more. | of heat is less. |

(This is why the noon is hotter than morning (I-13)

| IV | Dawn | Dusk / Twilight |
|---|---|---|
| i) | Period of diffused sunlight between sunrise & complete day light | i) Period of diffused sunlight between sunset and complete darkness. |

| V | Summer Solstice | Winter Solstice |
|---|---|---|
| i) | Sunrays fall vertically over the tropic of cancer. | i) Sunrays fall vertically over the tr. of capricorn. |
| ii) | Occurs on 21st of June | ii) Occurs on 22nd Dec. |
| iii) | Northern hemisphere is inclined towards the sun. | iii) Southern hemisphere is inclined towards the sun. |
| iv) | Summer for northern, winter for southern hemisphere | iv) Winter for northern, summer for the southern hemisphere. |
| v) | Days are longer and | v) Days are shorter and |

| | |
|---|---|
| nights are shorter in the northern hemisphere. | night are longer in the northern hemisphere. |




Position of earth on 21 June

Position of earth on 22nd December