



(GEOGRAPHY) LESSON -3

MOTIONS OF THE EARTH

INSTRUCTIONS



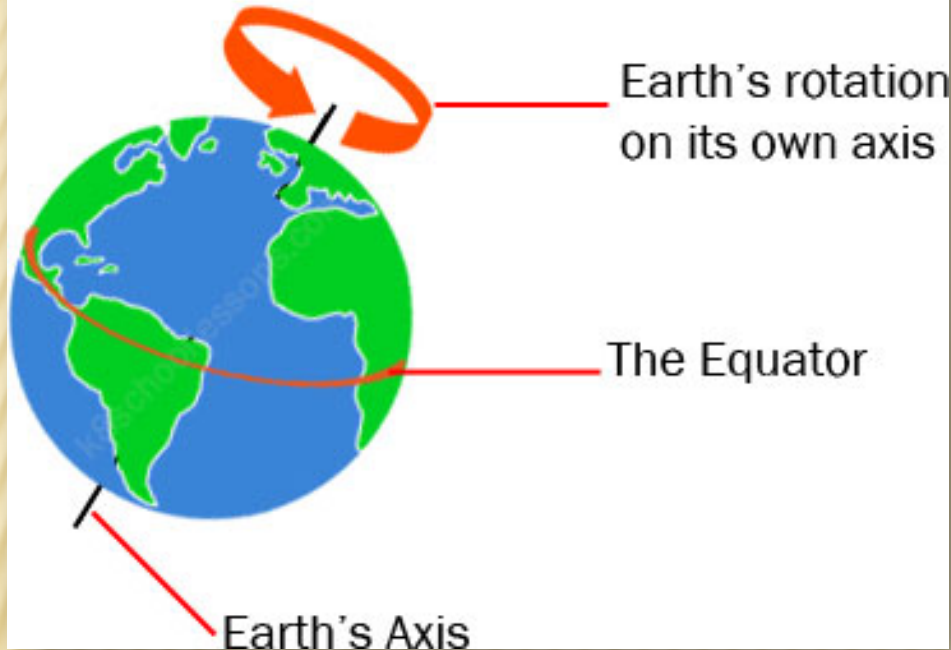
- ✗ Read the slides carefully
- ✗ Sit in a comfortable area with no clutter around
- ✗ Keep notebook, book, pencil box (with pen, pencil, eraser, etc.) close at hand
- ✗ Read and re-read till you understand
- ✗ Take a note of the Exercises
- ✗ You do not need a new notebook to take notes, solve Exercises or complete Worksheets
- ✗ Just use available resources at home
- ✗ Study with full concentration.

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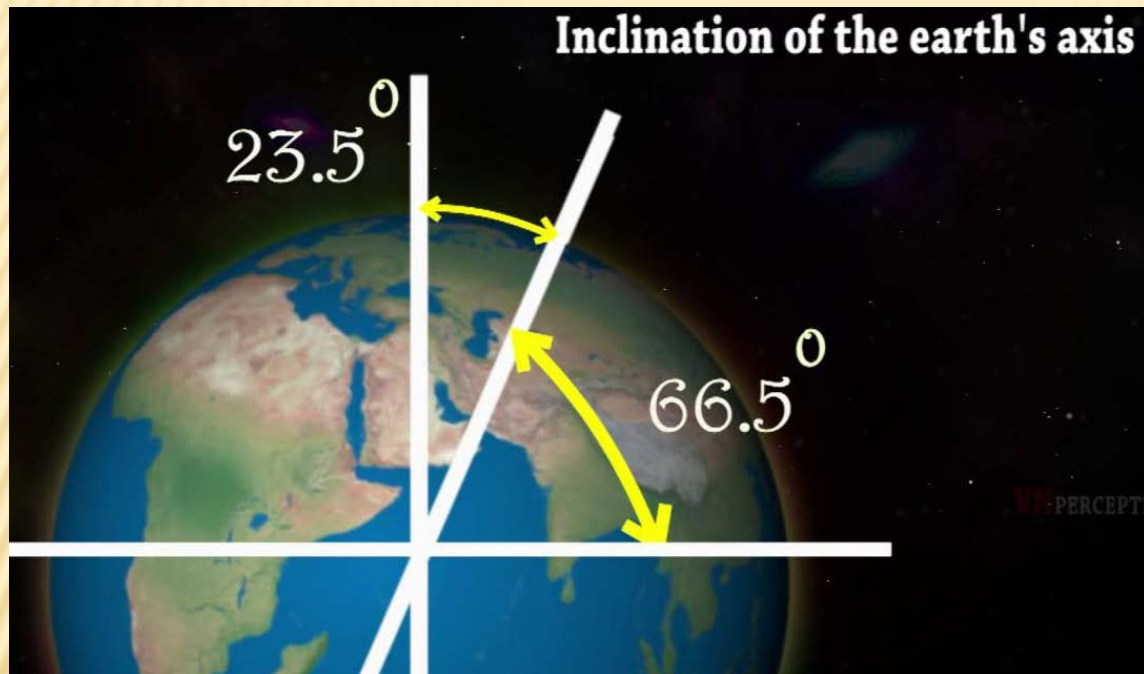
ROTATION OF THE EARTH

