Rotation of Earth

- Earth rotates along its axis from **west to east.**
- It takes approximately 24 hrs to complete on rotation.
- **Days and nights** occur due to rotation of the earth.
- The circle that divides the day from night on the globe is called the **circle of illumination.**
- Earth rotates on a **tilted axis**. Earth's rotational axis makes an angle of **23.5°** with the normal i.e. it makes an angle of **66.5°** with the orbital plane. Orbital plane is the plane of earth's orbit around the Sun.

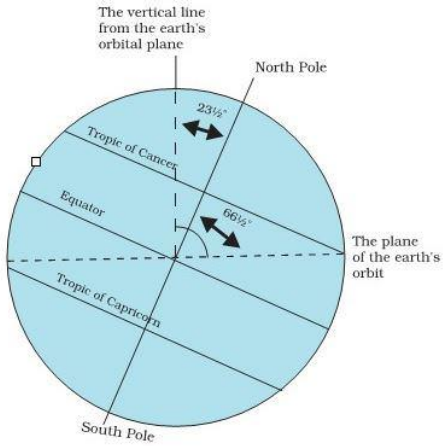


Figure 3.1 : Inclination of the Earth's axis and the orbital plane

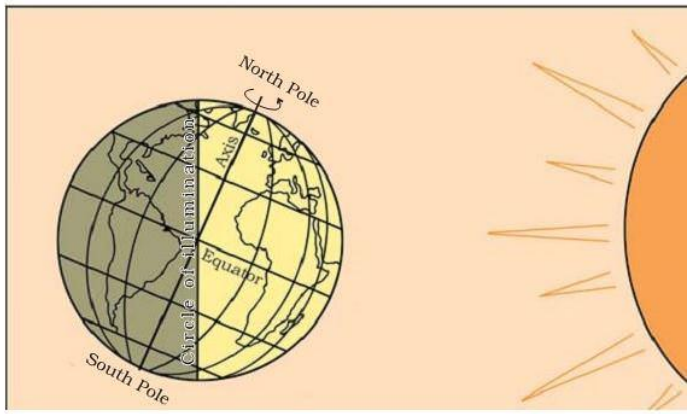
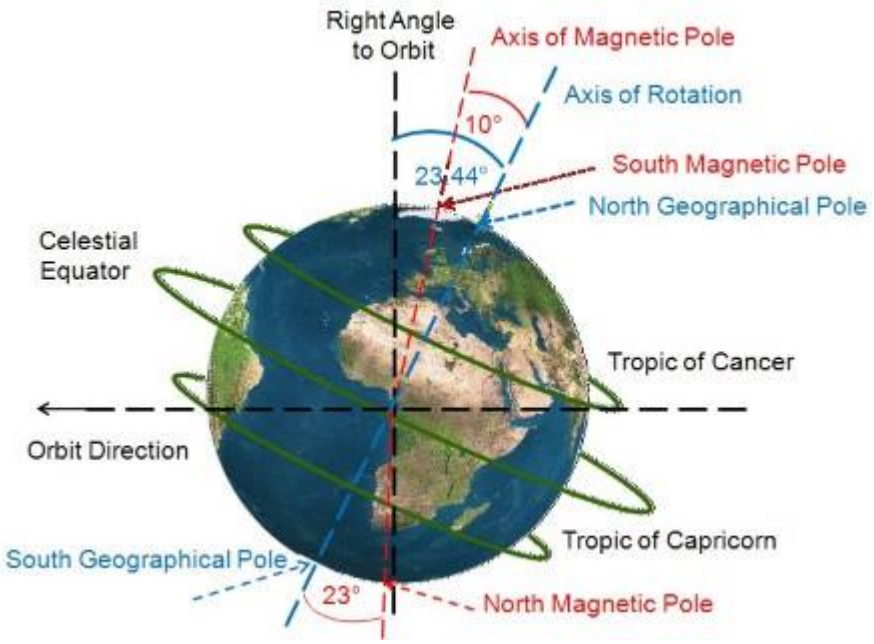
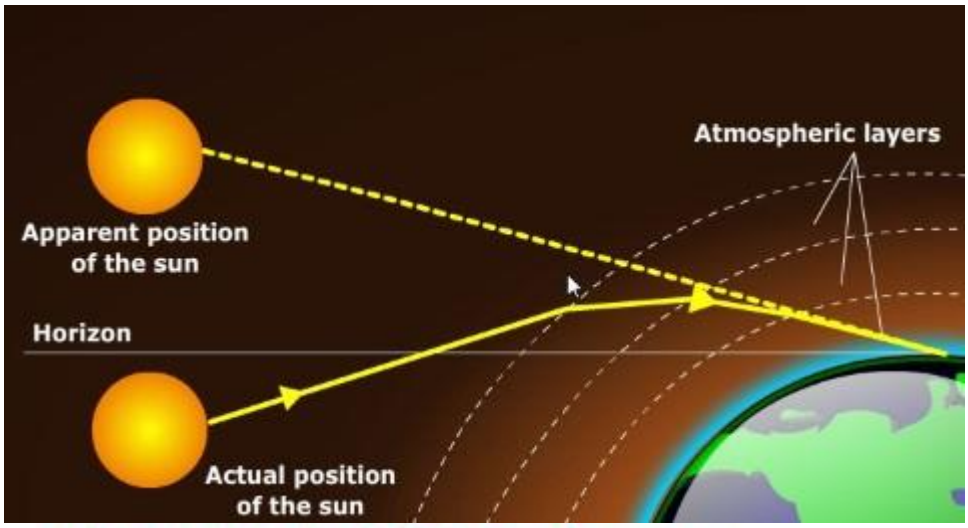


