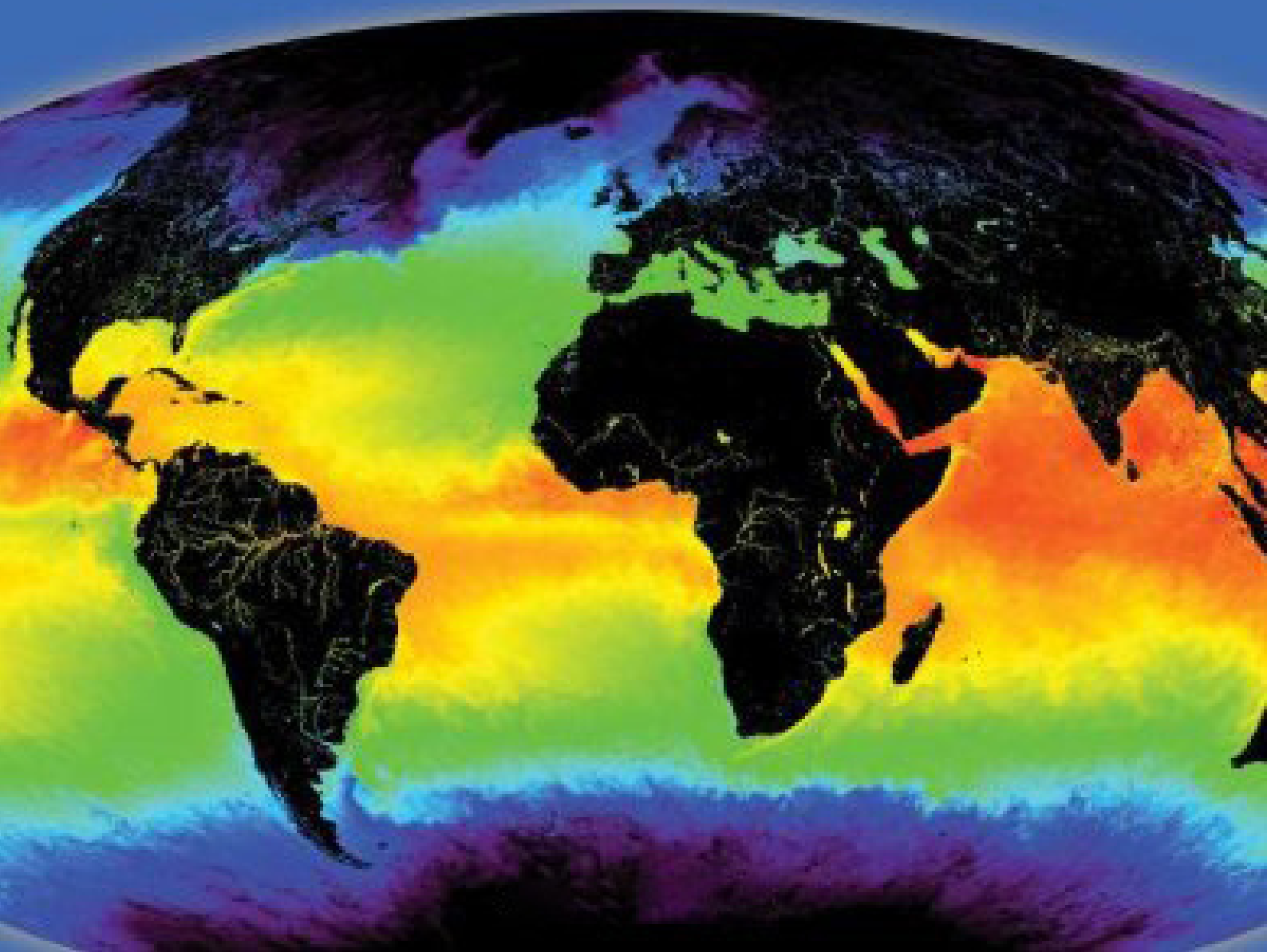