Earth's Rotation



- ✖ Nicolaus Copernicus, a Polish astronomer, in the 16th Century, was the first to say that the earth only appeared to be stationary. But actually, the earth not only spins (rotates) on its axis but also moves around the sun (revolves).
- ✖ **Rotation** and **Revolution** are the two important movements of the earth.

DETAILS OF ROTATION



- ✗ The axis of the earth is not vertical line which passes through its centre.
- ✗ It is inclined at an angle of $66\frac{1}{2}^\circ$ with the plane of the earth's orbit. This is known as the inclination of the earth's axis.
- ✗ The inclination is always in the same direction i.e. towards the Pole Star.
- ✗ The circumference of the earth at the equator is about 40,000 kms and earth completes 1 rotation in about 24 hours.
- ✗ Earth rotates from West to East.
- ✗ The **axis** of the earth is an **imaginary** line which passes through its centre.
- ✗ '**Earth Day**' is the period of one rotation of the earth is called one earth-day.
- ✗ 1 earth-day = 24 hours.
- ✗ Every morning, we notice that the sun rises in the east, travels across the sky during the day and finally sets in the west in the evening. This is due to the rotation of the earth.
- ✗ **Rotation** is also called the **daily motion** of the earth.

EFFECTS OF EARTH'S ROTATION

- ✗ It makes us feel that the sun, the moon and the other heavenly bodies move from East to West.
- ✗ It causes the **bulging** of the equator and **flattening** at the poles.
- ✗ It causes days and nights on earth.
- ✗ It gives us the concept of **direction** based on the sunrise and sunset.
- ✗ It causes deflection in the direction of winds and ocean currents.
- ✗ It gives us a day of 24 hours.
- ✗ It causes tides **twice** a day
- ✗ The direction of the rotation of the earth is **anticlockwise** at the North Pole and at the equator.

THE CIRCLE OF ILLUMINATION

- ✗ Due to the **spherical** shape of the earth, only one- half of it gets light from the sun at a time and the other half remains in darkness.
- ✗ The '**Circle of Illumination**' is an imaginary line which separates the lit part of the earth from the dark one.
- ✗ The **speed of rotation** of the earth is **fastest** at the equator (about 1,675 km per hour) and **decreases** towards the **poles**, where it is 0.
- ✗ At '**dawn**' (the first light of day before actual sunrise) and at '**dusk**' or **twilight** (the time of day immediately following sunset), **diffused** or **partial** sunlight is experienced.