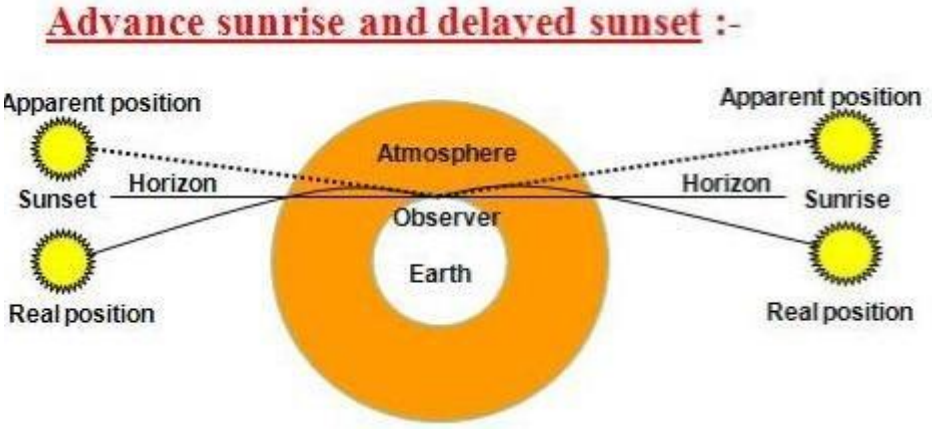
Figure 3.2 : Day and Night on the Earth due to rotation



Why are days always longer than nights at the equator?

- If there was no atmosphere, there would be no refraction and the daytime and nighttime would be near equal at the equator, at least during equinoxes.
- But due to atmosphere, the sun's rays gets refracted (bending of light). Refraction is particularly stronger during the morning and the evening time when the sun's rays are slant.
- Even though the actual sun is below the horizon, its apparent image would appear above the horizon due to refraction. This makes the days longer than nights at the equator.





Why temperature falls with increasing latitude (as we move from equator towards poles)?

- Because of the spherical (Geoid) shape of the earth and the position of the sun.
- Because the energy received per unit area decreases from equator to poles.
- Because Equator receives direct sunlight while Poles receive slant or oblique rays of the Sun.

Revolution

- The second motion of the earth around the sun in its orbit is called revolution. It takes **365¼ days** (one year) to revolve around the sun.
- Six hours saved every year are added to make one day (24 hours) over a span of four years. This surplus day is added to the month of February. Thus every fourth year, February is of 29 days instead of 28 days. Such a year with **366 days is called a leap year.**

