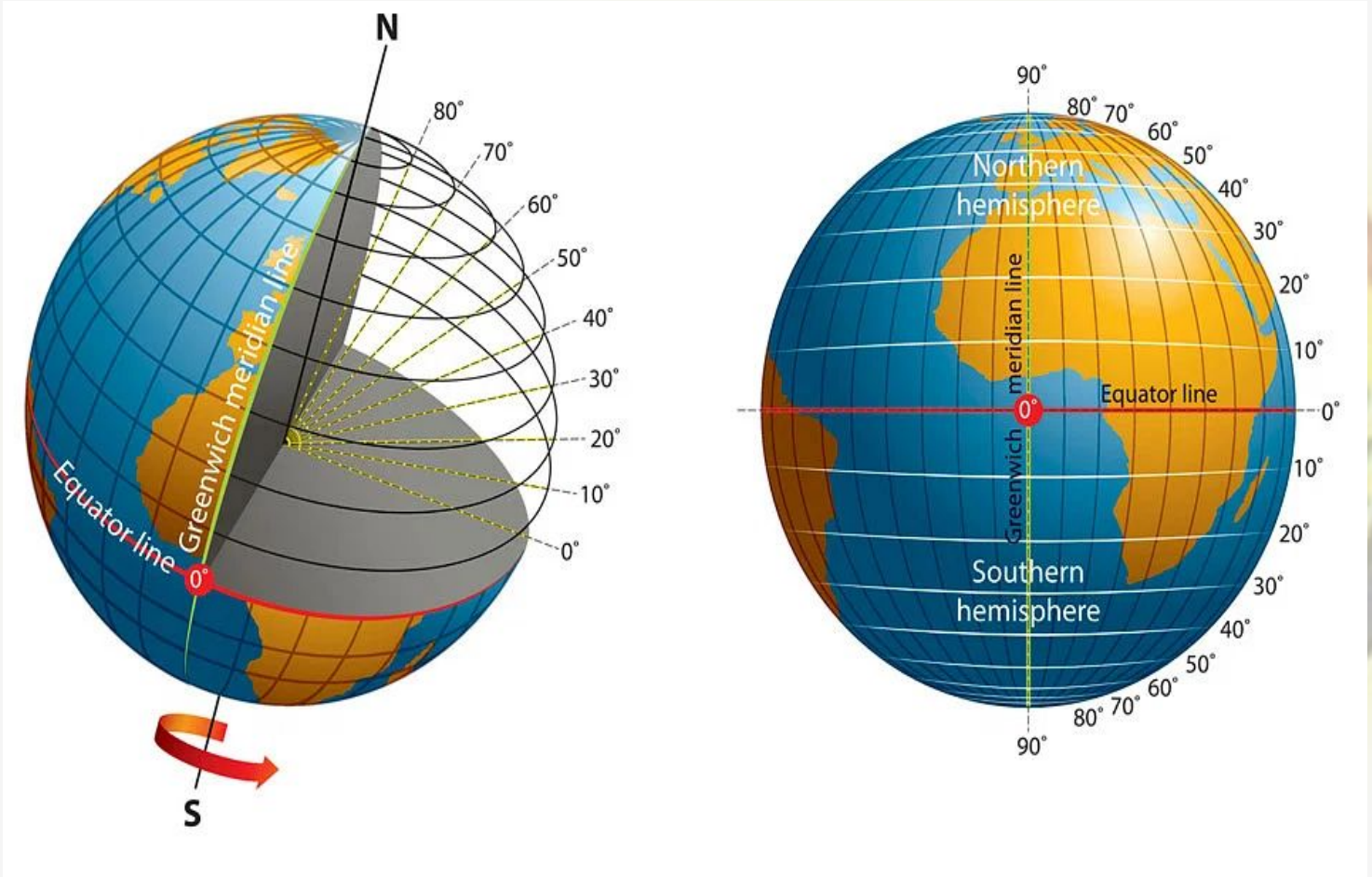
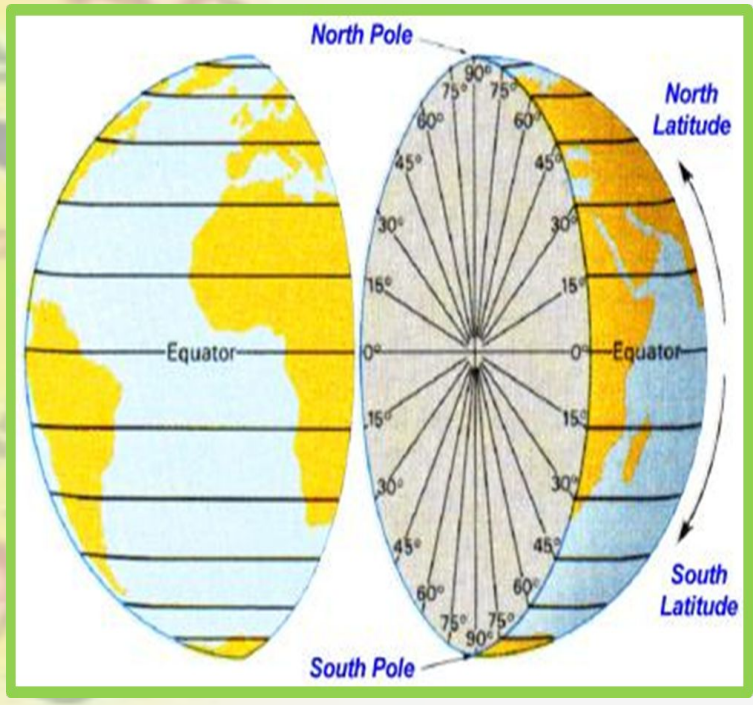
# Fundamentals of Geography

1. Latitudes
2. Longitudes
3. Time-zones
4. Seasons on Earth



# Latitudes

- Latitude is the measure of how far north or south a point is from the Earth's center, expressed in degrees.
- Due to the Earth's slight flattening at the poles, the distance covered by one degree of latitude varies.
- At the equator (0° latitude), one degree of latitude equals approximately 68.704 miles.
- At 45° latitude, one degree of latitude equals around 69.054 miles.
- At the poles, one degree of latitude covers about 69.407 miles.
- On average, one degree of latitude is considered to be approximately 69 miles (111 kilometers).
- Converting miles to kilometers, 1 mile equals 1.607 kilometers.