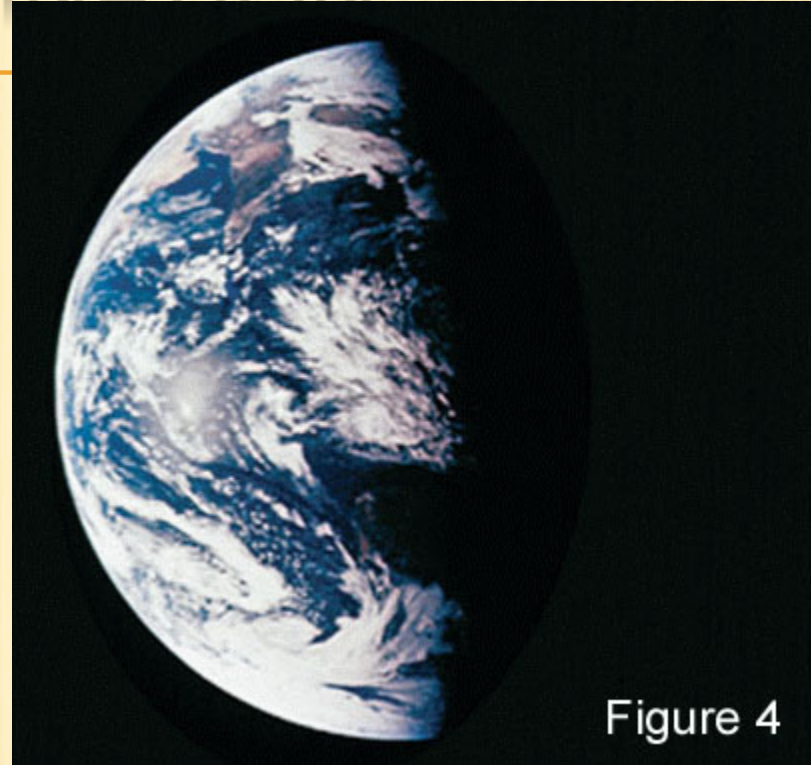
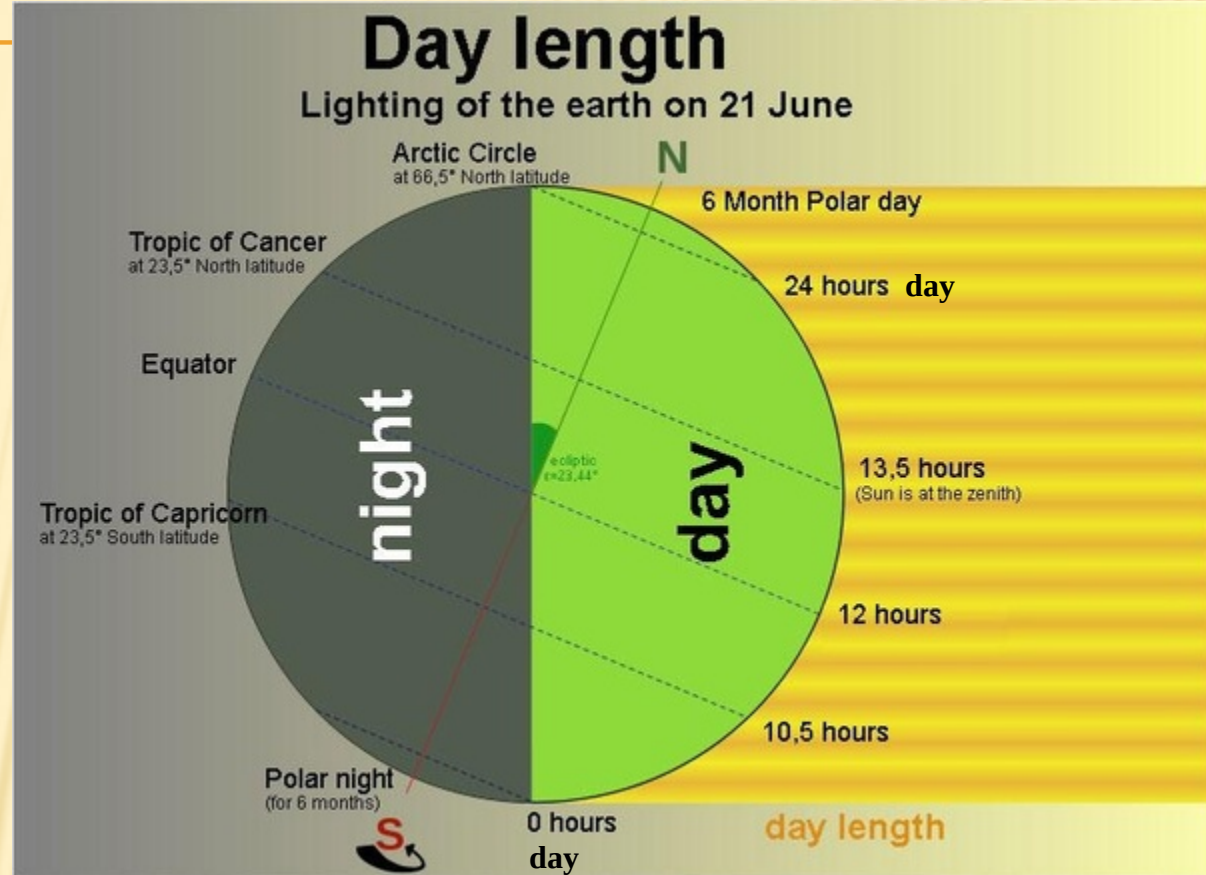


