



3

Rotation and Revolution of the Earth

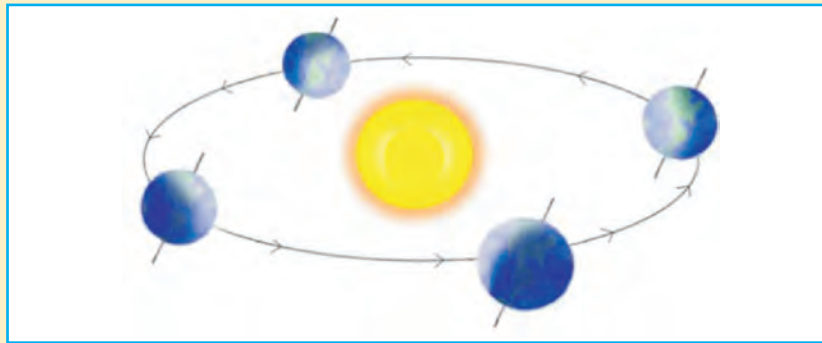
Focus On

- ◆ Rotation
- ◆ Revolution



HERE WE GO.....

- What do you see in the picture?
- Name the two types of motion that the Earth does?



Long long ago, the Earth was thought to be the centre of the universe and the Sun and the seven other planets were considered to move around it. Later on, we came to know that the Sun is the centre of the Solar System and all the planets revolve around it. The Earth also rotates on its axis continuously causing day and night. All the planets, including our planet, Earth revolve around the Sun in a definite path called the **orbit**.

We will now study in detail these two movements of the Earth and their effects.

Rotation

The globe is a miniature model of the Earth. It is grasped by two pins at an angle of $66\frac{1}{2}^\circ$ to the plane of the Earth's orbit which support it and allow it to spin freely.

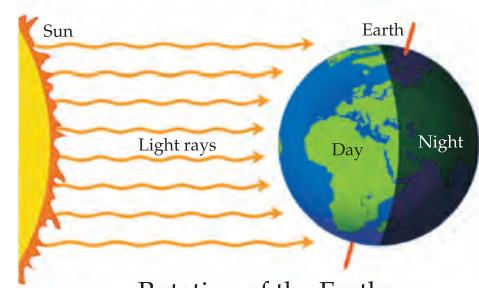
Similarly, the Earth also rotates on its axis continuously at a speed of 24,855 miles/24 hours or 1,038 miles/hour. One rotation takes 24 hours to complete.



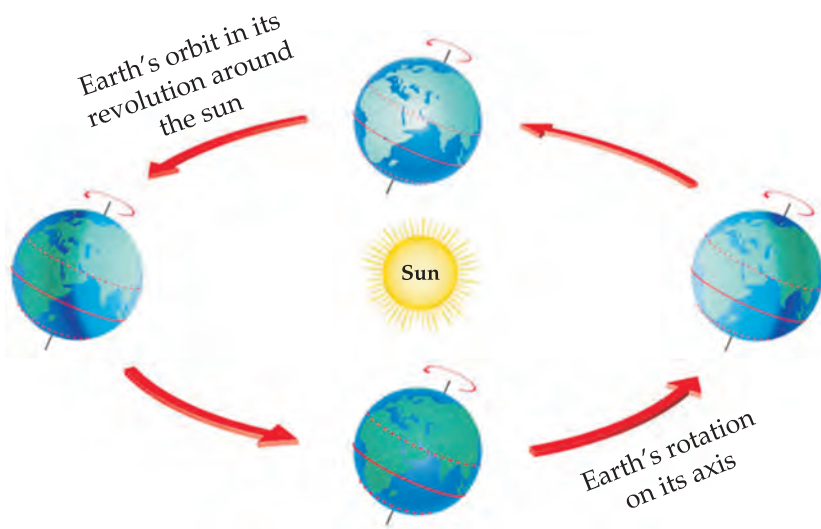
The effects of rotation

Day and night occur due to the rotation of the Earth on its axis. The side of the Earth that faces the Sun has day while the opposite side has night. The two sides of our planet alternatively face the Sun and go away from it thus observing day and night respectively with the rotation of the Earth.

The tilt of the Earth causes the days to be longer in summer and shorter in winter. It is always in the direction of the Northern Star. The Earth rotates counter clockwise due to which we see the Sun rising in the east and setting in the west. The tidal waves in the sea happen due to the rotation of the Earth.