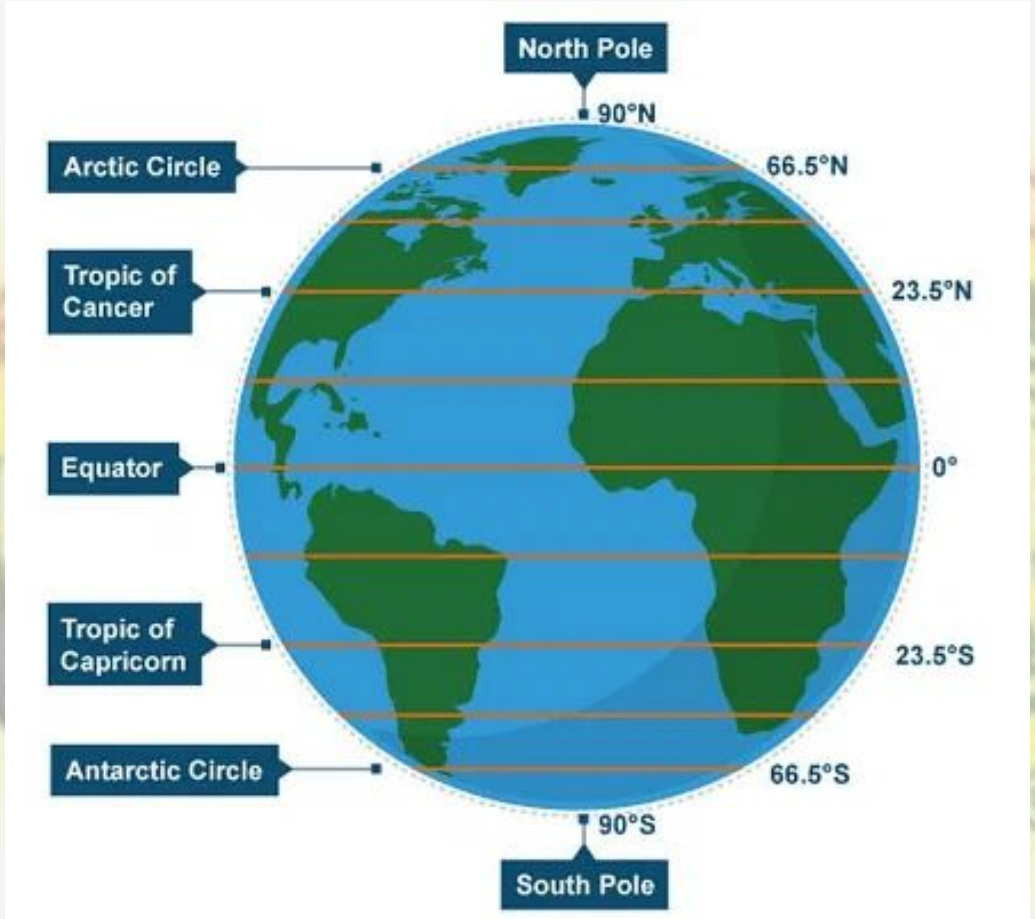


# Important parallels of latitudes



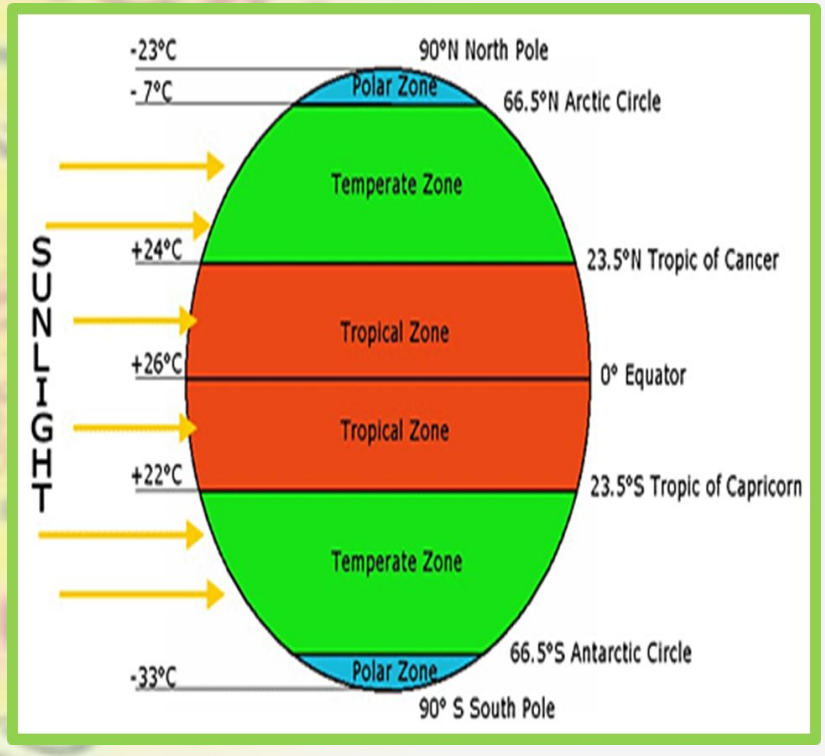
There are some important lines of latitude other than the equator, which is at 0°.
The North Pole is at 90°N, and the South Pole is at 90°S.
Four significant lines are:

- Tropic of Cancer at $23\frac{1}{2}°$ north of the equator, in the northern hemisphere.
- Tropic of Capricorn at $23\frac{1}{2}°$ south of the equator, in the southern hemisphere.
- Arctic Circle at $66\frac{1}{2}°$ north of the equator.
- Antarctic Circle at $66\frac{1}{2}°$ south of the equator.



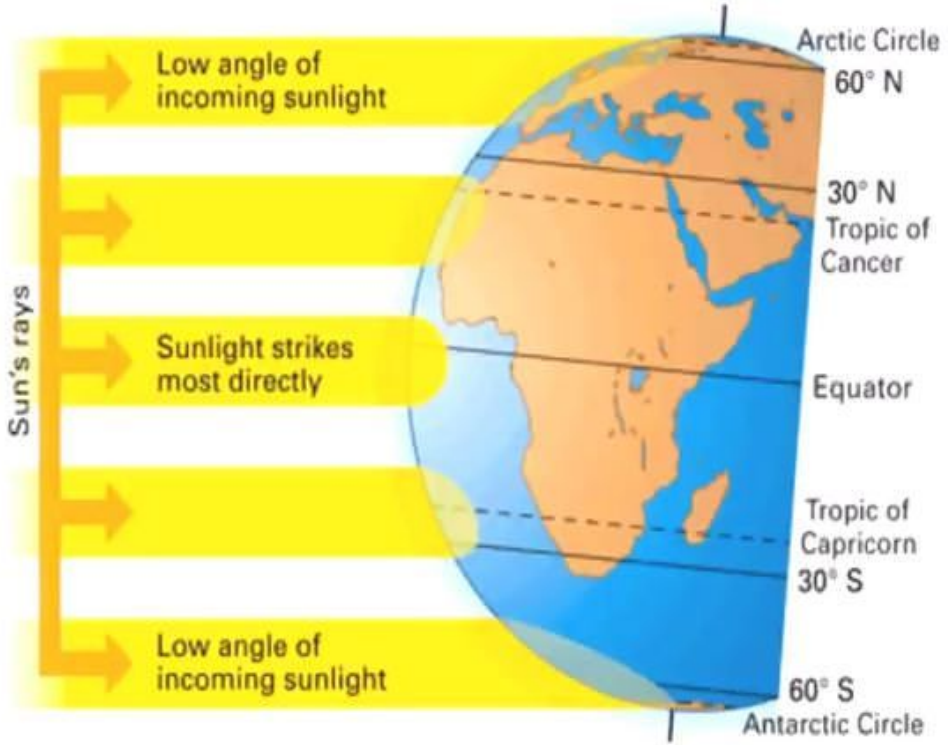
# Latitudes

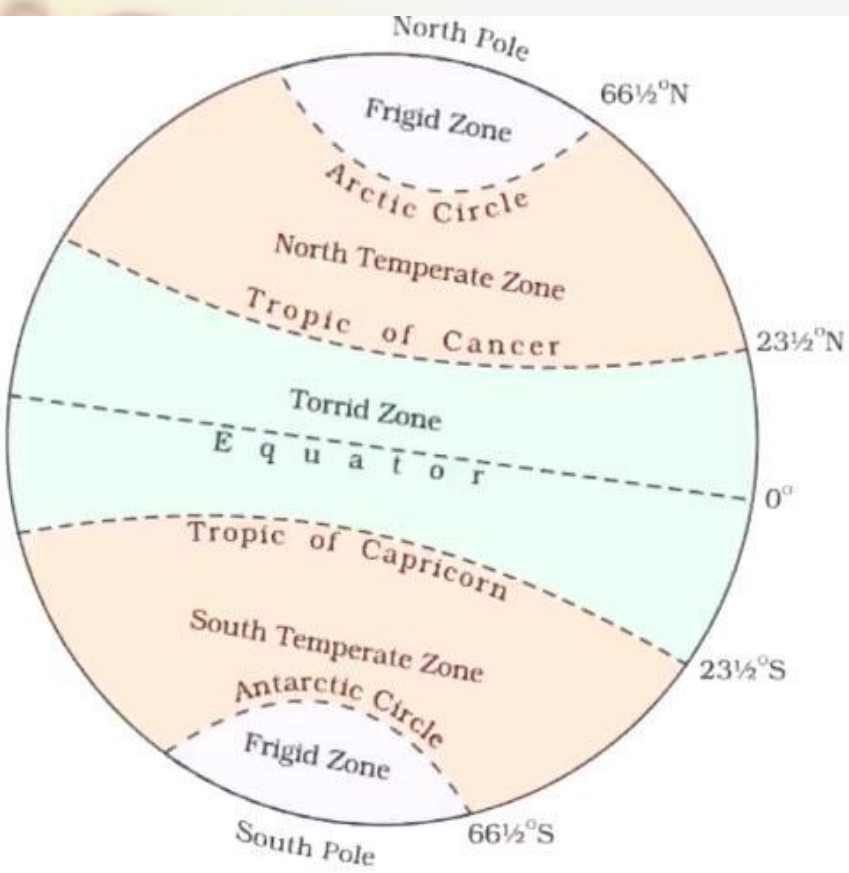
- Largest latitude – Equator
- Tropics – heat surplus
- Temperate, polar regions – heat deficit
- Responsible for pressure system and planetary wind system



# Latitudinal Heat zones of the earth





# Latitudinal Heat zones of the earth (Description)

1. The region between the Tropic of Cancer and the Tropic of Capricorn gets the most heat from the sun. This area is known as the torrid zone because the sun is directly overhead at least once a year.