Figure 4

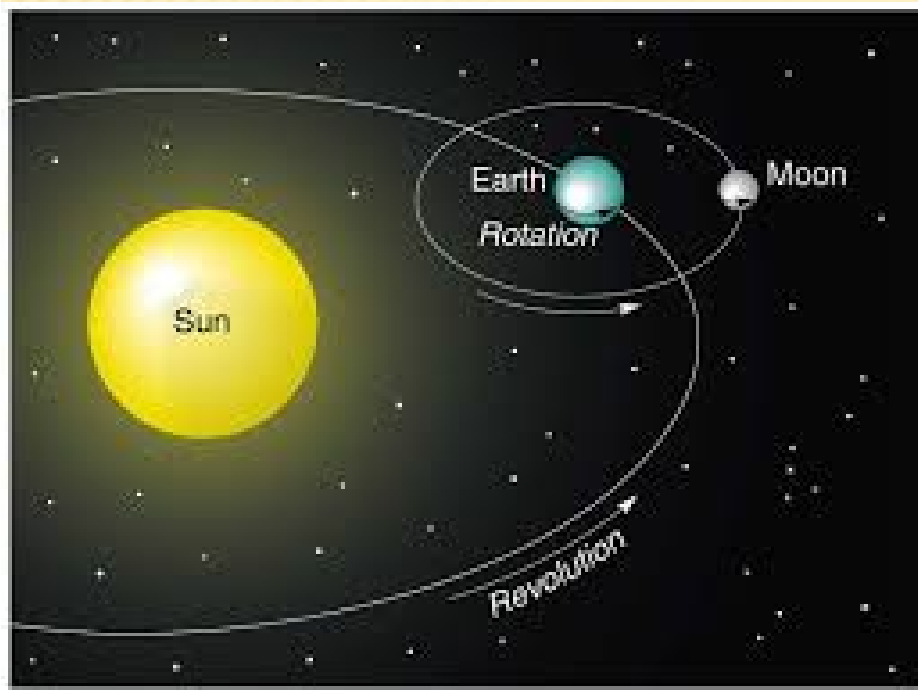
LENGTH OF DAY AND NIGHT

- ✗ The axis of earth's rotation is tilted at 23.5 degrees. Due to this the poles experience **6** months of **day** and **6** months of **night**.
- ✗ In the figure, the **North** Pole is inclined **towards** the sun and the **South** Pole is turned **away** from the sun. Thus, a **larger** part of the **Northern** Hemisphere receives sunlight. This results in **longer** days and shorter nights.
- ✗ The process is reversed during this time in Southern Hemisphere.



