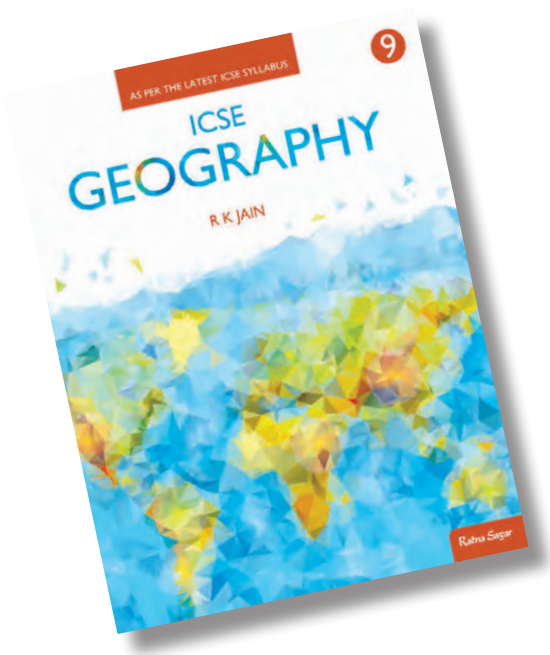
COMPANION

ICSE GEOGRAPHY



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1. The Earth as a Planet

A. Fill in the blanks.

1. The origin of the universe is probably due to the **Big Bang** theory.

2. The Solar System belongs to the **Milky Way** galaxy.

3. All the planets revolve around the Sun in the **anti-clockwise** direction.

4. The equatorial diameter of the Earth is about **12,756** km.

5. The speed of light coming from the Sun is **300,000** km per second.

B. Explain the following terms:

1. **Universe:** It is anything that exists in space. The universe consists of countless stars which form a galaxy and there are many such galaxies in the universe.

2. Planet: There are several solar systems in a galaxy and a planet is an important part of a solar system. Planets are heavenly bodies that revolve around a star like our sun.

3. Galaxy: The cluster of stars in the sky is called a galaxy. Each galaxy consists of countless number of stars.

4. Solar System: The sun has a family which is called the solar system. The main members of the Solar family are the planets, satellites, asteroids, comets and meteors.

5. Star: A star is a ball of hot gases. Our sun is the largest star of our solar system.

6. Water Cycle: The Earth is about 29 per cent of land and 71 per cent of water. Water is found in oceans, seas, gulfs, bays, lakes, rivers, etc. This water continuously moves from the Earth's surface into the atmosphere and back again to the Earth's surface. This is called the water cycle.

C. Answer the following questions very briefly.

1. Name the planets in the Solar System in order of their distance from the Sun.
Answer: The planets in our solar system in order of their distance from the Sun are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

2. How much time is taken by the light from the Sun to reach the Earth?
Answer: The light from the Sun, takes about 8 minutes and 20 seconds to reach the Earth.

3. Which layer of the atmosphere protects us from the harmful ultraviolet rays?
Answer: The Ozone layer present in the atmosphere protects us from the harmful ultraviolet rays.

4. Who conducted the Bedford Canal experiment in England?
Answer: Dr Wallace conducted the Bedford Canal experiment in England.

5. What is Milky Way Galaxy?
Answer: The Milky Way Galaxy is a cluster of stars in the sky.

D. Given reasons for each of the following.
1. The Earth is not a perfect sphere.
Answer: The Polar diameter of the Earth is about 12,714 km, while the Equatorial diameter is about 12,756 km. The difference between the Polar and the Equatorial diameters is only about 42 km. Had it been a perfect sphere then the Polar diameter and Equatorial diameter would have been the same. Thus, the Earth is not a perfect sphere.

2. Biosphere is a functional unit of nature.
Answer: The narrow zone of contact between land, water and air, where all forms of life exist, is called the Biosphere. The biosphere provides all the nutrients and resources which the living organisms need to survive. Every organism in the biosphere is influenced by and in turn influences the biotic (living) and abiotic (non-living) components of biosphere through numerous modes of interactions. Thus, Biosphere is a functional unit of nature.

3. The Sun looks bigger than the other stars in the sky.
Answer: The Sun is the largest member of the Solar System and is a huge ball of very hot gases. The Sun is located at an average distance of about 148 million km from the Earth, which is much closer than the other stars thus, it appears bigger in size.

4. The Earth is the home of humankind.
Answer: Life exists on the Earth due to the presence of land, water and air. The narrow zone of contact between land, water and air has favourable conditions where all forms of life exist. The Earth has the perfect temperature conditions, ample amount of water, land and other gases in perfect proportion which are required for life to exist. Thus, it is home of humankind.

5. The Earth is often called the Blue Planet.
Answer: When astronauts from the Earth, for the first time, landed on the surface of Moon, they watched the Earth from there and it looked blue in colour due to the presence of water all over it. Thus, the Earth is often called the Blue Planet.

E. Answer the following questions briefly.
1. What is the importance of Sun for life on the Earth?
Answer: Earth is the only planet in the Solar System which is known to have life, and this is due to the presence of land, water and air on it. The solar energy from the Sun keeps the three domains of the Earth, namely the lithosphere, the hydrosphere and the atmosphere together.

2. How is the Earth located at an optimum distance from the Sun?

Answer: The Earth is located at an average distance of about 148 million km from the Sun. Among the other seven planets, those near the Sun are too hot and those away from the Sun are too cold to sustain life. Thus, the Earth is located at an optimum distance from the Sun.

3. Name the ancient scholars and philosophers, who felt that the Earth is spherical in shape.
Answer: Pythagoras, Aristotle, Varahamihira, Aryabhata and Copernicus were the ancient scholars and philosophers, who felt that the Earth is spherical in shape.

4. How does Pole Star and horizon help in finding the shape of the Earth?
Answer: The findings are as follows:

1. The Pole Star: The position of the Pole Star is always vertically above the North Pole. The angle of elevation of the Pole Star is different at different places. This angle decreases towards the Equator, where it is 0°. This is possible only if the Earth is spherical in shape.

2. The Sighting of a Ship: While standing on the sea coast, if we watch a ship approaching the land, first we will see the smoke coming out of the chimney of the ship (because the entire ship lies below the line of sight). As the ship comes up over the horizon, we can see the chimney, then deck and finally the entire ship. This is due to the curved surface of the Earth. Had the Earth been flat, then we could see the whole ship at a time.

5. Name the inner and the outer planets in the Solar System.
Answer: In our Solar System, the Inner Planets include Mercury, Venus, Earth and Mars, while the Outer Planets include Jupiter, Saturn, Uranus and Neptune.

F. Answer the following questions.

1. Explain the Bedford Canal experiment for finding the shape of the Earth.
Answer: In the Bedford Canal experiment, three poles of equal length were fixed on the level bed of the Bedford canal at a distance of one mile or 1.6 km apart from the other. It was ensured that the three poles had the same height above the water in the canal. Dr Wallace observed the top parts of these poles with the help of a telescope. He found that the middle pole was higher by about eight inches or 20 cm. This experiment was repeated in several other directions and at different places. It proved beyond doubt that the surface of the Earth is curved and the Earth is spherical in shape.

2. Explain at least three reasons to prove that the Earth is a unique planet.
Answer: The three reasons to prove that the Earth is a unique planet are as follows:
1. Earth is the only planet which is neither too hot nor too cold for life to exist on it.
2. It is the only planet where atmosphere, lithosphere and hydrosphere interact and together form a biosphere. Which is habitable by biotic and abiotic components.
3. The presence of atmosphere, which consists of gases in an appropriate proportion and an ever going hydrological cycle make it a unique planet.

3. What is the significance of ozone layer in the atmosphere?
Answer: The ozone layer present in the atmosphere acts as a shield and protects the planet from harmful ultraviolet rays coming from the Sun. It also absorbs the radiations from the Earth's surface, thereby keeping it warm.

4. How can a sailing ship and circumnavigation help in finding the shape of the Earth?

Answer: We know that sailors have been travelling around the world in different directions and almost all of them came back to the starting point. In the early years of the sixteenth century, Ferdinand Magellan, a Portuguese navigator and explorer, went on a voyage and discovered the Strait of Magellan. He sailed across the Pacific Ocean. Though he was killed in the Philippines, but his ship Victoria continued westwards and finally completed the voyage around the world and proved that the Earth is spherical in shape.

5. What is importance of Sun in the Solar System?

Answer: Apart from providing heat and light, the sun's gravitational force keeps all the main members of the Solar family such as the planets, satellites, asteroids, comets and meteors together.

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2. The Geographic Grid – Latitudes and Longitudes

A. Fill in the blanks.

1. The network of **parallels** and **meridians** on the globe forms the grid system.

2. The shortest route on the Earth's surface is along **Great** Circle.

3. The two ends of the axis of the Earth are called the **North Pole and the South Pole**.

4. The equator divides the Earth into two **equal** parts.

B. Distinguish between the following.

1. Parallels and Meridians

Parallels	Meridians
The lines which run from east to west and are parallel to the equator.	The lines which run from north to south.
They are called latitudes.	They are called longitudes.

2. Great Circle and Small Circle

Great Circle	Small Circle
The line, where the plane intersects the surface of a sphere, creates a Great Circle.	When a plane passes through a sphere, but not through its centre, the line where the plane intersects the surface of the sphere, creates a Small Circle.
The centre of the Great Circle always coincides with the centre of the sphere.	The centre of the Small Circle never coincides with the centre of the sphere.
It is the largest circle that can be drawn on a sphere.	It is not the largest circle that can be drawn on a sphere.
The Great Circle represents the circumference of the sphere.	The Small Circle does not represent the circumference of the sphere.
Example: Equator	Example: Arctic Circle

3. Local time and Standard time

Local Time	Standard Time
The time calculated by the position of the Sun at noon at a given place is called its local time.	The local time can be confusing if all places on Earth use their own local time. Thus, through an international agreement, the local time of the standard meridian is linked to the GMT. The local time of the standard meridian is known as the standard time.

4. Latitude and Longitude

Latitude	Longitude
The lines which run from east to west and are parallel to the equator.	The lines which run from north to south.

Latitude is defined as the angular distance of a place north or south of the equator measured as an angle, whose apex is at the centre of the Earth.	Longitude is defined as the angular distance of a place east or west of the Prime Meridian measured as an angle whose apex is at the centre of the Earth.
They are called parallels.	They are called meridians.

C. Answer the following questions very briefly.

1. How many parallels can be drawn on a globe at an interval of 10 degrees?
Answer: 18 parallels can be drawn on a globe at an interval of 10 degrees.

2. How many meridians can be drawn on a globe at an interval of 15 degrees?
Answer: 24 meridians can be drawn on a globe at an interval of 15 degrees.

3. How can we fix or locate the position of a place on the globe?
Answer: We can fix or locate the position of a place on the globe by determining the point where the latitudes and longitudes cross for that place.

4. Name any three countries which have more than two Time Zones.
Answer: Russia, Canada and the USA have more than two Time Zones.

D. Explain the following terms.

1. Grid System: The network of parallels and meridians on the globe is called the grid system.

2. Greenwich Mean Time: The mean solar time at Prime Meridian at Greenwich (0° longitude) is known as Greenwich Mean Time (GMT). The time at all other places is calculated with respect to GMT.

3. **Standard Meridian:** To maintain uniformity in time across a country, a standard meridian was chosen with respect to GMT to determine the local time for that country. However, certain countries are so vast that one standard meridian is not enough for them to determine the local time, for instance, the USA.

4. Axis of the Earth: It is an imaginary line on which the Earth rotates. The end points of this imaginary axis are called the North Pole and the South Pole.

E. Answer the following questions briefly.

1. What are the main characteristics of the Great Circle?
Answer: The line, where the plane intersects the surface of a sphere, creates a Great Circle. The centre of the Great Circle always coincides with the centre of the sphere. It is the largest circle that can be drawn on a sphere. The Great Circle represents the circumference of the sphere. Example: Equator.

2. What are the references needed for measuring and locating places on the Earth?
Answer: To find the exact location of a place on the Earth's surface, we should know its position in the north-south direction (latitude) and in the east-west direction (longitude).

3. What are the main advantages of the standard time?
Answer: The local time can be confusing if all places on Earth use their own local time. The smooth functioning of railways, airways and other means of transport and communication would be disrupted. Thus, the main advantages of the standard time are helping us avoid confusion in time across longitudes in a particular country and smooth functioning of various means of transport.

4. What is the concept of latitudes and longitudes?
Answer: Latitude is defined as the angular distance of a place north or south of the equator measured as an angle, whose apex is at the centre of the Earth. Longitude is defined as the angular distance of a place east or west of the Prime Meridian measured as an angle whose apex is at the centre of the Earth.

F. Write the names of the following.

1. 23½° N: Tropic of Cancer

2. 23½° S: Tropic of Capricorn

3. 66½° N: Arctic Circle

4. 66½° S: Antarctic Circle

5. 0° E or W: Equator

G. Give reasons for each of the following.

1. We cannot describe the location of any place on a smooth sphere.
Answer: We cannot describe the location of any place on a smooth sphere because it will not have a fixed top or bottom and no sides.

2. The axis of the Earth helps in marking parallels and meridians.
Answer: The axis of the Earth serves as the 0° reference for marking all meridians and parallels at an equal or regular interval of angular distance.

3. The Earth is not a perfect sphere.
Answer: The equatorial diameter is bigger than the polar diameter of the Earth, thus, it is not a perfect sphere.

4. The International Date Line does not follow the 180° meridian exactly.
Answer: The International Date Line does not follow the 180° meridian exactly. It makes some adjustments to accommodate those countries and island groups (under the same administration) which are lying across or close to this line. It deviates from the 180° meridian in the Bering Sea to include all the Aleutian Islands of Alaska within the same day, and again in the South Pacific to keep islands of the same group (Tonga and Fiji) within the same day.

H. Answer the following questions.

1. What are the chief characteristics of parallels?

Answer: The characteristics of parallels are as follows:

1. All parallels are complete circles except 90° N and 90° S, which are only points.
2. Equator is the largest parallel and the length of other parallels decreases as one moves away from the equator towards the poles.
3. All parallels are located at an equal distance from each other.
4. The length of a degree of latitude along a meridian on the surface of the Earth is about 111 km.
5. Some important parallels help in dividing the Earth roughly into three heat zones – the Torrid Zone, the Temperate Zone and the Frigid Zone.
6. The equator is the only Great Circle, while others are Small Circles.
7. The places which are to the north of the equator are in the north latitudes, while the places which are to the south of the equator are in the south latitudes.
8. The places which are located near the equator are in the low latitudes, while those which are located near the poles are in the high latitudes.

2. What are the chief characteristics of meridians?

Answer: The main characteristics of meridians are as follows:

1. The length of all the meridians is the same as all of them are semicircles joining the North Pole with the South Pole.
2. Any two opposite meridians, when taken together, (say 10° E and 170° W) form a complete circle which is a Great Circle.
3. The maximum distance between any two meridians at the equator is about 111 km for 1° of longitude.
4. The distance between any two meridians decreases as one moves away from the equator towards the poles. All the meridians meet at the poles.
5. East of the Prime Meridian up to 180° is the Eastern Hemisphere, whereas west of the Prime Meridian up to 180° is the Western Hemisphere.
6. All the meridians cross the parallels at right angles.
7. All the meridians are aligned in the true north-south direction on the Earth's surface.

3. Explain the concept of the Time Zones.

Answer: Time Zones are a relative concept. For instance, some countries in the world such as Russia, Canada, the USA, Australia, etc. have a large longitudinal extent. One standard meridian for each of these countries was not enough to provide uniformity of time. A cross country rail traveller in the USA in the1870s might have experienced as many as 24 different times between the Atlantic and the Pacific coasts. Keeping the above problem in mind, the International Prime Meridian Conference held in 1884, in Washington DC agreed to divide the world into 24 Standard Time Zones, each extending over 15° of longitude. These standard time zones help a country follow a common time for various states/cities and avoid confusion in the movement of transportation.

4. Describe the relationship between longitude and time.

Answer: The earth rotates through 360° (longitudes) in 24 hours or 15° in one hour or 1° in 4 minutes. When the Earth rotates from west to east, every meridian on the Earth's surface faces the Sun once every day. This is the time when the Sun is at the highest point in the sky. We call it the midday or noon at that meridian. Let us start from the Prime Meridian at Greenwich (0° longitude). When the Sun is at the highest point in the sky at Greenwich, all the places situated along the Prime Meridian will have midday or noon. As the Earth rotates from west to east, the places lying to the east of Prime Meridian (say Delhi) will be ahead of the Greenwich Mean Time or the GMT (for it already would have had noon) and those places which are to the west of Prime Meridian (say New York) will be

behind GMT (they are yet to experience noon). The difference of time between any two places, with reference to the Greenwich Mean Time, is according to difference in longitudes of those places.

5. What is International Date Line and why it is needed?

Answer: An imaginary line which runs from the north pole to the south pole and marks the change in the calendar date is called International Date Line. The International Date Line is in the middle of a time zone. Thus, there is no hourly change at that point, but a change only of the date. It is needed so that the travellers can change the calendar date upon crossing it and avoid confusion. Also, the International Date Line does not follow the 180° meridian exactly. It makes some adjustments to accommodate those countries and island groups (under the same administration) which are lying across or close to this line. It deviates from the 180° meridian in the Bering Sea to include all the Aleutian Islands of Alaska within the same day, and again in the South Pacific to keep islands of the same group (Tonga and Fiji) within the same day. So the International Date Line does not cross any landmass or island, as no country in the world would like to have two different days and dates on one single day in its territory.

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3. Rotation and Revolution

A. Fill in the blanks.

1. The movement of Earth around its axis is called **rotation**.
2. The movement of Earth around the Sun is called **revolution**.
3. The spring equinox in the Northern Hemisphere occurs on **21st March**.
4. The summer solstice in the Southern Hemisphere occurs on **22nd December**.
5. The path of the Earth around the Sun is called **orbit**.

B. Distinguish between the following.

1. Rotation and Revolution

Rotation	Revolution
The movement of the Earth on its axis.	The movement of the Earth around the Sun.
It takes one day to complete one rotation.	It takes one year to complete one revolution.

2. Leap day and Leap year

Leap Day	Leap Year
The one extra day that occurs in February every four years is called a leap day.	The year which occurs every four years and consists of 366 days instead of 365 is called a leap year.

3. Perihelion and Aphelion

Perihelion	Aphelion
The Earth is nearest to the Sun on or about 3 January and the distance between the Earth and the Sun is about 146 million km. This position is called perihelion (peri means near and helios means Sun).	The Earth is at its farthest point from the Sun on about 4 July and the distance between the Earth and the Sun is about 151 million km. This position is called aphelion (ap means away from and helios means Sun).

4. Equinox and Solstice

Equinox	Solstice
In two positions, that is on 21 March and 23 September, the rays of the Sun are directly overhead the equator and days and nights are of equal duration. These positions of the Earth are known as the equinoxes.	In other two positions, that is on 21 June and 22 December, the rays of the Sun are directly overhead at the Tropic of Cancer and the Tropic of Capricorn respectively. Days are long and nights are short in the respective hemispheres. These positions of the Earth are known as the solstices.

C. Answer the following questions very briefly.

1. What is the contribution of Nicolaus Copernicus?
Answer: Nicolaus Copernicus broke the myth of Earth being stationary while the Moon and the Sun moved around it. He proved that the Earth only appeared to be stationary. Actually, it not only spins on its axis, but also moves around the Sun.

2. What was the ancient view about the movement of the heavenly bodies?
Answer: In ancient times people observed the movement of heavenly bodies, especially the Sun and the Moon, with great interest and anxiety. They noticed that the Sun rises in the morning, reached its highest point in the sky around midday and in the evening it sets in the west. This made them believe that the Sun and the Moon moved around the stationary Earth.

3. What is the average speed of Earth's movement around the Sun?
Answer: The average speed of Earth's movement around the Sun is 30 km per second.

4. What are the dates on which the phenomenon of seasons can be easily understood?
Answer: 21 March, 21 June, 23 September and 22 December are the dates on which the phenomenon of seasons can be easily understood.

5. What is the direction of Earth's rotation around its axis?
Answer: The earth rotates from West to East around its axis.

D. Give reasons for each of the following.

1. The days are longer than nights during the summer season.
Answer: Due to the inclination of the Earth's axis, the circle of illumination shifts its position as the Earth revolves around the Sun. This reveals that the winters have longer nights and the summers have longer days. Also, when the Northern Hemisphere experiences longer nights, the Southern Hemisphere experiences longer days and vice versa.

2. The distance between the Earth and the Sun is not the same throughout the year.
Answer: The shape of the Earth's orbit is not circular, but is elliptical. This means that the distance between the Earth and the Sun does not remain the same throughout the year. The Earth is nearest to the Sun on or about 3 January and the distance between the Earth and the Sun is about 146 million km. This position is called perihelion (peri means near and helios means Sun). The Earth is at its farthest point from the Sun on about 4 July and the distance between the Earth and the Sun is about 151 million km. This position is called aphelion (ap means away from and helios means Sun).

3. The movements of the Earth affect the heat received on earth.

Answer: The Earth receives perpendicular rays of the Sun on the Tropic of Cancer on 21 June. At this time the Northern Hemisphere receives more heat and light. The days are longer and the nights are shorter in the Northern Hemisphere. Similarly, on 22 December, the position of the Earth is reversed. The Sun shines vertically over the Tropic of Capricorn. Now the Southern Hemisphere is inclined towards the Sun while the Northern Hemisphere is away from the Sun, thus, the Northern Hemisphere enjoys the winter season and the Southern Hemisphere experiences summer season. This proves that the movement of the Earth affect the heat received on earth.

4. The rotation of the Earth gives us the sense of time.
Answer: The rotation of the Earth also helps us to develop a sense of time. When the Sun appears to rise at a particular place, it is referred to as the morning time. The time of the setting Sun in the west is called the evening time. The concept of a.m. and p.m. is also due to the rotation of the Earth. The Earth takes about 24 hours or one day to complete one rotation on its axis.

5. The days and nights are equal on 21 March every year.
Answer: The Earth maintains its position towards the Sun in such a manner that the Sun shines vertically over the equator on 21 March. Thus, the length of day and night are equal on 21 March every year.

E. Answer the following questions briefly.

1. What causes the change in seasons?
Answer: The revolution of the Earth causes changes in seasons.

2. Give two features of the Earth's rotation.
Answer: The two features of the Earth's rotation are as follows:

1. It causes the alternate occurrence of day and night.
2. The flattening of the Earth at the poles and bulging at the equator is also due to the Earth's rotation.