2. Beyond the Tropic of Cancer and Tropic of Capricorn, the sun never shines directly overhead. As we move away from these zones toward the poles, the sun's rays become slanted. This creates moderate temperatures in areas between the Tropic of Cancer and the Arctic Circle in the north, and between the Tropic of Capricorn and the Antarctic Circle in the south. These places are called temperate zones.

3. The areas close to the poles, between the Arctic Circle and the North Pole in the north, and between the Antarctic Circle and the South Pole in the south, are very cold. Here, the sun stays low in the sky, and its rays are always slanting. These regions are called frigid zones because they remain cold throughout the year.

## Let's try this

Q. Who among the following was first to state that Earth was spherical?

A. Aristotle

B. Copernicus

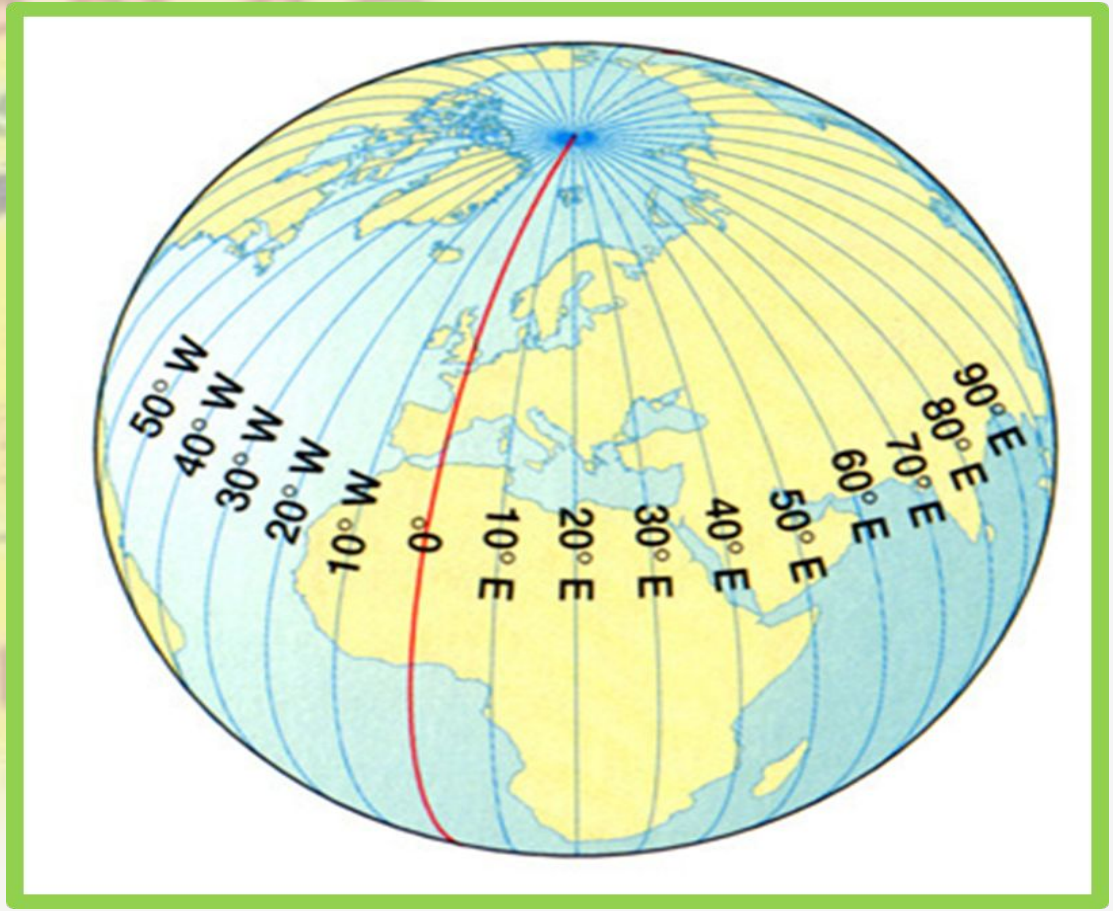
C. Ptolemy

D. Strabo

# Longitude

- Longitude is a measure of distance, in degrees, east or west of the Prime Meridian.
- On a globe, longitude lines are shown as semi-circles that go from the North Pole to the South Pole, passing through the equator.
- The Prime Meridian, at 0° longitude, runs through the Royal Astronomical Observatory at Greenwich, near London.
- All other meridians, or lines of longitude, spread out from the Prime Meridian, going both east and west, up to 180°.
- Meridians get closer together near the poles, just like lines of latitude get shorter.
- One important job of longitude lines is to help figure out local time compared to Greenwich Mean Time (GMT), also known as World Time.
- The International Date Line is directly opposite to the Prime Meridian, at a longitude of 180°.

- Angular distance of a place from prime meridian
- Also called meridians
- 0 degree = Greenwich in UK
- 180 degree = International date line