Rotation of the Earth



Rotation of the Earth around the Sun

Fact Byte

The Sun illuminates half of the Earth at a time. The border line of the sunlit Earth and the dark Earth is called the circle of illumination or the terminator or the twilight zone.



FOLLOW IT



At what speed does the Earth revolve around the Sun?



LET'S DO



What are aphelion and perihelion. Try to find out on internet.

Revolution

The Earth also constantly revolves around the Sun in a definite path that is known as the orbit like all other planets. The orbit of the Earth is elliptical.

The Earth takes $365\frac{1}{4}$ days i.e. one year to complete one revolution around the Sun. That is the reason we have 365 days in our calendar year. The $\frac{1}{4}$ leftover day is accumulated and added as an extra day in the calendar year as 29th February after every four years. The year is known as the **leap year**.

The Effects of Revolution

The change of seasons on our planet occur due to the Earth's revolution around the Sun. The seasons on Earth are affected by the following factors.

- ❖ The angle of the Sun's rays.
- ❖ The length of the days.



The Sun's rays are parallel to each other when they reach the Earth.

The part of the Earth that is tilted towards the Sun, receives more sunlight and observes summer. On the other hand, the part of the Earth that is tilted away from the Sun, receives less sunlight and hence, observes winter.

FOLLOW IT



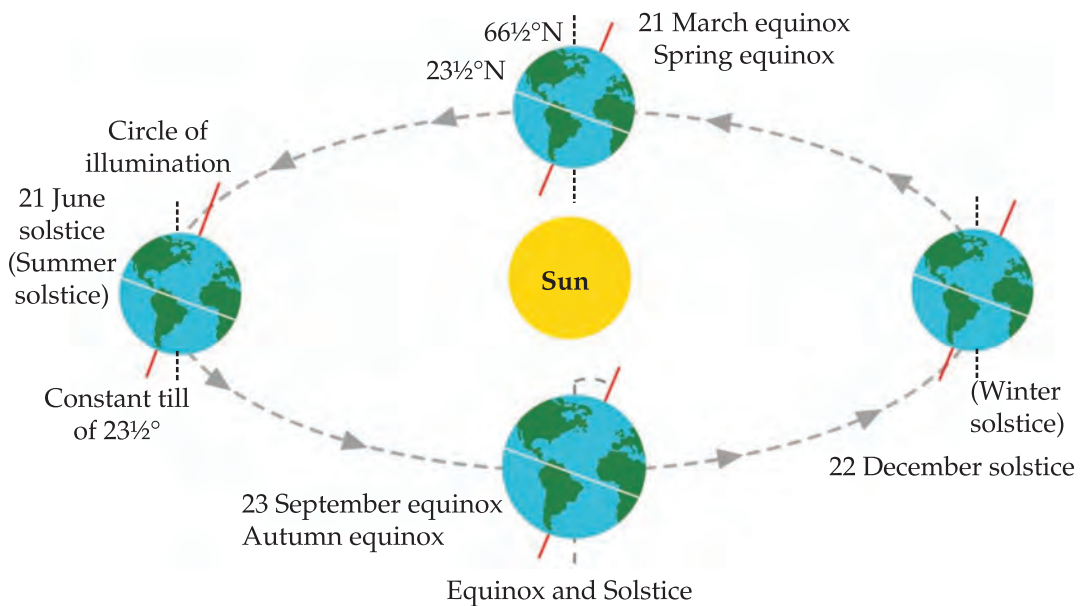
Balance is the key point of the Earth's movement. The Earth is moving in a very fine balance with everything around it to bring beautiful seasons on Earth. It brings the bright morning and the soothing nights. This balance is the essence of any beautiful thing. It teaches us the lesson of balance.

If the Earth had been rotating straight on its axis then all seasons would have occurred at the same time on the Earth. But since the Earth is tilted on its axis, when the Sun's rays fall on the Earth's surface, they are not parallel to the plane of the sunlight.

In the month of June, the Northern Hemisphere is tilted towards the Sun and hence, it experiences summer, while the Southern Hemisphere which is tilted away during this period, receives indirect sunrays and experiences winter. In winter, when the Earth moves to the other part of the orbit, the Southern Hemisphere faces the Sun and hence observe summer, while during this period, Northern Hemisphere observe winter.

Solstices

A solstice is an event which occurs when the Sun appears to reach its most northern or southern expedition, relative to the celestial equator on the celestial sphere. This causes the hemisphere to point directly towards or away from the Sun. This brings a change in seasons.