3. What are the main observations noticed in the course of Earth's revolution?
Answer: The main observations noticed in the course of Earth's revolution are:

1. Variation in the length of day and night.
2. The change in seasons.

4. Describe the main features during the time of equinoxes.
Answer: The term 'equinox' means equal days. The Earth maintains its position towards the Sun in such a manner that the Sun shines vertically over the equator on 21 March and 23 September. The Earth is said to be in the spring and the autumnal equinoxes respectively on these dates and the Earth experiences equal durations of daylight and night on these days every year.

5. What will happen, if the Earth's axis becomes vertical?

Answer: If the axis of the Earth would have been vertical, then every place on Earth would have experienced 12 hours of daylight and 12 hours of darkness, in one full day. The Sun's rays would always strike the Earth vertically at the equator. Also, the phenomenon of seasons will not have prevailed.

F. Write True or False against each of the following.

1. The axis of the Earth is an imaginary line.	True
2. The speed of Earth's rotation at equator is 30 km per second.	False
3. The North Pole experiences six months of day in the summer season.	True
4. The bulging of the Earth at the equator is due to its revolution.	False
5. The movement of the Sun is from east to west.	True

G. Write short notes on each of the following.

1. Inclination of Earth's axis.

Answer: The axis of the Earth is an imaginary line passing through the centre of the Earth. The axis of the Earth is inclined at an angle of 66½° to the plane of its ecliptic. Due to the inclination of the Earth's axis, the circle of illumination shifts its position as the Earth revolves around the Sun.

2. Variation in the length of day and night.

Answer: The duration of day and night varies according to the Earth's position in the orbit. The winters have longer nights and the summers have longer days. When the Northern Hemisphere experiences longer nights, the Southern Hemisphere experiences longer days and vice versa. As we move away from the equator, the difference in the duration of day and night increases.

3. Summer Solstice

Answer: The Earth receives perpendicular rays of the Sun on the Tropic of Cancer on 21 June. At this time the Northern Hemisphere receives more heat and light. The days are longer and the nights are shorter in the Northern Hemisphere. This position is called summer solstice in the Northern Hemisphere. Similarly, on 22 December, the position of the Earth is reversed. The Sun shines vertically over the Tropic of Capricorn. Now the Southern Hemisphere is inclined towards the Sun while the Northern Hemisphere is away from the Sun. This position is known as the summer solstice in the Southern Hemisphere.

4. Kepler's Law of Planetary motion.

Answer: When the distance between the Earth and the Sun is about 146 million km (nearest to the Sun), the position is called perihelion and when this distance is about 151 million km (farthest from the sun), the position is called aphelion. According to the Kepler's Law of Planetary Motion, the Earth moves fastest when it is in perihelion and slowest when it is in aphelion.

H. Answer the following questions.

1. What are the main effects of Earth's rotation?

Answer: The main effects of the Earth's rotation are as follows:

1. From any point on the surface of the Earth, the Sun, the Moon and other heavenly bodies appear to move from east to west.
2. The alternate occurrence of day and night is experienced everywhere on the Earth's surface.
3. It has resulted in the flattening of the Earth at the poles and bulging at the equator. Thus the shape of the Earth is not a perfect sphere, but an oblate spheroid.
4. The Earth rotates on its axis from west to east and so the Sun appears to rise in the east. Once the direction of the rising Sun is known, it is easy to find out other directions such as west, north and south.
5. The Earth's rotation deflects the air and the ocean currents towards the right in the Northern Hemisphere and towards the left in the Southern Hemisphere.
6. It causes the regular occurrence of tides twice a day.
7. The difference of time on the Earth's surface is also due to the Earth's rotation. The Earth completes one full circle in about 24 hours.
8. The rotation of the Earth also helps us to develop a sense of time.

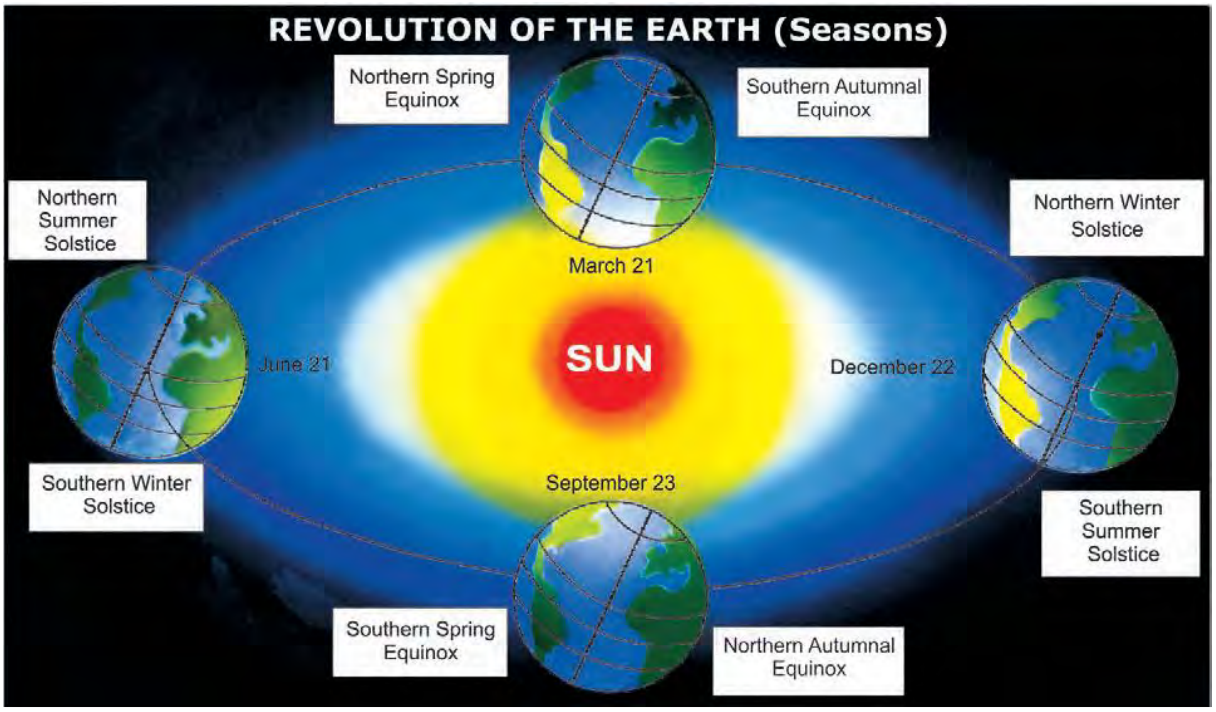
2. What are the main effects of Earth's revolution?

Answer: The following are the main effects of the revolution of the Earth:

1. Variation in the length of day and night.
2. The phenomenon of seasons.

3. Describe the phenomenon of season with the help of a diagram.

Answer: The phenomenon of seasons can be understood from the diagram given below:



4. What are the main observations during the rotation of the earth?

Answer: The main observations during the rotation of the earth are as follows:

1. Due to the rotation of the Earth, half of the Earth's surface receives light from the Sun and experiences day, the other half of the Earth's surface is turned away from the Sun and is in darkness, thus experiences night.
2. There are more hours of sunlight during the summer season than during the winter season, especially in places located far away from the equator.
3. The poles experience six months of complete daylight followed by six months of darkness.
4. The apparent movement of the celestial or heavenly bodies like the Sun, the Moon and other stars from east to west is an illusion created by the rotation of Earth on its axis from west to east.
5. The rotation of the Earth causes all parts of the Earth's surface, except the poles, to move in a circular path.
6. The speed of rotation varies from place to place, it is constant at any given place, that is why we experience no sense of motion.
7. The Earth takes about 24 hours or one day to complete one rotation on its axis.

5. What is the impact of the inclination of Earth's axis on the circle of illumination during revolution?

Answer: Due to the inclination of the Earth's axis, the circle of illumination shifts its position as the Earth revolves around the Sun. This reveals that:

1. the duration of day and night varies according to the Earth's position in the orbit.
2. the winters have longer nights and the summers have longer days.
3. when the Northern Hemisphere experiences longer nights, the Southern Hemisphere experiences longer days and vice versa.
4. the duration of day and night at the equator is always the same.
5. as we move away from the equator, the difference in the duration of day and night increases.

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4. STRUCTURE OF THE EARTH

A. Fill in the blanks.

1. The outer solid layer of the Earth is called the **Lithosphere.**

2. The average density of the Earth is about **5.5 g per cubic cm.**

3. The primary waves of earthquake are also called the **Longitudinal** waves.

4. The boundary between crust and mantle is called the **Moho or the Mohorovicic discontinuity**.

B. Explain the following terms.

1. Biosphere: The narrow zone of contact between land, water and air, where all forms of life exist, is called the biosphere.

2. Barysphere: The core lies below the mantle and is around the centre of the Earth. It is also called **barysphere** (which means heavy metallic rocks).

3. Hydrosphere: The water bodies are the liquid realm, called the hydrosphere.

4. Lithosphere: The landmass is the solid realm, called the lithosphere. The lithosphere is the outer solid layer of the Earth. The Greek word 'lithos' means rocks.

C. Answer the following questions very briefly.

1. Name the indirect sources of knowledge about the structure of the Earth.
Ans: The indirect sources of knowledge about the structure of the Earth are:

- Temperature inside the Earth,
- Pressure inside the Earth,
- Density of different layers of the Earth, and
- Behaviour of earthquake waves.

2. What is the basis on which the Earth is divided into concentric layers?
Ans: On the basis of the study of earthquake waves, varying density and other physical and chemical properties of rocks, the Earth can be divided into three concentric layers – the crust, the mantle and the core.

3. Name the most abundant elements found in the Earth's crust.
Ans: The main elements of the crust are silica, aluminium and magnesium.

4. What is the main feature of the secondary waves?
Ans: The Earth behaves like a solid up to a depth of about 2900 km from the surface. The secondary waves do not pass beyond this layer. Actually the secondary waves cannot pass through a liquid.

D. Distinguish between the following.

1. SIAL and SIMA: The main elements of the crust are silica, aluminium and magnesium. The upper continental layer is lighter (average density 2.5 g per cubic cm) and consists of silicates and aluminium (**SIAL**). The lower layer is dense (average density 3.0 g per cubic cm) and consists of silicates and magnesium (**SIMA**).

2. P waves and S waves: The longitudinal waves are called primary waves (P waves), where as the transverse waves are called the secondary waves (S waves). The P and S waves can penetrate deep into the Earth. The study of a seismogram reveals that the velocities of P and S waves increase with depth, up to about 2900 km below the surface of the Earth. But the S waves do not pass beyond this layer. Actually the S waves cannot pass through a liquid.

3. Mohorovicic discontinuity and Gutenberg discontinuity: The boundary between the crust and the mantle is called Moho or the Mohorovicic discontinuity. On the other hand, the boundary between the mantle and the core is called the Gutenberg discontinuity.

4. The crust and the core: The Earth can be divided into three concentric layers – the crust, the mantle and the core. The crust is the outermost solid layer of the Earth. It is also called the lithosphere, or rocky crust. The core lies below the mantle and is around the centre of the Earth. It is also called barysphere (which means heavy metallic rocks). The crust is made up of many kinds of rocks whereas the core is made up of heavy metals such as nickel and iron. The average density of the crust is less than 3 g per cubic cm whereas the average density of the core ranges between 5.0 g per cubic cm and 13.0 g per cubic cm.

E. Give reasons for each of the following.

1. Our knowledge about the structure of the Earth is based on indirect observation.
Ans: Our knowledge about the structure and interior of the Earth, from direct observations, is very limited. The deepest man-made hole in the Earth (a drill hole) is only about 8 km deep. This is quite insignificant, when compared to the mean radius of the Earth, which is about 6378 km. Thus, we have to depend upon the indirect sources of information, such as temperature and pressure inside the Earth, Density of different layers of the Earth, and behaviour of earthquake waves.

2. The density of rocks increases slowly towards the centre of the Earth.
Ans: The Earth is not composed of a uniform material. The materials of the inner layers are heavier than that of the outer layers. The density of rocks increases slowly towards the centre of the Earth, because the area around the centre of the Earth has heavy metals like nickel and iron.

3. The Earth behaves as a solid up to the depth of about 2900 km from the surface.

Ans: The primary and secondary waves can penetrate deep into the Earth. The study of a

seismogram reveals that the velocities of primary and secondary waves increase with depth, up to about 2900 km below the surface of the Earth. The secondary waves do not pass beyond this layer. Actually the secondary waves cannot pass through a liquid. So it is concluded that the Earth behaves like a solid up to a depth of about 2900 km from the surface.

4. The rocks and minerals cannot remain in a solid state inside the Earth.
Ans: It is a known fact that as we go down from the surface of the Earth to the interior of the Earth, the temperature increases at an average rate of about 1 °C for every 32 m of descent. At this rate, the temperature near the centre of the Earth would be very high. Hot springs and volcanic eruptions provide evidence of very high temperature inside the Earth. The rocks and the minerals cannot remain solid at such a high temperature.

F. Answer the following questions.

1. Name at least four indirect sources of information for the structure of the Earth.
Ans: The indirect sources of information for the structure of the Earth are:

- Temperature inside the Earth,
- Pressure inside the Earth,
- Density of different layers of the Earth, and
- Behaviour of earthquake waves.

2. Describe briefly the behaviour of earthquake waves which pass through the interior of Earth.
Ans: The study of the behaviour of earthquake waves provides accurate information about the Earth's structure. The graphic recording of earthquake waves by a seismograph, shows that there are three types of earthquake waves. These are:

- the longitudinal or primary waves (P waves),
- the transverse or secondary waves (S waves), and
- the surface or long waves (L waves).

The P and S waves can penetrate deep into the Earth, while the L waves travel along its circumference. The study of a seismogram reveals that the velocities of P and S waves increase with depth, up to about 2900 km below the surface of the Earth. The S waves do not pass beyond this layer. Actually the S waves cannot pass through a liquid.

3. How does temperature help in finding out the structure of the Earth?
Ans: As we go down from the surface of the Earth to the interior of the Earth, the temperature increases at an average rate of about 1 °C for every 32 m of descent. About 100 km below the surface of the Earth, the temperature is about 1400 °C. This is enough to melt the material in the mantle. At this rate, the temperature near the centre of the Earth would be very high. The rocks and the minerals cannot remain solid at such a high temperature.

4. Name any three important features of the Earth's crust.

Ans: Three important features of the earth's crust are:

- The crust is a relatively thin layer with an average thickness of about 60 km.
- The crust is made up of many kinds of rocks and the density of rocks increases with an increase in depth.
- The average density of the crust is less than 3 g per cubic cm (the average density of the Earth is about 5.5 g per cubic cm).

5. Name any three characteristics of the core of the Earth.

Ans: Three characteristics of the core of the earth are:

- The core is made up of heavy metals such as nickel and iron. Thus, it is also known as NIFE (NI for nickel and FE for iron).
- The average density of the core ranges between 5.0 g per cubic cm and 13.0 g per cubic cm. It increases towards the centre of the Earth.
- The temperature of the outer core is about 2200 °C while it may be as high as 5000 °C of the inner core.

5. LANDFORMS OF THE EARTH

A. Fill in the blanks.

1. The **tectonic** forces originate from within the earth.

2. The **gradational** forces originate from outside the earth.

3. The Himalayas are young **fold**, mountains in **Asia.**

4. The Tibet plateau is known as the **Roof** of the world.

5. The loess plains are the **Depositional** plains.

B. Give at least one example for each of the following.

1. Block mountain: Black Forest in Germany, the Vosges in France

2. Young fold mountain: The Himalayas, the Rockies

3. Depositional plain: The Gangetic Plains in India, the Canadian Plains

4. Residual mountain: The Nilgiris and the Rajmahal Hills in India

5. Structural plain: The great plains of USA and the coastal plains lying between the Western Ghats and the Arabia Sea in India

6. Old fold mountain: The Urals, the Appalachians

7. Volcanic plateau: The Deccan and the Malwa Plateaus of India and the Columbia Plateau region of north-western USA

8. Intermontane plateau: The Tibetan Plateau in Asia, the Plateau of Bolivia in South America

C. Answer the following questions very briefly.

1. What are the major landforms on the basis of elevation and slope?
Ans: The major landforms, on the basis of elevation and slope are classified into mountains, plateaus and plains.

2. What is the name of the processes involved in the creation of mountains?
Ans: The processes involved in the creation of mountains are called orogenesis, which means the birth of mountains.

3. Which fold mountain range in Asia is still rising?
Ans: The Himalayas in Asia is the fold mountain range which is still rising.

4. Which type of landform has a large summit area?
Ans: Plateau is a type of landform that has a large summit area.

5. Name the various types of depositional plains.
Ans: The types of depositional plains are alluvial plains, drift plains and loess plains.

D. Distinguish between the following.

1. Tectonic forces and Gradational forces
Ans: The landforms on the Earth's surface have been created and developed by two types of forces – the **tectonic** forces and the **gradational** forces. The tectonic forces originate from within the Earth and create irregularities on the surface of the Earth. The gradational forces originate from outside the Earth and work to modify and smoothen the irregularities created by the tectonic forces.

2. Orogenesis and Orogeny
Ans: The processes involved in the creation of mountains are called orogenesis, which means the birth of mountains. Orogeny is defined as the period of mountain building.

3. Mountains and Plateaus
Ans: Landmasses which rise more than 900 m above the mean sea level are called the mountains. About half of the surface of the mountains should have steep slopes.
A plateau is a highland with a steep slope and a large summit area. It rises abruptly from the surrounding region and its surface can be plain, rolling or hilly.

4. Alluvial plains and Loess plains
Ans: Alluvial plains are formed by the alluvial deposits brought down by the rivers. The Gangetic Plains in India, the Huang Ho Plain in China and the Po Valley in Italy are examples of alluvial plains.
The loess plains are formed by the depositional work of the wind. A typical example is the plains of north-western China.

E. Answer the following questions briefly.

1. Give two main features of mountains.
Ans:

- Landmasses which rise more than 900 m above the mean sea level are called the mountains.
- About half of the surface of the mountains should have steep slopes.

2. Give two main features of plateaus.

Ans:

- Plateaus are the oldest landforms occupying a large portion of the Earth's surface.
- A plateau is a highland with a steep slope and a large summit area that rises abruptly from the surrounding region. Its surface can be plain, rolling or hilly.

3. Give two main uses of plains.

Ans:

- The plain areas generally have a longer growing season, which helps to grow more than one crop in a year, particularly in the tropical climate.
- It is easier to construct roads, railways, canals and airports in the plain areas.

4. Give at least two characteristics of fold mountains.

Ans:

- Most of the prominent mountain ranges in the world such as the Himalayas, the Rockies and the Andes are fold mountains.
- The fold mountains are formed by the horizontal compressional forces that crumple the crust of the Earth into arches and troughs.

5. How are volcanic plateaus formed?

Ans: The volcanic plateaus are formed by the work of the fissure flows. It is difficult to locate the fissure from which the lava flow has actually occurred. The total thickness and the area covered by the lava is extensive.

F. Answer the following questions.

1. What is the significance of mountains for human beings?

Ans: The mountains are very useful to man in the following ways:

- They act as an effective barrier against the cold and the hot winds.
- They influence the condensation of moisture by forcing the winds to rise and reach their dew point.
- Rivers originating from the mountains provide water even during the dry periods.
- The mountain slopes provide rich pastures and valuable forests. The forests provide wood for fuel, building material and paper.
- The rugged slopes provide sites for the development of hydroelectric and multi-purpose projects.
- The mountains serve as tourist and health resorts due to cool climate in summers.
- Some mountains have rich reserves of minerals.
- Mountain passes can be used for developing roadways and railways.
- Mountain rocks can be used as building material.

2. How are the block mountains formed?

Ans: The block mountains are formed by the horizontal tensional forces, which cause faults in the Earth's crust. The faults break the crust into blocks. When these blocks are raised, the block mountains are formed. Sometimes, there are two parallel faults and the land between them stands above the surrounding area. Such block mountains have flat tops and steep slopes. A block mountain can also be formed if the crust on either side of the faults sinks downwards.

3. How are the structural plains formed?
Ans: Plains are the lowlands, where the slope of the land is gradual, but never abrupt. The plain areas can be flat, moderately rolling or even hilly. The plains are seldom alike and their height above the sea level varies.
Most of the structural plains have been formed due to the upliftment of the submerged landmasses. The coastal plains which are structural plains are also formed by the uplift of a part of the sea floor bordering a continent. The coastal plain becomes broader towards the sea due to the deposition of materials brought by the sea waves. Offshore beaches formed in this manner are found all over the world.

4. Write a short note on the intermontane plateau.
Ans: The intermontane plateaus are the highest, largest and the most complex in the world. They are partly or completely enclosed by the mountains. Most of them have been formed along with the mountain ranges which enclose them. The Tibetan Plateau in Asia, called the 'Roof of the World' is the largest and the highest intermontane plateau in the world.

5. What is the importance of plateaus for human beings?

Ans: The importance of plateaus for human beings:

- Due to higher elevation, the temperature is low and the growing season is short in plateaus, thus farming is not an important economic activity on plateaus.
- The streams coming from the surrounding mountains dissect the flat and rolling surface of the plateaus into deep canyons.
- The grasslands in the plateau regions are extensively used for livestock rearing. Crop farming is possible, if water is available for irrigation in the plateau region.
- The plateau regions are rich in mineral resources and thus, mining is the chief occupation.

G. On the outline maps of the world, mark and name the following.

1. Mountains: Himalayas, Andes, Rockies, Salt range, Vosges, Kilimanjaro.

2. Plateaus: Deccan Plateau of India, Bolivian Plateau, Tibetan plateau, Tarim basin, Columbia plateau.

3. Plains: Loess plain, Prairie plains, Kashmir valley, Canadian plains, Indo-gangetic plains.

Ans: MAP WORK

H. Project.
Prepare a report on the origin, formation and significance of Himalaya Mountains in Asia.
Ans: To do in assignment copy.

6. Rocks

A. Fill in the blanks.

1. Minerals are solid **inorganic** substances.

2. The science of rock study is called **Petrology**.

3. Rocks do not have a **definite** chemical **composition.**

4. An element is found in the **molten** form in the Earth's interior.

5. Rock cycle has neither a **beginning** nor an **end**.

B. Give reasons for each of the following.

1. Igneous rocks are also called primary rocks.

Ans. At the time of its birth, the Earth was in the molten state. On cooling and solidification, the outer crust of the Earth was formed. Thus, the igneous rocks were the first to be formed and are known as the primary rocks.

2. Minerals are more useful than rocks.

Ans. Minerals are a combination of elements which occur naturally in rocks. These are solid inorganic substances which have a definite chemical composition. Minerals are useful for plant and animal life on the Earth. A mixture of two or three minerals can form rocks.