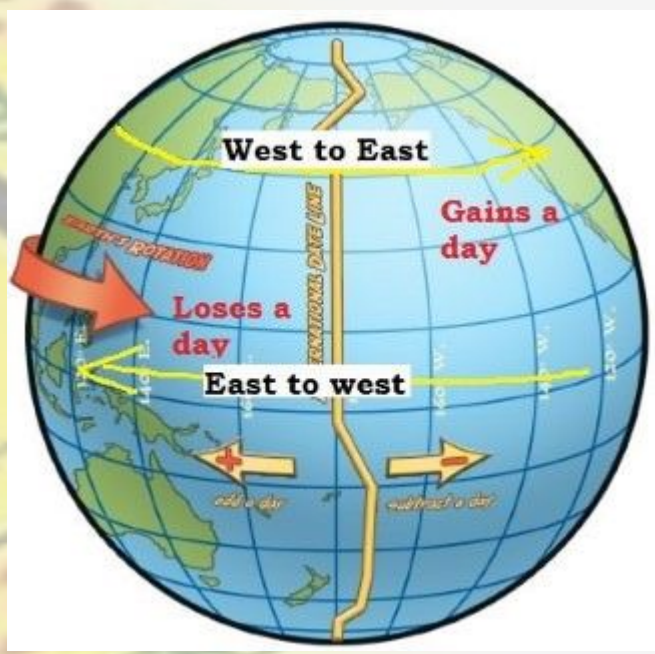
# Longitude and Time

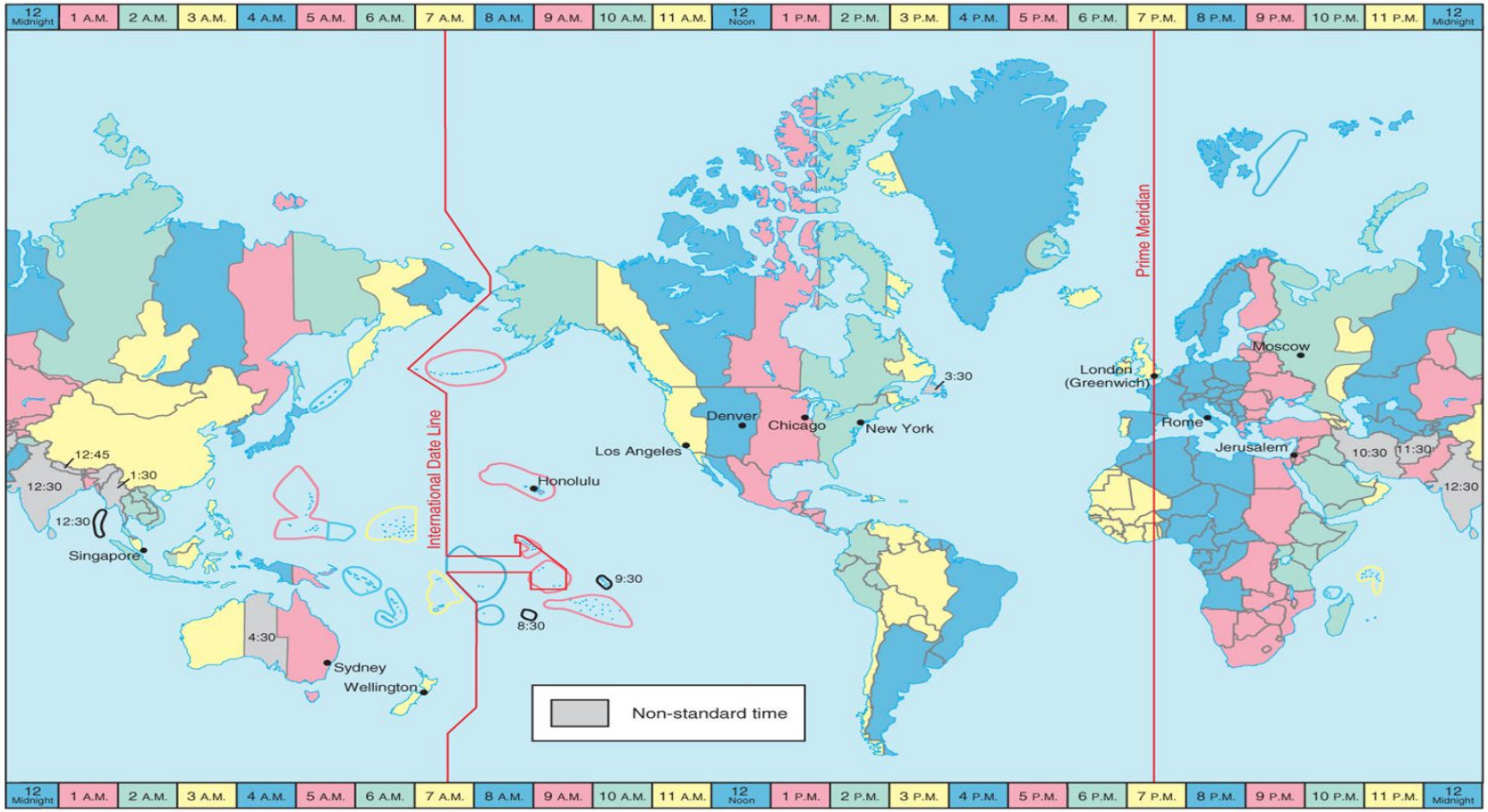
1. Earth completes a full rotation of 360° in 24 hours, so it moves through 15° of longitude every hour or 1° every 4 minutes.
2. Earth spins from west to east, so moving 15° eastward adds 1 hour to local time, while moving 15° westward subtracts 1 hour.
3. Places to the east of Greenwich see the sun earlier and gain time, while places to the west see the sun later and lose time.
4. To find local time from Greenwich Mean Time (GMT), we add or subtract the hour difference based on the given longitude.
5. The graticule is a network of latitude and longitude lines on a globe, helping to pinpoint locations.
6. Great circles are imaginary lines that divide the Earth into two equal halves and have their center at the Earth's center. The largest great circles on the globe are the Equator and all meridians.

- Earth rotates 360 °s in 24 hours
- 360/24 = 15°
- 15° longitude= 1 hour

# International Date Line

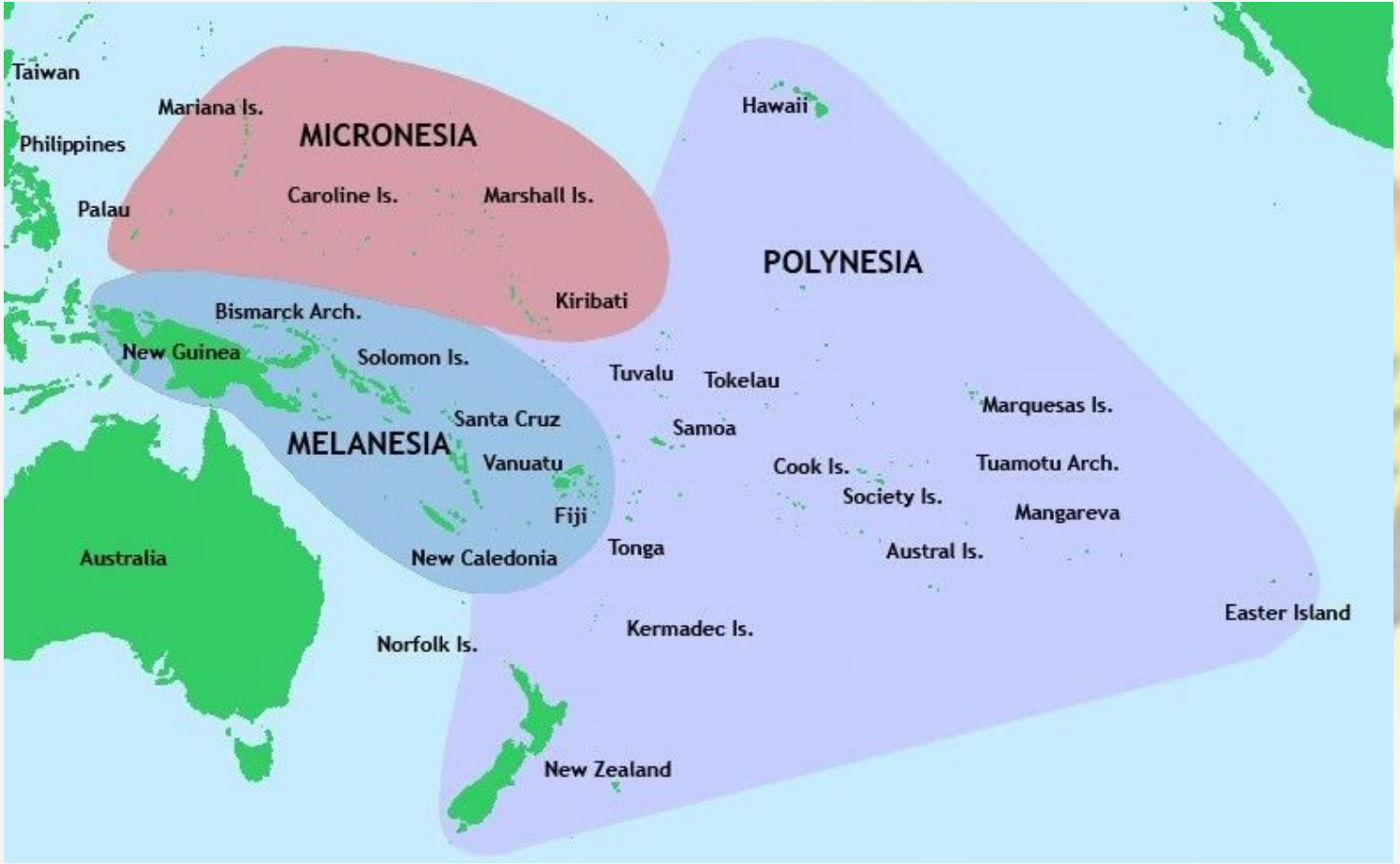
- When traveling east from Greenwich, a person gains time until they reach the 180° meridian, where they'll be 12 hours ahead of GMT.
- Traveling west from Greenwich, a person loses 12 hours when they reach the 180° meridian. So, there's a total time difference of 24 hours or one day across this meridian.
- The International Date Line is located at the 180° meridian. Crossing it changes the date by one day. Traveling east across it, a person gains a day, while traveling west across it, a person loses a day.
- In the Pacific Ocean, the International Date Line curves away from the straight 180° meridian near places like the Bering Strait, Fiji, and Tonga. This prevents confusion in islands where the meridian passes through, ensuring consistency in the day and date.





