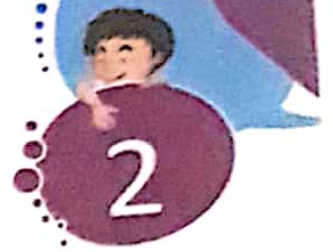


Rotation and Revolution



LEARNING OBJECTIVES

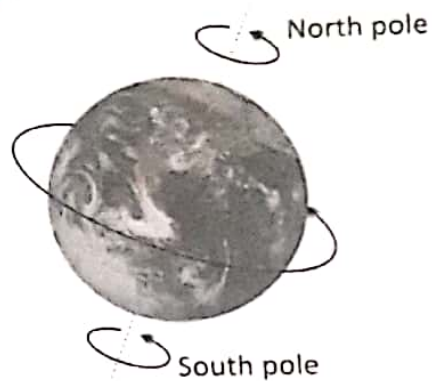
- Movements of the Earth
- Day and Night
- Seasons
- Rotation of the Earth
- Revolution of the Earth



MOVEMENTS OF THE EARTH

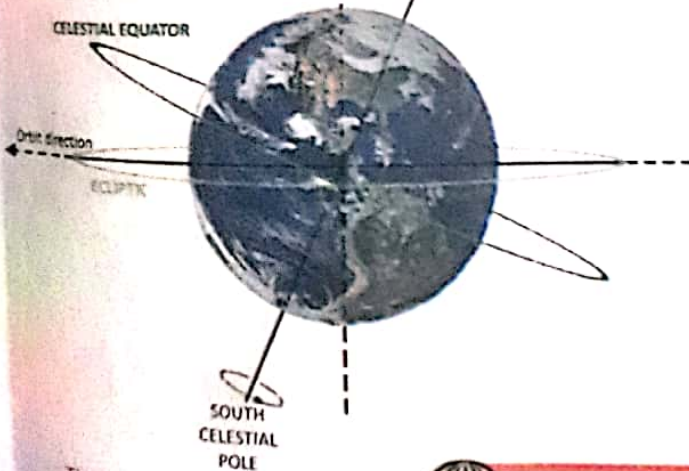
The Earth is constantly moving. It moves in the two ways—rotation and revolution. **Rotation** refers to the spinning of the Earth on its own axis. **Revolution** refers to the movement of the Earth around the Sun. Both these movements take place simultaneously.

Rotation causes day and night. Revolution causes change in seasons. So, the movements of the Earth are very important for life to flourish on it.



ROTATION OF THE EARTH

Perpendicular to orbit
Axial tilt or Obliquity
Rotation Axis
NORTH CELESTIAL POLE



If we watch a basketball spinning on our fingers we will notice that it spins about an imaginary axis. This axis coincides with our finger at the bottom. In the same way, the Earth too has its own axis on which it rotates.

The **axis of the Earth** is an imaginary line that pass straight from the North Pole to the South Pole through the centre of the Earth. It is titled at an angle of $23\frac{1}{2}^{\circ}$ from the plane of the centre of the Earth. It takes 24 hours for the Earth to complete one single rotation about this axis.

The axial tilt of the Earth



DAY AND NIGHT

Occurrence of day and night is the most important consequence of Earth's rotation. As the Earth



rotates, a part of it experiences day. The part which is not facing the Sun experiences night. This takes place alternately since the Earth rotates constantly. You can experiment this by lighting a torch adjacent to a globe. You would observe that one part of it receives light and the other half remains dark. This explains how we experience day and night periodically. The Earth's rotation also causes tides to form. You would learn more about tides in the higher classes.



Occurrence of day and night on Earth

Another noticeable consequence of Earth's rotation is reflected in our dates. As we learnt in the previous chapter, the eastern hemisphere is ahead of the western hemisphere by a day. This is because the Earth rotates from west to east. It implies that in 24 hours, places located in the eastern hemisphere face the Sun and turn away from it before places located in the western hemisphere. This is the reason why when it is 1 January in India it is the night of 31 December in the US.

Did You Know?

Japan is known as the Land of the Rising Sun because it is the first country to experience sunrise. This is because it is located at the extreme east of the eastern hemisphere.



REVOLUTION OF THE EARTH

While it is rotating on its axis, the Earth is also revolving around the Sun. The Earth takes a fixed path or route to move around the Sun at a speed of 30 kilometres per second. This path is called the **orbit**. Like the Earth all other planets move around the Sun in their own orbits and the time taken to move around the Sun varies depending on their distance from the Sun.