3. Igneous rocks are also called parent rocks.

Ans. At the time of its birth, the Earth was in the molten state. On cooling and solidification, the outer crust of the Earth was formed. Thus, the igneous rocks were the first to be formed and are known as the primary rocks. The other types of rocks were formed, directly or indirectly, from the igneous rocks. Thus these rocks are also known as the parent rocks.

4. The intrusive igneous rocks have large crystals.

Ans. When the rising magma during the volcanic activity is not able to reach the surface of the Earth and gets cooled and solidified below the surface of the Earth, the rocks thus formed are called intrusive igneous rocks. The rate of cooling is slow inside the Earth. Thus, the rocks formed are coarse textured, hard and have large crystals.

C. Distinguish between the following.

1. Rocks and Minerals

Rocks	**Minerals**
The hard materials of the crust are called rocks.	Minerals are a combination of elements which occur naturally in rocks.
Rocks do not possess a definite chemical composition.	These are solid inorganic substances which have a definite chemical composition.

2. Magma and Lava

Magma	**Lava**
Hot and molten material found below the Earth's surface is called magma.	Hot and molten material found on the Earth's surface is called lava.

3. Sill and Dyke

Sill	**Dyke**
Sills are usually parallel to the bedding planes of sedimentary rocks. These are formed due to the intrusion and solidification of magma between these bedding planes.	Dykes represent wall-like formation of solidified magma. These are mostly perpendicular to the beds of sedimentary rocks.

4. Batholith and Laccolith

Batholith	**Laccolith**
Batholiths are long irregular and undulating forms of solidified magma. They are usually dome shaped and their side walls are very steep. They form the core of mountain ranges. The batholiths can be exposed on the surface due to intense weathering and erosional work.	Laccoliths are formed due to the intrusion of magma along the bedding planes. The magma cools and solidifies just below the crust of the Earth. The upper surface of the laccoliths are dome shaped while the bottom is mostly flat. These can be several kilometres in diameter and thousands of metres thick.

5. Acidic and Basic igneous rocks

Acidic Igneous Rocks	**Basic Igneous Rocks**
The acidic igneous rocks have more silica (granite).	The basic igneous rocks have lower amount of silica (gabbro).

6. Thermal and Dynamic metamorphism

Thermal Metamorphism	**Dynamic Metamorphism**
In the case of thermal metamorphism, the parent rocks are changed under the influence of high temperatures prevailing in the Earth's crust. For example: Limestone is converted into marble; sandstone into quartzite; shale into slate and coal into graphite.	In the case of dynamic metamorphism, the original rocks are changed under the influence of pressure at great depths inside the Earth's crust. For example: granite is converted into gneiss and shale into schist.

D. Answers the following questions very briefly.

1. Name the three main types of rocks.

Answer: The three main types of rocks are Igneous Rocks, Metamorphic Rocks and Sedimentary Rocks.

2. What do we get when coal and limestone are metamorphosed?

Answer: When metamorphosed, coal turns into graphite and limestone turns into marble.

3. What are the two main sources of energy for the working of a rock cycle?

Answer: The two main sources of energy for the working of a rock cycle are:

a. The heat inside the Earth, which can melt the existing rocks, and

b. The solar energy responsible for weathering and erosion, and finally converting the rocks into sedimentary rocks.

4. Name the various types of moraines.
Answer: Moraines are of four types - lateral, medial, ground and terminal moraines.

E. Classify the following into igneous, sedimentary and metamorphic rocks.

1. Granite - Igneous

2. Basalt - Igneous

3. Coal - Sedimentary

4. Marble – Metamorphic

5. Graphite – Metamorphic

6. Gneiss – Metamorphic

8. Dolerite - Igneous

7. Sandstone - Sedimentary

9. Limestone - Sedimentary

10. Schist – Metamorphic

11. Slate – Metamorphic

12. Pumice – Igneous

F. Answer the following questions briefly.

1. How are sedimentary rocks formed?
Answer: The processes of weathering and erosion constantly break the igneous and other rocks into fragments of all shapes and sizes. These agents provide the raw materials needed to form the sedimentary rocks. The broken rock material is carried away by running water, glaciers, wind, sea waves, etc. and deposited in water bodies or in the depressions. The deposited materials are called sediments. The sediments are generally deposited in horizontal layers or strata thereby making sedimentary rocks.

2. Give two main features of the igneous rocks.
Answer: Two main characteristics of igneous rocks are:

a. The igneous rocks are hard and compact.
b. These rocks are generally granular and crystalline.

3. Give two main characteristics of metamorphic rocks.
Answer: Two main characteristics of metamorphic rocks are:

a. Most of the metamorphic rocks are impermeable or non-porous.
b. These rocks are associated with valuable minerals, such as gold and silver.

4. Distinguish between chemically and organically formed sedimentary rocks.

Answer: The difference between chemically formed and organically formed sedimentary rocks is as follows:

Chemically Formed Sedimentary Rocks	Organically Formed Sedimentary Rocks
The running water contains chemical materials in suspension. When this chemically active water comes in contact	The organic sediments are derived from the disintegration or decomposition of plants and animals. They contain large quantities of lime.

with rocks, it is able to remove the soluble materials from the rocks. These chemical materials after settling down are compacted and cemented to form rocks. The deposition generally takes place in lakes and lagoons. The water evaporates and the rocks are compacted. The main examples are gypsum, rock salt, dolomite, etc.	These materials after being settled down, compacted and cemented to form organic sedimentary rocks. The main examples are limestone, corals, chalk, etc. On the basis of transporting agents such as running water, wind, glaciers, ocean currents, sea waves, etc. the sedimentary rocks are of three types: Argillaceous, Aeolian, and Glacial Sedimentary Rocks.

G. Explain the following terms.

1. Element: The smallest component of the Earth's crust or lithosphere is element.

2. Bedding plane: It is the surface separating successive layers of a stratified rock from the preceding layer.

3. Clastic rocks: The pre-existing rocks break down due to weathering and erosion into fragments. These materials are transported and deposited at suitable places by different agents like running water (rivers), wind, glacier and sea waves. In this process the lower layers come under the pressure of the upper layers. Thus, these mechanically formed rocks are also called clastic rocks.

4. Lithification: The process of cementation, compaction and hardening of the transported loose sediments into hard sedimentary rocks is called lithification.

5. Stratigraphy: It is that branch of geology that deals with the study of rock layer, layering, order and relative position of strata and their relationship to the geological timescale.

6. Aqueous rocks: The rocks formed in water bodies with dominance of clay in their composition are called aqueous rocks.

H. Answer the following.

1. Describe the working of a rock cycle.

Answer: At the Earth's surface, the igneous or primary rocks are exposed to various agents of weathering and erosion. The broken rocks are transported and deposited in the basins or depressions. Here, the sediments are compressed and cemented to form the sedimentary rocks. The leftover igneous rocks and the newly formed sedimentary rocks can possibly change into metamorphic rocks due to heat and pressure in course of time. The formation of sedimentary rocks on the surface of the Earth and their conversion into the metamorphic rocks takes place within the crust of the earth. The sedimentary rocks may be buried again and may melt to form the igneous rocks.

2. How are rocks and minerals useful for human beings?

Answer: Rocks and minerals are extremely useful for human beings as most of their economic activities are dependent on them. The main benefits are as under:

a. The characteristics of rocks influence the relief and drainage of the area.
b. Rocks and stones were widely used in the making of tools and implements.
c. Rocks provide us building stones which are used in the construction of houses, roads, dams, etc.
d. Potash, nitrates, phosphates, etc. are widely used in the manufacturing of chemical fertilizers.
e. Silica and clay are used in the making of glass and pottery.

f. Metals and chemicals in the rocks form the basis of the development of modern industries.
g. Coal, petroleum and natural gas are important sources of power and energy.
h. Soil is the main product of rocks. All agricultural activities depend upon the quality and fertility of soils.
i. In the past, minerals helped in the growth of civilizations and thus, the periods of history have been named as Stone age, Bronze age, Iron age, etc.
j. Precious metals, such as gold, silver, platinum, etc. and a variety of gemstones are found only in rocks.

3. What are the main characteristics of sedimentary rocks?

Answer: The main characteristics of sedimentary rocks are as follows:

a. The sedimentary rocks are comparatively softer than the igneous rocks.
b. These rocks have layers horizontally arranged one above the other.
c. The raw material for the sedimentary rocks is derived from the older rocks, plants and animal remains. Thus, these rocks have fossils of plants and animals between the layers.
d. The sedimentary rocks are found over the largest surface area (about 75 per cent) of the earth.
e. These rocks have been mostly formed under water and therefore have mud cracks or marks of ripples and waves.
f. The composition of the sedimentary rocks depends upon the nature of cementing elements and rock forming minerals.
g. Most of the sedimentary rocks are permeable and porous.
h. The sedimentary rocks are not crystalline and are not found in massive forms such batholiths, laccoliths, etc.

4. How are metamorphic rocks formed?

Answer: The rocks originating at or near the Earth's surface are sometimes subjected to tremendous heat and pressure. This can change the original characteristics of rocks, such as their colour, hardness, texture and mineral composition. This change results in the formation of metamorphic rocks. The word metamorphic means the changed form. Both igneous and sedimentary rocks can change into the metamorphic rocks.

7. Volcanoes

A. Fill in the blanks.

1. The term volcano has probably been derived from **Vulcan – the Roman God of fire**.

2. The scientists who study about volcanoes are called **volcanologists**.

3. The vent of a volcano is connected to the interior of the Earth by a **pipe**.

4. Mt Vesuvius is the example of a **sleeping** volcano.

5. The temperature inside the Earth increases at the rate of 1 °C for every **32 metres** of depth.

B. Distinguish between the following.

1. Dormant and Extinct volcanoes

Dormant Volcanoes	**Extinct Volcanoes**
The volcanoes which have become quiet after eruption and do not show any indication of future eruption are called Dormant Volcanoes. These are also called the sleeping volcanoes.	The volcanoes which have not erupted for thousands of years are called Extinct Volcanoes. It may be pointed out that no volcano can be declared permanently dead, as we do not know what is exactly happening below the ground surface.

2. Crater and Caldera

Crater	**Caldera**
Craters are depressions formed at the mouth of the volcanic vent, which is usually funnel-shaped. It differs from caldera with regard to size and mode of formation.	Caldera is an enlarged form of a crater. It is surrounded by steep walls and is formed usually due to the subsidence of the crater.

3. Batholiths and Laccoliths

Batholiths	**Laccoliths**
Batholiths are long, irregular, undulating and dome-shaped features. Their side walls are very steep, almost vertical. They are buried deep within the Earth.	Laccoliths are formed due to the intrusion of magma along the bedding planes of horizontal sedimentary rocks. They are usually mushroom or dome shaped.

4. Vent and Pipe

Vent	**Pipe**
The vent is an opening of circular or nearly circular shape at the centre of the cone.	The vent is connected to the interior of the Earth by a narrow pipe. The volcanic materials erupt through this pipe

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C. Answer the following questions very briefly.

1. What is endogenetic mechanism?
Answer: It is that component of the volcanism which operates below the Earth's crust. The endogenetic mechanism includes the creation of hot and liquid magma and gases in the mantle and the crust, their expansion and upward ascent, their intrusion and cooling and solidification in various forms below the crustal surface. They form batholiths, laccoliths, sills, dykes, phacoliths, etc.

2. What is a volcano?
Answer: A volcano is a vent or an opening, usually circular or nearly circular in form, through which heated materials consisting of water, gases, liquid lava and rock fragments are erupted from the highly heated interior to the surface of the Earth.

3. Name some intrusive features of volcanic landform.
Answer: Some intrusive features of volcanic landform are batholiths, laccoliths, phacoliths, lopoliths, sills, dykes, etc.

4. Give one example each for active, dormant and extinct volcanoes.
Answer: The examples of active, dormant and extinct volcanoes are as follows:

- Active Volcano – Etna
- Dormant Volcano – Mt Vesuvius
- Extinct Volcano – Ben Navis

5. What is Ring of Fire?
Answer: The Circum-Pacific Belt includes the volcanoes of the eastern and western coastal areas of the Pacific Ocean. This belt is also known as the Ring of Fire of the Pacific Ocean.

D. Name the continents in which the following volcanoes are located.

1. Kilimanjaro – Africa

2. Krakatoa – Asia

3. Rainier – North America

4. Popocatepetl – North America

5. Aconcagua – South America

6. Cotopaxi – South America

7. Etna – Europe

8. Pelee – South America

9. Fujiyama – Asia

10. Vesuvius – Europe

11. Stromboli – Europe

12. Mt St Helena – North America

E. Answer the following questions briefly.

1. Explain the process of exogenetic mechanism.
Answer: The exogenetic mechanism includes the process of appearance of magma as lava, volcanic dust and ashes, fragmental materials, mud, smoke, etc. in different forms such as fissure flows or violent volcanic eruptions, hot springs, geysers, fumaroles, etc.

2. Name the extrusive features of volcanic landforms.
Answer: The extrusive features of volcanic landforms are cinder or ash cones, composite cones, basic-lava cones, acid-lava cones, lava domes, lava plugs, craters, calderas, etc.

3. Name any three processes associated with volcanic activity.
Answer: The three processes associated with volcanic activity are as follows:

1. A gradual increase of temperature with increasing depth at the rate of 1 °C for every 32 metres.
2. Magma is formed due to the lowering of melting point, which in turn is caused by the reduction in pressure of the overlying material.
3. Gases and vapour are formed due to heating of water, which reaches underground through percolation.

4. What is acid rain?
Answer: The rain that happens after a volcanic eruption and consists of fragmented materials, dust, ash, smoke, etc. is called acid rain. It is poisonous and hazardous.

5. Describe any three constructive effects of volcanic eruptions.
Answer: Three constructive effects of volcanic eruptions are as follows:

1. Lava can give rise to fertile soils. Most of the precious stones are formed due to volcanic activity.
2. Geysers and springs are tourist attractions and are also important from the medical point of view due to the chemicals dissolved in them.
3. Most of the volcanic rocks when exposed on the surface are a storehouse of metals and minerals.

F. Answer the following questions.

1. Describe the main components of a volcano.
Answer: The main components of a volcano are as follows:

1. The volcano of explosive type has a volcanic cone, which is formed when the erupted material accumulates around the vent.
2. The vent is an opening of circular or nearly circular shape at the centre of the cone.
3. The vent is connected to the interior of the Earth by a narrow pipe. The volcanic materials erupt through this pipe.
4. A funnel-shaped hollow at the top of the cone is called the crater.

2. What are the main causes of volcanic activity?

Answer: The main causes of volcanic activity are as follows:

1. A gradual increase of temperature with increasing depth at the rate of 1° C for every 32 metres.
2. Magma is formed due to the lowering of melting point, which in turn is caused by the reduction in pressure of the overlying material.
3. Gases and vapour are formed due to heating of water, which reaches underground through percolation.
4. The ascent of magma forced by vast volume of gases and water vapour.

3. Explain the formation of cinder and composite cones.

Answer: Cinder or ash cones are formed due to the accumulation of loose particles around the vent. Its size increases due to the continuous accumulation of volcanic material minus lava. The larger particles are arranged near the crater and the finer particles are deposited at the outer margins of the cone.

4. Describe the destructive effects of volcanic eruption.

Answer: The destructive effects of volcanic eruption are as follows:

1. The hot lava ejected from the volcano moves at a fast speed. This can bury man-made infrastructure, kill human beings and animals, destroy agricultural farms and pastures, plug rivers and lakes, burn and destroy forests.
2. The fall out of large quantities of fragmented materials, dust, ash, smoke, etc. creates health hazards due to poisonous gases emitted during eruption. It also causes acid rain.
3. Heavy rains mixed with volcanic dust and ash cause mud-flow on the steep slopes of the cones.
4. Earthquakes caused due to explosive eruptions can generate destructive tsunamis, seismic waves, etc. These can cause loss of life and property in the affected coastal regions.
5. The volcanic eruptions can change the heat balance of the Earth and the atmosphere, causing global warming.
6. Some scientists believe that the fall of volcanic materials caused the mass extinction of a few animal species. They believed that the mass extinction of dinosaurs about 65 million years ago is related to the increased worldwide volcanic activity.

5. Describe the Circum-Pacific belt of volcanoes.

Answer: The Circum-Pacific Belt includes the volcanoes of the eastern and western coastal areas of the Pacific Ocean. This belt is also known as the Ring of Fire of the Pacific Ocean. It begins from Antarctica and runs northwards through Andes of South America and Rockies of North America to reach Alaska. From there, it turns eastwards along the coast of Asia to include the volcanoes of Sakhalin, Kamchatka, Japan and Philippines. This belt finally merges with the Mid-continental Belt in Indonesia. Most of the high volcanic cones and volcanic mountains are found in the Circum-Pacific Belt.

8. EARTHQUAKES

A. Fill in the blanks.

1. Most of the earthquakes are caused by **Tectonic** forces.

2. The intensity of an earthquake is maximum near the **Epicentre.**

3. The Push waves travel at a speed of about **6 km per second.**

4. The intensity of an earthquake is measured on the **Richter Scale.**

5. Most of the damages during an earthquake are done by the **Surface** waves.

B. Explain the following terms.

1. Seismic waves: The waves generated by an earthquake are called the seismic waves. These are recorded by an instrument called the **seismograph.**

2. Richter Scale: The magnitude or intensity of an earthquake is measured on the Richter Scale. The number indicating the magnitude or intensity on a Richter Scale ranges between 0 and 9.

3. Primary waves: Primary Waves (P) also called Push Waves are the fastest and travel at a speed of about 6 km per second. These waves are the first to arrive. These waves are identical to sound waves. They can pass through liquid and gas. These waves can cause small displacements by pushing and pulling the rocks.

4. Tsunami: Tsunamis are large seismic waves that are generated when the sea floor is deformed by seismic activity, vertically displacing the overlying water in the ocean. A tsunami can be 10 to 20 m high when it hits the shore. A tsunami is a series of waves that come ashore at intervals of 10 to 45 minutes. It can cause great loss to life and property, especially in the coastal areas.

5. Tectonic forces: Forces caused due to sudden movements in the Earth's crust that results in the shaking of the earth are called tectonic forces.

6. Seismograph: It is an instrument that records the waves generated by an earthquake, seismic waves.

C. Answer the following questions very briefly.

1. How do the earthquake waves travel from the place of origin?
Ans: The earthquake waves originate from the focus, the place of its origin and radiate in all directions in concentric circles. These waves or vibrations spread out in every possible direction. The intensity of vibrations is maximum near the epicentre.

2. Which part of India is associated with frequent earthquakes?
Ans: The Himalayan region in India is associated with frequent earthquakes.

3. Which scale is used in USA for measuring the intensity of an earthquake?
Ans: The intensity scale commonly used in the United States (Mercalli Scale) is the one named after an Italian volcanologist **Giuseppe Mercalli**. The values on this scale are given from I to XII in Roman numerals.

4. Which type of plates experience moderate earthquakes?
Ans: Divergent plates experience moderate earthquakes.

5. What is the meaning of tsunami in Japanese language?

Ans: Tsunami is a Japanese word which means 'harbour wave'.

D. Give one word for each of the following.

1. The point vertically above focus on Earth's surface.

Ans: Epicentre

2. Name the waves generated by an earthquake.

Ans: Seismic waves

3. The science which deals with earthquake waves.
Ans: Seismology

4. The earthquake waves which are last to arrive.

Ans: Surface waves

5. The forces which originate from below the Earth's surface.
Ans: Tectonic forces

E. Give reasons for each of the following.

1. The Richter Scale does not have any upper limit.
Ans: The Richter Scale is an open ended logarithmic scale and thus has no upper limit or number. The vibrations of an earthquake with a magnitude of 2 are 10 times greater in amplitude than those of an earthquake with a magnitude of 1, and the vibrations of an earthquake with a magnitude of 8 are one million times greater in amplitude than those of an earthquake with a magnitude of 2 on a Richter Scale. This is the reason the scale does not have any upper limit.

2. Moderate earthquakes are caused near divergent plate boundaries.
Ans: Normally, moderate earthquakes are caused along the divergent plate boundaries, because the rate of movement of plates away from the mid-oceanic ridges is rather slow. Thus, shallow focus (about 30 km deep) earthquakes are caused along the mid-oceanic ridges.

3. Most of the earthquakes are linked with fold mountains.
Ans: Fold mountains are formed when two tectonic plates move together. The movement of two plates forces sedimentary rocks upwards into a series of folds. Folding and faulting take place due to the horizontal and vertical movements in the Earth's crust. These movements cause imbalance in the crustal rocks which results in earthquakes of varying magnitude.

4. The Circum-Pacific belt has more frequent earthquakes.
Ans: The Circum-Pacific belt includes the coastal margins of North America, South America and East Asia. These areas represent the eastern and western margins of the Pacific Ocean respectively and account for about 65 per cent of the total earthquakes of the world.

Earthquakes of a higher magnitude and a deeper focus (up to 700 km deep) are caused along the convergent plate boundaries. This is due to the collision and subduction of heavy oceanic plate beneath the lighter continental plate in the asthenosphere. This process explains the occurrence of frequent earthquakes along the Circum-Pacific belt.

5. The Deccan Plateau of India has experienced less earthquakes.

Ans: The Deccan Plateau is located in the least seismic active zone in India. So there will be less movement of plates, causing less earthquakes.

F. Answer the following questions briefly.

1. What are the main features of Primary waves?
Ans: Primary waves or **Push Waves** are the fastest and travel at a speed of about 6 km per second. These waves are the first to arrive. These waves are identical to sound waves. They can pass through liquid and gas. These waves can cause small displacements by pushing and pulling the rocks.

2. Which human activities can cause earthquakes?
Ans: Certain human activities such as pumping of ground water and oil, deep underground mining, blasting of rocks by dynamites (for the construction of dams, reservoirs, roads), nuclear explosion, water storage in big reservoirs, etc. can cause tremors of serious earthquakes.

3. Mention any two constructive effects of earthquakes.

Ans: Constructive effects of earthquakes are:

- Over a period of time, a large amount of energy is stored up in the Earth. This stored up energy is released along the plate boundaries by the earthquake. This activity helps the Earth in keeping itself in proper shape.

- The landslides caused by an earthquake can form depressions, which are formed as lakes. There are many such lakes in the Himalaya mountains.

4. Name the main earthquake belts in the world.

Ans: Main earthquake belts in the world are:

- **Circum-Pacific Belt** includes the coastal margins of North America, South America and East Asia.
- **Mid-Continental Belt** includes the Alpine mountains and their offshoots in Europe, Mediterranean Sea, northern Africa, eastern Africa and the Himalayas.
- **Mid-Atlantic Ridge Belt** includes the Mid-Atlantic ridge and several islands near the ridge.