# Why is the international date line drawn in a zigzag manner?

- The International Date Line (IDL) passes through the Pacific Ocean. It is an imaginary line, like longitudes and latitudes.
- The time difference on either side of this line is 24 hours. So, the date changes as soon as one crosses this line.
- Some groups of Islands (**Polynesia, Melanesia, Micronesia**) fall on either of the dateline. So if the dateline was straight, then two regions of the same Island Country or Island group would fall under different date zones. Thus to avoid any confusion of date, this line is drawn through where the sea lies and not land. Hence, the IDL is drawn in a zig-zag manner.



**1. Statements**

1. The shape of the Earth is Geoid.
2. The region that lies between Tropic of Cancer and Tropic of Capricorn is called Torrid Zone.
3. The temperature decreases from equator to poles because of the shape of the earth.
4. North Poles is a latitude.

**Which of the above statements are true?**

a. 1 and 2 only b. 1, 3 and 4 only c. 1, 2 and 3 only d. All

**2. Which of the following statements is false?**

a. Both Longitudes and Latitudes are necessary to determine time at a location.
b. Both Longitudes and Latitudes are necessary to determine a location.
c. GMT is a reference time zone. All other time zones make use of GMT to specify time at a location.
d. Places to the east of Greenwich gain time while those to the west lose.

**3. Statements**

- A person travelling from Japan to USA across International Date Line will gain a day.
- A person travelling from Hawaii to New Zealand across International Date Line will lose a day.
- It is **not** convenient for a country of greater latitudinal extent but smaller longitudinal extent to have multiple time zones.
- On a 24 hour clock, the time is 00:00 in London. Then the time in Mumbai on a 12 hour clock will be 05:30 AM.

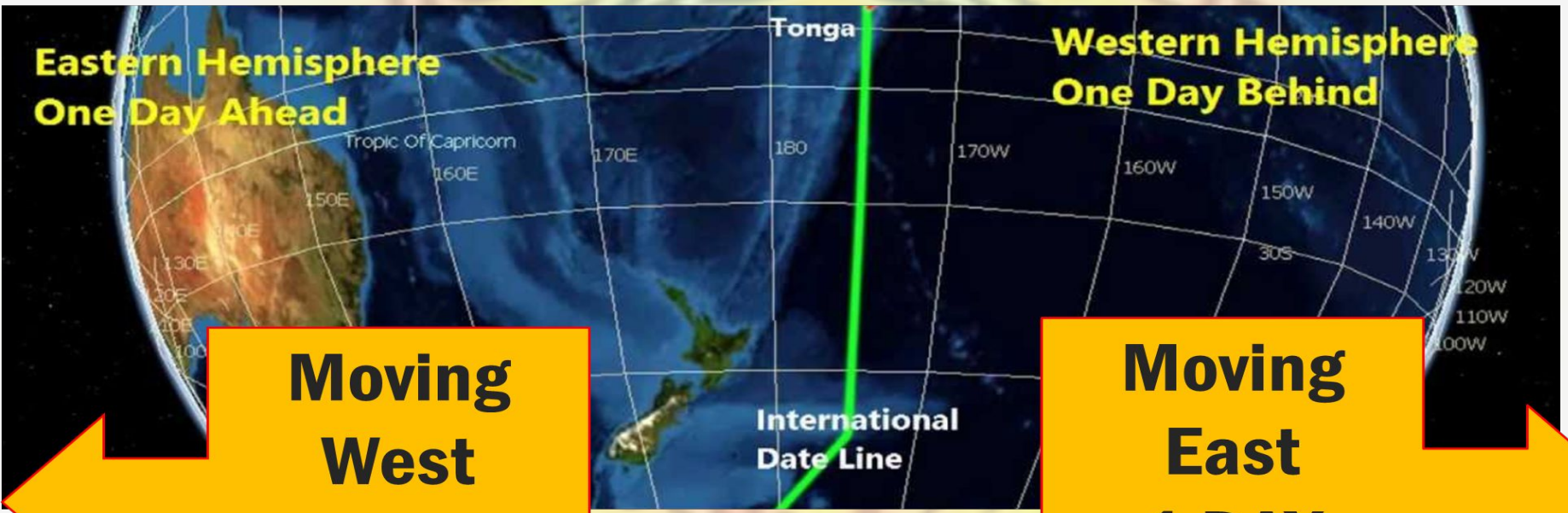
**Which of the above statements are false?**

a. None b. 2 and 4 only c. 1, 2 and 3 only d. 3 only

**31st Dec Morning Russia**

**30th Dec Morning Alaska**

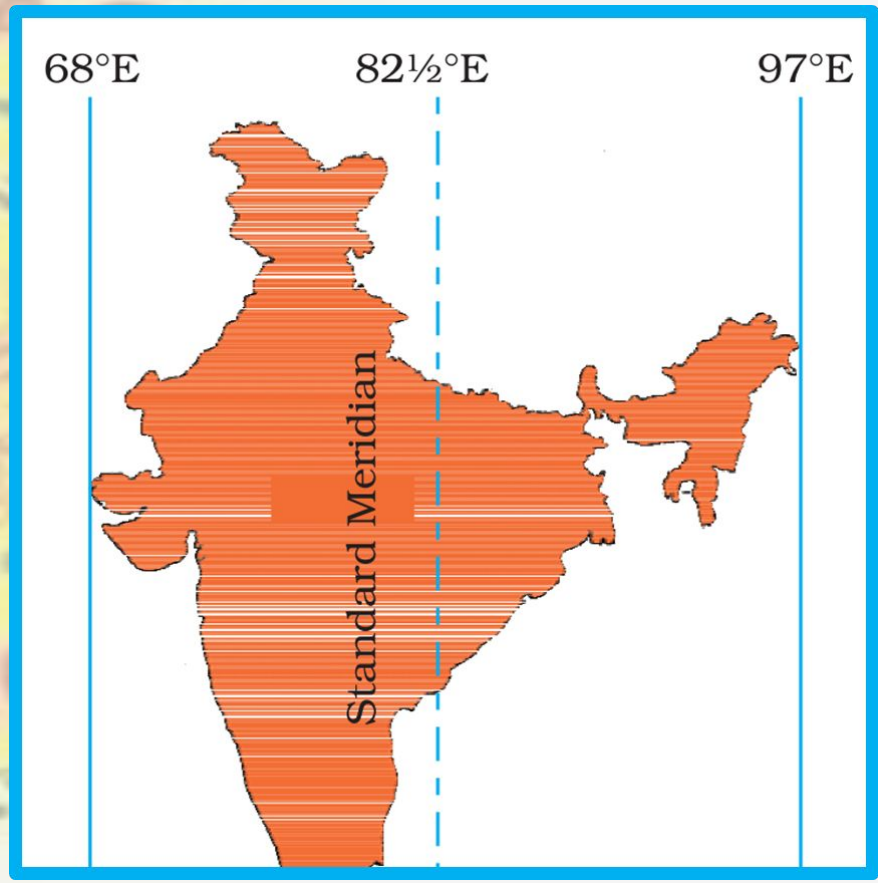
# International Date Line




**Moving West 1 DAY Lost**

**Moving East 1 DAY Gain**

1. Standard time of a country is the local time of a specific longitude passing through an important place in that country.
2. Each country chooses its own standard meridian.
3. The angular distance between a country's standard meridian and the Greenwich Meridian Time (GMT) determines its time zone.
4. For instance, India's standard time is based on the longitude passing through Allahabad, which is at 82.5° east of the Prime Meridian. This means India's time is 5.5 hours ahead of GMT.
5. A simple rule to remember: lose 12 hours to the west of the Prime Meridian and gain 12 hours to the east of it.



If 12 noon at GMT what is the time at 30 ° W?

- Difference = 30 °
- 15 ° => 1 hour
- 30 ° => 2 hours
- East (means minus) 12 - 2 = 10 am

If 12 noon at GMT what is the time at 75 ° E?