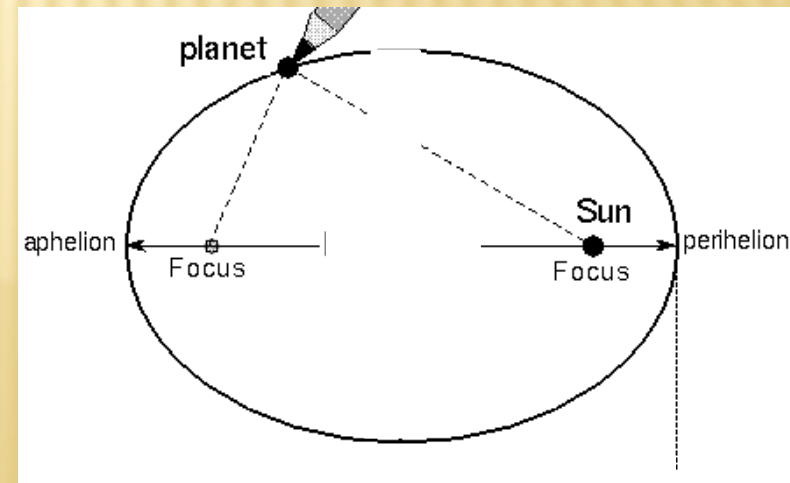
- ✗ Throughout the year the length of days and nights is **equal** at the equator i.e. **12 hours each**.
- ✗ **If the earth's axis was vertical then the length of days and nights would be equal i.e. 12 hours each throughout the year at all places on the earth.**

