3. Rotation and Revolution

EXERCISE

A. Answer the following questions :

1. What is meant by the inclination of the Earth's axis?

Ans.
- The Earth rotates on this axis, but it is not at right angle to the plane of revolution.
- It makes an angle of 66½° with the plane of ecliptic and is tilted 23½° from a line of perpendicular to that plane.

2. Name an effect of the Earth's rotation.

Ans. The effect of Earth's rotation:
- The daily occurrence of day and night.

3. State two effects of West to East rotation of the Earth.

Ans. The two effects of West to East rotation of Earth:
- Rotation causes day and night.
- Variation in temperature.
- Rising of the Sun in the East and setting in the West

4. What causes slight flattening of the Earth at two poles?

Ans. Rotation of the Earth creates a centrifugal force, just like a spinning top and causes a bulge at the Equator.

5. What is meant by the Revolution of the Earth? What are its effects?

Ans. The motion of the Earth along its elliptical orbit around the Sun in approximately 365¼ days is termed as Revolution.

Effects of Revolution are:
- Changing altitude of the mid-day Sun at different times of the year.
- Varying length of Day and Night.

6. Explain the meaning of the terms 'Solstice' and 'Equinox'.

Ans.
- **Solstice:** The word 'Solstice' in Latin, means 'Sun standing still or 'reaching the 'Zenith (the, highest) point'.
- **Equinox:** The word Equinox in Latin means equal and night. It means the day on which all places on Earth have equal length

of day and night.

7. What causes the formation of day and night? Explain with the help of a neat diagram.

Ans. Rotation causes day and night.

8. When do Summer Solstice and Winter Solstice occur? How do they occur?

Ans. **Summer Solstice:** It occurs on 21st of June.

- The sun shines directly overhead the Tropic of Cancer.
- Hence, the length of the day increases with increasing latitude North of the Equator.
- Daylight lasts for the entire 24 hours beyond the Arctic Circle towards the North Pole.

Winter Solstice: It occurs on 22nd of December.

- The sun shines directly overhead the Tropic of Capricorn.
- Hence, the length of the day increases as one goes towards South Pole.
- Night lasts for the entire 24 hours beyond the Arctic Circle towards the North Pole.

9. Which is the longest day in the Southern Hemisphere?

Ans. The longest day in the Southern Hemisphere is on 22nd of December.

10. Which is the longest day in the Northern Hemisphere?

Ans. The longest day in the Northern Hemisphere is on 21st June.

11. Name the path along which the Earth travels when moving round the Sun. How long does this movement take place?

Ans. The path along which the Earth travels around the Sun is called the Orbit. It takes 365¼ days to complete one revolution.

12. On what date does the Arctic Circle experiences 'Midnight Sun'?

Ans. On 21st June the Arctic Circle experience 'Midnight Sun'.

13. What is a Leap Year?

Ans. The Earth takes 365¼ days to complete one revolution.

- Every four years the extra ¼ day difference between the tropical year and the calendar year of 365 days is taken as one whole day.

- By adding a day in February every 4th year , or to a multiple of 4 years , we are able to account for the ¼ year . This is called the Leap year.

14. Give the dates when days and nights are of equal duration on the Equator.

Ans. On March 20 or 21 (vernal or spring equinox) and September 22 or 23 (autumnal equinox) the days and nights are of equal duration on the Equator.

15. Explain with the help of a diagram, the part played by the inclination of Earth's axis in causing day and night of varying duration, except at the Equator.

Ans. The length of day and night varies according to the seasons due to the inclination of the Earth's axis:

1. On 21st of June the sun shines directly overhead the Tropic of Cancer.

- Hence, the length of the day increases with increasing latitude North of the Equator.
- Daylight lasts for the entire 24 hours beyond the Arctic Circle towards the North Pole.

2. On 22nd of December the sun shines directly overhead the Tropic of Capricorn.

- Hence, the length of the day increases as one goes towards South Pole.
- Night lasts for the entire 24 hours beyond the Arctic Circle towards the North Pole.