- Difference = 75 °
- 15 ° => 1 hour
- 75 ° => 5 hours
- East (means add) 12 +5 = 5 pm

## Let's try this

Q. If it is 10.00 am IST, then what would be the local time at Shillong on 92 deg E Longitude?

a)9.38 am

b)10.38 am

c)10.22 am

d)9.22 am

# Rotation of the Earth

1. The Earth rotates on its axis from west to east, in an anticlockwise direction.
2. It also rotates around the sun in an elliptical path from west to east, also in an anticlockwise direction.
3. The axis of Earth's rotation is inclined at 66.5° to the plane of its orbit.
4. The axis of Earth's rotation is tilted at 23.5° to perpendicular to the plane of its orbit.
5. The velocity of Earth's rotation decreases from the equator to the poles.
6. Objects weigh less at the equator and more at the poles.
7. This is because there's greater centrifugal force at the equator due to its higher velocity.
8. And there's higher gravitational force at the poles due to their shorter radius.
9. Earth moves in space in two main ways:
10. a. It rotates on its axis once every 24 hours, causing day and night.
11. b. It revolves around the sun in an orbit, completing it every 365.25 days, causing the seasons and the year.
12. During its revolution around the sun, Earth's axis remains tilted in the same direction, pointing to a fixed spot in the sky called Polaris or the Polestar, ensuring parallelism of the axis.
13. The Polestar is the brightest star in the sky in the northern direction, often used for navigation.

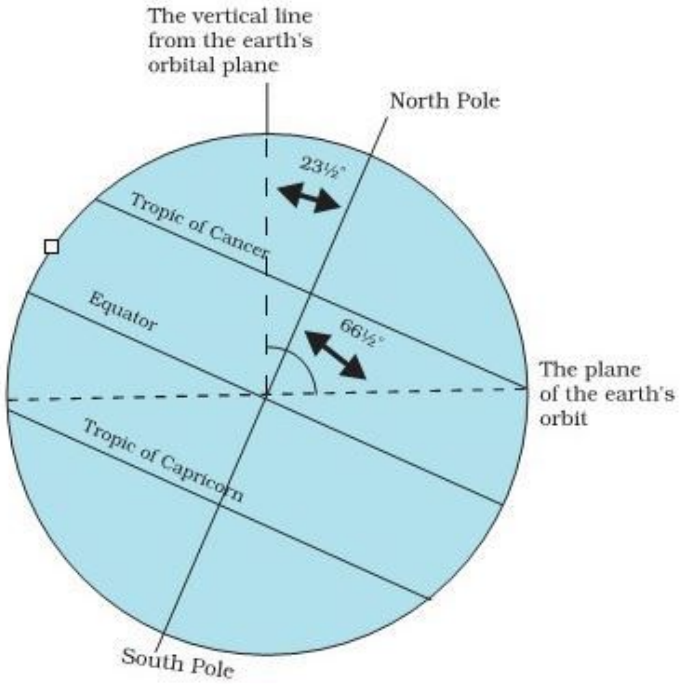



*Figure 3.1 : Inclination of the Earth's axis and the orbital plane*

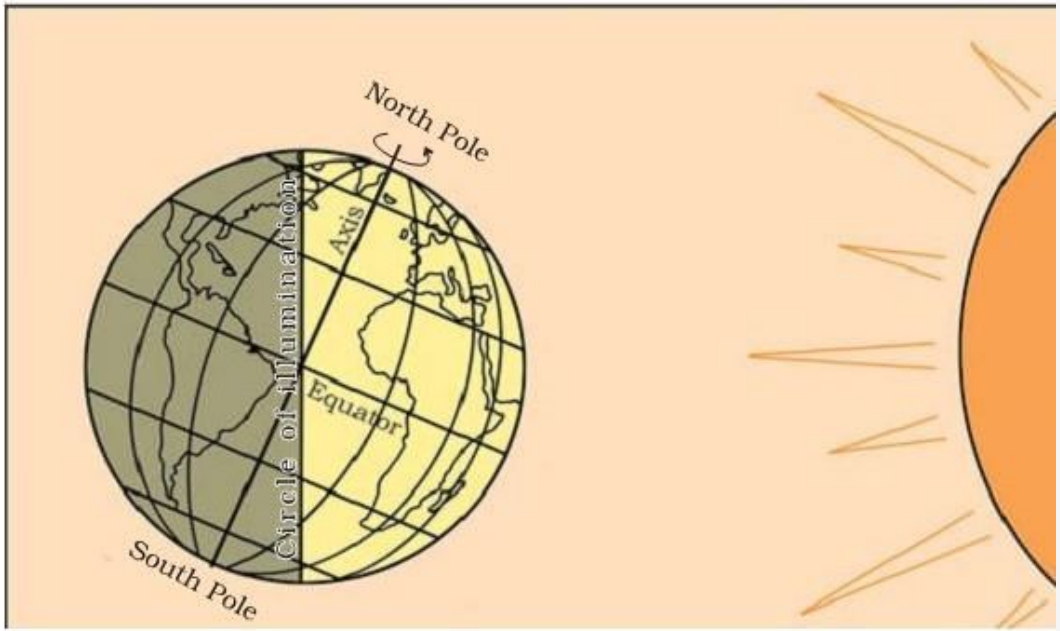
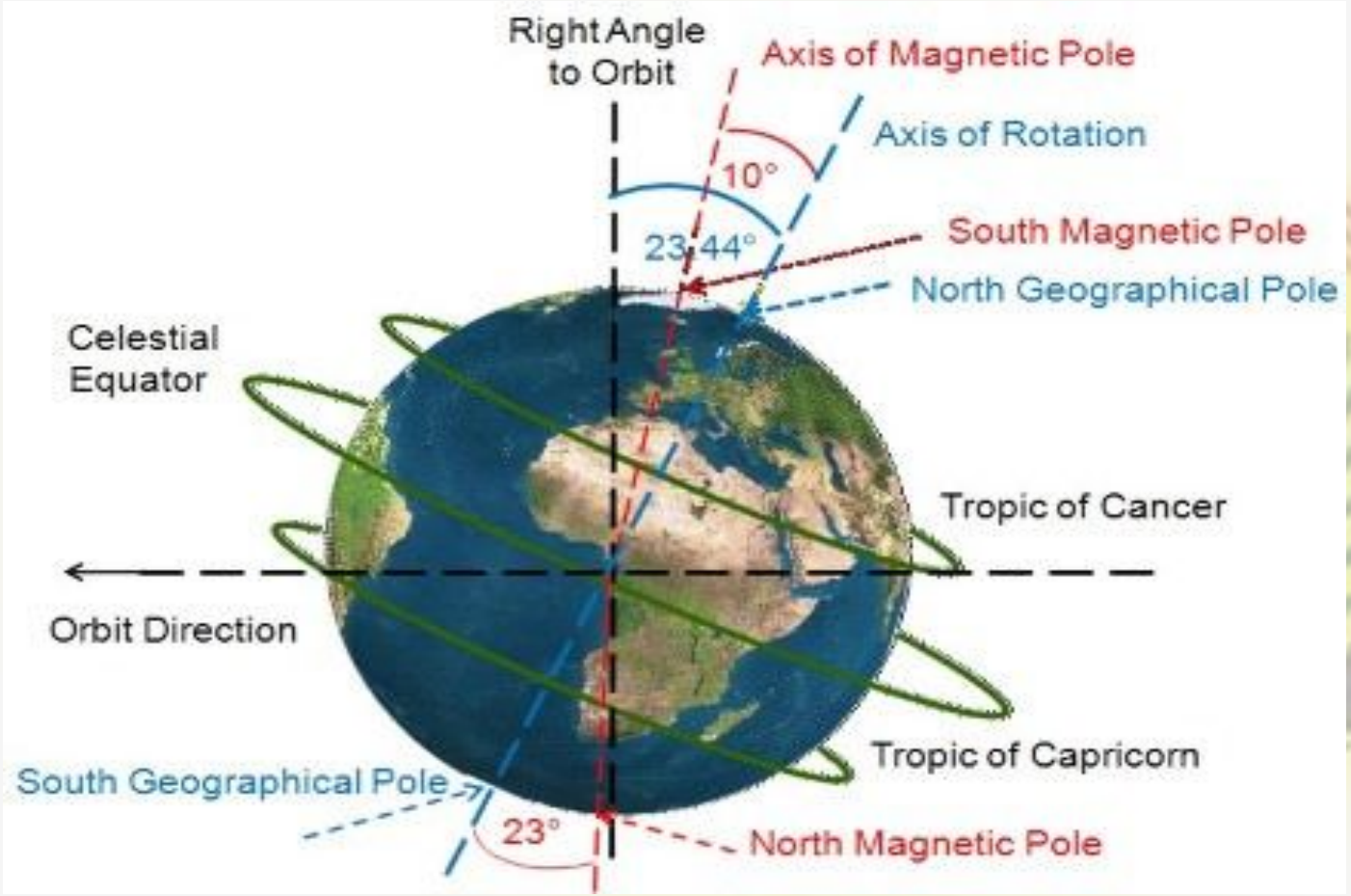
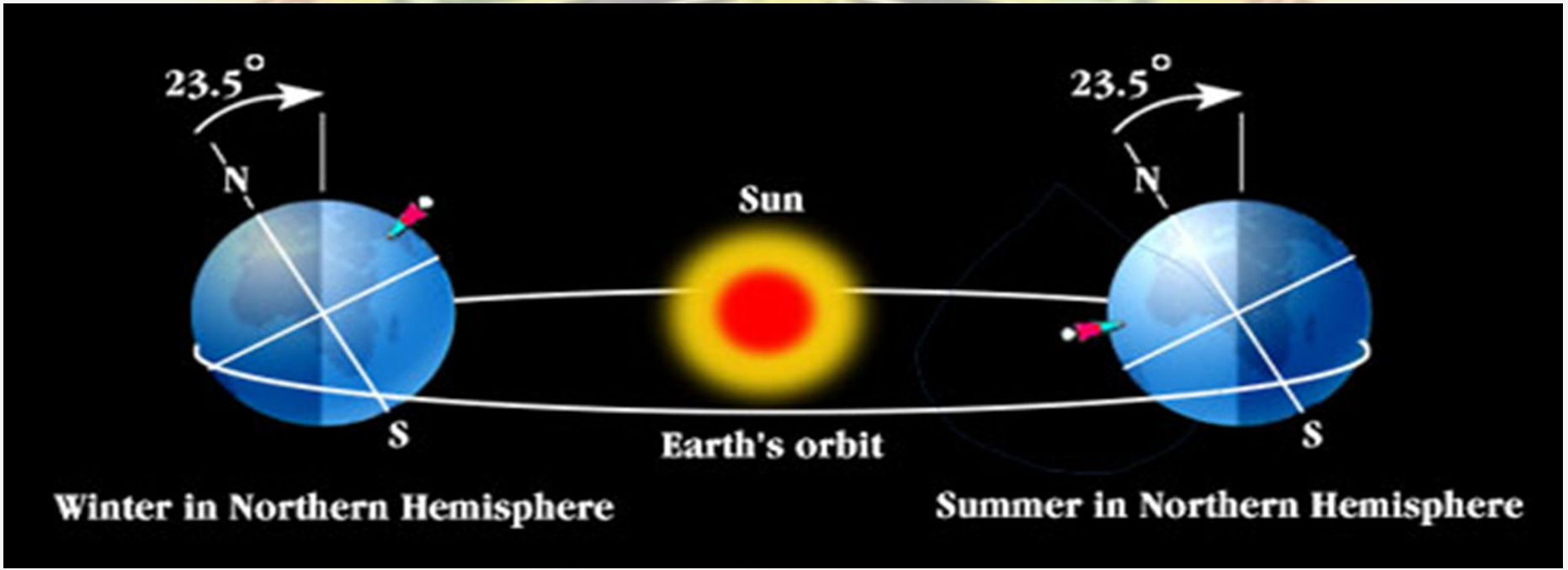