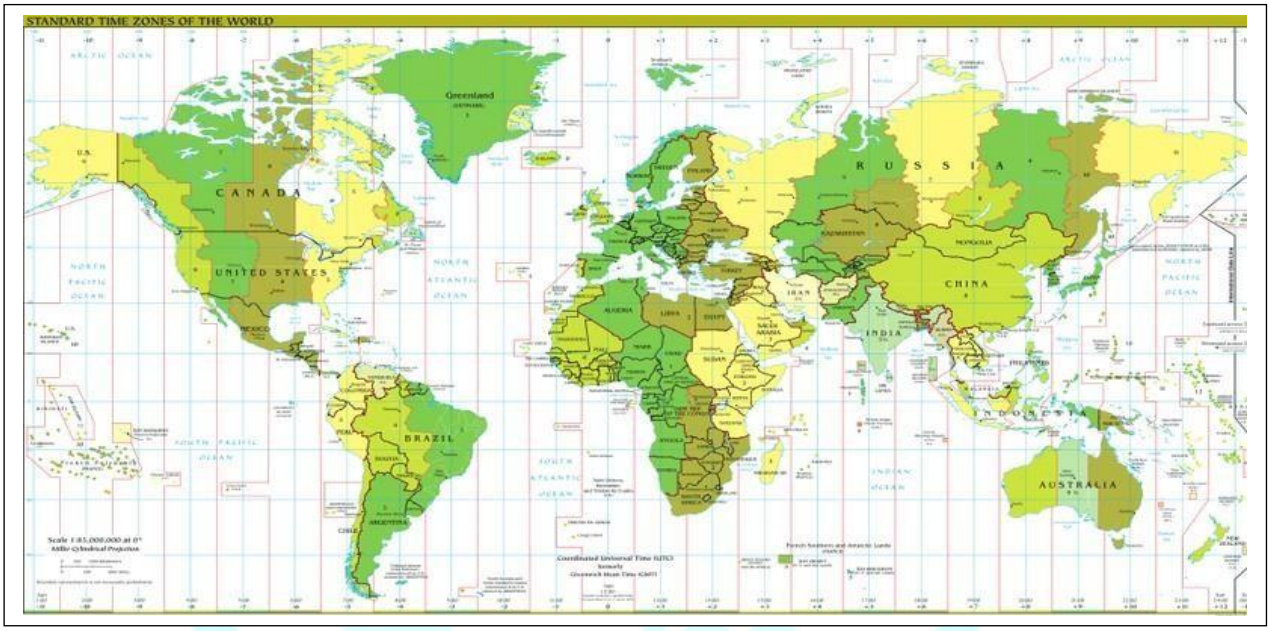
MALUKA IAS