REVOLUTION OF THE EARTH

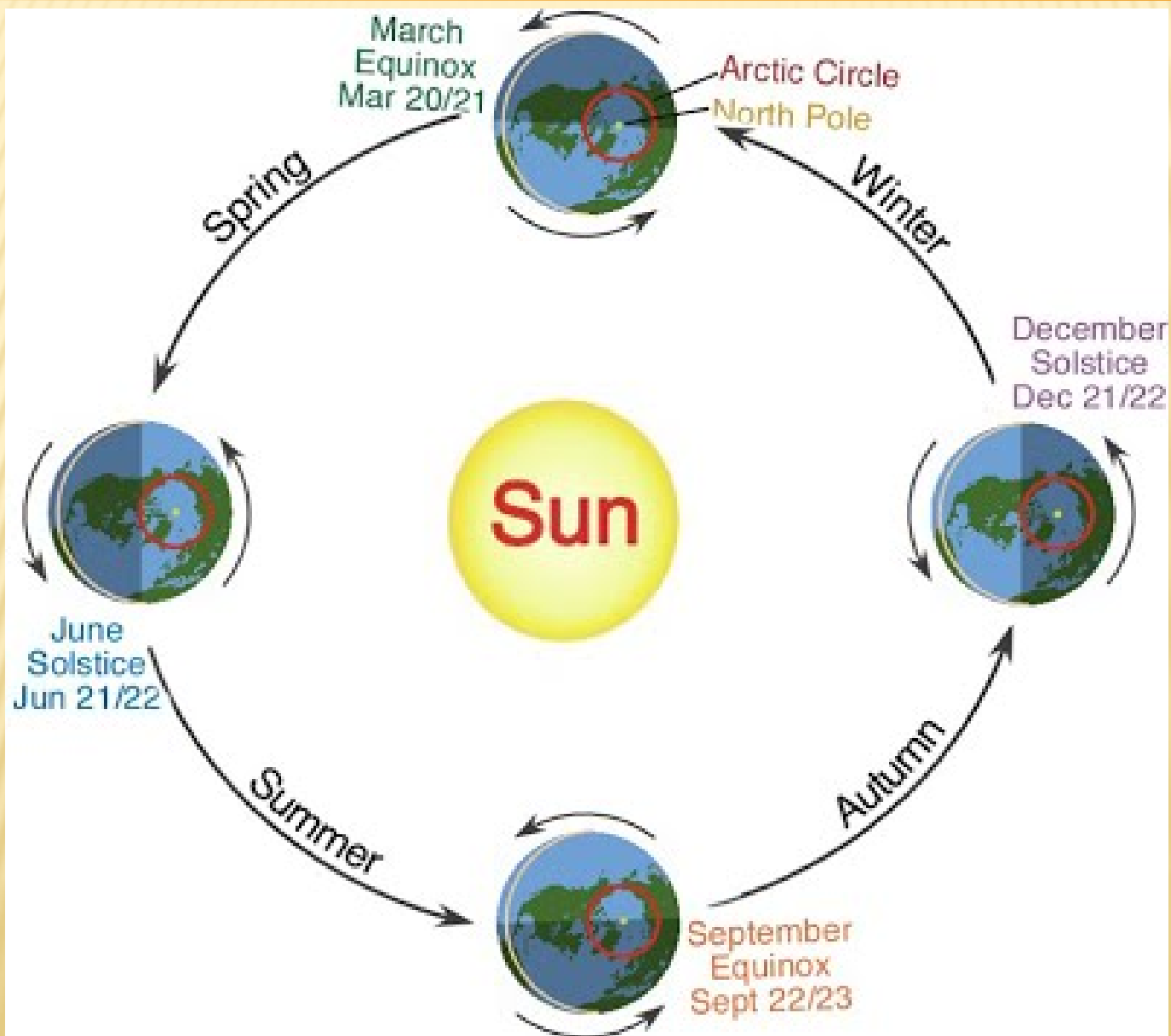


- ✗ The speed of the earth's revolution is about 30 kms/second.
- ✗ The earth takes 365 days, 5 hours, 48 minutes and 56 seconds ($365 \frac{1}{4}$ days approx.) to complete one revolution around the sun.
- ✗ **Revolution** is also called the **annual motion** of the earth.
- ✗ For our convenience, we count only 365 days in one year and **the balance of 6 hours is added to 1 extra day after every four years.**
- ✗ The additional day is added to the month of February of that year. Thus February has 29 days and that year has **366** days, this is the concept of **leap year.**
- ✗ The path along which the earth moves around the sun is called the **orbit, which is fixed.**
- ✗ **The length of the orbit is about 965 million km.**

- ✗ The shape of Earth's orbit is **elliptical** or **oval**.
- ✗ The sun occupies one focus of this ellipse. And so the distance between earth and sun is not constant.
- ✗ **Perihelion** ('peri' means 'near', 'helios' means 'sun')- when the distance between earth and sun is minimum, 146 million kms.
- ✗ **Aphelion** ('ap' means 'away from', 'helios' means 'sun')- when the distance between earth and sun is maximum, 151 million kms.