*Figure 3.2 : Day and Night on the Earth due to rotation*



# Reason for seasons: Tilted Earth



# 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.**

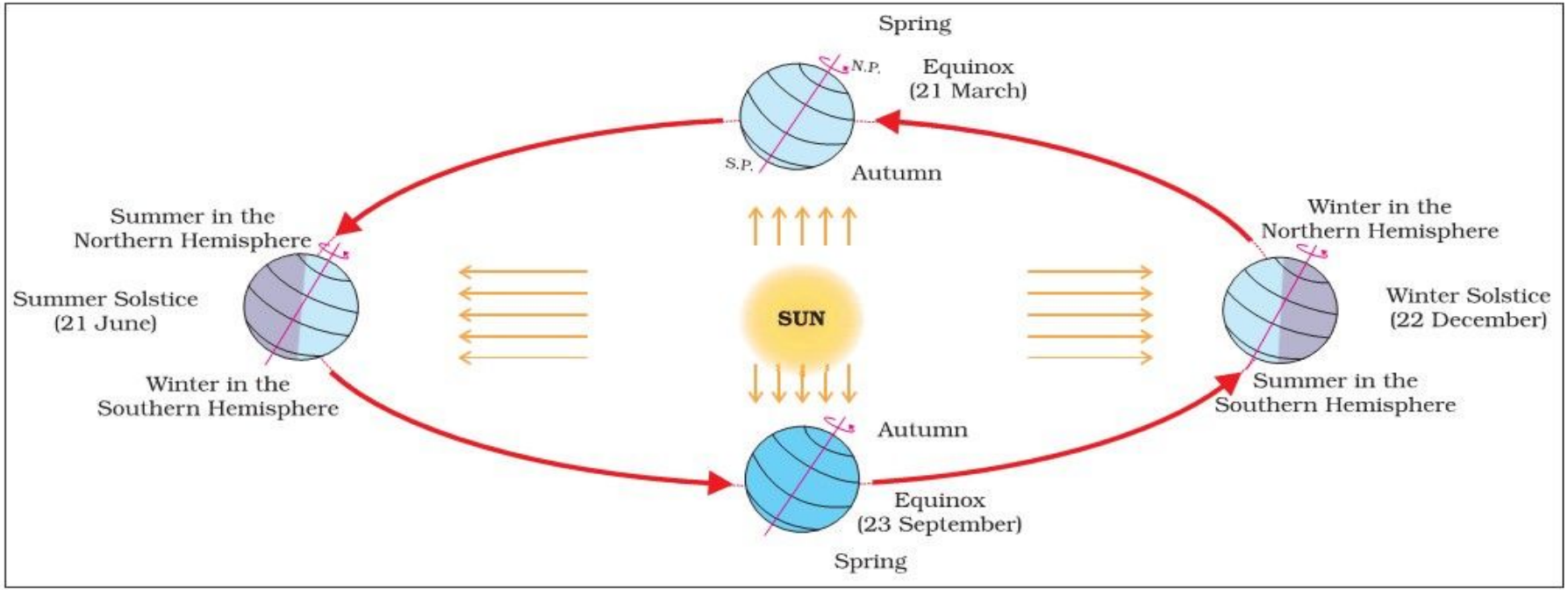



*Figure 3.3 : Revolution of the Earth and Seasons*

# Solstice

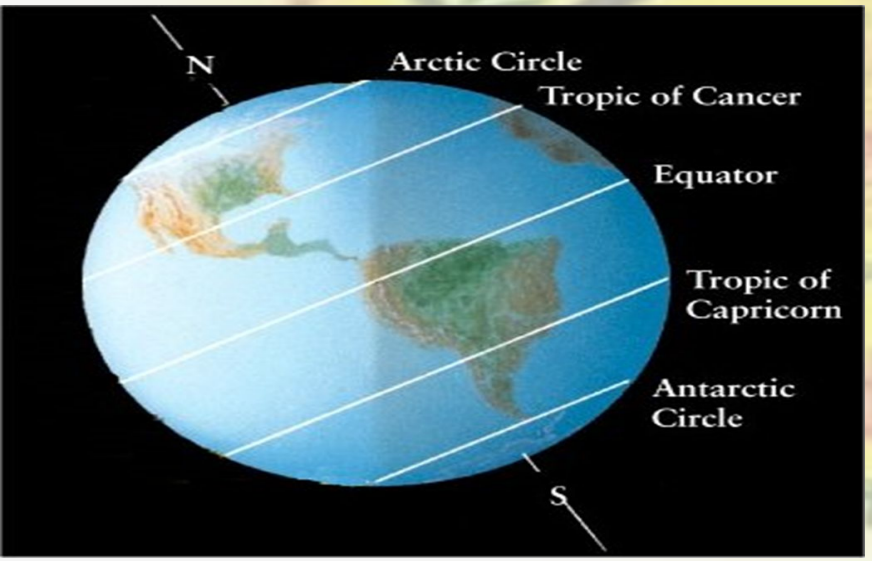
- On June 21st, the northern hemisphere leans towards the sun, causing direct sunlight to hit the Tropic of Cancer. This results in more heat for those areas.
- Places near the poles receive less heat because sunlight reaches them at a slant.
- The north pole tilts toward the sun, leading to continuous daylight beyond the Arctic Circle for about six months.
- Since much of the northern hemisphere is receiving sunlight, it's summer north of the equator. June 21st marks the longest day and shortest night there.
- Meanwhile, in the southern hemisphere, the opposite happens—it's winter. Nights are longer than days. This is known as the summer solstice.
- On December 22nd, the Tropic of Capricorn gets direct sunlight as the south pole tilts towards it. Sunlight falls vertically at the Tropic of Capricorn, so more of the southern hemisphere gets light. Thus, it's summer in the southern hemisphere with longer days and shorter nights.
- Conversely, the northern hemisphere experiences winter, with shorter days and longer nights. This marks the winter solstice.