Climatology

CLASS NOTES



Chapter : 1
Earth And Its Surrounds, Location And Relation



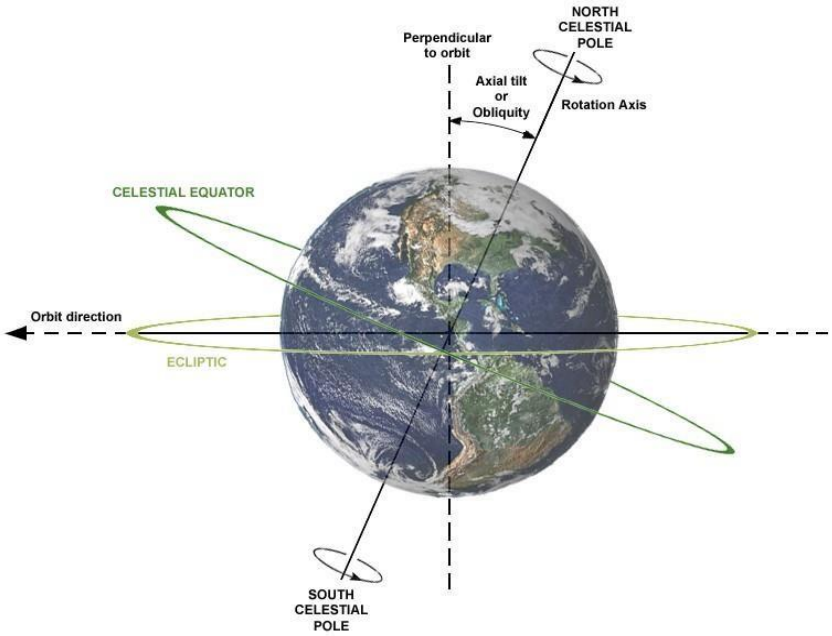
We are going to learn here

⇒ 1.1 Rotation And Revolution Of The Earth

⇒ 1.2 Latitude And Longitude

1.1 ROTATION AND REVOLUTION OF THE EARTH

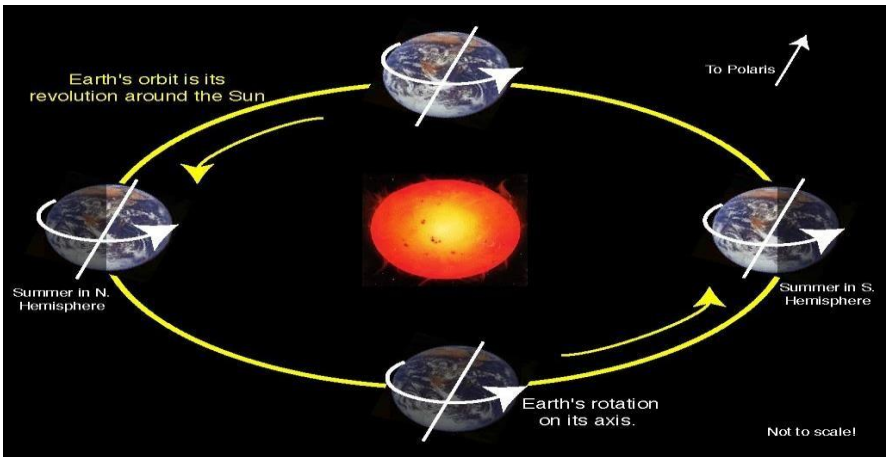
EARTH'S ROTATION:



- Imagine a line passing through the center of Earth that goes through both the North Pole and the South Pole. This imaginary line is called an **axis**.
- Earth spins around its axis, just as a top spins around its spindle.
- This spinning movement is called Earth's **rotation**. At the same time that the Earth spins on its axis, it also orbits, or revolves around the Sun.
- This movement is called **revolution**.
- A pendulum set in motion will not change its motion, and so the direction of its swinging should not change.
- However, Foucault observed that his pendulum did seem to change direction. Since he knew that the pendulum could not change its motion, he concluded that the Earth, underneath the pendulum was moving.
- An observer in space will see that Earth requires 23 hours, 56 minutes, and 4 seconds to make one complete rotation on its axis.
- But because Earth moves around the Sun at the same time that it is rotating, the planet must turn just a little bit more to reach the same place relative to the Sun.
- Hence the length of a day on Earth is actually 24 hours. At the equator, the Earth rotates at a speed of about 1,700 km per hour, but at the poles the movement speed is nearly nothing.

EARTH'S REVOLUTION:

- For Earth to make one complete revolution around the Sun takes 365.24 days. This amount of time is the definition of one year.
- The gravitational pull of the Sun keeps Earth and the other planets in orbit around the star.
- Like the other planets, Earth's orbital path is an ellipse so the planet is sometimes farther away from the Sun than at other times.



The closest Earth gets to the Sun each year is at perihelion (147 million km) on about January 3rd and the furthest is at aphelion (152 million km) on July 4th.