The Earth takes $365\frac{1}{4}$ days to revolve around the Sun. But in our calendar, a year has only 365 days. So what do we do with the $\frac{1}{4}$ or quarter day? This quarter of a day is accumulated and after four years when it becomes a day it is added to that particular year to the month of February making 29 days. This year is known as the **leap year**. The year 2016 was a leap year. Can you tell which will be the next two leap years?

Did You Know?

The shape of the Earth's orbit around the Sun is not circular—it is a geometrical shape called an ellipse. The orbits of all bodies in the solar system, wherever they are, are elliptical. This remarkable fact was discovered in the early 1600s by the great German astronomer and mathematician Johannes Kepler.

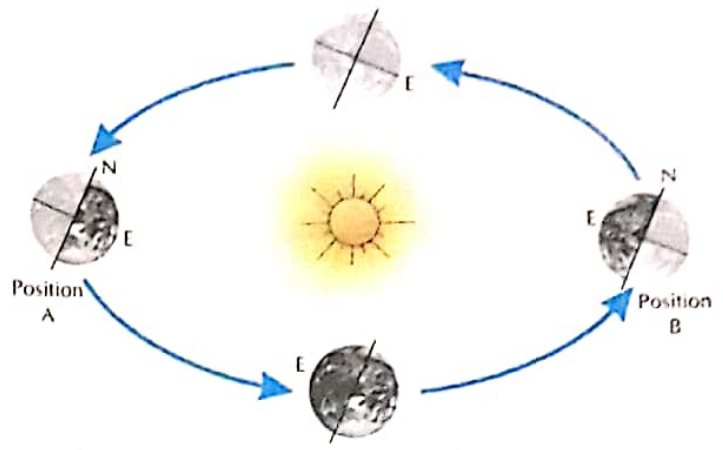


SEASONS

The seasons are caused by revolution. As the Earth moves round the Sun, it comes nearer to the Sun and also goes far away from it. This means that it is hot when the Sun is near and cold when it is farther away.

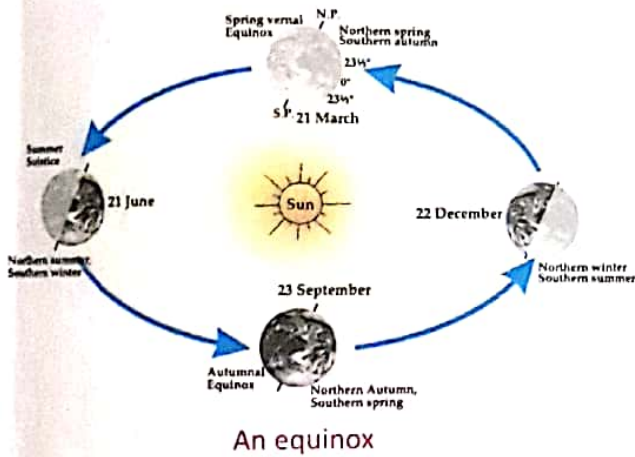
But the Earth's seasons are not caused by revolution alone. It happens also because the Sun heats up the atmosphere unequally. Since the Earth is a sphere, the sunlight does not strike the Earth at the same angle everywhere.

The seasons are also the result of the tilt of the Earth's axis. As the Earth travels along its orbit, it sometimes leans toward the Sun and sometimes away from the Sun. Because of this, different parts of the globe face the Sun at different times of the year. This gives us the seasons.



The Earth revolves around the Sun

The northern and southern halves of our planet get different amounts of sunlight over the course of the year. When the North Pole is tilted towards the Sun, the Northern Hemisphere experience summer. The Southern Hemisphere is away from the rays of the Sun and it experiences winter. When the South Pole faces the Sun, Southern Hemisphere experiences summer and it will be winter in the Northern Hemisphere.



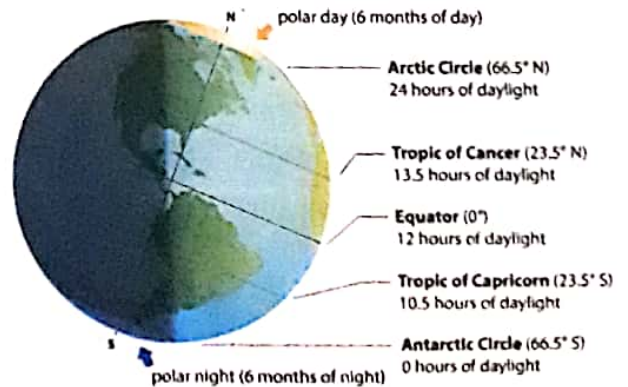
An equinox

There are four main seasons that the Earth experiences— summer, winter, spring and autumn. When the northern hemisphere experiences summer, the southern hemisphere will have winter and vice versa.