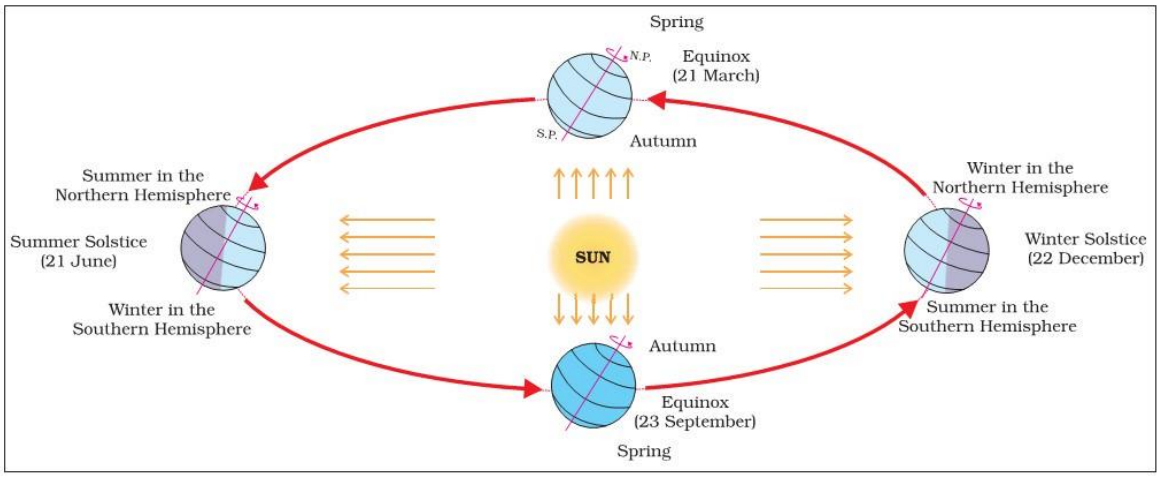


Figure 3.3 : Revolution of the Earth and Seasons

Solstice

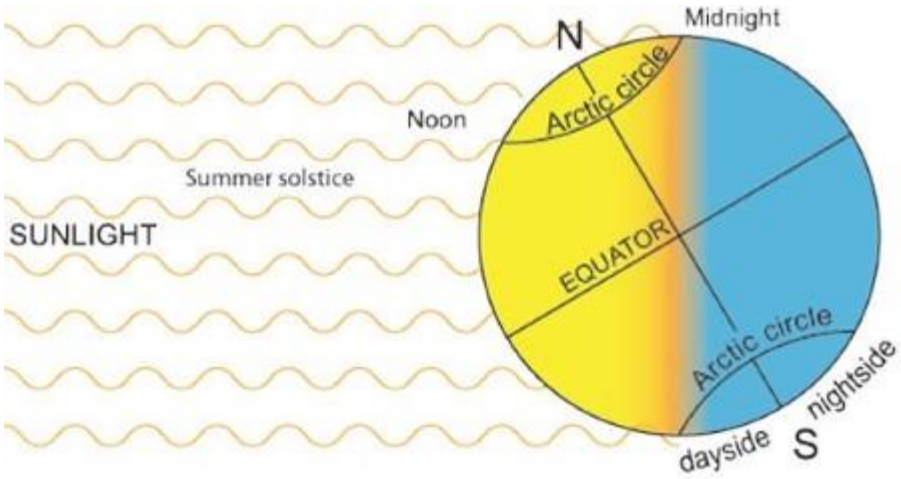
- On **21st June**, the northern hemisphere is tilted towards the sun. The rays of the sun fall directly on the **Tropic of Cancer**. As a result, these areas receive more heat.
- The areas near the poles receive less heat as the rays of the sun are slanting.
- The north pole is inclined towards the sun and the places beyond the **Arctic Circle** experience continuous daylight for about six months.
- Since a large portion of the northern hemisphere is getting light from the sun, it is summer in the regions north of the equator. The **longest day and the shortest night** at these places occur on **21st June**.
- At this time in the southern hemisphere all these conditions are reversed. It is winter season there. The nights are longer than the days. This position of the earth is called the **summer solstice.**
- On **22nd December**, the Tropic of Capricorn receives direct rays of the sun as the south pole tilts towards it. As the sun's rays fall vertically at the **Tropic of Capricorn** (23½° s), a larger portion of the southern hemisphere gets light. Therefore, it is summer in the southern hemisphere with longer days and shorter nights. The reverse happens in the northern hemisphere. This position of the earth is called the **winter solstice.**

Equinox

- On **21st March** and **September 23rd**, direct rays of the sun fall on the equator. At this position, neither of the poles is tilted towards the sun; so, the whole earth experiences equal days and equal nights. This is called an equinox.
- On 23rd September, it is **autumn season [season after summer and before the beginning of winter]** in the northern hemisphere and **spring season [season after winter and before the beginning of summer]** in the southern hemisphere. The opposite is the case on 21st March, when it is spring in the northern hemisphere and autumn in the southern hemisphere.
- Thus, you find that there are **days and nights and changes in the seasons because of the rotation and revolution of the earth respectively**.
- ***Rotation === Days and Nights.***
- ***Revolution === Seasons.***

Why regions beyond the Arctic circle receive sunlight all day long in summer?

- This is because of the tilt of the earth.
- Earth's axis at the north pole is tilted towards the sun in summer.
- So the whole of Arctic region falls within the 'zone of illumination' all day long in summer.



Daylight saving in some temperate regions

- Daylight saving time (DST) or **summer time** is the practice of **advancing clocks** during summer months by one hour.
- In DST, evening time is increased by sacrificing the morning hours.

[Normal days = Start office at 10 AM and close at 5 PM

In DST = Advance clock by one hour (can be more) = Start office at 9 AM and Close at 4 PM]

- Typically, users in regions with summer time (Some countries in extreme north and south) adjust clocks forward one hour close to the start of spring and adjust them backward in the autumn to standard time.
- Advantage: Putting clocks forward benefits retailing, sports, and other activities that exploit sunlight after working hours. Reduces evening use of incandescent lighting, which was formerly a primary use of electricity.

- Problems: DST clock shifts sometimes complicate timekeeping and can disrupt travel, billing, record keeping, medical devices, heavy equipment, and sleep patterns.

1. Variations in the length of daytime and night time from season to season are due to

a. the earth's rotation on its axis
b. the earth's revolution round the sun in an elliptical manner
c. latitudinal position of the place
d. **revolution of the earth on a tilted axis**

Hint: Revolution + Rotation on a Tilted Axis = = Variation in seasons = = Variation in Day time and Night time