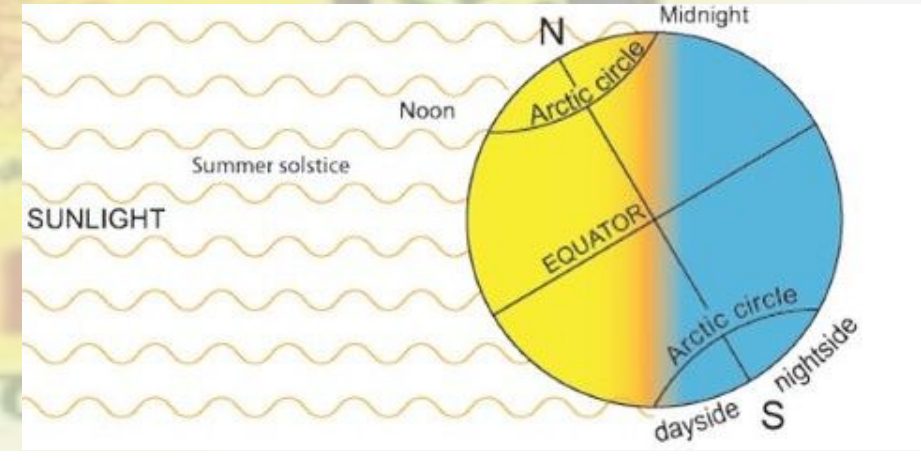
# Equinox

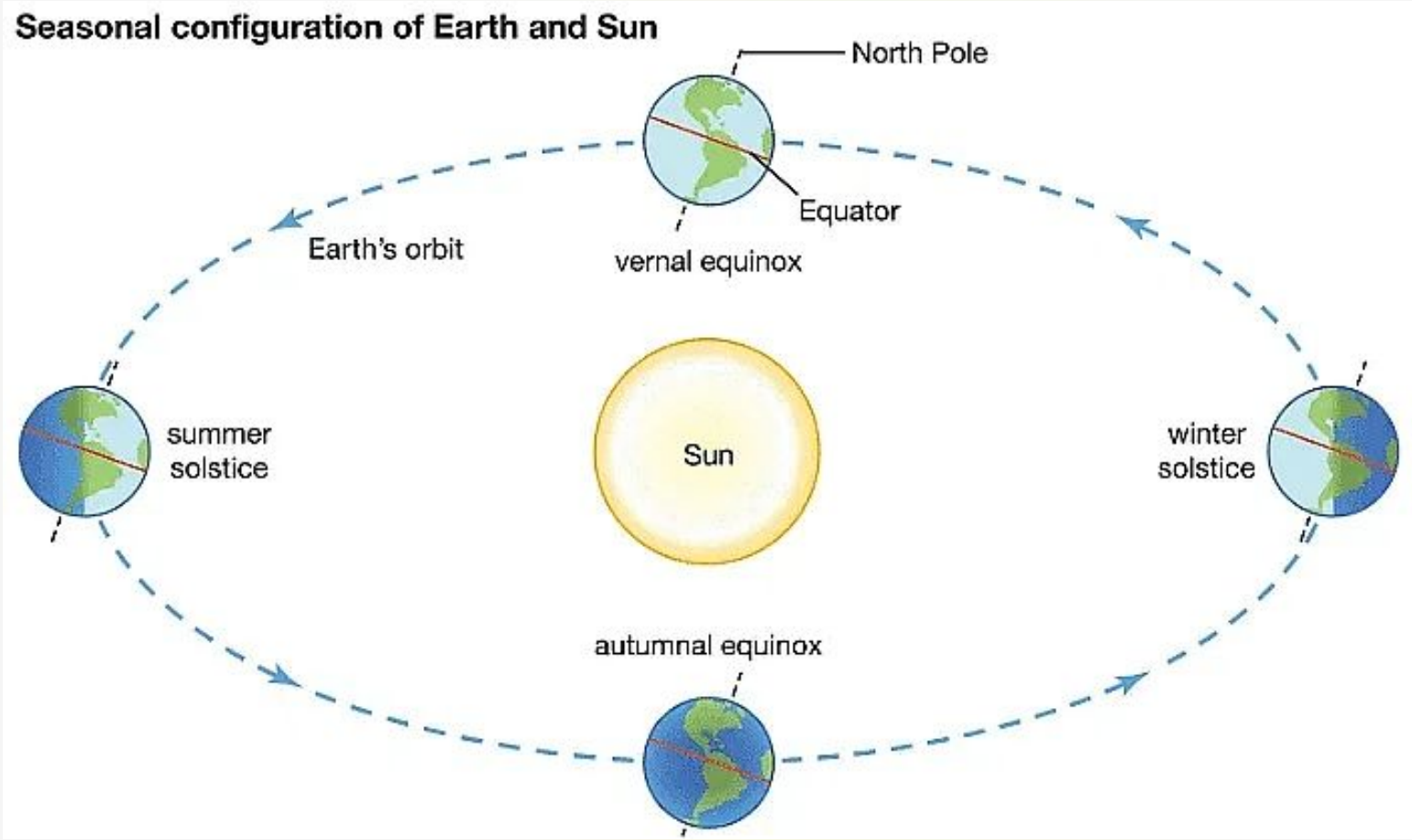
- On March 21st and September 23rd, the sun's rays directly hit the equator. Neither pole is tilted toward the sun, so the entire Earth has equal day and night. This is called an equinox.
- On September 23rd, it's autumn in the northern hemisphere and spring in the southern hemisphere. On March 21st, it's the opposite—spring in the northern hemisphere and autumn in the southern hemisphere.
- The rotation of the Earth causes days and nights, while its revolution around the sun causes seasons.
- 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.





## Let's try this



Q. Which one of the following straits is nearest to the International Date Line?

a)Malacca Strait

b)Bering strait

c)Strait of Florida

d)Strait of Gibraltar

## Let's try this

Q. Through which one of the following groups of countries does equator pass?

a)Brazil, Zambia and Malaysia

b)Columbia, Kenya and Indonesia

c)Brazil, Sudan and Malaysia

d)Venezuela, Ethiopia and Indonesia

## Let's try this

Variations in length of daytime and night-time from season to season are due to

a)Earth's rotation on its axis

b)Earth's revolution around the sun in an elliptical manner

c)Latitudinal position of the place

d)Revolution of earth on a tilted axis