During the months of January, February and March, the Southern Hemisphere faces the Sun directly and the Northern Hemisphere gets indirect rays of the Sun due to the tilt of the Earth's axis. This makes the nights longer and days shorter in the Northern Hemisphere. Hence, the Northern Hemisphere observes colder temperature while the Southern Hemisphere receives warmer temperature during this period. The shortest day of the Earth is 21 December. It is called the **Winter solstice**. It marks the beginning of winter in the Northern Hemisphere. During this period, the South Pole gets 24 hours of daylight while the North Pole has no daylight at all.

Due to the tilt of the Earth during the months of July, August and September, the Northern Hemisphere is pointed towards the Sun. The longest day of the year is 21 June. This is called



the **Summer Solstice**. During this period, the North Pole has 24 hours of daylight whereas the South Pole is completely deprived of daylight. Hence, it is summer in the Northern Hemisphere and winter in the Southern Hemisphere at the same time.

Equinox

The term 'equinox' literally means 'equal day and night'. This **phenomenon** occurs twice a year when days and nights are exactly equal everywhere on Earth. This occurs on 21 September in Autumn and 21 March in Spring. We call these **Autumn equinox** and **Spring equinox** respectively.

Flash On

- ◆ The Earth completes one rotation in 24 hours rotating on its axis.
- ◆ Rotation of the Earth on its axis causes day and night.
- ◆ The Earth is tilted on its axis at an angle of $66\frac{1}{2}^\circ$ to the plane of the Earth's orbit.
- ◆ The seasons change due to the revolutions of the Earth.



Stir Up Your Mind

A. Tick (✓) the correct answer :

1. When does the summer solstice occur?
 (a) 21 December (b) 21 June (c) 21 March (d) 21 September
2. When does the spring equinox occur?
 (a) 21 December (b) 21 July (c) 21 March (d) 21 September
3. What is the ancient belief about the Earth?
 (a) The Sun is the centre of the Solar System
 (b) The Earth is the centre of the universe
 (c) All the planets revolve around the Sun
 (d) All of the above
4. The Earth is tilted on its axis at an angle of:
 (a) $61\frac{1}{2}^\circ$ (b) $15\frac{1}{2}^\circ$ (c) 66° (d) $66\frac{1}{2}^\circ$
5. When does the winter solstice occur?
 (a) 21 December (b) 21 July (c) 21 March (d) 21 September

B. Fill in the blanks :

1. _____ is the longest day of the year.
2. When the day and night become equal, it is called the _____.
3. During the months of January, February and March, the _____ gets 24 hours of sunlight.
4. The Northern Hemisphere experience summer in the months of _____, _____ and _____.
5. A leap year comes after every _____ years and an extra day is added to the month of _____ in this year.



C. Match the following :

Column A

1. Spring is the opposite of
2. Spring equinox occurs on
3. The shortest day of the year is
4. During the winter solstice, the South Pole gets
5. Equal day and night

Column B

- (a) equinox
- (b) 24 hour sunlight
- (c) autumn
- (d) 21 March
- (e) 21 December

D. Answer the following briefly :

1. What is the shape of the Earth's orbit?
2. Define solstice?
3. What is an equinox?
4. What is the direction of the Earth's rotation on its axis?
5. What do you mean by orbit?

E. Answer the following in detail :

1. How does the revolution of the Earth around the Sun play an important role?
2. Explain the reason for change in season at different times of the year in both hemispheres.
3. What is equinox and how is it important?
4. How the rotation of the Earth on its axis is significant for us?
5. Which adjustment is made in our solar calendar?



Practice Time

QUIZ

1. How much time does the Moon take to complete one revolution around the Earth?
2. When was the last leap year held? When will be the next leap year?
3. What is the first day of winter known as?
4. What would have been the difference if the Earth was not tilted on its axis?
5. Name two other things that move around the Sun?

DO IT

Make a model of the Solar System with the help of balloons. Find out about the circular movement of the other planets in the Solar System.

HOTSPOT

- A. Although the Earth is rotating at such a fast pace, we don't feel dizzy. Why?**
- B. What if the Earth had more moons like Jupiter, Mars and Saturn?**
- C. What is the reason of the Northern Star staying fixed or constant?**

YOUR TURN

Try to find out the way of measuring distances of the celestial bodies located in space.