3. On March 21st and September 23rd, during Equinox, the Circle of Illumination coincides with meridians because the Sun is overhead at noon along the Equator. Thus all places have 12 hours of day and 12 hours of night.

16. What do you mean by the Sidereal Day?

Ans. The spinning of the Earth on its axis is termed as rotation.

- The period of rotation or the time required for the Earth to complete 360° is 24 hours, 56 min, and 4.09 sec.
- This period is termed as Sidereal Day.

17. What is Perihelion? Mention the date of this phenomenon.

Ans. The Earth is said to be in Perihelion on January 3rd when distance

is least or about 147 million km.

18. Why does the speed of Earth's revolution vary?

Ans. The mean velocity of the speed of the Earth is 107000 km/hr or 30 km/sec, but varies according to the path of the orbit occupied. The velocity is greatest at Perihelion and least at Aphelion.

19. State the effect of speed of Earth's rotation.

Ans. The effects of speed of Earth's rotation are:

- The ocean currents and winds on the Earth's surface are deflected towards the right in the Northern Hemisphere and left in the Southern Hemisphere due to Coriolis force.
- Cyclones and anticyclones are also deflected in both the hemispheres causing atmospheric changes.
- The bulging of the air at the Equator and flattening at the Poles takes place due to different speed of rotation.

20. State any two special features of Summer Solstice.

Ans. The two special features of Summer Solstice are:

- It occurs on 21st of June.
- The sun shines directly overhead the Tropic of Cancer.
- Hence, the length of the day increases with increasing latitude North of the Equator.
- Daylight lasts for the entire 24 hours beyond the Arctic Circle towards the North Pole.

21. What are two motions of the Earth?

Ans. Rotation and Revolution are the two motions of the Earth.

22. What is an orbit?

Ans. The path along which the Earth revolves around the Sun is called Orbit.

23. What is meant by the 'inclination of the Earth'?

Ans. Same as 1st answer.

24. State two effects of West to East rotation of the Earth.

Ans. Same as 3rd

25. Explain the term 'Equinox'. When does it occur?

Ans.

- The word Equinox in Latin means equal and night. It means the day on which all places on Earth have equal length of day and night.

- On March 20 or 21 (vernal or spring equinox) and September 22 or 23 (autumnal equinox) occur.

B. Define the following :

1. Earth's Axis

Ans. **Earth's Axis:** An imaginary straight line passing through the North Pole, the centre of the Earth, and the South Pole. The Earth rotates around this axis.

2. Plane of Ecliptic

Ans. **Plane of Ecliptic:** The ecliptic plane is defined as the imaginary plane containing the Earth's orbit around the sun.

3. Perihelion

Ans. **Perihelion:** The Earth is said to be in Perihelion on January 3rd when distance is least or about 147 million km between it and the Sun.

4. Aphelion

Ans. **Aphelion:** The Earth is at its farthest point from the Sun on July 4th at a distance of 152 million km.

5. Ferrell's Law

Ans. **Ferrell's law:** The ocean currents and winds on the Earth's surface are deflected towards the right in the Northern Hemisphere and left in the Southern Hemisphere due to Coriolis force created by the rotation of the Earth. This is called Ferrell's law.

6. Rotation

Ans. **Rotation:** The spinning of the Earth on its polar axis is termed as Rotation.

C. Distinguish between the following pairs :

1. Solstice and Equinox

Solstice	Equinox
The word solstice in Latin, means 'Sun standing still or 'reaching the Zenith (the highest) point.	The word Equinox in Latin means equal and night. It means the day on which all places on Earth have equal length of day and night.
There are two types: Summer solstice and winter solstice	There are two types of Equinox: Vernal or spring and autumnal .

Summer solstice occurs on June 21, and winter solstice on December 21.	Spring equinox on March 20 and autumnal equinox on September 22nd.

2. Perihelion and Aphelion

Perihelion	Aphelion
The Earth is said to be in Perihelion on January 3rd.	The Earth is said to be on Aphelion on July 4th.
The distance between the Sun and the Earth is the least.	Earth is at its farthest point from the Sun.
It is about 147 million km.	It is about 152 million km.