5. What are the factors on which the intensity of earthquake depend?

Ans: The intensity of an earthquake at a specific location depends on the following factors:

- The total amount of energy released
- The distance from the epicentre
- The type of rocks

G. Answer the following questions.

1. What is the role of plate tectonics in the occurrence of the earthquakes?

Ans: All tectonic activities, such as seismic events, vulcanicity, mountain building, faulting, etc. occur along the tectonic plate margins. The Earth's crust has 6 major plates and 20 minor plates, which are floating independently on asthenosphere. The tectonic events are taking place along the boundaries of these moving plates. Major tectonic events associated with these plate boundaries are folding and faulting.

Normally, moderate earthquakes are caused along the divergent plate boundaries, because the rate of movement of plates away from the mid-oceanic ridges is rather slow. Thus, shallow focus (about 30 km deep) earthquakes are caused along the mid-oceanic ridges.

Earthquakes of a higher magnitude and a deeper focus (up to 700 km deep) are caused along the convergent plate boundaries. This is due to the collision and subduction of heavy oceanic plate beneath the lighter continental plate in the asthenosphere. This process explains the occurrence of frequent earthquakes along the Circum-Pacific and the Mid-Continental earthquake belts.

2. Explain any three destructive effects of the earthquakes.

Ans: Three destructive effects of the earthquakes are:

- **Deformed ground surface:** The earthquake tremors result in the deformation of the ground surface, due to the rise and subsidence of the ground surface and faulting activity. The alluvium filled areas of the flood plains may get fractured at several places.

- **Damage to man-made structures:** Man-made structures such as buildings, roads, rails, factories, dams, bridges, etc. get severely damaged.

- **Damage to towns and cities:** The towns and cities are the worst affected due to high density of buildings and population. Under the impact of tremors, large buildings collapse and men and women get buried under the debris. Groundwater pipes are damaged and thus water supply is totally disrupted. Electric poles and telephone wires are damaged. The collapse of the sewer system causes epidemics.

3. Compare the characteristics of Primary and Secondary Seismic waves.
Ans: Primary Waves (P) or Push Waves are the fastest and travel at a speed of about 6 km per second. These waves are the first to arrive. These waves are identical to sound waves. They can pass through liquid and gas. These waves can cause small displacements by pushing and pulling the rocks, similar to a shunting train.

Secondary Waves (S) or Shake Waves are the next to arrive. Their rate of movement is less than that of the primary waves. The vibrations caused by these waves are at right angles to the direction of their movement. These waves move at right angles to the primary waves. The secondary waves cannot pass through liquids.

4. Explain any three constructive effects of the earthquakes.

Ans: The constructive effects of earthquakes:

- The landslides caused by an earthquake can form depressions, which are formed as lakes. There are many such lakes in the Himalaya mountains.
- The coastal areas can possibly be uplifted or subsided by an earthquake. This may lead to the formation of new landforms.
- The earthquake waves are the main source of collecting data about the structure and interior of the Earth.

5. Describe the Mid-continental earthquake belt in the world.
Ans: Mid-Continental Belt includes the Alpine mountains and their offshoots in Europe, Mediterranean Sea, northern Africa, eastern Africa and the Himalayas.

The Mid-Continental Belt extends through Sulaiman and Kirthar zones in the west, the Himalayas in the north and Myanmar in the east. This belt also represents the weaker zone of fold mountains. About 21 per cent of the total seismic events are recorded in this belt.

The Himalayan region is a zone of maximum intensity and it is gradually rising at the rate of 5 cm per year. This causes earthquakes in India, Tibet and Nepal.

H. On the given outline map of the world, mark and name the earthquake belts.

Ans: Map Work

CHAPTER-9 WEATHERING

A. Fill in the blanks.

1. The landforms on the Earth's surface are created by the **tectonic** forces.

2. The main source of energy for the exogenic forces is **the Sun.**

3. The exogenic processes can be divided in **aggradation** and gradation.

4. The rocks are generally **bad** conductors of heat.

5. The chemical union of water with a mineral is called **hydration**.

B. Distinguish between the following.

1. Disintegration and Decomposition
Ans: The disintegration of rocks does not change the chemical composition of rocks. It is a mechanical process. It is caused by changes in temperature, plants and animals. The decay or decomposition of rocks is a chemical process. It is caused in the presence of high temperature and abundant moisture. The combination of oxygen, carbon dioxide and water with minerals in the rocks often leads to chemical changes and decomposition in the rocks.

2. Hydration and Solution
Ans: The chemical union of water with a mineral is called hydration. Solution is the first step in the chemical decomposition and disintegration of rocks. Some minerals in the rocks get dissolved in water and are removed in solution.

3. Weathering and Erosion
Ans: The process which involves loosening, disintegration and decomposition of rocks at or near the Earth's surface are called weathering. The process of weathering involves no motion and thus, it is a static process. Weathering is followed by the process of erosion, in which the weathered rock material is picked up and transported to different places.

4. Mechanical and Chemical weathering
Ans: The mechanical weathering is responsible for the disintegration of rocks without changing their chemical composition. It is caused by changes in temperature, plants and animals. The processes which cause rocks to decay or decompose are known as chemical weathering. The process of chemical weathering is promoted by high temperature and abundant moisture.

C. Answer the following questions very briefly.

1. How are the various landforms formed on the surface of the Earth?
Ans: The tectonic forces working in the interior of the Earth tend to cause differences in surface elevations. Continuous removal and transfer of disintegrated and decomposed rocks through landslides, rockfall, rock slides, etc. can cause lowering of the height of the affected areas and also help in the evolution and formation of various landforms on the surface of the Earth.

2. What are the different processes of weathering?
Ans: Different processes of weathering include loosening, disintegration and decomposition of rocks at or near the Earth's surface. A large number of factors and agents, such as heating, cooling, freezing, thawing, plants, animals, chemical action, etc. help the process of weathering.

3. What are the agents which help in mechanical weathering?
Ans: Agents which help in mechanical weathering are changes in temperature, plants and animals.

4. When can rainwater be an effective agent of weathering?
Ans: Rainwater when mixed with carbon dioxide in the atmosphere, becomes a light carbonic acid. It acts on chalk, limestone, marble and gypsum. In the process, the carbonates are converted into bicarbonates, which are easily soluble in water and thus becomes an effective agent of weathering.

5. Name the processes involved in chemical weathering.
Ans: The combination of oxygen, carbon dioxide and water with minerals in the rocks often leads to chemical changes and decomposition in the rocks. The work of chemical weathering is carried out through solution, oxidation, carbonation and hydration.

D. Give reasons for each of the following.

1. The processes of weathering are interconnected.
Ans: The mechanical weathering is responsible for the disintegration of rocks without changing their chemical composition. It is caused by changes in temperature, plants and animals.
The processes which cause rocks to decay or decompose are known as chemical weathering. The process of chemical weathering is promoted by high temperature and abundant moisture. The biological weathering involves both physical disintegration and chemical decomposition of rocks. Thus, all the three types of weathering are interconnected.

2. The changes in temperature cause weathering of rocks.
Ans: In the arid regions, the difference between the day and night temperatures is very high. During the daytime, the bare rocks are heated and their outer layers expand. At night, the rocks contract due to fall in temperature. The amount of expansion and contraction of the rocks is not the same. This leads to the development of cracks on the surface of rocks. Over a period of time, the rocks split up into blocks. Thus, changes in temperature cause weathering of rocks.

3. Chemical changes can occur in some rocks.
Ans: The combination of oxygen, carbon dioxide and water with minerals in the rocks often leads to chemical changes and decomposition in the rocks. Some rocks such as rock salt, limestone and gypsum are easily soluble in water. Minerals of some rocks, such as iron, react with oxygen in the presence of moisture and such chemical changes cause the rusting of iron, which leads to decay and decomposition. Chalk, limestone, marble and gypsum

react with carbonic acid. In the process, the carbonates are converted into bicarbonates, which are easily soluble in water. So chemical changes occur in some of the rocks and cause chemical weathering.

4. Human beings are responsible for weathering of rocks.
Ans: Human beings have become the most powerful agent of weathering and erosion. Mining activities for extraction of minerals, blasting of hills and ridges by dynamites for road and dam construction and mineral extraction, quarrying for industrial and building raw materials, etc. result in the disintegration of rocks. Human beings also increase the rate of weathering on hill slopes by modifying the ground surface through deforestation. This can cause mass movement of broken rock materials down the slope in the form of slides, landslides or debris fall.

5. Plants can cause weathering and consolidation of rocks.
Ans: The roots of the plants penetrate through the cracks made originally by physical disintegration of rocks. These roots, while moving downwards, are able to widen the cracks and finally the rocks split apart. Thus, plants help in weathering of rocks. Plants also help in consolidation of rocks. The plants can also prevent disintegration of rocks by binding the surface layers of rocks.

E. Answer the following questions briefly.

1. Mention the factors on which weathering depends.
Ans: The work of weathering depends mainly on the following factors:

- The type of rocks
- The climatic conditions
- The type of vegetation cover
- The slope of land
- The exposure to Sun, wind and rain.

2. What is exfoliation and how does it occur?
Ans: The rock masses are generally poor conductors of heat. The outer layers expand more than the inner layers. This can completely loosen the outer rock layers. In due course of time, the outer loose layer may peel off from the main rock mass in the form of thin shells. This type of weathering is called exfoliation.

3. How do plants cause weathering and consolidation of rocks?
Ans: Plants cause both weathering as well as consolidation of rocks. The roots of the plants penetrate through the cracks made originally by physical disintegration of rocks. These roots, while moving downwards, are able to widen the cracks and finally the rocks split apart. The plants can also prevent disintegration of rocks by binding the surface layers of rocks.

4. How is biological weathering caused by human beings?
Ans: The biological weathering or organic weathering involves both physical disintegration and chemical decomposition of rocks. It is carried out through plants, animals and human beings. Human activities such as mining for extraction of minerals, blasting of hills and ridges by dynamites for road and dam construction and mineral extraction, quarrying for industrial and building raw materials, etc. result in the disintegration of rocks. Human beings also increase the rate of weathering on hill slopes by modifying the ground surface through deforestation.

5. Describe the chief characteristics of weathering.
Ans: The term weathering is used for the breaking up and decay of exposed rocks. The weathering of rocks is caused by changes in temperature, frost action, plants, animals and human activities. The process of weathering involves no motion and thus, it is a static process. The products remain where they were formed. It is generally followed by the process of erosion, in which the weathered rock material is picked up and transported. The process which involves loosening, disintegration and decomposition of rocks at or near the Earth's surface are called weathering. A large number of factors and agents, such as heating, cooling, freezing, thawing, plants, animals, chemical action, etc. help the process of weathering.

F. Write True or False against each of the following.

1. Denudation results in lowering the level of land.

2. The exogenic forces work through weathering only.

3. The Polar regions do not experience any type of weathering.

4. The process of weathering is generally followed by the process of erosion.

5. The process of weathering is dynamic in nature.

Ans: 1. True 2. False 3. False 4. True 5. False

G. Answer the following questions.

1. Describe the various processes involved in physical weathering.
Ans: Physical weathering or mechanical weathering is caused by changes in temperature, plants and animals. It is more effective in dry areas and occurs in the following ways.

1. **Block Disintegration:** In the arid regions, the difference between the day and night temperatures is very high. During the daytime, the bare rocks are heated and their outer layers expand. At night, the rocks contract due to fall in temperature. The amount of expansion and contraction of the rocks is not the same. This leads to the development of cracks on the surface of rocks. Over a period of time, the rocks split up into blocks. This is known as block disintegration.

2. **Granular Disintegration:** The rocks are composed of a variety of minerals which react to heat differently. The rocks also expand and contract at different rates. This causes

a series of joints and cracks in the outer rock layers. The rocks are broken into pieces and fragments, which have angular shapes. This is known as granular disintegration.

3. **Exfoliation:** The rock masses are generally poor conductors of heat. The outer layers expand more than the inner layers. This can completely loosen the outer rock layers. In due course of time, the outer loose layer may peel off from the main rock mass in the form of thin shells. This type of weathering is called exfoliation.

2. What is the importance of weathering?
Ans: Rocks are disintegrated and decomposed due to the work of different processes of weathering. They produce a large amount of rock waste. The weathered rock material is very useful in the process of soil formation, and can also expose mineral deposits.
Weathering can cause damage to human settlements in the foothill zones when the mass movement of rock waste come down the hill slopes. It can also obstruct the river channel and may form lakes. The rapid rate of weathering, due to deforestation in hilly areas, can cause overloading of rivers and retard their flow. This can also cause rapid rate of siltation of river beds.
Continuous removal and transfer of disintegrated and decomposed rocks through landslides, rockfall, rock slides, etc. can cause lowering of the height of the affected areas and also help in the evolution and formation of various landforms.

3. What are the effects of weathering in different climatic conditions?
Ans: The climatic conditions play an important role in different weathering processes.

- The Equatorial Regions experience hot and humid climate almost throughout the year. In such conditions, the chemical weathering is more rapid and continuous.
- The Tropical Regions have a distinct dry season and wet season. The evaporation is high and oxidation of iron and aluminium takes place. In this region weathering helps in the formation of laterite soils.
- In Desert Regions, the climate is hot and dry. In such areas mechanical weathering is common. In some semi-arid regions, some chemical weathering also takes place.
- In Temperate Regions, frost is the most powerful agent of mechanical weathering. Chemical weathering through solution is more effective in the limestone areas.
- In Polar Regions**,** the climate is very cold throughout the year. The permanent snow cover prevents the weathering of rock surface. At some places, due to frost action, mechanical weathering can occur.

4. Describe the work of different agents of biological weathering.
Ans: The biological weathering or organic weathering involves both physical disintegration and chemical decomposition of rocks. It is carried out through plants, animals and human beings.
Human Beings: Nowadays, human beings have become the most powerful agent of weathering and erosion. Mining activities for extraction of minerals, blasting of hills and ridges by dynamites for road and dam construction and mineral extraction, quarrying for industrial and building raw materials, etc. result in the disintegration of rocks. Human beings also increase the rate of weathering on hill slopes by modifying the ground surface through

deforestation. This can cause mass movement of broken rock materials down the slope in the form of slides, landslides or debris fall.

Plants: The roots of the plants penetrate through the cracks made originally by physical disintegration of rocks. These roots, while moving downwards, are able to widen the cracks and finally the rocks split apart. In the cities we can see the plants growing in the cracks of broken pavements. The plants can also prevent disintegration of rocks by binding the surface layers of rocks.

Animals and Insects: The burrowing animals such as earthworms, ants, rats, etc. help in loosening the rocks by bringing rock particles from the lower layers of the Earth crust to the surface. Now, the other agents can easily remove these rock fragments. The pounding hoofs of running animals also break the rocks. Some animals, after death, also provide acids and chemicals for the decomposition of rocks.

5. Describe the various processes involved in chemical weathering.

Ans: The work of chemical weathering is carried out through solution, oxidation, carbonation and hydration.

Solution: Solution is the first step in the chemical decomposition and disintegration of rocks. Some minerals in the rocks get dissolved in water and are removed in solution. The solubility of the minerals and rocks depends on the nature of rocks. For example, rock salt, limestone and gypsum are easily soluble in water.

Oxidation: The atmospheric oxygen in the presence of moisture enters into chemical union with minerals, especially those with iron contents. It causes the rusting of iron, which leads to decay and decomposition. The original colour of the rock is also changed into red, yellow or brown. This process of chemical weathering is called oxidation.

Carbonation: Rainwater when mixed with carbon dioxide in the atmosphere, becomes a light carbonic acid. It acts on chalk, limestone, marble and gypsum. In the process, the carbonates are converted into bicarbonates, which are easily soluble in water. This process is known as carbonation.

Hydration: The chemical union of water with a mineral is called hydration. Feldspar, a silicate of aluminium, is found in almost all the rocks. On its chemical combination with water, the feldspar increases in volume. It exerts pressure and the outer shell gets detached by the mechanical force of expansion. Whatever is left behind is kaolin, a mixture of sand and clay.

H. Project

If possible, visit a hilly region and find out how the rocks disintegrate.

Ans: Activity Work

10. Denudation

A. Fill in the blanks.

1. The processes of denudation include **weathering** and **erosion**.
2. The upper course of a river is mostly in the **mountainous regions**.
3. The highly meandering river in Uttar Pradesh is **Gomti**.
4. The effect of wind erosion on land surface is like that of a **sandpaper**.
5. The sand dunes are located **within** the desert margins.

B. Write short notes on the following.

1. Loess: When the depositional work of the wind starts, its force or velocity declines or some obstruction like trees, bushes, forests, marshes, swamps, etc. comes in the way of the wind, which results in the deposition of fine dust particles in big masses or sheets known as loess.

2. Flood Plain: An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding. An important characteristic of floodplains is that the sluggish water of the river is turned at the slightest obstruction. This can form a system of meanders.

3. Barchan: The Parabolic Sand dunes or Barchans are a special type of transverse sand dune. A barchan also migrates like an ordinary sand dune. The sand-free corridors between two ranges of barchans are used as caravan routes.

4. Ox-bow Lake: In the meanders, the beds are highly curved and arms are very close to each other. Most of the rivers in the Northern Plains of India have developed ox-bow type of meanders. In course of time, due to lateral erosion, the meandering loops become almost circular and come very close to each other. The strip of land between these two loops continues to become narrow till the river cuts through this strip and takes a straight course. Thus, the circular meander or loop is left behind completely cut off from the main channel forming an ox-bow lake. Actually the formation of an ox-bow lake is both due to erosion and deposition.

5. Rapids: The steep sloping segments of the rivers are called rapids. They are smaller than the waterfalls. A typical feature in the upper course of a river is the development or the occurrence of waterfalls and rapids.

6. River Basin: The area in which the work of the river is carried out on a large scale is called the river basin. The main river along with other tributaries together develops a river system or a river basin.

C. Give reasons for each of the following.

1. The meandering of a river is a natural process.

Answer: The meandering of river can occur in all types of terrains. It is more in regions having level surface with gentle slope. Meanders are the result of both erosional and depositional work of the rivers. Practically all the rivers in the Northern Plains of India have developed meandering courses.

2. V-shaped valley is formed mostly in the mountains.
Answer: Most of the rivers originate in the highlands. Thus, their upper courses lie generally in the mountainous regions. In the upper course, the slope of the land is steep and the velocity of the river is very high. The river carries less volume of water, but due to high velocity, it can transport large amount of materials. The main work of the river in this stage is the downward erosion or down cutting, which causes the deepening of the river valley. The exposed surface on both sides of the deep valley is affected by the agents of weathering. The broken rock materials from both sides is taken into the river, partly due to the force of gravity and partly by the rainwater flowing into the river. The upper part of the valley is widened due to the work of weathering, giving it a typical V-shape.

3. The river can deposit the sediments at any point along its course.
Answer: The water in the river deposits the material which it has transported. As the river flows down towards the sea, it goes on depositing sediments in its channel, along the banks and also in the surrounding areas. The deposition of sediments takes place regularly at the mouth of the river, on the sides of the stream channel, in the bed of the river and in front of the river mouth. The order in which the sediments are deposited are boulders, pebbles, gravels, sand, silt and clay. The deposition is not just confined to the lower course of the river, though much of it is deposited there.

4. The wind can possibly erode the rocks from all sides.
Answer: Unlike rivers and glaciers, the wind erodes the rocks from all sides due to its changing directions.

5. The wind has to deposit the transported sediments.
Answer: The depositional work of the wind starts when its force or velocity declines or some obstruction like trees, bushes, forests, marshes, swamps, etc. comes in the way of the wind.

D. Answer the following questions very briefly.
1. What are the main agents of erosion?
Answer: The main agents of erosion are running water, moving ice, wind and sea waves.

2. From where do the agents of denudation derive their energy to do work?
Answer: The agents of denudation derive their energy to do work from velocity of the agent, slope and temperature of the region, nature of particle, and quantity of matter.

3. Mention the factors on which the work of river or running water depends.
Answer: The work of the river or running water depends upon the following factors:

a. The amount of water in the river
b. The speed of the river
c. The slope of the river bed
d. The load carried by the river
e. The nature of rocks in its valley.

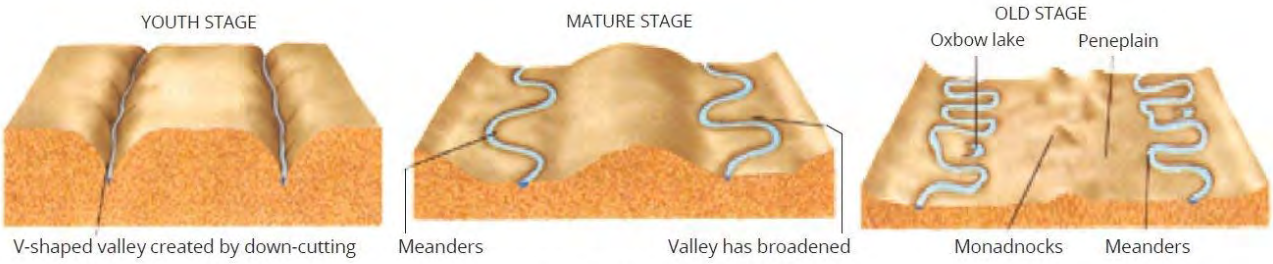
4. What are the main characteristics of the hot deserts?
Answer: The main characteristics of hot deserts are presence of sand dunes, scrub vegetation, high temperatures during the day and low temperatures during the night.

5. Name the various types of sand dunes.

Answer: The sand dunes are of three types according to their shape:

a. Longitudinal sand dunes
b. Transverse sand dunes
c. Parabolic sand dunes or Barchans

E. Explain the formation of meanders and ox-bow lakes in the middle course of a river with the help of diagrams.



The work of running water or river

F. Answer the following questions briefly.

1. Describe the formation of delta near the mouth of a river.

Answer: When a river enters a lake or a sea, it tends to deposit its load at its mouth. This leads to the formation of delta.

2. How are the waterfalls formed in the upper course of a river?

Answer: Waterfalls are caused either due to a sudden descent or abrupt break in the course of the river. It is a vertical drop of water from a great height. The waterfalls are also formed when the tributary streams join the main stream from a higher point, thus forming hanging valleys. Such waterfalls are common in the glaciated regions. The normal waterfalls in the course of a river are generally formed due to an abrupt change in the slope of the valley floor.

3. How can the flow of the river water be checked?

Answer: The flow of the river water can be checked in one of the following ways:

a. when the river leaves the hills and enters the plains, due to break in slopes,
b. when the river enters a lake or a sea,
c. when the valley floor widens and floods the surrounding regions,
d. when the river enters the arid region and the volume of water is rapidly reduced,
e. when the river enters the sea and the deposition is made around the mouth of the river,
f. when the river is overloaded, that is, much above its carrying capacity.