THE PHENOMENON OF SEASONS



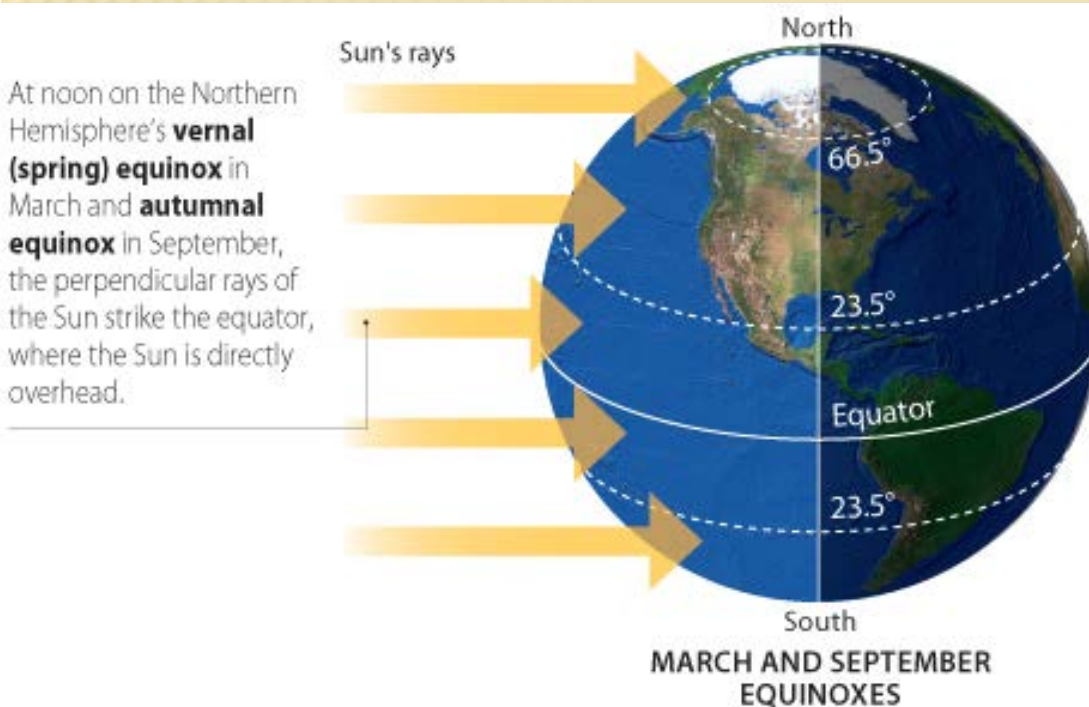
EFFECTS OF REVOLUTION

- ✗ The revolution of the earth causes **variation** in the length of day and night.
- ✗ There is **variation** in the distribution of heat over the surface of the earth and this causes the phenomenon of **seasons**.
- ✗ Four selected days are mentioned below:
 - + 21 March (3rd month)
 - + 21 June (6th month)
 - + 23 September (9th month)
 - + 22 December (12th month)

Seasons

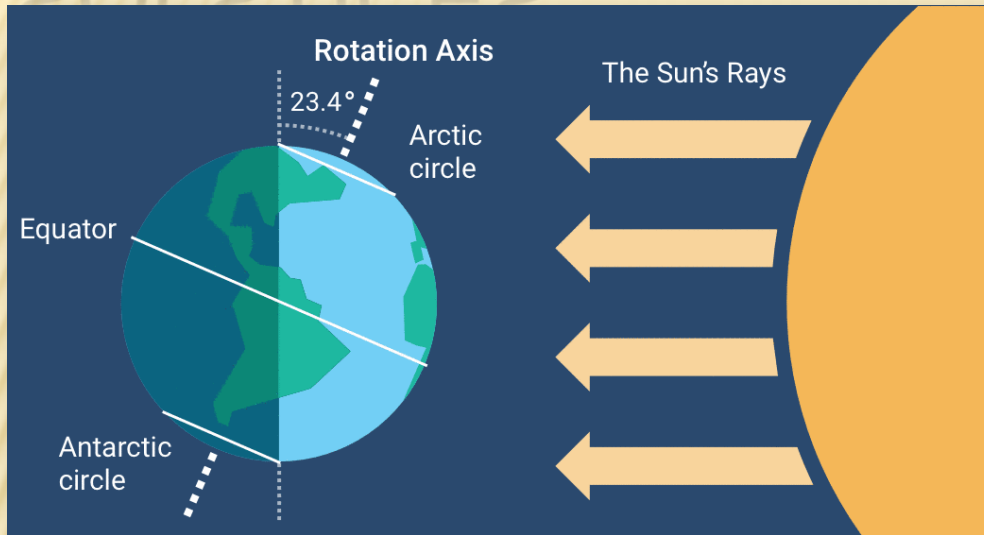
- ✗ One year is divided into **four** seasons-
 - ✗ Spring season
 - ✗ Summer season
 - ✗ Autumn season
 - ✗ Winter season
- ✗ The **change** of season is due to the following reasons:-
 - ✗ the rotation of the earth
 - ✗ The revolution of the earth around the sun
 - ✗ The inclination of the earth's axis
- ✗ **Solstice**- A solstice is the day when the midday sun shines vertically overhead at one of the tropics (i.e. either Tropic of Cancer or Tropic of Capricorn).
- ✗ **Equinox**- (means 'equal nights') An equinox is the day when midday sun shines vertically overhead at the equator and the length of day and night is of equal duration throughout the world.

EQUINOXES



- ✗ On March 21 (**Spring**) and September 23 (**Autumnal**) Equinoxes are experienced in the **Northern Hemisphere**.
- ✗ On these days, North Pole and South Pole lie at an equal distance from the sun.
- ✗ The seasons are reversed in the Southern Hemisphere.