3. Rotation and Revolution

Rotation	Revolution
The spinning of the Earth on its polar axis is termed as Rotation.	The motion of the Earth along its elliptical orbit around the Sun in approximately 365¼ days is termed as Revolution.
Rotation causes day and night, Variation in temperature & rising of the Sun in the East and setting in the West.	Revolution causes changing altitude of the mid-day Sun at different times of the year & varying length of Day and Night.
It takes around 24 hours to complete one rotation.	It takes 365¼ days to complete one revolution.

4. Spring Equinox and Autumn Equinox

Spring Equinox	Autumn Equinox
On March 20 or 21 vernal or spring equinox occurs.	On September 22 or 23 autumnal equinox occur.
In the Northern Hemisphere this date marks the end of Winter and beginning of Spring when the days will start getting longer and the nights shorter.	In the Northern Hemisphere this date marks the end of Summer and beginning of Autumn when the days will start getting shorter and the nights longer.

D. Give reasons for the following :

1. Altitude of the Sun varies at a place according to seasons.

Ans. Altitude of the Sun varies at a place according to the seasons because:

Of the Earth's revolution round the Sun with its axis inclined at 66½° to the place of ecliptic, changes in the apparent altitude of the mid-day Sun.

2. Seasons are reversed in Northern and Southern Hemisphere.

Ans. Seasons are reversal in the Northern and Southern Hemisphere because of:

- the rotation of the Earth on its inclined axis.
- the position of the Earth during its revolution round the Sun.
- The inclination of the Earth's axis with its fixed position pointing to the Pole .
- The angle that the Sun makes with the Zenith of a place observed at noon.

3. Days and nights are equal at all places on the Earth on March 21.

Ans. Days and nights are equal at all places on the Earth on March 21st because:

- the Circle of illumination passes through the Poles and thus divides the Earth into equal halves.
- Hence, day and night are of equal length; 12 hours each at all latitudes.

4. Winds get deflected from their normal path.

Ans. Winds get deflected from their normal path due to :

- the speed of Rotation.
- Coriolis Force which makes the ocean currents and winds to deflect towards the right in the Northern Hemisphere and left in the Southern Hemisphere.

5. The region beyond Arctic Circle is known as the 'Land of Mid-night Sun'.

Ans. The region beyond the Arctic Circle is known as "Land of Mid-night Sun' because:

- During summer on June 21st, the Sun never sets in mid-summer and there is daylight for 24 hours .
- North Pole is inclined towards the Sun.

6. The speed of rotation at Singapore is much faster than that at Tokyo or Russia.

Ans. The speed of rotation at Singapore is much faster than that at Tokyo or Russia as:

- the speed of rotation is maximum at the Equator and goes on decreasing towards the Poles and finally is minimum at the Poles.
- As Singapore is located close to the Equator the speed is more whereas Tokyo or Russia are located away from the Equator (i.e., they are located towards the Poles) and hence the speed is less.

7. Mid-day Sun can be seen overhead in Chennai twice a year, but not even once in Delhi. Why?

Ans. Mid-day Sun can be seen overhead in Chennai twice a year, but not even once in Delhi because:

- Chennai is much closer to the equator than Delhi due to which it receives more amount of sunlight as compared to Delhi.

8. The Poles experience six-month day and six-month night.

Ans. The Poles experience six-month day and six-months night because:

- of the inclination of the Earth, each Pole is tilted towards and away from the Sun for about six months each.
- When the North Pole is tilted towards the Sun, it experiences continuous daylight for six months.

9. Noon is hotter than morning.

Ans. Noon is hotter than morning because:

- during morning time the sun rises just above the horizon and shines with less intensity.
- but during noon it is overhead and emits large amount of heat so noon is hotter than morning.

10. The variation in the lengths of day and night goes on increasing towards Poles.

Ans. The variation in the lengths of day and night goes on increasing towards poles because of the :

- Circle of Illumination
- Rotation and Revolution
- Inclination of the Earth's axis.