4. What characteristics are associated with the transportation of wind?

Answer: The characteristics that are associated with the transportation of wind are as follows:

a. The wind can transport the material on and above the ground surface.
b. The finer materials are transported to greater distance in one step, while the coarse materials are transported in stages by rolling and jumping.
c. The wind can transport materials through suspension, saltation and traction.

d. Fine particles of dust are kept in suspension by the upward moving air, and can be carried to great distances.

5. What is deflation?

Answer: The process of removing, lifting and blowing away dry and loose particles of sand and dust by the wind is called deflation.

G. Answer the following questions.

1. Describe the conditions favourable for the formation and development of a delta.

Answer: When a river enters a lake or a sea, it tends to deposit its load at its mouth. This leads to the formation of delta. The ideal conditions for the formation and growth of a delta are as under:

a. The river should originate from the high mountains and should have a well-developed river system. It will help in bringing down a large amount of sediments.
b. During the course of the river, there should not be any big lake, otherwise the sediments brought by the river would get deposited in these lakes.
c. The lower course of the river should be extensive and plain. It will make the flow of the river sluggish, otherwise the deposition will not be possible.
d. The deposition of sediments takes place regularly at the mouth of the river, on the sides of the stream channel, in the bed of the river and in front of the river mouth.
e. These deposits obstruct the free flow of the main river, which gets divided into several branches, called distributaries. The network of these distributaries finally gives shape to the delta.

2. What are the main features of a river in its upper course?

Answer: In the upper course, the slope of the land is steep and the velocity of the river is very high. The river carries less volume of water, but due to high velocity, it can transport large amount of materials.

a. The main work of the river in this stage is the downward erosion or down cutting, which causes the deepening of the river valley.
b. Normally a narrow and deep valley with steep walls is developed, called the I-shaped Valley.
c. The exposed surface on both sides of the deep valley is affected by the agents of weathering.
d. The broken rock materials from both sides is taken into the river, partly due to the force of gravity and partly by the rainwater flowing into the river.
e. The upper part of the valley is widened due to the work of weathering, giving it a typical V-shape.

3. Distinguish between V-shaped and I-shaped valleys.

V-shaped Valley	I-shaped Valley
The exposed surface on both sides of the deep valley is affected by the agents of weathering. The broken rock materials from both sides is taken into the river, partly due to the force of gravity and partly by the rainwater flowing into the river. The upper part of the valley is widened due to the work of weathering, giving it a typical V-shape. It is known as the V-shaped valley.	The main work of the river in the upper course is the downward erosion or down cutting, which causes the deepening of the river valley. Normally a narrow and deep valley with steep walls is developed, called the I-shaped Valley.

4. Describe the work of wind as an agent of erosion.

Answer: The work of wind as an agent of erosion is as follows:

a. The strong winds can pick up and carry dust, sand and even gravel.
b. These loose rock materials carried by the wind act as its tool in wearing down the hard rocks.
c. The effect of the wind on the land surface is that of a sandpaper.
d. The particles of sand and quartz carried by the wind polish the surface of the rocks.
e. Unlike rivers and glaciers, the wind erodes the rocks from all sides due to its changing directions.

5. Distinguish between longitudinal and parabolic sand dunes.

Longitudinal sand dunes	Parabolic sand dunes
The Longitudinal sand dunes are formed parallel to the direction of the wind. They extend for hundreds of kilometres in length with an average width of about one kilometre. The longitudinal sand dunes are separated by the sand-free bare surface, called hammada.	The Parabolic sand dunes or Barchans are a special type of transverse sand dune. A barchan also migrates like an ordinary sand dune. The sand-free corridors between two ranges of barchans are used as caravan routes.

11. Hydrosphere

A. Fill in the blanks.

1. The total amount of water on the Earth's surface is **71 per cent**.

2. The water in the oceans and seas is **97 per cent**.

3. The average depth of ocean water is about **3,800 metres** below the mean sea level.

4. The highest high tide in the world occurs in the Bay of **Fundy**.

5. The currents flowing away from equator are **warm** currents.

B. Distinguish between the following.

1. Waves and Tides

Waves	Tides
The movement of surface water in which the rise and fall of the water surface is more predominant than the actual forward motion of the water particles is called a wave. The wave represents a series of parallel crests separated by troughs and are mainly due to winds.	Since time immemorial, the inhabitants of the coastal areas have been observing the rise and fall in the level of the sea water. This alternate rise and fall in the level of sea water is known as tide.

2. Warm water and Cold water currents

Warm Water Currents	Cold Water Currents
The warm currents are those which flow from the low latitudes in the tropical zone towards the high latitudes in the temperate and sub-polar zones.	The cold currents are those which flow from the high latitudes towards the low latitudes.

3. Tidal waves and Tidal current

Tidal Waves	Tidal Current
A tidal wave is a shallow water wave caused by the gravitational interactions between sun, moon and earth.	When a gulf is connected to the open sea by a narrow channel, the water flows into the gulf at the time of high tide and comes out of the gulf at the time of low tide. This inward and outward movement of water is known as the tidal current.

4. Drift and Current

Drift	Current
The forward movement of the surface water of the oceans under the influence of prevailing winds is called drift. The velocity of movement is low, i.e. 1 km to 3 km per hour. For example, the North Atlantic Drift.	The currents are referred to as the movement of oceanic water in a definite direction with a velocity ranging between 3 km to 8 km per hour. For example, the North Equatorial Current.

C. Answer the following questions very briefly.

1. What are the different forms of the ocean water movements?

Answer: The movement of ocean water takes place in the form of waves, tides and currents.

2. What is the relationship between the Sun, the moon and the tides.

Answer: The gravitational attraction of the Sun and the Moon is responsible for the occurrence of tides.

3. Explain the meanings of tidal bore and ebb tide.

Answer: When the tide enters the narrow and shallow estuary of a river, the front of the tidal wave appears to be vertical due to the piling up of the river water against the tidal wave and the friction of the river bed. It looks as if a vertical wall of water is moving upstream. This is called a tidal bore. When we say the tide going out, the level of the sea water falls and the movement of sea water is towards the sea. This is called the ebb tide or the low tide.

4. Name the factors which cause the movement of ocean currents.

Answer: The factors which cause the movement of ocean currents are as follows:

a. Variation in the Temperature of Ocean Water;
b. Variation in the Salinity of Ocean Water;
c. Evaporation from Ocean's Surface;
d. Direction of the Prevailing Winds; and
e. Rotation of the Earth.

5. What is the role of the rotation of Earth in ocean currents?

Answer: The Earth's rotation on its axis causes the Coriolis effect, which changes the general direction of the ocean currents. For example, the currents from the equator towards the North Pole and the South Pole are deflected to their right in the Northern Hemisphere and to their left in the Southern Hemisphere. The rotational force also causes the movement of ocean water near the equator in opposite direction.

D. Write short notes on the following.

1. Spring and neap tides: On full moon and new moon days, the Sun, the Moon and the Earth are almost in the same line. On these days, the Sun and the Moon exert their combined gravitational force on the Earth. Thus on these two days, the high tides are the highest and are known as spring tides. The height of a spring tide is about 20 per cent more than the normal high tide. They occur twice every month.

On half Moon days (i.e. first and last quarter phases of the Moon), the Sun and the Moon are at right angles to the centre of the Earth. The tide producing force of the Moon and the Sun, work in opposite directions and they partly cancel each other's force. In such cases, the high tide is lower than the normal and low tide is higher than the normal. The difference is about 20 per cent. This is known as the neap tide.

2. Kuroshio current: The Kuroshio Current is an important warm current, which develops partly due to the Coriolis force and partly due to the obstruction by the Philippines in the flow of the North Equatorial Current. The average speed is about 30 km per day and the average surface temperature

is about 20 °C. This current keeps the eastern coast of Japan warm even in the coldest month (January), when it is snowing heavily in Honshu and Hokkaido. A branch of Kuroshio Current enters the Sea of Japan as Tsushima Current and keeps the western coast of Japan comparatively warm. Around 35° N, the Kuroshio current comes under the impact of the Westerlies and flows in the north-east direction to reach the western coast of North America. Further northwards, it is known as the Aleutian Current.

3. Labrador Current: The Labrador Current is a cold water current, which has its origin in the Arctic Ocean and it flows from north to south between Greenland and the Baffin islands. The average speed of the Labrador Current is about 25 km per day. This current brings huge icebergs with it from the Arctic Ocean. The Labrador Current merges with the Gulf Stream near Newfoundland. This helps in the growth of planktons – a feed for fish. Thus, the Grand Banks near Newfoundland have become the ideal fishing ground in the world.

4. North Atlantic Drift: The forward movement of the surface water of the oceans under the influence of prevailing winds is called drift. The velocity of movement is low, i.e. 1 km to 3 km per hour. For example, the North Atlantic Drift. The Gulf Stream moves north-eastwards under the influence of Westerlies and the rotation of the Earth. Now this current is called the North Atlantic Drift. The North Atlantic Drift gradually widens and its speed decreases. It becomes a prominent, slow-moving current. Near Western Europe, it splits into two parts. One part moves northwards, past UK and Norway, while the other part is deflected southwards as the cold Canary Current. The warm water of the Gulf Stream and the North Atlantic Drift together modify the weather conditions off the eastern coast of North America and the western coast of Europe.

E. Answer the following questions briefly.

1. How are the tides caused?

Answer: The gravitational attraction of the Sun and the Moon is responsible for the occurrence of tides in the sea water. We know that each and every body in the universe exerts an attractive force on every other body. The Earth exerts an attractive force on the Moon and vice versa. The same is true for both the Sun and the Earth. It is this attractive force of Sun and Moon on the Earth that causes tides.

2. Describe the role of centrifugal force in the occurrence of tides.

Answer: Two high tides are produced at one and the same time on the Earth. One high tide occurs on the side of the Earth facing the Moon and the other on the diametrically opposite side.

This is due to the fact that two forces are acting simultaneously at every point on the Earth. These are the gravitational force of the Sun and the Moon and the other is the centrifugal force, which is the same everywhere. These two forces act in the opposite directions and they balance each other at the centre of the Earth.

3. How do the temperature and salinity of ocean water influence the ocean currents?

Answer: The temperature and salinity of ocean water influence the ocean currents as under:

Variation in the Temperature of Ocean Water

a. The temperature of ocean water decreases from the equator towards the poles, and also from the surface towards the bottom of the oceans.

b. Due to this variation in temperature, the density of water is less in the equatorial region than in the polar regions.
c. Thus, the warmer and lighter water from the equatorial region moves towards the polar regions.

Variation in the Salinity of Ocean Water

a. If two water bodies have same temperature, then the water body with higher salinity will have greater density than the one with lower salinity.
b. The dense water tends to sink down and the fresh water takes its place and thus causes circulation.
c. Thus, ocean currents are generated from the areas of lesser salinity to the areas of greater salinity.

4. How do the ocean currents influence the fishing industry?
Answer: The Labrador Current merges with the Gulf Stream near Newfoundland. This helps in the growth of planktons – a feed for fish. Thus, the Grand Banks near Newfoundland have become the ideal fishing ground in the world.

5. How do tides help in water transport?
Answer: Tides generally help in making some of the rivers navigable for ocean going vessels. Large ships enter the harbour of a shallow sea during high tides and they go back also at the time of high tides. London and Kolkata have become important ports due to the tidal nature of the mouths of the Thames and Hugli rivers respectively.

F. Answer the following questions.
1. Describe the pattern and importance of Gulf Stream.
Answer: The Gulf Stream is one of the largest warm water currents. It originates from the Gulf of Mexico (about 20° N). It leaves the Gulf of Mexico through the Florida Strait and moves in a north-easterly direction along the eastern coast of North America. The average speed is about 30 km per day and its average width is about 70 km. Under the impact of the Westerlies, this warm current reaches the western coast of Europe (about 70° N latitude). The general direction of flow of the Gulf Stream, north of 30° N latitude, is northwards. Near Newfoundland, its water mixes with the cold water of the Labrador Current, which forms very dense fog. The foggy conditions around Newfoundland hamper the navigation of ships.

2. How are the tides useful in human activities?
Answer: Tides are useful in human activities in the following ways:

a. Tides generally help in making some of the rivers navigable for ocean going vessels. Large ships enter the harbour of a shallow sea during high tides and they go back also at the time of high tides. London and Kolkata have become important ports due to the tidal nature of the mouths of the Thames and Hugli rivers respectively.
b. The river mouths and estuaries are kept clean of sedimentation due to the action of tidal currents. The force of the outgoing tide and the river current carries the silt away to the open sea. This helps navigation, but retards the process of delta formation.

c. At the time of high tides, the salty sea water is stored in the low-lying coastal areas. This water is spread out in fields and used for preparing common salt.
d. The tidal force can also be used as a source for generating electricity. Britain, Canada and France have developed power stations which convert tidal energy into electricity.
e. The water, during the high tide, strikes the coastal areas with a great force and breaks the regular coastline. Thus, it helps in the development of creeks and inlets along the coast.
f. The inflow of the salty tidal water, especially along the coast of cold countries, retards the process of freezing and prevents the harbours from becoming ice-bound.
g. The fishing industry is helped by the rhythm of high and low tides. The fishermen mostly sail out to the open sea during low tides and return to the coast at high tides.

3. Explain the development of the Kurile or Oyashio current.
Answer: The Oyashio or Kurile Current is a cold current which originates from the Bering Strait and moves southwards along the coast of Kamchatka Peninsula to touch the islands of Kurile. It carries with it the cold water and icebergs from the Arctic Ocean to the coast of eastern Russia and Japan. Near 50° N latitude, it is bifurcated into two branches. One of them merges with Kuroshio Current and creates dense fog which is hazardous for navigation, but ideal for abundant growth of plankton. Thus the north-eastern coast of Japan is an important fishing ground in the world. The second branch moves up to the Japanese coast. The Oyashio Current is comparable to the Labrador Current of the North Atlantic Ocean.

4. What are the various effects of ocean currents?
Answer: The ocean currents influence the distribution of temperature, pressure, wind and precipitation in the adjoining coastal areas. Thus, they also affect, directly or indirectly, the economy and life of people in these regions.

a. The ocean currents can influence the distribution of temperature over the globe. The warm and cold currents increase and decrease the temperature of the coastal regions respectively.
b. The ocean currents help in balancing the ocean temperature as the warm currents carry the warm water of the tropical regions to the colder areas of the temperate and polar regions. The cold currents bring cold water of the high latitudes to the low latitudes.
c. The warm currents increase the moisture-bearing capacity of the wind, while the cold currents decrease the same. Regions under the influence of warm currents experience heavy rainfall, while the cold currents bring dry conditions. Deserts are found mostly along the western side of the continents along which the cold currents flow.
d. The mixing of warm and cold currents causes dense fog, which hampers smooth navigation. Such conditions are found near Newfoundland and Japan.
e. The ocean currents used to decide the ocean routes for navigation of commercial ships in ancient times. Today the motor-powered ships do not care much for the ocean currents or prevailing winds.
f. The ocean currents distribute various nutrients and other things necessary for the existence, survival and growth of fishes. They transport the planktons, the food for fishes, from one area to another.
g. The warm currents help in keeping the seaports ice-free and hence they remain open throughout the year, even in the higher latitudes.

h. Icebergs coming with the cold water currents from the Arctic Ocean and Antarctica cause heavy damage to vessels. So ships avoid such routes.
i. The ocean currents affect the route of cyclones as the low pressure conditions created by warm attract cyclones.

5. How do the tides occur in coastal areas?
Answer: The tides largely follow the apparent movement of Moon in the sky. The gravitational force of the Moon will be maximum at the Earth's surface facing the Moon, while it will be minimum at the opposite side of the Earth. Two high tides are produced at one and the same time on the Earth. One high tide occurs on the side of the Earth facing the Moon and the other on the diametrically opposite side. This is due to the fact that two forces are acting simultaneously at every point on the Earth. These are the gravitational force of the Sun and the Moon and the other is the centrifugal force, which is the same everywhere. These two forces act in the opposite directions and they balance each other at the centre of the Earth.

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12. Composition and Structure of the Atmosphere

A. Fill in the blanks.

1. The atmosphere is held close to the Earth by the force of **gravity**.

2. Oxygen is mainly confined to the **lower** layers of atmosphere.

3. The ozone layer protects us from the harmful **ultraviolet** rays.

4. The upper limit of the troposphere is called the **tropopause**.

5. The jet planes fly mostly in the lower part of **stratosphere**.

B. Explain the following terms.

1. Atmosphere: The envelope of air which surrounds the Earth is called the atmosphere. The atmosphere is a mixture of colourless, odourless and tasteless gases, water vapour, smoke, dust particles, etc. It is held close to the Earth by the force of gravity.

2. Normal lapse rate: The height of the troposphere increases during the summer season and decreases during the winter season. It has about 90 per cent of the air in the atmosphere. The temperature in this layer decreases with increasing altitude, roughly at a rate of 1 °C for every 165 metres of ascent. This is called the normal lapse rate.

3. Carbon sink: The tropical rainforests, which use much of the carbon dioxide in the atmosphere to carry out photosynthesis act as areas of carbon sink.

4. Photosynthesis: The process by which green plants and some other organisms use sunlight to synthesize nutrients from carbon dioxide and water. Photosynthesis in plants generally involves the green pigment chlorophyll and generates oxygen as a by-product.

5. Ozone hole: With the continuous depletion of the ozone layer a hole has been created in it due to the release of chlorofluorocarbons in the atmosphere, this hole so created is called the Ozone Hole.

6. Jet stream: Strong winds which blow from west to east at 50 km in the troposphere are called jet stream.

C. Answer the following questions very briefly.

1. Name the main gases present in the atmosphere.

Answer: The main gases present in the atmosphere are nitrogen (78 per cent), oxygen (21 per cent), carbon dioxide, hydrogen, argon, helium, etc.

2. Which gases are mainly responsible for the greenhouse effect?

Answer: The major greenhouse gases are water vapour, carbon dioxide, chlorofluorocarbons (CFCs), methane and nitrogen oxide.

3. How does ozone prevent the Earth from becoming very hot?

Answer: Ozone acts as a filter and absorbs most of the harmful ultraviolet rays coming from the Sun. Thus, the ozone gas prevents the Earth from becoming too hot.

4. What is the main impact of ozone depletion?

Answer: The ozone depletion results in the rise of temperature on the Earth's surface. This causes global warming, acid rain, melting of continental glaciers, rise in sea level, skin cancer, poisonous smog, decrease in photosynthesis, ecological instability and disaster.

5. Which layer of the atmosphere helps in long distance communication?

Answer: Ionosphere reflects low frequency radio waves back to the Earth and thus helps in long distance communication.

D. Distinguish between the following.

1. Tropopause and Stratopause

Tropopause	Stratopause
The upper limit of the troposphere is called the tropopause.	Stratopause is the end of stratosphere.

2. Ozonosphere and Ionosphere

Ozonosphere	Ionosphere
The upper part of the stratosphere which has the maximum concentration of ozone is called the ozonosphere.	The layer (lower layer), within the thermosphere, containing ionized molecules is called the ionosphere.

3. Global warming and Greenhouse effect

Global Warming	Greenhouse Effect
A doubling of the amount of carbon dioxide present in the atmosphere would raise the Earth's average temperature by 3.5 °C and 4.5 °C. This possible increase in the worldwide temperature is called global warming.	Carbon dioxide in the atmosphere helps to regulate the temperatures on the Earth by preventing the heat energy near the Earth's surface from escaping into the space. This is known as the greenhouse effect.

4. Aurora Borealis and Aurora Australis

Aurora Borealis	Aurora Australis
The colourful light seen in the night sky near the two poles of the Earth is due to the interaction of ionosphere with the lower atmospheric layer. Near the North Pole, this phenomenon is known as Aurora Borealis or the northern lights.	The colourful light seen in the night sky near the two poles of the Earth is due to the interaction of ionosphere with the lower atmospheric layer. Near the South Pole this phenomenon is called Aurora Australis or the southern lights.

E. Answer the following questions briefly.

1. What has made the Earth a unique planet?

Answer: The presence of water and air has made the Earth a unique planet in the Solar System, otherwise the Earth would have been barren like other planets.

2. Why does the sky look blue in colour?
Answer: The blue colour of the sky is due to the selective scattering of the solar radiation by the dust particles.

3. Name the various layers of atmosphere and their extent.
Answer: The various layers of atmosphere and their extent are as follows:

1. The troposphere is the lowest layer of the atmosphere and its average height is about 18 km near the equator and about 8 km over the poles.
2. The stratosphere lies above the troposphere and extends up to a height of about 50 km.
3. Mesosphere lies beyond the stratosphere and extends from about 50 km to about 80 km above the mean sea level.
4. Thermosphere lies beyond the mesosphere. In this layer, the temperature increases rapidly with the increase in height above the mean sea level. The layer, within the thermosphere, containing ionized molecules is called the ionosphere.
5. Exosphere is the uppermost layer of the atmosphere. Our knowledge about this layer is extremely limited.

4. What is the importance of troposphere for human beings?
Answer: Troposphere is the most important layer, because all weather phenomena like the formation of clouds, fog, frost, dew, blowing of winds, thunder, lightning, precipitation, etc. occur in this layer.

5. What are the main features of stratosphere?
Answer: The main features of stratosphere are as follows:

1. The stratosphere lies above the troposphere and extends up to a height of about 50 km.
2. In the stratosphere, temperature increases with the increase in altitude due to the absorption of ultraviolet radiations from the Sun. But at about 50 km, the temperature begins to fall.
3. It is the home of strong winds called jet stream which blow from west to east.
4. There is very little mixing of air between the troposphere and the stratosphere. Thus, it is free from water vapour and dust particles.

F. Give reasons for each of the following.

1. The exact thickness of the atmosphere is not known.
Answer: The exact thickness of the atmosphere is unknown as there is no sharp boundary between the atmosphere and the outer space.

2. The composition of air varies from season to season.
Answer: The quantity of water vapour, dust etc. varies from season to season. Therefore, the composition of air varies from season to season.

3. The amount of water vapour in the air decreases with increase in height above mean sea level.
Answer: Water vapour comes in the atmosphere due to evaporation and transpiration. The amount of water vapour present in the air depends on the temperature. Thus, it decreases with increase in

height above the sea level. It is more in hot and humid tropical areas and less in deserts and polar regions.

4. The thermosphere protects us from meteors.
Answer: The thermosphere protects us from meteors and obsolete satellites, as the high temperatures can burn nearly all the debris coming towards the earth.

5. The atmosphere softens the Sun's glare during the daytime.
Answer: The atmosphere prevents the Sun's harmful ultraviolet rays from reaching the Earth's surface. It softens the Sun's glare during daytime by filtering the amount of heat that reaches the Earth.