- **Earth's elliptical orbit has nothing to do with Earth's seasons.**
- During one revolution around the Sun, Earth travels at an average distance of about 150 million km.
- Earth revolves around the Sun at an average speed of about 27 km (17 mi) per second, but the speed is not constant.
- The planet moves slower when it is at aphelion and faster when it is at perihelion.
- The reason the Earth (or any planet) has seasons is that Earth is tilted 23 1/2oon its axis.
- During the Northern Hemisphere summer the North Pole points toward the Sun, and in the Northern Hemisphere winter the North Pole is tilted away from the Sun.

Solstice:

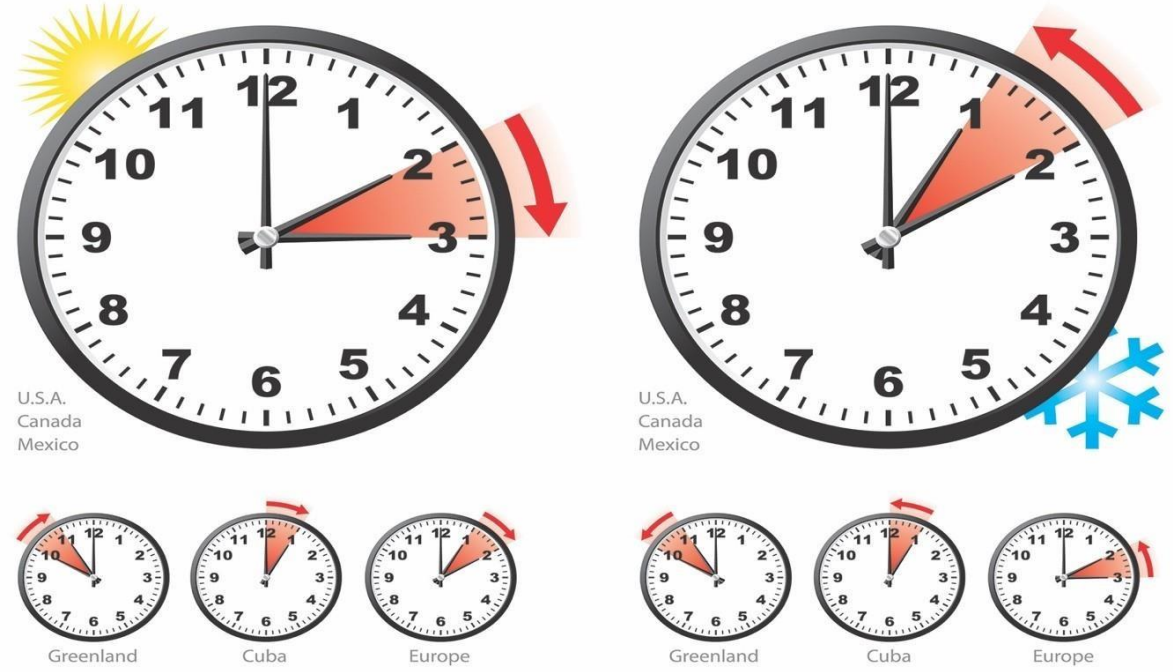
- On 21st June, the northern hemisphere is tilted towards the sun. The rays of the sun fall directly on the Tropic of Cancer. As a result, these areas receive more heat.
- The areas near the poles receive less heat as the rays of the sun are slanting.
- The north pole is inclined towards the sun and 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.