11. The Sun is never overhead beyond the Tropics.

Ans. The Sun is never overhead beyond the Tropics because:

- The Tropic of Cancer in the Northern hemisphere and Tropic of Capricorn in the Southern Hemisphere mark the limit of the overhead Sun,
- as beyond the tropics the Sun never shines vertically at any time of the year.

12. The regions, near North Pole and South Pole, have six months of continuous day-light and darkness.

Ans. Same as 8th

E. Diagrams :

1. Draw a labelled, self-explanatory diagram of the Summer Solstice in the Northern Hemisphere.

2. Draw a diagram of the position of the Earth on December 22. Draw and name the Equator, Arctic Circle, and Antarctic Circle.

3. Draw a neat sketch to show the phenomenon of day and night.

4. With the help of a diagram show how the tilt of the Earth's axis and the revolution causes (i) seasons, (ii) variation in the length of day and night.

5. Draw self-explanatory diagrams of Perihelion and Aphelion.

Ans. Students to answer these questions themselves.

F. Choose the correct option:

1. The Earth rotates on its axis from

(a) East to west (b) West to east

(c) North to south (d) South to north

2. Earth revolves around the sun on an_____ path.

(a) Oval (b) Circular

(c) Elliptical (d) Spherical

3. One Sidereal Day is equal to _____.

(a) 12 hours (b) 23hr 56 minutes 4.09 sec

(c) 8 hours (d) 14 hours

4. Which of the following statement related to the coriolis force is correct?

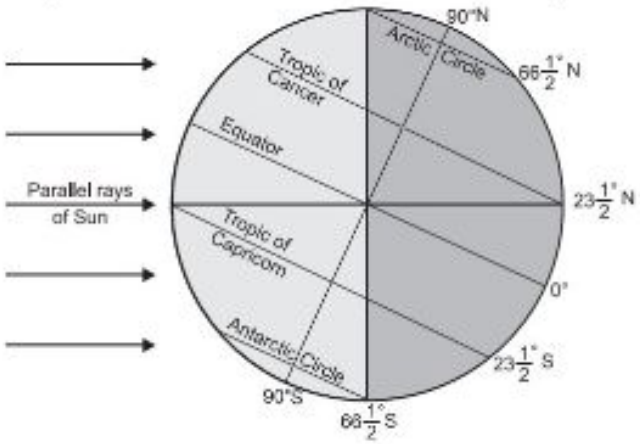
(a) Coriolis force deflects the winds to their left in Northern Hemisphere & right in Southern Hemisphere.

(b) Coriolis effect is maximum in the Equator & least in poles.

(c) Coriolis force is generated due to earth's rotation.

(d) All of the above.

5. Which of the following date is known as Summer Solstice in Northern Hemisphere?
   (a) 22nd July (b) 21st June
   (c) 22nd December (d) 23rd September
6. Which of the following date is known as Winter Solstice in Northern Hemisphere?
   (a) 22nd July (b) 21st June
   (c) 22nd December (d) 23rd September
7. Which of the following date is known as Autumnal Equinox in Northern Hemisphere?
   (a) 22nd July (b) 21st June
   (c) 22nd December (d) 23rd September
8. On which of the following date Sun gives vertical ray on the Tropic of Capricorn?
   (a) 22nd July (b) 21st June
   (c) 22nd December (d) 23rd September
9. On which of the following date is the day & night equal?
   (a) 22nd July (b) 21st June
   (c) 22nd December (d) 23rd September
10. Identify the phenomena in Northern Hemisphere in this picture.



   (a) Summer solstice (b) Winter Solstice
   (c) Autumnal Equinox (d) Vernal Equinox
11. Which of the following country is known as 'the land of Midnight Sun'?
   (a) Sweden (b) Iceland (c) Germany (d) Norway
12. When earth is at its farthest point from the Sun, it is said to be,
   (a) Perihelion (b) Aphelion (c) Perigee (d) Apogee

Answers

1. b	2. c	3. b	4. c	5. b	6. c	7. d
8. c	9. d	10. b	11. d	12. b		