G. Answer the following questions.

1. Describe the role played by water vapour and dust particles in the atmosphere.
Answer: The presence of water vapour in the atmosphere is responsible for the formation of clouds, fog, precipitation and many other weather phenomena. The minute particles such as dust particles, salt particles, pollens, smoke, volcanic ashes, etc. present in the atmosphere help in the formation of water drops, clouds, etc. The solid particles also help in the scattering of solar radiation. The blue colour of the sky is due to the selective scattering of the solar radiation by the dust particles.

2. What are the main effects of global warming?
Answer: Global warming would adversely affect the ecosystems on the Earth and the weather patterns around the world in the following ways:

1. If the temperature of the atmosphere increases, the temperature of the oceans, which are involved in various weather phenomena, would also increase. As the ocean water becomes warm, severe storms like hurricanes would become more common.
2. Many areas in the world would experience changes in their rainfall pattern. Such changes would affect agriculture.
3. The increase in temperature would speed up the melting of glaciers, ice caps and icebergs in the far northern and southern parts of the world. This would cause flooding of the land in the coastal regions.
4. The rise in temperature can cause changes in the ocean currents. Water in lakes and rivers on the Earth's surface would evaporate faster.
5. Such changes would change the habitats of organisms. Those unable to adjust to these rapid changes may not be able to survive.

3. What is the significance of atmosphere?
Answer: The atmosphere is of great significance for the survival of human beings and other life forms on the Earth. Some of them are as under:

1. The atmosphere prevents the Sun's harmful ultraviolet rays from reaching the Earth's surface.
2. It shields us from the meteors which are continuously coming towards the Earth from the outer space.
3. It acts like a greenhouse by trapping the heat and thus controls the extremes of temperature during day and night.

4. It softens the Sun's glare during daytime.
5. The atmosphere has weight and exerts pressure, which depends upon the air temperature.
6. The change of weather and climate is due to the presence of the atmosphere.
7. Water vapour present in the atmosphere causes condensation and precipitation.
8. Sound waves can travel only in air.
9. Life on Earth is possible due to the presence of oxygen and carbon dioxide in the air.
10. The ionosphere reflects radio waves back to the Earth and thus helps in long distance communication.

4. Describe the importance of three main gases in the atmosphere.

Answer: The importance of three main gases in the atmosphere is as follows:

1. Nitrogen is the most prevalent gas in the atmosphere and is essential for the growth of plants. The plants cannot have it directly from the air, but get it from the soil. Nitrogen can dilute oxygen and slows down the process of oxidation. The atmospheric nitrogen can be directly used in the making of chemical fertilizers, nitric acid, ammonia, etc.
2. Oxygen is mainly confined to the lower layers of atmosphere. It is the most important gas in the atmosphere as it is needed by all living organisms for breathing. It is also essential for combustion. Oxygen also helps in the decomposition of organic matter.
3. Carbon dioxide is a heavy gas and found only in the lower layers of the atmosphere. It is used by the plants during the process of photosynthesis. Carbon dioxide in the atmosphere allows the incoming short wave solar radiations to reach the Earth, but obstructs the outgoing long wave terrestrial radiations. Thus, it keeps the air near the Earth's surface warm at night.

5. What are the problems created by the depletion of ozone in the atmosphere?

Answer: The ozone depletion results in the rise of temperature on the Earth's surface. This causes global warming, acid rain, melting of continental glaciers, rise in sea level, skin cancer, poisonous smog, decrease in photosynthesis, ecological instability and disaster.

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13. Insolation

A. Fill in the blanks.

1. The atmosphere is heated by the **terrestrial** radiations.
2. The temperature at the surface of the Sun is about **6000 °C**.
3. The horizontal transfer of heat by wind is called **advection**.
4. The maximum insolation is received in the **tropical** zone of Earth.
5. The insolation received by the Earth **decreases** from equator towards the poles.

B. Define the following terms.

1. Insolation: The incoming solar radiation, which reaches the surface of the Earth is called insolation.
2. Advection: The process of horizontal transfer of heat by the wind is known as advection.
3. Terrestrial radiation: The radiation of heat energy from the surface of the Earth is in the form of long waves, known as terrestrial radiation.
4. Conduction: When two bodies having unequal temperature come in contact with one another, the heat energy flows from the hotter body to the cooler body. This transfer of heat is called conduction.
5. Solar radiation: With a surface temperature of about 6000 °C, the Sun is constantly radiating heat energy into the space in the form of electromagnetic radiation. This is known as the solar radiation.
6. Leeward side: The side of a mountain slope or any other relief feature which does not face the sun is called the leeward side.

C. Answer the following questions very briefly.

1. Why is the Sun a very hot body?
Answer: The Sun is a huge ball of gases that generates heat by continuous nuclear reactions. Thus, it has surface temperature of about 6000 °C.

2. How much time is taken by the solar radiations to reach the earth?
Answer: The solar radiations take about 8 minutes and 20 seconds to reach the surface of the Earth.

3. What is the full form of insolation?
Answer: The full form of insolation is incoming solar radiation.

4. What is the extent of the Tropical zone on the earth?
Answer: The extent of the Tropical zone extends from the Tropic of Cancer in the north to the Tropic of Capricorn in the south on the surface of the Earth.

5. How is the atmosphere heated due to compression?
Answer: When the air current descends, it presses the lower layer of the atmosphere. Due to this pressure and the increasing weight of the upper layers, the lower layer of the atmosphere gets heated.

D. Give reasons for each of the following.

1. The vertical rays of the Sun bring more insolation than the oblique rays of the Sun.

Answer: The equatorial region receives almost vertical rays of the Sun for a major part of the year. Away from the equator towards the poles, the inclination of the Sun rays increases. Thus, the equatorial region is warmer than the higher latitudes and the temperature of the air generally decreases from the equator towards the poles.

2. The Earth receives only one part of the 200 crore parts of the solar radiation.

Answer: The Earth because of its small size and great distance from the Sun is able to intercept only one in two billion (200 crore) parts of the solar radiation.

3. Landmasses gain or lose heat more quickly than water bodies.

Answer: The Earth's surface consists of land and water which react differently to heating. In general, it has been observed that the landmasses absorb and lose heat more quickly than the water bodies.

4. The atmosphere is not heated directly by solar radiations.

Answer: The Sun is the most important source of heat for the atmosphere, but the atmosphere is not directly heated by the rays of the Sun. The Earth's surface being solid, absorbs the incoming solar radiations. Thus, the surface of the Earth is directly heated by the solar radiations. The absorbed heat energy is re-radiated by the Earth's surface in the form of terrestrial radiation which heats up the atmosphere.

5. The temperature of the atmosphere varies greatly from place to place.

Answer: The temperature of a place depends largely on the amount of insolation received by that place. The variation in the temperature of the atmosphere is due to the combined effect of a number of factors. Some of them are the latitude and altitude of the place, the distance from the sea, the slope of the land, the prevailing winds, and the ocean currents.

E. Answer the following questions briefly.

1. Name any four factors which influence the temperature of air.

Answer: The four factors which influence the temperature of air are the altitude of the place, the distance from the sea, the slope of the land, and the prevailing winds.

2. Name the various processes involved in the heating of atmosphere.

Answer: The main processes which heat up the atmosphere are conduction, convection, radiation, advection and compression.

3. How is the atmosphere heated by the process of advection?

Answer: Sometimes the air masses move from one region to another along with the winds. These winds carry the temperature of one place to another. The air temperature of a place thus rises or falls depending upon whether the wind is coming from a warm or a cool area.

4. How does the slope of land influence the temperature of air?

Answer: The slope of a mountain or any other relief feature facing the Sun receive more insolation than the slope on the leeward side. This is due to the inclination of Sun rays on such slopes. Thus,

the Sun facing slopes record higher temperatures than the leeward slopes where the Sun's rays reach more slanting.

5. Name any four factors on which the amount of insolation received depends.
Answer: Four factors on which the amount of insolation received depends are the inclination of the Sun's rays, the amount of atmosphere to be crossed, the duration of sunshine or the length of the day, and the transparency of the atmosphere.

F. Answer the following questions.
1. How is air heated by the process of convection?
Answer: When the air is heated, it rises upwards. It leaves behind a partial vacuum near the surface of the Earth. The continuous upward movement of the heated air mass pushes aside the air at the higher levels. As a result, the pushed air mass moves horizontally towards cooler areas and descends gradually due to the increased density. The cooler air mass moves horizontally near the Earth's surface to fill the partial vacuum. This cooler air mass is also heated and rises upwards. This is how the convection current develops above the surface of the Earth. It helps in the transfer of heat to various layers of the atmosphere.

2. How do the ocean currents influence the temperature of air?
Answer: The effect of ocean currents largely depends on the winds that blow over the ocean current. The winds blowing from sea to land and passing over the warm water current tend to increase the air temperature in the coastal areas, while the winds passing over a cold water current tend to decrease the air temperature in the coastal areas.

3. Explain the heating of air by the process of radiation.
Answer: After receiving insolation, the surface of the Earth is heated and becomes a radiating body. The radiation of heat energy from the surface of the Earth is in the form of long waves, known as terrestrial radiation. After sunset, insolation ceases but the Earth's surface continues to radiate heat energy even during the night. Thus, the atmosphere is heated by the terrestrial radiation and not by the incoming solar radiation.

4. Distinguish between the processes of conduction and compression.
Answer: The differences between the process of conduction and compression are as follows:

Conduction	Compression
When two bodies having unequal temperature come in contact with one another, the heat energy flows from the hotter body to the cooler body. Conduction continues till both the bodies attain the same temperature or when the contact is broken.	When the air current descends, it presses the lower layer of the atmosphere. Due to this pressure and the increasing weight of the upper layers, the lower layer of the atmosphere gets heated.

5. Distinguish between the influence of latitude and altitude of a place on the temperature of that place.
Answer: Difference between the influence of latitude and altitude of a place on the temperature of that place is as follows:

Influence of Latitude	Influence of Altitude
The inclined rays of the Sun spread over a larger area than the vertical rays of the Sun. The equatorial region receives almost vertical rays of the Sun for a major part of the year. Away from the equator towards the poles, the inclination of the Sun rays increases. Thus, the equatorial region is warmer than the higher latitudes and the temperature of the air generally decreases from the equator towards the poles.	The lower layers of the atmosphere are comparatively warmer than the upper layers, even in the same latitudes. The temperature of the air decreases with increase in height from the Earth's surface at an average rate of 1 °C for every 165 m of height. Thus, the lower layers of air which come in direct contact with the Earth's surface, get more heat from the ground surface than the layer of air lying at a greater height.

6. How do winds and ocean currents influence the temperature in coastal areas?

Answer: The prevailing winds help in the redistribution of temperature. The winds coming from the warmer areas, i.e. the low latitudes, increase the temperature of the region over which they are blowing, while the winds coming from the cooler areas, i.e. the higher latitudes, decrease the temperature over which they are blowing. The effect of these winds is, however, limited to the period during which they blow. The winds blowing from ocean to coastal lands bring in marine influence and thus lower the temperature. The winds associated with warm oceanic currents raise the temperature of coastal areas, while the wind coming in contact with cold oceanic currents lower the temperature of coastal areas.

14. Atmospheric Pressure and Winds

A. Fill in the blanks.

1. The atmospheric pressure is measured with the help of a **barometer**.

2. The normal atmospheric pressure at sea level is **1013** millibars.

3. The humid air exerts **less** pressure than the dry air.

4. The vertical movement of air is called **air current**.

5. The hill slope facing the wind is called the **windward** slope.

B. Explain the following terms.

1. Atmospheric pressure: Air is a mixture of several gases and like any other matter has weight. Air exerts its weight as pressure on the surface of the Earth. This is known as the atmospheric pressure. The atmospheric pressure is defined as the weight of the column of air at any given place and time.

2. Isobar: The lines joining the places having equal atmospheric pressure at the sea level are called the isobars. The distribution of atmospheric pressure is shown with the help of isobars on a map.

3. Horse Latitudes: The sub-tropical high pressure belt is characterised by anticyclonic conditions which cause atmospheric aridity. This is one of the reasons for hot deserts being found in the western parts of the continents in both the hemispheres. This zone is not a continuous belt but is broken into a number of high pressure centres or cells. At sea, this belt has little surface winds and is referred to as the horse latitudes.

4. Periodic winds: The winds which change their direction periodically are called the periodic winds or the seasonal winds. In one season they blow in one direction and in another they blow in the opposite direction. These winds are caused by the unequal heating and cooling of the land and the sea.

5. Pressure gradient: The distance between the isobars shows the rate and the direction of the changes in the pressure. It is referred to as the pressure gradient. There are two types of pressure systems – high pressure and low pressure.

6. Cyclone: A cyclone represents a low pressure system at the centre surrounded by high pressure. The winds in a cyclone tend to converge towards the centre. Their movement is anticlockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

7. Doldrums: The surface winds are generally absent as the winds approaching equatorial low pressure belt begin to rise upwards. Thus, only vertical currents are experienced in this belt. Due to extreme calm conditions, the equatorial low pressure belt is also known as the doldrums.

8. Planetary winds: The winds which constantly blow in the same direction throughout the year are called the permanent winds or the planetary winds or the prevailing winds. Planetary winds blow over vast areas of continents and oceans.

C. Answer the following questions very briefly.

1. What factors influence the distribution of atmospheric pressure on the Earth?

Answer: Factors such as air temperature, altitude and rotation of the Earth influence the distribution of atmospheric pressure on the Earth.

2. Name the major atmospheric pressure belts on the Earth.

Answer: The main pressure belts on the Earth are as under:

1. Equatorial Low Pressure Belt.
2. Sub-Tropical High Pressure Belts in both the hemispheres.
3. Sub-Polar Low Pressure Belts in both the hemispheres.
4. Polar High Pressure Belts in both the hemispheres.

3. What are the various types of winds? Give at least one example of each type.

Answer: Winds are generally classified into the following four major types:

1. Permanent winds or the Planetary winds – Trade Winds, the Westerlies and the Polar Easterlies.
2. Periodic winds or the Seasonal winds – Monsoon winds, land breezes and the sea breezes.
3. Local winds – Loo (India), Chinook (USA), Foehn & Mistral (Europe).
4. Variable winds – Tropical cyclones, Temperate cyclones, and Anticyclones.

4. How did the trade winds get their names in the past?

Answer: Trade winds got their name from the Latin word trado meaning constant direction, or from the German word trade meaning track.

5. What factors control the speed and direction of winds?

Answer: Factors that control the speed and direction of winds are pressure gradient and Coriolis Effect.

D. Write short notes on the following.

1. Loo: Loo (India) are very hot and dry winds which blow in the plains of North India and Pakistan, in the months of May and June, usually in the afternoons. Their movement is feeble during the night hours. The temperature of the air ranges between 40 °C to 50 °C. A loo can cause sunstroke to the people.

2. Chinook: Chinook (USA) means 'snow-eater'. The word has been derived from the name of a Red Indian tribe that lived near the mouth of the Columbia river. Chinook is a warm dry south-westerly wind which blows down the eastern slopes of the Rockies in parts of USA and Canada. While descending along the eastern leeward slope, these winds can increase the temperature by about 15 °C to 20 °C in a couple of hours. It is useful to ranchers as it keeps the grasslands clear of snow during the winter season.

3. Polar Easterlies: The winds which blow from the polar high pressure areas towards the sub-polar low pressure areas are known as the Polar Easterlies or the Polar Winds.

4. Sea Breezes: The sea breezes blow from sea to land during daytime. The winds are caused due to the unequal heating and cooling of land and water. The sea breezes begin to blow at about 11:00 a.m. and stop blowing around 8:00 p.m. The cooling effect may reach up to 60 km inland. Due to sea breezes the weather becomes pleasant. Sea breezes are more active during the summer season. The velocity of sea breezes varies from 20 km to 40 km per hour.

5. Anticyclones: An anticyclone has a high pressure centre surrounded by low pressure on all sides. It has an oval or circular arrangement of isobars, highest value being at the centre. A progressive rise in the barometer indicates the approach of an anticyclone which lies between two cyclones and has no definite direction of movement. The winds are divergent and radiate from the high pressure centre. They are generally light and slow and never become violent. The general movement of the winds is clockwise in the Northern Hemisphere and anticlockwise in the Southern hemisphere. The anticyclones are often accompanied by cold and hot waves. They are associated with calm conditions and fine weather in summer, and fog and frost during the winter.

6. Jet stream: A jet stream is a narrow belt of westerly winds at a high altitude (8 km to 14 km) in the troposphere. Their speed varies from about 110 km per hour in the summer season to more than 180 km per hour in the winter season. The jet streams are several hundred kilometres wide and about 2 km to 5 km deep.

E. Answer the following questions briefly.

1. How is the atmospheric pressure distributed on the Earth's surface?

Answer: The general distribution of pressure on the Earth is not uniform. The atmospheric pressure belts are found more or less in regular pattern in the Southern Hemisphere than in the Northern Hemisphere. The regularity of the pressure belts is disturbed due to the unequal distribution of land and water on the Earth. The atmospheric pressure largely depends upon air temperature which generally decreases as we move away from the equator towards the poles. However, there is a low pressure belt near the equator due to high mean annual temperature and a high pressure belt near the poles due to low mean annual temperature. These two pressure belts follow the rule, i.e. the atmospheric pressure increases with decrease in temperature.

2. Explain the concept of Inter-Tropical convergence zone.

Answer: The equatorial low pressure belt represents the zone of convergence of the Northeast and the Southeast Trade winds. They are also known as the Inter- Tropical Convergence Zone or ITCZ.

3. What are the main features of southwest monsoon winds?

Answer: The Southeast Trade winds cross the equator and blow from the southwest to the northeast direction under the influence of the Coriolis force. The summer monsoons give highly variable weather with frequent spells of drought and heavy rain.

4. Distinguish between Mistral and Foehn winds.

Answer: The difference between Mistral and Foehn winds is as follows:

Mistral Winds	**Foehn Winds**
Mistral (Europe) is a cold north-westerly wind experienced on the north-western coast of the Mediterranean Sea, especially in the Rhone river valley. It reaches the Rhone delta as an extremely strong cold and dry wind during the winter months. Mistral brings cloudless sky which is helpful in aviation.	Foehn (Europe) is a strong dry and hot wind which develops on the leeward side of the Alps mountain range. While descending on the leeward side, it warms up and becomes dry. The wind helps in animal grazing by melting the snow in the late winter season. It also hastens the ripening of grapes in the autumn season.

5. What are the main characteristics of temperate cyclones?

Answer: The main characteristics of temperate cyclones are as follows:

1. They are most dominant over the North Atlantic Ocean, especially during the winter season.
2. Due to their vast sizes, the winds are not circular but tend to move in an elliptical pattern.
3. The movement is fastest in the winter months and slowest in the summer months. The depressions travel with the Westerlies and their direction is from west to east.
4. The average speed of their movement is about 30 km to 40 km per hour.
5. These cyclones are usually accompanied by extensive clouds and precipitation.
6. The winds are less violent and move eastwards in the belt of the Westerlies and cause very heavy rainfall.
7. These depressions do not become weak or die out on reaching the landmasses.

F. Give reasons for each of the following.

1. The sub-polar low pressure belt is dynamically produced.

Answer: The winds coming from the sub-tropics and the polar regions converge in this belt and rise upwards. The great temperature contrast between the sub-tropical and the polar regions gives rise to cyclonic storms in this belt. The surface air also spreads out in this region due to the Earth's rotation. This also leads to the development of low pressure. Thus, these two low pressure belts are dynamically produced.

2. The monsoon winds change their direction with the change of season.

Answer: Besides unequal heating, the origin and development of the Monsoon winds is also influenced by the location and direction of the mountain ranges, and the conditions of air circulation in the upper troposphere. The modern theories based on air masses and the jet streams are becoming more relevant. During the summer season, the ITCZ shifts northwards due to the migration of the Sun towards the Tropic of Cancer. Thus, the Southeast Trade winds cross the equator and blow from the southwest to the northeast direction under the influence of the Coriolis force. Similarly, during

the winter season, the sub-tropical high pressure belt and the thermal equator retreat southwards. The Trade winds in both the hemispheres are re-established.

3. The location of the pressure belts is not fixed on earth.

Answer: The general distribution of pressure on the Earth is not uniform. The atmospheric pressure belts are found more or less in regular pattern in the Southern Hemisphere than in the Northern Hemisphere. The regularity of the pressure belts is disturbed due to the unequal distribution of land and water on the Earth.

4. The Westerlies are very strong in the Southern Hemisphere.

Answer: The presence of large landmasses with irregular relief in the Northern Hemisphere have made the westerlies complex and complicated. However, the absence of landmasses and the dominance of oceans in the Southern Hemisphere have made the Westerlies more vigorous. Their velocity increases southwards and they become stormy.

5. The cyclones blow from east to west in the tropical zone and from west to east in the temperate zone.

Answer: Cyclones move along with the Trade winds in the tropical zone and with the Westerlies in the temperate zone. Thus, they blow from east to west in the tropical zone and from west to east in the temperate zone.

G. Answer the following questions.

1. Explain the development of subtropical high pressure belts.

Answer: The subtropical high pressure belts are not of thermal origin and are formed due to the rotation of the Earth and the subsidence of air.

2. What are the main characteristics of the Trade winds?

Answer: The Trade winds have the following characteristics:

1. These winds blow from 30° N to 30° S latitudes on both sides of the equator.
2. Their direction in the Northern Hemisphere is from the northeast to southwest and they are called Northeast Trade winds.
3. Their direction in the Southern Hemisphere is from southeast to northwest and they are called Southeast Trade winds.
4. These winds blow from the cooler to the warmer areas as they come from the tropical region to the equatorial region. They bring pleasant weather.
5. These are often dry winds and are not able to give much precipitation.
6. These winds are more regular and constant over the oceans than over the landmasses.
7. Their velocity ranges from 15 to 25 km per hour.
8. These winds are strong during the winter and weak during the summer.
9. In the Indian Ocean, north of the equator, these winds take the form of Monsoon winds.

3. Compare the main features of the tropical and temperate cyclones.

Answer: The main features of the tropical and temperate cyclones are as follows:

Tropical Cyclones	Temperate Cyclones
The tropical cyclones are seasonal and occur in the later part of the summer season.	The temperate cyclones, also called the temperate depressions, originate in the zone where the warm Westerlies meet the cold Polar winds.
They are of thermal origin, i.e. they are formed due to the unequal heating of land and water.	They are most dominant over the North Atlantic Ocean, especially during the winter season.
They are common in the Northern Hemisphere and occur in the months of August and September.	Due to their vast sizes, the winds are not circular but tend to move in an elliptical pattern.
The diameter usually varies from 80 to 320 km.	The movement is fastest in the winter months and slowest in the summer months. The depressions travel with the Westerlies and their direction is from west to east.
In spite of their smaller size, they affect a greater part of the atmosphere.	The average speed of their movement is about 30 km to 40 km per hour.
They move westwards in the tropical zone and are accompanied by violent destructive winds.	These cyclones are usually accompanied by extensive clouds and precipitation.
At the centre of the cyclone, calm and dry conditions prevail and this calm centre is called the eye of the cyclone. The calm region is surrounded by winds of hurricane force and the velocity of the wind exceeds 100 km per hour with heavy rain and violent thunderstorms.	The winds are less violent and move eastwards in the belt of the Westerlies and cause very heavy rainfall.
The rainfall is more in the front part of the cyclone than in the rear part.	These depressions do not become weak or die out on reaching the landmasses.