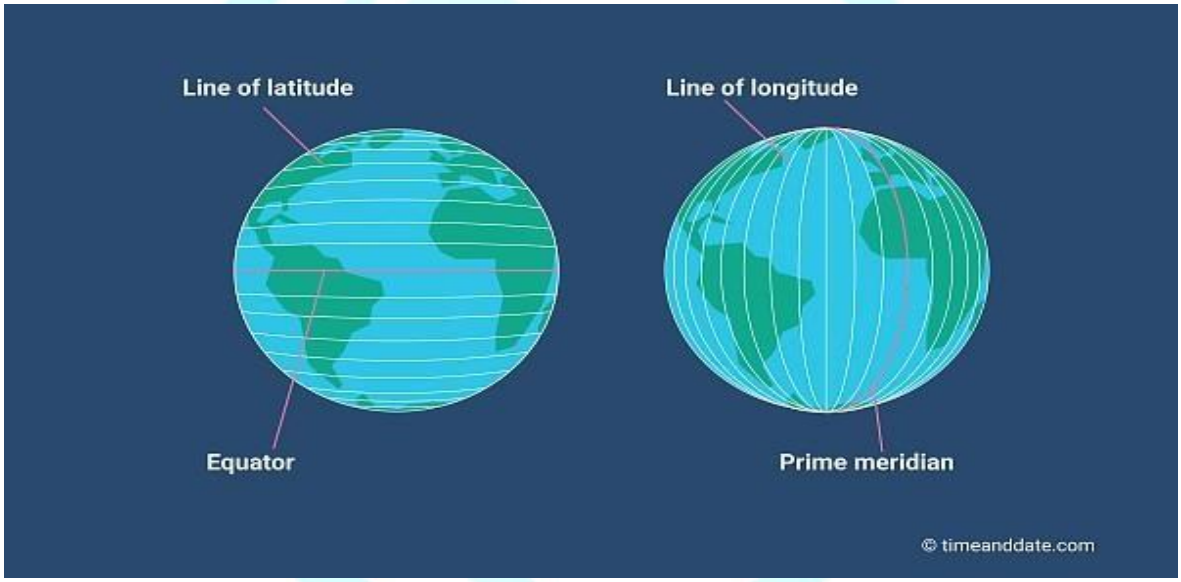
What is Daylight Savings Time (DST)?



- Daylight Savings Time (DST) is the international process of putting all clocks within temperate climates (countries that have summer and winter) ahead an hour during summer time, to take advantage of the fact that days last much longer.
- When this is done, people wake up earlier, and thus can use more of the daylight to their advantage – whether that may be for leisure purposes or work purposes.
- **DST is used in most of Europe, the United States, Mexico and much of Canada, as well as countries in South America, portions of Australia and New Zealand.**
- However, while the benefits of DST are there, it also has a few drawbacks – including "clock confusion", and disruption in the sleeping cycle, where people would simply wake up late for work.
- These drawbacks and others has had other countries that fall in the geographical areas where Daylight Savings Time is applicable opt out, like all of East Asia, northern portions of Australia, much of South America, and countries in North and South Africa.
- **DST is beneficial in a lot of temperate climates, the more extreme north and extreme south (countries like Finland, Norway, Greenland, and portions of Russia, or portions of Chile, Argentina and the entirety of Antarctica) actually experience quite extreme time changes as well.**
- The further away from the equator you are, the more does sunrise and sunset fluctuate.
- Because of that, DST isn't quite as useful up (and down) there. Same goes for tropical countries, and other places near the equator, since sunrise and sunset barely fluctuates the closer you are to the equator.
- Some of the countries that used to be on DST have decided to simply change their time zones (which is why you'll see portions of Russia, China, and Canada in time zones that… they really shouldn't be in, normally) to replicate the effects of DST without having to turn clocks forward and back twice a year.

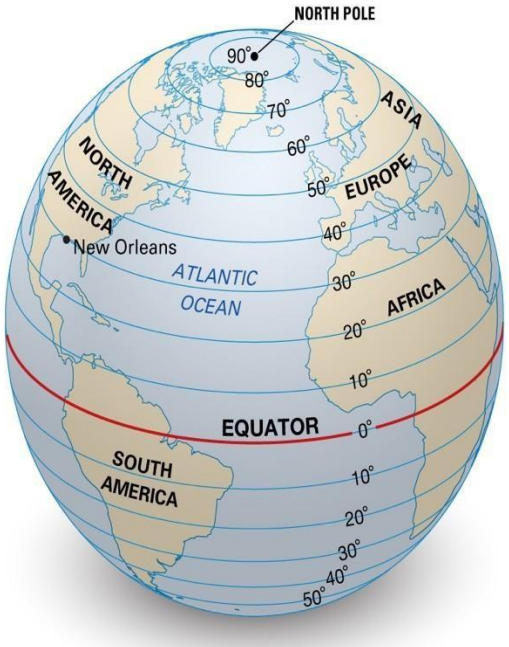
1.2 LATITUDE AND LONGITUDE:

- The latitudes and longitudes are commonly referred to as geographical coordinates as they provide systematic network of lines upon which the position of various surface features of the earth, can be represented.
- With the help of these coordinates, location, distance and direction of various points can be easily determined.
- Although an infinite number of parallels and meridians may be drawn on a globe, only a selected number of them are usually drawn on a map.
- Latitudes and longitudes are measured in degrees (°) because they represent angular distances. Each degree is further divided into 60 minutes (‘) and each minute into 60 seconds (“).



PARALLELS OF LATITUDES

- The latitude of a place on the earth’s surface is its distance north or south of the equator, measured along the meridian of that place as an angle from the centre of the earth.
- Lines joining places with the same latitudes are called parallels. The value of equator is 0° and the latitude of the poles are 90°N and 90°S.
- If parallels of latitude are drawn at an interval of one degree, there will be 89 parallels in the northern and the southern hemispheres each.
- The total number of parallels thus drawn, including the equator, will be 179. Depending upon the location of a feature or a place north or south of the equator, the letter N or S is written along with the value of the latitude.
- If the earth were a perfect sphere, the length of 10 of latitude (a one degree arc of a meridian) would be a constant value, i.e. 111 km everywhere on the earth.
- This length is almost the same as that of a degree of longitude at the equator. But to be precise, a degree of latitude changes slightly in length from the equator to the poles.
- While at the equator, it is 110.6 km at the poles, it is 111.7 km.
- Latitude of a place may be determined with the help of the altitude of the sun or the Pole Star.



FACTS ABOUT LINES OF LATITUDE

- Are known as parallels.
- Run in an east-west direction.
- Measure distance north or south from the Equator.
- Are parallel to one another and never meet.
- Cross the prime meridian at right angles.
- Lie in planes that cross the Earth's axis at right angles.
- Get shorter toward the poles, with only the Equator, the longest, a great circle.

Latitudinal Heat zones of the earth:

- The mid-day sun is exactly overhead at least once a year on all latitudes in between the Tropic of Cancer and the Tropic of Capricorn.
- This area, therefore, receives the maximum heat and is called the torrid zone.
- The mid-day sun never shines overhead on any latitude beyond the Tropic of Cancer and the Tropic of Capricorn.
- The angle of the sun's rays goes on decreasing towards the poles.
- As such, the areas bounded by the Tropic of Cancer and the Arctic circle in the northern hemisphere, and the Tropic of Capricorn and the Antarctic circle in the southern hemisphere, have moderate temperatures.
- These are, therefore, called temperate zones.
- Areas lying between the Arctic circle and the north pole in the northern hemisphere and the Antarctic circle and the south pole in the southern hemisphere, are very cold.
- It is because here the sun does not raise much above the horizon.
- Therefore, its rays are always slanting.
- These are, therefore, called frigid zones.

MERIDIANS OF LONGITUDE:

- Unlike the parallels of latitude which are circles, the meridians of longitude are semi-circles that converge at the poles.
- If opposite meridians are taken together, they complete a circle, but, they are valued separately as two meridians.
- The meridians intersect the equator at right angles.
- Unlike the parallels of latitude, they are all equal in length.
- For convenience of numbering, the meridian of longitude passing through the Greenwich observatory (near London) has been adopted as the Prime Meridian by an international agreement and has been given the value of 0°.
- The longitude of a place is its angular distance east or west of the Prime Meridian. It is also measured in degrees.
- The longitudes vary from 0° to 180°eastward and westward of the Prime Meridian.
- The part of the earth east of the Prime Meridian is called the eastern hemisphere and in its west referred to as the western hemisphere.