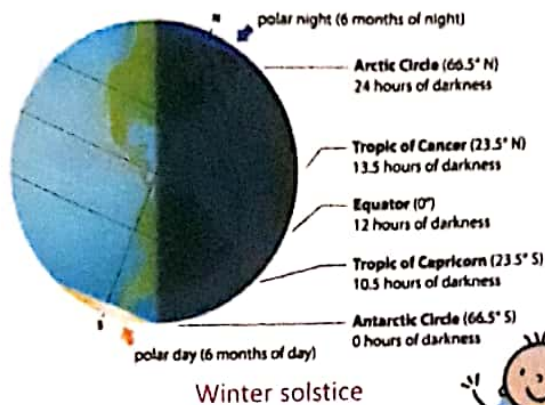
Twice a year the Sun shines directly overhead the Equator during equinoxes and once on each tropic during the solstices. ['Equi' means equal and 'nox' means night, so equinox, means equal day and night.] ['Sol' means Sun and solstice means the standing still of the Sun.] 4

On 21 March and 23 September the Sun is directly overhead the Equator and the Earth experiences spring or vernal equinox and autumnal equinox on these two days, respectively.

On 21 June when the Sun is shining directly overhead the Tropic of Cancer and the northern hemisphere is tilted towards the Sun it experiences summer solstice. The number of hours of daylight goes on increasing as we move to the north and beyond the Arctic Circle. There is six months of continuous daylight. All the places in the northern hemisphere have their longest day on this date.



Summer solstice



On 22 December, the Sun is directly over the Tropic of Capricorn in the southern hemisphere and the tilt of the axis brings the southern hemisphere closer to the Sun, making it summer. Thus the northern hemisphere experiences winter solstice during this time. This is the shortest day in the northern hemisphere.

HOTS (Higher Order Thinking Skills) Questions

What do you think would happen if the Earth's axis was not tilted?

Let's Ponder

- There are two movements of the Earth—rotation and revolution.
- Rotation happens when the Earth spins on its axis from west to east once in twenty-four hours and causes day and night.
- When the Earth moves around the Sun on its orbit once in 365¼ days it is called revolution.
- Seasons are caused due to the tilt of the axis of the Earth and revolution around the Sun.



EXERCISE

A. Oral Questions :

1. Name the two movements of the Earth.
2. What is an orbit?

B. Tick (✓) the correct option :

1. The movement of the Earth around the Sun is called :
 a. revolution b. rotation c. orbit d. none of these
2. A leap year occurs once in every :
 a. 5 years b. 2 years c. 4 years d. 1 year
3. Day and night is caused by :
 a. rotation b. tilted axis c. revolution d. none of these
4. The total number of main seasons are :
 a. six b. five c. two d. four

C. Unscramble the following letters to form the correct word :

1. It occurs once in four years : _____ year. (LPAE)
2. The path taken by the Earth to revolve around the Sun : _____ (RBOTI)

- 3. The imaginary line passing through centre of the Earth : _____ (XIAS)
- 4. This is the movement of the Earth on its axis : _____ (OTTRIOAN)

Give one word for the following :

- 1. The spinning of the Earth on its axis. _____
- 2. The moving of the Earth on a fixed path around the Sun. _____
- 3. An imaginary line though the centre of an object around which the object? _____
- 4. The two time in a year when the Sun is furthest north or south of the equator. _____
- 5. A path fallowed by a celestial body round another body. _____

Fill in the blanks :

- 1. The _____ in the Earth's axis causes seasons.
- 2. The main effect of rotation is _____.
- 3. The main effect of revolution is _____.
- 4. The Earth takes _____ days to revolve around the Sun.
- 5. _____ and _____ are two movements of the Earth.

Match the columns :

- | | |
|------------------|--|
| 1. Equi | a. Earth revolves on it |
| 2. Axis | b. Winter solstice |
| 3. Orbit | c. Leap year |
| 4. 22 December | d. Imaginary line on which the Earth rotates |
| 5. The year 2016 | e. Equal |

Answer the following questions :

- 1. What are the two movements of the Earth? Explain.)
- 2. How are seasons caused?
- 3. How are day and night caused? Illustrate with a diagram.
- 4. Define equinox and solstice.
- 5. Explain the position of the Earth during summer solstice.



THINGS TO DO

- On a chart paper draw diagrams to show a. how day and night are caused and b. the revolution of the Earth. Label your diagrams neatly.

Teacher's Notes

Use a globe to explain the rotation of the Earth and the occurrence of day and night. Use a football to represent the Sun and explain the revolution of the Earth and the occurrence of seasons.