4. How does the air mass theory explain the development of the monsoon winds?

Answer: According to the Airmass Theory, Trade winds, in both the hemispheres, meet each other near the equator. The meeting place is called the Inter-Tropical Convergence Zone (ITCZ). This is the zone of the ascending air. The ITCZ shifts to the north and to the south of the equator with the change of seasons. During the summer season, the ITCZ shifts northwards due to the migration of the Sun towards the Tropic of Cancer. Thus the Southeast Trade winds cross the equator and blow from the southwest to the northeast direction under the influence of the Coriolis force. These displaced Southeast Trade winds are called the Southwest or the Summer Monsoons. During the winter season, the sub-tropical high pressure belt and the thermal equator retreat southwards. The

Trade winds in both the hemispheres are re-established. These are the Northeast or the Winter Monsoons.

5. What are the main characteristics of the Westerlies?

Answer: The Westerlies have the following characteristics:

1. Westerlies blow between 35° and 65° latitudes on both sides of the equator.
2. In the Northern Hemisphere these winds blow from southwest to northeast and in the Southern Hemisphere from northwest to southeast.
3. As these winds blow from warmer areas to cooler areas they bring rain almost throughout the year.
4. The general features of Westerlies are largely modified due to cyclones and anticyclones associated with them.
5. The presence of large landmasses with irregular relief in the Northern Hemisphere have made the westerlies complex and complicated.
6. The absence of landmasses and the dominance of oceans in the Southern Hemisphere have made the Westerlies more vigorous. Their velocity increases southwards and they become stormy.
7. Westerlies are best developed between 35° S and 65° S latitudes and their velocity becomes so great that they are called the Roaring Forties, the Furious Fifties and the Shrieking Sixties at 40° S, 50° S and 60° S latitudes respectively.
8. As these winds blow in opposite direction to the Trade winds they are also known as the anti-trade winds.

15. Humidity

A. Fill in the blanks.

1. Relative humidity is always expressed as a **percentage**.
2. Convectional rainfall mostly occurs in the **equatorial** region.
3. Smog is the mixture of **fog** and **smoke**.
4. The amount of absolute humidity **decreases** from equator to poles.
5. The cirrus clouds have a **hair-like or silky** appearance.

B. Explain the following terms.

1. Humidity: Humidity is the amount of water vapour present in the atmosphere at a particular time and place.

2. Precipitation: The release of moisture in liquid or in solid form, after condensation of moisture in the atmosphere, is known as precipitation. The common forms of precipitation are rainfall, snowfall, hailstorm, drizzle, sleet, etc.

3. Dew point: The level at which the air is not in a position to take up any more moisture is called dew point.

4. Absolute humidity: It is defined as the ratio between the actual amount of moisture present in the air at a given temperature.

5. Nimbus: It is a Latin word which means 'rainy clouds'. It is generally used as a prefix or a suffix given to rain bearing, low level clouds.

C. Answer the following questions very briefly.

1. How does condensation take place in the atmosphere?

Answer: Condensation takes place due to the loss of heat and can occur in one of the following ways:

a. When the warm moist air rises upwards and it expands.
b. When the warm moist air comes in contact with the cold surface.
c. When the warm moist air mixes with the air coming from the colder regions.

2. What conditions are necessary for rain to occur?

Answer: The following conditions are necessary for rains to occur:

a. there should be sufficient amount of evaporation from the water bodies,
b. there should be wind to carry the water vapour from one place to another, and
c. there should be some way of decreasing the temperature of the moist air.

3. What are the various forms of condensation?

Answer: Fog, mist, dew and frost are the various forms of condensation.

4. How are clouds formed in the atmosphere?

Answer: As the moist air ascends, it expands, loses temperature, becomes cool, and gets saturated. With further decrease in temperature beyond the dew point, condensation of the moisture takes place high up in the air and it results in the formation of clouds.

5. What are the common forms of precipitation?

Answer: The common forms of precipitation are rainfall, snowfall, hailstorm, drizzle, sleet, etc.

D. Distinguish between the following.

1. Fog and Mist

Fog	**Mist**
The condensation of water vapour takes place around the dust and smoke particles that remain suspended in the air. It is called fog.	A light fog is called mist.
It is drier than mist.	It is a little more moist than fog.

2. Dew and Frost

Dew	**Frost**
The deposition of water droplets on some solid objects like leaves, flowers, grass-blades, pieces of rocks, etc. is called dew.	Sometimes due to excessive fall in temperature, the solid objects become so cold that minute crystals of ice, in place of water droplets, get deposited on the solid objects. This is called frost.

3. Stratus and Cumulous clouds

Stratus Clouds	**Cumulous Clouds**
The Stratus clouds have uniform layers. They are low, dull, grey and featureless. When these clouds are associated with rain or snow, they are called the Nimbo-stratus clouds, which are accompanied by thunder and lightning.	The Cumulous clouds are dense, widespread, dome-shaped and have flat bases. They are associated with fair weather but sometimes they become thunderclouds.

4. Condensation and Transpiration

Condensation	**Transpiration**
The process of transformation of water vapour into water (liquid) and ice (solid) is called condensation.	A special case of evaporation is transpiration which entails loss of water from the leaves and stems of the plants.

E. Answer the following questions briefly.

1. What is the significance of relative humidity?

Answer: The relative humidity tells us about the possibility of precipitation. The high and low relative humidity indicates the possibility of wet and dry conditions respectively. Relative humidity is directly related to human health. That is why, the equatorial region with high temperature and

high relative humidity and the tropical hot deserts with very low relative humidity are unfavourable for human health.

2. Describe the mechanism of cyclonic rainfall.

Answer: The mechanism of cyclonic rainfall can be explained in the following manner:

a. When the cold polar air mass and the warm westerly air mass, coming from the opposite directions, converge along a line, a front is formed.
b. In the warm air mass, the wind is lifted upwards along the front, while the cold air mass, being heavier, settles downwards.
c. The warm air mass lying over the cold air mass is cooled and gets saturated due to the increase in relative humidity.
d. The cooling beyond the saturation point leads to the condensation of moisture in the warm air mass of the cyclone.

3. How do the hailstones develop in the atmosphere?

Answer: The hailstones develop in the atmosphere in the following manner:

a. Hailstones develop mostly in the cumulonimbus clouds. Small droplets of water are formed in the lower part of the clouds due to condensation. Many of them join together to form large ones.
b. The strong rising convection current carries these raindrops to the higher levels, which causes freezing and gives rise to small ice pellets. They fall for some distance, slightly melt at the lower levels and are carried up again.
c. This happens several times until the weight of the ice pellets becomes so heavy that they cannot be carried up by the current. Ultimately, these ice pellets fall as hailstones on the Earth.

4. Describe the occurrence of snowfall from the atmosphere.

Answer: If the air mass is full of water vapour at a temperature below the freezing point, then the moisture from the atmosphere is released in the form of frozen ice crystals. Once the water starts freezing in a cloud the ice crystals in hexagonal shapes start increasing in size. Due to melting on the edges, several ice crystals stick together to form snowflakes.

5. Explain the mechanism of convectional rainfall.

Answer: The mechanism of convectional rainfall can be explained in the following manner.

a. The ground surface is intensely heated due to the insolation received during the daytime.
b. Thus the air coming in contact with the warm ground surface gets heated, expands and rises upwards.
c. The ascending warm and moist air cools due to its expansion in the higher altitudes.
d. The cooling of the ascending air increases its relative humidity.
e. The moist air becomes saturated and further cooling causes condensation, cloud formation and then rainfall.

F. Give reasons for each of the following.

1. The leeward side of a mountain gets less rainfall.

Answer: The windward slopes receive maximum amount of rainfall, while the leeward side gets less rainfall. The windward slope of a mountain, at the time of rainfall, has cumulus clouds while the leeward slope has stratus clouds. The ascending air, after crossing the mountain barrier descends along the leeward slope and is thus warmed up due to compression.

2. The amount of humidity varies from place to place.

Answer: Humidity refers to the amount of water vapour present in the atmosphere at a particular time and place. Humidity in air is due to the various processes of evaporation from the land and water surfaces of the Earth.

3. The possibility of rainfall depends on relative humidity.

Answer: The absolute humidity determines the amount of precipitation while the relative humidity tells us about the possibility of precipitation. The high and low relative humidity indicates the possibility of wet and dry conditions respectively.

4. Precipitation is not possible without the clouds.

Answer: The release of moisture in liquid or in solid form, after condensation of moisture in the atmosphere, is known as precipitation. Whenever there are clouds in the sky, some sort of precipitation always occurs, although we do not feel it on the Earth.

5. The convectional rainfall occurs mainly near the equator.

Answer: The ascending moist air starts cooling and this causes immediate saturation and condensation. The convectional rainfall mainly occurs in the equatorial region, where the daily heating of the ground surface causes convectional currents.

G. Answer the following questions.

1. What are the main features of orographic rainfall?

Answer: The main features of orographic rainfall are as follows:

a. The windward slopes receive maximum amount of rainfall, while the leeward side gets less rainfall.
b. The windward slope of a mountain, at the time of rainfall, has cumulus clouds while the leeward slope has stratus clouds.
c. The ascending air, after crossing the mountain barrier descends along the leeward slope and is thus warmed up due to compression.
d. If the mountains are of less height, the maximum rainfall does not occur on their top, but it occurs on the other side.
e. The orographic rainfall may occur in any season. It is more widespread and is of longer duration than the convectional rainfall.
f. The orographic rainfall is also supported by convectional and cyclonic methods of condensation.
g. Most of the precipitation in the world is orographic in nature.

2. Describe the main characteristics of convectional rainfall.

Answer: The main characteristics of convectional rainfall are as follows:

a. The ascending moist air starts cooling and this causes immediate saturation and condensation.
b. Thus the convectional rainfall occurs in the form of heavy downpour, which is always associated with lightning and thunder.
c. The rainfall occurs for a short duration through thick, dark and extensive cumulonimbus clouds.
d. The convectional rainfall mainly occurs in the equatorial region, where the daily heating of the ground surface causes convectional currents.
e. Thus the sky is overcast by about 3:00 p.m. every day, which causes heavy rains. The sky is usually cleared by 4:00 p.m.
f. This type of rainfall also occurs in the tropical, subtropical and the temperate regions in the summer seasons.

3. Explain the mechanism and necessary conditions for orographic rainfall to occur.

Answer: The mechanism of orographic rainfall can be explained in the following manner:

This type of rainfall occurs when warm moist saturated air mass approaches a mountain barrier and is forced to ascend. The mountain barrier, lying across the direction of the moving air, forces the warm moist air to rise along the mountain slope. As the air mass rises, it expands and loses temperature. This increases the relative humidity of the air mass. Consequently, the ascending air becomes saturated and condensation begins.

The following conditions are necessary for the occurrence of the orographic rainfall to occur:

a. There should be a mountain barrier across the direction of the wind so that the moist air is forced to move up along the mountain slope. If the mountain barrier runs parallel to the direction of the wind, the air is not obstructed and no rainfall occurs. Rajasthan receives very low rainfall because the Aravalli range lies parallel to the direction of the wind.
b. If the mountains are located very close and parallel to the coast, they become an effective barrier for the moist winds. The Western Ghats in India present the ideal conditions for the orographic rainfall.
c. If the mountains are located close to the coast, even low height can be an effective barrier, as moist air gets saturated even at low height. The mountains in the interior should be very high as the air, after covering long distance, does not carry enough moisture.

4. What are the main characteristics of cyclonic rainfall?

Answer: The main characteristics of cyclonic rainfall are as follows:

a. In the tropical cyclone, the lifting of air is almost vertical and is often associated with convection. When saturated, it gives heavy showers accompanied by thunder and lightning.
b. The tropical cyclones, regionally known as typhoons, hurricanes, tornadoes, etc. yield heavy downpour in China, Japan, Southeast Asia, India, USA, etc.
c. Since the lifting of warm air along the warm front of the temperate cyclone is slow and gradual, the condensation of moisture is also slow and gradual. Thus, the precipitation occurs in the form of drizzle. It is widespread and continues for a longer duration.
d. The precipitation associated with the cold front is always in the form of thunder showers but is of a shorter duration. Sometimes it occurs in the form of snowfall and hailstorm.
e. Most of the rainfall in the temperate region is received through frontal or cyclonic rains.

5. Describe the distribution of precipitation in the world.

Answer: The mean annual rainfall on Earth is about 100 cm but it is not evenly distributed. Most of the annual rainfall is received during a few months of the year, while the rest of the months either remain dry or receive little rainfall. In spite of great variations in the distribution pattern, some generalisation can be made about the average annual distribution of precipitation in the world. These are as under:

a. The total amount of rainfall is the highest in the equatorial region and decreases gradually towards the poles with a great deal of irregularity.
b. The coastal areas receive greater amount of rainfall than the interior of the continents which are generally far from the main source of moisture.
c. The mountain barriers tend to concentrate precipitation on the windward slope. Rainfall decreases as one moves towards the leeward slope.
d. Between 35° and 45° latitudes in both the hemispheres, there occurs heavy rain on the eastern coast which decreases gradually towards the western coast.
e. Between 45° and 65° latitudes in both the hemispheres, the rainfall from the Westerlies is first received on the western coast and decreases gradually towards the eastern coast.
f. Rainfall is more over the oceans than over the continents. This is due to the greater amount of evaporation from the ocean surface.

16. Pollution – Types and Sources

A. Fill in the blanks.

1. In the past, the human beings lived in **harmony** with environment.

2. The substances which cause pollution are called **pollutants**.

3. The use of loudspeakers is not allowed after **10:00 p.m.** in India.

4. SPM stands for the suspended **particulate** matter.

5. Smog is mostly formed during the **winter** season.

6. The main source of water pollution is the **industrial** waste.

B. Explain the following terms.

1. Environment: Everything, living as well as non-living, which surrounds us and influences our activities (directly or indirectly) is called our environment.

2. Pollutants: The substances which cause pollution of air, water and soil are called pollutants.

3. Pollution: There has been a large scale increase of unwanted materials in the environment due to exploitation or over-utilisation of natural resources. Any undesirable change in the biotic or abiotic components of our environment, which is harmful to living organisms, is called pollution or environmental pollution.

4. Dredging: The work of dredging (which is associated with operations to keep the harbours and waterways free from silting) dumps large amount of materials into the marine water bodies.

5. Radioactivity: Radiation is defined as the release of energy from atoms of some elements. It is also the movement of energy in the form of invisible waves through space. The emission of these invisible radiations is known as radioactivity.

6. Smog: Smog is the mixture of fog and smoke. The volatile organic compounds are released into the air by burning wood, coal, petrol, diesel, natural gas, and other materials used in factories or homes. This causes the formation of smog.

C. Answer the following questions very briefly.

1. How was the harmony between the human beings and the environment disturbed?

Answer: The harmony between human beings and environment was disturbed by rapid growth of population, excessive urbanisation and increasing consumerism in the modern society.

2. Name the main types of pollution.

Answer: The main types of pollutants are as follows:

a. On the basis of origin – Primary and Secondary Pollutants
b. On the basis of state – Solid, Liquid, and Gaseous Pollutants
c. On the basis of degradation – Biodegradable and Non-biodegradable Pollutants

3. What are the main pollutants of air?

Answer: The main pollutants in the air can be oxides of carbon, sulphur and nitrogen, hydrocarbons and other suspended particulate matter (SPM).

4. Name the natural sources of environmental pollution.

Answer: The natural sources of environmental pollution are volcanic eruptions, forest fires, landslides, dust storms, floods, etc.

5. Name the human made sources of environment pollution.

Answer: Human activities such as transport vehicles, industries, burning garbage, brick kilns, urbanisation, mining and extraction of oil, agricultural processes, deforestation, etc. are the examples of human made sources of environment pollution.

D. Distinguish between the following.

1. Primary and Secondary pollutants

Primary Pollutants	**Secondary Pollutants**
The primary pollutants are those which enter the environment directly from various sources, such as carbon monoxide, sulphur dioxide, hydrocarbons.	The secondary pollutants are those which are formed by chemical interactions between the primary pollutants and the atmospheric gases, such as sulphuric acid, nitric acid, etc.

2. Organic and Inorganic substances

Organic Substances	**Inorganic Substances**
The substances which are biodegradable are called organic substances. Example: animal dung	The substances which are not biodegradable are called inorganic substances. Example: plastic

3. Biodegradable and Non-biodegradable substances

Biodegradable Substances	**Non-biodegradable Substances**
The biodegradable substances are mostly the organic matter, such as domestic garbage, crops and vegetable residues, animal dung, human excreta, remains of animals, sewage, etc.	The non-biodegradable substances are mostly the inorganic substances and organic polymers, such as plastics, synthetic fibres and rubber, pesticides, hydrocarbons, coal ash and toxic metals.

4. Biotic and Abiotic components of environment

Biotic Components of Environment	**Abiotic Components of Environment**
Living things like plants and animals are called biotic components of environment.	Non-living things like air, water and land are called abiotic components of environment.

E. Answer the following question briefly.

1. What is the role of fossil fuels in air pollution?

Answer: Air pollutants are mainly due to the burning of fossil fuels (coal and petroleum), either in the internal combustion engines or in homes.

2. What is soil pollution? Name its main pollutants.

Answer: Soil pollution is defined as the change in the physical, chemical and biological conditions of soil due to the presence of various toxic materials in it. Harmful substances are added to the soil through the surface run-off or through leaching. The pollutants remain in the soil for a longer period of time. Main pollutants and causes of soil pollution are dumped waste materials, agrochemicals, mining activities and large scale urbanisation.

3. How does carbon monoxide affect human beings?

Answer: The vehicles are the single largest source of carbon monoxide, which bonds easily with haemoglobin. It can inhibit the delivery of oxygen to different parts of body.

4. What is radiation pollution and what are its main sources?

Answer: The release of radiations, which can degrade the quality of environment and create danger for the living organisms, is called radiation pollution. Nuclear accidents and X-rays are its main sources of pollution.

5. Name the main natural and human made sources of air pollution.

Answer: The main natural sources of air pollution include gases from volcanic eruptions, forest fires, dust storms, gases coming from the decaying plants, pollen from seed bearing plants, spores from fungi, ferns, suspended particles, animals, microorganisms and inorganic substances.

The main human-made sources of air pollution include smoke and gases from chimneys and furnaces of factories, thermal power plants, exhaust of automobiles and railway engines, brick kilns, burning of garbage, suspended particulate matter from agriculture, industries, mining, power plants, etc.

F. Give reasons for each of the following.

1. Human beings in the past, lived in harmony with environment.

Answer: In the past, human beings lived in harmony with the environment. The relationship was guided by the fact that man belongs to the Earth and not the other way.

2. Human activities are polluting the air and water.

Answer: Air pollutants are mainly due to the burning of fossil fuels (coal and petroleum), either in the internal combustion engines or in homes. In the present age, due to industrialisation, most of the water bodies are highly polluted. Thus, nowadays, human activities are responsible for most of the air and water pollution.

3. The excessive use of chemical fertilizers can cause soil pollution.

Answer: Nowadays, heavy doses of chemical fertilizers are added to the soil to increase the agricultural production. The chemical fertilizers contain potassium, phosphorus and nitrogen, which are important plant nutrients. Their excessive use causes soil pollution and reduces the fertility of soils.

4. Domestic waste is the main source of water pollution.

Answer: In the municipal drains the domestic waste is mixed up with garbage from urban and rural settlements. This highly polluted water is discharged into rivers, lakes and ponds. The domestic wastes contain plenty of organic matter in the form of food and its residues, soaps and detergents, human excreta and large number of pathogens. It is roughly estimated that about 75 per cent of pollutants in water are mainly due to domestic waste. Thus, the domestic waste and garbage are the main sources of water pollution.

5. Radiation can be useful as well as harmful for the human beings.

Answer: Radiations can be useful as well as harmful. For example, the X-rays are very useful in diagnosing diseases, by imaging the inner parts of the body. But X-rays also account for about 50 per cent of harmful artificial exposure of human beings to radiations, especially children.

G. Answer the following questions.

1. Classify the pollutants on the basis of degradation and explain each type.

Answer: On the basis of degradation, pollutants can be divided into two parts:

a. The biodegradable pollutants are mostly the organic matter, such as domestic garbage, crops and vegetable residues, animal dung, human excreta, remains of animals, sewage, etc.
b. The non-biodegradable pollutants are mostly the inorganic substances and organic polymers, such as plastics, synthetic fibres and rubber, pesticides, hydrocarbons, coal ash and toxic metals.

2. Describe the various types of water pollution and their main sources.

Answer: Water pollution can be studied under two headings – pollution of fresh water and pollution of marine water.

a. **Pollution of Fresh Water**

The fresh or clean water is one of the basic needs of all living organisms. It is actually a medium for various life processes. Due to its high dissolving capacity, water can be easily and quickly polluted. Fresh water is needed for agricultural and industrial growth.

b. **Pollution of Marine Water**

In the present age of technology and large scale industrialisation, the coastal areas of oceans and seas are most vulnerable to pollution. These areas receive direct discharges from the rivers, which carry a large amount of dissolved and particulate matter. The oceans and seas are being used as endless dustbins for wastes. The industries use the marine water bodies as a convenient dumping ground for wastes which are toxic in nature. The pollution in the oceans and seas is rapidly increasing due to oil spills from cargo oil tankers, oil losses during offshore exploration and extraction and leakage from the underground pipelines. The work of dredging (which is associated with operations to keep the harbours and waterways free from silting) dumps large amount of

materials into the marine water bodies. This dredged material also contains oil, heavy metals, nutrients, industrial wastes and sewage sludge.

3. How is acid rain formed and what are its effects?

Answer: The oxides of nitrogen and sulphur are produced due to the burning of coal. They can form nitric acid and sulphuric acid, which may fall as acid rain. Acid rain can cause skin problems, weaken or destroy historical monuments or even destroy crops.

4. Explain the various sources of soil pollution.

Answer: The main sources of soil pollution are:

Soil Pollutants from Chemical Fertilizers

The present system of agriculture, not only in our country but almost in every country of the world, is a major source of soil pollution. Nowadays, heavy doses of chemical fertilizers are added to the soil to increase the agricultural production. The chemical fertilizers contain potassium, phosphorus and nitrogen, which are important plant nutrients. Their excessive use causes soil pollution and reduces the fertility of soils. They can also harm the aquatic life in the nearby water bodies.