SOLSTICES

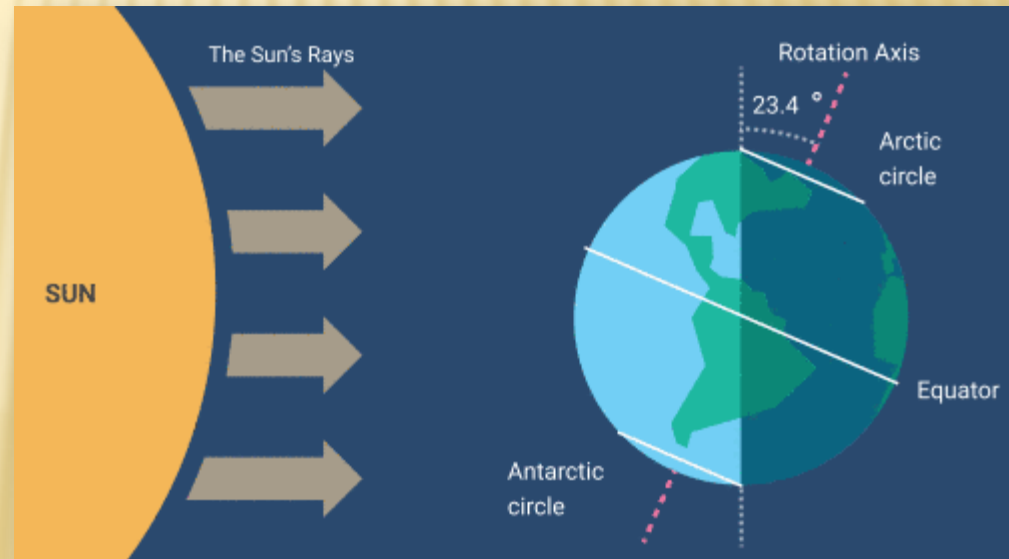


Summer Solstice- 21 June

- ✗ The North Pole is inclined towards the sun.
- ✗ The rays of the sun fall vertically over the Tropic of Cancer ($23\frac{1}{2}^{\circ}$ N)
- ✗ A large portion of the Northern Hemisphere gets heat and light from the sun.
- ✗ Days are longer than nights in the Northern Hemisphere.
- ✗ Many places in Northern Hemisphere experience Summer season.
- ✗ On this day, longest day and shortest nights occur during 21st June in Northern Hemisphere.

Winter Solstice- 22 December

- ✗ The South Pole is inclined towards the sun.
- ✗ The rays of the sun fall vertically over the Tropic of Capricorn ($23\frac{1}{2}^{\circ}$ S)
- ✗ A large portion of the Southern Hemisphere gets heat and light from the sun.
- ✗ Days are longer than nights in the Southern Hemisphere.
- ✗ Many places in Southern Hemisphere experience Summer season.
- ✗ On this day, longest day and shortest nights occur during 22nd December in Southern Hemisphere.



THINK AND ANSWER

Q1. What would happen if the earth did not rotate?

Ans. If there had been no rotation of the earth then one- half of the earth would have been constantly in daylight and another half would have been constantly in darkness.

The portion under sunlight would have been too hot. On the other hand, the portion in dark would have been freezing cold.

Such extremes of temperature could have made it impossible for life to thrive on our planet.

Q2. Differentiate between the Summer and Winter Solstice.

Ans.

Summer Solstice	Winter Solstice
Falls on 21 st June.	Falls on 22 nd December
Longest day and shortest night in Northern hemisphere.	Longest day and shortest night in Southern hemisphere.
Summer season in Northern hemisphere. Winter in Southern hemisphere.	Summer in Southern hemisphere. Winter in Northern hemisphere.

WORKSHEET 1

Q1. Tick the correct answers

i) The movement of the earth around the sun is known as

- a) Rotation b) Revolution c) Inclination

Answer: (b) Revolution

ii) Direct rays of the sun fall on the equator on

- a) 21 March b) 21 June c) 22 December

Answer: (a) 21 March

iii) Christmas is celebrated in summer in

- a) Japan b) India c) Australia

Answer: (c) Australia

iv) Cycle of the seasons is caused due to

- a) Rotation b) Revolution c) Gravitation

Answer: (b) Revolution

Q2. Fill in the blanks:-

1. A leap year has _____ number of days.

Answer: 366

2. The daily motion of the earth is _____.

Answer: Earth Day/ rotation

3. The earth travels around the sun in an _____ orbit.

Answer: elliptical/ oval

4. The sun's rays fall vertically on the Tropic of _____ on 21st June.

Answer: Cancer

5. Days are shorter during _____ season.

Answer: Winter