Soil Pollutants from Biomedical Waste

Biomedical wastes are generated in hospitals, clinics and pathological laboratories. They include bandages, blood-stained cotton, plaster pads, syringes, metal needles, used bottles, expired medicines, chemicals, etc. Most of the biomedical wastes which are dumped with urban wastes are toxic and infectious in nature. This waste provides a breeding ground for the growth of pathogens, which can affect human health. Thus, such waste materials can pollute the soil.

Soil Pollutants from Pesticides and Insecticides

Nowadays, farmers use a variety of pesticides and insecticides to control the growth of pests, insects and weeds on the farmlands to save the crops. Pesticides remain active even after destroying their targets.

The residues of pesticides and insecticides can change the chemical properties of soil and kill even useful insects and microorganisms in the soil. Most of the pesticides are non-biodegradable. These toxic materials can also enter the plant products.

5. Describe the main sources of radiation pollution.

Answer: The main sources of radiation pollution can be natural, such as solar rays and natural radioactivity, or human made such as X-rays, nuclear waste, nuclear accidents, etc.

X-rays

It helps in diagnosing various types of ailments and skeletal disorders. The X-rays are high energy rays and can easily penetrate through the soft tissues of the body. Excessive and indiscriminate use of X-rays can cause damage to the internal organs of the human body. They can affect the chromosomes, which affect mutations.

Nuclear fallout

The nuclear power plants take all possible safety measures for their smooth working and are considered to be quite safe, but there have been technical failures due to human errors, such as in the case of nuclear power plant in Chernobyl (Soviet Union) in 1986.

Nuclear waste

The main sources of nuclear waste are the nuclear power plants, industries, research laboratories and the institutions using radioactive materials. These wastes keep on emitting radiations regularly in the environment.

17. Pollution – Effects and Prevention

A. Fill in the blanks.

1. The main gas responsible for greenhouse effect is **carbon dioxide**.

2. CFCs are organic chemicals which are **light** in weight.

3. Noise level between **80** and **130** dB can cause temporary hear loss.

4. Fossil fuels include coal, petroleum and **natural gas**.

5. Carpooling is more popular with people living in **big cities**.

6. The use of solar cookers can save **energy**.

B. Explain the following terms.

1. Necrosis: Sulphur Dioxide (SO_2) retards the growth of crops and other plants and causes necrosis in leaves.

2. Pathogens: Pathogens are organisms that cause disease.

3. Passive smokers: Passive smoking is the inhalation of smoke by persons other than the active smoker.

4. Public transport: The public transport is a shared passenger transport service which is available for use by the general public. The means of public transport include city buses, trams, local passenger trains, metros, subways, etc.

5. Acid rain: During the rainy season, SO_2 (produced by volcanic eruptions, industries, and burning of fossil fuels) combines with water and forms sulphuric acid. This causes acid rain.

6. Global warming: The concept of global warming suggests that there will be an increase in temperature on the Earth's surface and atmosphere. This is due to increase in the amount of carbon dioxide and other greenhouse gases in the atmosphere.

7. Carpooling: Carpooling, also known as car-sharing, is the shared use of cars by persons with similar travel needs. It means that people living in the same area and going for work to the same area, should not use their individual vehicles every day. In the system of carpooling more than one person travels in a car.

8. Fossil fuels: The fossil fuels were formed due to the decay of buried plants and animals over millions of years. They include coal, petroleum and natural gas. The fossil fuels produce energy when burnt. Energy is needed for cooking, running transport vehicles and industries.

C. Answer the following questions very briefly.

1. Why is urban population more affected by pollution?

Answer: In big cities, pollutants are present in high concentrations. Thus, the urban population is more likely to be affected by pollution than the rural population.

2. What is the relationship between CFC and ozone?

Answer: Chlorofluorocarbons are organic chemicals which can reach the layer of ozone in stratosphere. They can lower the ozone level in the atmosphere. Thus, they help in global warming.

3. What are the main sources of soil pollution?

Answer: Soils can be polluted by organic and inorganic chemicals and toxic metals. Industrial wastes, agricultural practices, biological agents, mining and smelting activities, urban and commercial wastes and radioactive waste are all sources of soil pollution.

4. Why should energy be saved?

Answer: Today, about 75 per cent of the world's requirement of energy is met by the burning of fossil fuels. Thus, the energy resources must be used judiciously, so that they are easily available for the present as well as for the future generations. Saving energy is actually using the resources fairly and rationally.

5. What is the main feature of public transport in cities?

Answer: The public transport is a shared passenger transport service which is available for use by the general public. It is different from other means of transport, such as taxicabs, carpooling or hired buses which are not shared by strangers.

6. Name a few non-conventional sources of energy.

Answer: The main non-conventional sources of energy are solar energy, wind energy, hydel energy, tidal energy, nuclear energy, biomass energy, geothermal energy, alternative fuels (biogas, hydrogen, alcohol, biodiesel, bio-petrol), etc.

D. Write True or False for each of the following.

1. The air pollutants have no effect on monumental buildings.	False
2. The industrial waste is toxic for living organisms even in small quantities.	True
3. Radioactive waste stays in the soil for thousands of years.	True
4. Carpooling probably originated in India due to poverty.	False
5. Organic farming uses natural environment to increase the agricultural production.	True
6. The fossil fuels are almost inexhaustible and would provide energy for thousands of years.	True

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E. Answer the following questions briefly.

1. Name the factors which determine the effects of pollution on environment and human health.

Answer: The main factors which determine the effects of pollution on environment and human health are as under:

1. The nature of pollutants
2. The concentration of the pollutants
3. The duration of exposure
4. The age of the receptor
5. The state of health of the receptor

2. How do lead, mercury and copper, as pollutants, affect human health?

Answer: The accumulation of lead in human body damages the nervous system, kidney, liver and brain. Children and pregnant women are most affected by lead poisoning. Mercury and its compounds can cause abdominal problems, headache, chest pain and diarrhoea. Copper can cause hypertension and drowsiness.

3. Describe the main effects of marine water pollution.

Answer: The marine water pollution has the following effects:

1. The sediments from agriculture and mining cause the growth of algae in water.

2. The pathogens in sea water can cause various diseases in aquatic life.
3. The nuclear wastes are disposed of in sealed containers. The leakage can cause serious damage to flora and fauna in marine habitat.
4. Oil spills cause frequent death of planktons, fish, coral reef, sea food and marine birds.

4. What are the main advantages of carpooling in big cities in India?

Answer: The main advantages of carpooling in big cities in India are as follows:

1. Carpooling not only reduces the travel expenses and stress of driving, but also helps in reducing traffic congestion/traffic jams on the roads and the need for parking spaces.
2. It is a sustainable way of travelling as it reduces the demand of non-renewable fossil fuels. It also reduces the emission of poisonous gases, such as carbon monoxide into the atmosphere.
3. It can help in reducing the number of cars on the roads and allow the traffic to move smoothly.

5. Name the public places which were declared No Smoking Zones by the Supreme Court of India.

Answer: Supreme Court of India prohibited smoking in public places, such as auditoriums, hospital buildings, health institutions, educational institutions, libraries, court buildings, public offices and public transport including the railways.

6. How can public transport vehicles help in saving energy?

Answer: The rapid transit system (metros) is generally regarded as more energy efficient than other forms of travel. It also saves the fossil fuels.

F. Give reasons for each of the following.

1. Noise pollution is an important cause of stress in human beings.

Answer: Noise pollution is the leading cause of stress today. High decibel (dB) noise has physiological and psychological effects on human beings. Noise level between 80–130 dB can cause temporary or permanent hear loss. Constant exposure to high dB noise can cause hypertension, stomach disorder, heart disease, hormone imbalance, etc. The emotional effects include anxiety, irritability, sleeplessness, lack of concentration, mental tiredness and lower working efficiency. The workers working in industries which use noisy machines generally have hearing disorders. Sudden and loud noise can cause collapse of weak buildings and glass panels.

2. The pollution of freshwater affects half of world's population.

Answer: Every year, there are more than 300 million cases of water related diseases which cause about 10 million deaths. The most polluted rivers are in Asia. They have five times more bacteria and about 20 times more lead than rivers in the industrialised countries.

3. Eutrophication often leads to the loss of aquatic life in a pond.

Answer: Domestic sewage, organic waste from industries and run-off from agricultural fields can cause excessive growth of aquatic vegetation, such as algae and weeds. This excessive growth of weeds in water bodies is called eutrophication. This occurs only in stagnant water bodies (ponds and lakes) and not in flowing water (rivers). They release toxins in water and also decrease the oxygen content in water. It often leads to the loss of aquatic life in stagnant water bodies.

4. Carpooling has become the need of the hour in Indian cities.

Answer: Carpooling not only reduces the travel expenses and stress of driving, but also helps in reducing traffic congestion on the roads and the need for parking spaces. It is a sustainable way of travelling as it reduces the demand of non-renewable fossil fuels. It also reduces the emission of poisonous gases, such as carbon monoxide into the atmosphere. It can help in reducing the number of cars on the roads and allow the traffic to move smoothly.

5. The rapid transit system is more energy efficient than other forms of travel.

Answer: It provides faster services for neighbourhood towns. The rapid transit railway system, also called metro, operates in big cities with high capacity and frequency. The metros can transport a large number of people quickly over short distances. It also saves the fossil fuels.

6. The various sources of energy must be used judiciously.

Answer: The fossil fuels are non-renewable sources of energy, while Sun, water and wind are renewable sources of energy. Today, about 75 per cent of the world's requirement of energy is met by the burning of fossil fuels. Thus, the energy resources must be used judiciously, so that they are easily available for the present as well as for the future generations.

G. Answer the following questions.

1. What is the effect of indoor air pollution in India?

Answer: The effects of indoor air pollution in India are as follows:

1. The smoke can cause chronic bronchitis and infection in the respiratory tract.
2. Tobacco smoke can cause lung cancer and also affect passive smokers.
3. Volatile organic compounds from building materials, paints, cleaning products, adhesive, etc. can cause irritation to mucous membrane, headache and insomnia.
4. Fibre glass can cause skin rashes and itching.
5. Moisture from refrigerators, air conditioners, ornamental plants, etc. help in the growth of fungi and bacteria which are health hazards.

2. How can radiation pollution affect human health?

Answer: The radiations from the radioactive substances have the following effects.

The exposure to high energy radiations from ultraviolet rays, X-rays and ionizing radiations can cause breast cancer, lung cancer, brain cancer, etc.

The exposure to high energy radiation is more harmful to infants and pregnant women.

The low energy radiations from computer, television, microwave ovens, mobile phones, etc. can cause fatigue, headache, dizziness, cataract, nervousness and skin diseases.

3. What are the disadvantages of carbon dioxide in the air?

Answer: Carbon dioxide is the main cause of greenhouse effect and consequently global warming. It can cause changes in regional and seasonal weather patterns.

4. Suggest at least four ways with the help of which we can easily save energy.

Answer: Some ways for saving energy are as under:

1. Avoid wastage of energy in our daily life and promote the use of alternate sources of energy.
2. Develop new technology to increase the efficiency of energy in domestic, industrial, transport and power generation sectors.
3. Electrical appliances such as fans, radios, televisions, music systems, air conditioners, heaters, geysers, etc. should be switched off when not in use.
4. The energy efficient appliances can be costlier, but the consumption of less energy will make them profitable in the long run. For example, the LED bulbs are energy efficient.

5. How can we restrict the use of fossil fuels in our daily life?

Answer: The main non-conventional sources of energy are solar energy, wind energy, hydel energy, tidal energy, nuclear energy, biomass energy, geothermal energy, alternative fuels (biogas, hydrogen, alcohol, biodiesel, bio-petrol), etc. These non-conventional sources can provide effective alternative to fossil fuels. The non-conventional sources of energy are mostly renewable in nature and the technologies based on these energy sources are mostly pollution free as their contribution to the greenhouse effect is just minimum. Thus, the development of the non-conventional renewable energy resources will definitely restrict the use of fossil fuels in future.

6. Describe the system and advantages of organic farming in India.

Answer: The system of organic farming relies on green manures, compost, biological pest control, etc. It combines scientific knowledge of ecology and modern technology with traditional farming practices based on naturally occurring biological processes. It is a well-known fact that organic food is free from pesticides and insecticides. Thus, it is more nutritious and healthy when compared with non-organic food.

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18. NATURAL REGIONS OF THE WORLD

A. Fill in the blanks.

1. The Amazon lowlands are included in the **equatorial** region.

2. The tropical grasslands in Africa are called the **Savanna**.

3. The tropical deserts are located on the **western** margins of the continents.

4. Most of the rainfall in the tropical monsoon region is from the **trade** winds.

5. In South Africa, the Mediterranean region is around **Cape Town** .

6. The temperate grasslands of Australia are called the **Downs** .

7. The word Taiga stands for **virgin** forests.

8. The Lapps live mostly in the **Scandinavia** countries.

B. Explain the following terms.

1. Permafrost: The ground surface in the tundra region is covered with snow for at least 8 to 9 months in a year. The region experiences cold storms known as blizzards. The ground is permanently frozen. It is termed as permafrost.

2. Tundra: Tundra is a Finnish word which means barren land. The tundra region is a vast lowland, lying along the shores of the Arctic Ocean. It lies beyond the Arctic Circle (66½° N) in the Northern Hemisphere and includes the extreme northern parts of North America, Europe and Asia.

3. Chinook: The dry warm winds blowing from the east of Rockies in the Southern Hemisphere which can melt the snow in winter are called Chinook.

4. Steppes: The temperate grasslands of Eurasia that extend for a distance of more than 3,200 km from the Black Sea across the Great Russian Plain up to the foothills of the Altai mountains are known as the Steppes.

5. Transpiration: The loss of water from the plant through the process of evaporation at the leaf surface is called transpiration. Most transpiration happens from the leaves of plants. The water, warmed by the sun, turns into vapour and passes out through thousands of tiny pores, mostly on the underside of the leaf surface.

6. Elephant grass: The coarse tall grass, which grows to a height of about 3 m, is the typical vegetation of Savanna or tropical grasslands. The ground layer has coarse, stiff and hard grasses. These grasses may be of 1 m to 3 m height. The 5 m tall grass is called the elephant grass.

7. Rain shadow: A region having little rainfall because it is sheltered from prevailing rain-bearing winds by a range of hills is called rain shadow. The Prairies lie in the rain shadow areas of the Rockies. That is why it is dry.

8. Resort climate: The Mediterranean type of climate is considered as a resort climate due to its pleasant and comfortable winter season.

C. Answer the following questions very briefly.

1. What type of rainfall is experienced in the equatorial region?
Ans: The rainfall in the equatorial region is heavy and well distributed almost throughout the year. The average annual rainfall is about 250 cm and there is no dry season in the year. The rainfall, being convectional in nature, is accompanied by thunder and lightning.

2. Name any three areas under tropical grasslands.
Ans: The tropical grasslands are found mainly in South America, Africa and Australia.

3. Where is the Atacama Desert located?
Ans: The Atacama Desert is located in South America.

4. Which are the main planetary winds in the Tropical Monsoon region?
Ans: The tropical monsoon region is under the domain of Trade winds. The monsoon region receives most of the rainfall from the south-west monsoon winds.

5. In which continent the Orinoco river basin is located?
Ans: Orinoco river basin is located in the continent of South America.

6. Which part of Australia is included in the Mediterranean region?
Ans: South-western Australia is included in the Mediterranean region.

7. Where are Prairie grasslands located?
Ans: The temperate grasslands of North America, also known as Prairie grasslands are located in Canada and USA.

8. Which region has the abundance of coniferous forests?
Ans: Coniferous forests are found in taiga region in abundance.

9. Name at least three nomadic tribes in the Tundra region.
Ans: The Inuits or Eskimos of North America, the Lapps of Scandinavia, the Samoyeds and Yakuts of Siberia are the nomadic tribes found in Tundra region.

D. Match the following:

Column A	Column B
1. Doldrums	**a.** Mediterranean region
2. Park landscape	**b.** Tundra region
3. Indian Subcontinent	**c.** Temperate grasslands
4. Olive trees	**d.** Tropical desert
5. Verkhoyansk	**e.** Tropical monsoon region
6. Yakuts	**f.** Equatorial region
7. Pampas	**g.** Taiga region
8. Kalahari	**h.** Tropical Grasslands

Ans: 1. – f 2. – h 3. – d 4. – a 5. – g 6. – b 7. – c 8. – d

E. Answer the following questions briefly.

1. Describe the climatic conditions in the equatorial region.
Ans: The equatorial region experiences uniformly high temperature almost throughout the year. The average annual temperature is about 27 °C and the annual range of temperature is only 3 °C.
The rainfall is heavy and well distributed almost throughout the year. The average annual rainfall is about 250 cm and there is no dry season in the year. The rainfall, being convectional in nature, is accompanied by thunder and lightning.

2. Describe the main vegetation of tropical grasslands in the world.
Ans: The coarse tall grass, which grows to a height of about 3 m, is the typical vegetation of Savanna or tropical grasslands. The rainfall is neither sufficient nor well distributed to support the growth of tall trees. The Savanna vegetation can also be classified as woodland, trees, shrubs and grasses. The trees are mostly broad-leaved and most of them are drought resistant and shed their leaves in the cool dry season. The main trees found in this region are baobab, acacia, eucalyptus, tamarind, etc. The park landscape is suitable for grass-eating mammals.

3. Why are the tropical deserts located on the western margins of the continents?
Ans: The trade winds give enough rainfall on the eastern margins of the continents, but as they reach the western margins they become dry. The ground temperature is so high that the raindrops are evaporated before they reach the ground surface. That is why the tropical deserts are located on the western margins of the continents.

4. How is the natural vegetation influenced by rainfall in the tropical monsoon region?
Ans: The combination of heat and good rainfall in the summer season favours the growth of natural vegetation and forests in the tropical monsoon region. The monsoon region receives most of the rainfall from the south-west monsoon winds during the months from June to September. The distribution of rainfall is irregular and uncertain both in time and place. So, the natural vegetation depends upon the amount of rainfall in the tropical monsoon region.

5. Explain the agricultural system and main crops produced in the Mediterranean region.
Ans: The crops are able to complete their vegetative growth during the cool wet season and can be harvested before the dry summer season.
The main crops in the Mediterranean region are wheat, olives, vine, citrus fruits, oats, barley, maize, tobacco, vegetables and flowers. For the summer crops, irrigation is necessary. Summer rains in some parts also favour the production of rice.

6. Describe the location and extent of the temperate grasslands in the world.
Ans: The temperate grasslands of Eurasia, known as the Steppes, extend for a distance of more than 3,200 km from the Black Sea across the Great Russian Plain up to the foothills of the Altai mountains. The temperate grasslands of North America, in Canada and USA are known as the Prairies. They extend from the foothills of the Rockies in the west up to the temperate deciduous forest belt in the east. In the Southern Hemisphere, the Pampas of South America, the Veld of South Africa and the Downs of the Murray-Darling basin in Australia are included in this region. Most of them are not far away from the sea coast.

7. What are the main economic activities in the taiga region of Eurasia?
Ans: The hunting of fur-bearing animals like musk-rats, ermine and silver fox are important economic activities. Some of the fur-bearing animals are also reared in fur-farms in Canada and Siberia. Fishing is popular in summer season, while lumbering in the winter season. Lumbering is the main occupation of the people in areas which are easily accessible. The softwood from the coniferous forests is widely used in the manufacture of wood pulp and paper, newsprint, matches, staple fibres, furniture and building materials.

8. Describe the extreme climatic conditions in the tundra region.
Ans: The main features of the climate in the tundra region is the general absence of insolation, and very low temperature throughout the year. The average annual temperature is about –12 °C.

- The winters are long and bitterly cold, while the summers are short and cool. The temperature during the summer season varies between 2 °C and 10 °C. The warmest month is June.
- The daily range of temperature is very low due to little difference in day and night temperature, but the annual range of temperature is quite high.
- The ground surface is covered with snow for at least 8 to 9 months in a year. The region experiences cold storms known as blizzards. The ground is permanently frozen.
- The precipitation is mostly in the form of snowfall and the rainfall is cyclonic in origin and brought by the Westerlies. The total annual rainfall is about 25 cm.

F. Give reasons for each of the following.

1. The migratory system of agriculture is still practised in the equatorial region.
Ans: The human settlements are small and scattered in the equatorial region. Since the region is sparsely populated, the migratory system of agriculture, variously known as milpa in Latin America, fang in parts of Africa, and ladang in Indonesia, is practised in the equatorial region.

2. The annual range of temperature is greater in tropical grasslands than in the equatorial region.

Ans: The tropical grasslands are found in the interior of continents in the tropical belt. It forms a zone of transition between the hot and humid equatorial region and the hot and dry lands of tropical deserts. These grasslands are mainly located between 5° and 20° north and south of the equator. The mean temperature is high throughout the year, i.e. between 24 °C and 32 °C.

On the other hand the equatorial region includes the area on both sides of the equator in a belt extending between 10° N and 10° S latitudes. This region experiences uniformly high temperature almost throughout the year. The average annual temperature is about 27 °C but the annual range of temperature is only 3 °C.

3. Agriculture is the main occupation of people in the tropical monsoon region.

Ans: Agriculture is the main occupation of people in the tropical monsoon region as the lowlands and the river valleys have fertile soils and enough water supply and thus are intensively cultivated. Where the rainfall is less, irrigation is practised. The main crops are rice, wheat, maize, oilseeds, tea and coffee. Other important crops cultivated in the monsoon region are sugarcane, tobacco, cotton, jute, cocoa, indigo, cinchona and tropical fruits.

4. The Westerlies influence the climatic conditions in the Mediterranean region.

Ans: The Mediterranean region comes under the influence of the Trade Winds during the summer season and the Westerlies during the winter season. The average temperature during the cool winter season ranges between 5 °C and 10 °C. The mean annual rainfall in this region ranges between 35 cm and 65 cm. Most of it occurs during the winter season and is received from the cyclonic storms associated with the humid Westerlies.

5. In the tropical deserts most of the tribal groups are still leading the nomadic style of life.

Ans: Most of the tribal groups such as Bedouins of Sahara and Arabian deserts of the tropical desert region migrate from place to place in search of water and pastures for their animals. They lead a life of nomadic herdsmen rearing camels, horses, sheep and goats. They live in tents and depend mostly on their animals for their survival. They still lead the nomadic style of life. The Bushmen of Kalahari desert in South Africa and the Aborigines of Australia practice food gathering and hunting.

6. There is general absence of natural vegetation, especially trees in the temperate grasslands.

Ans: The rainfall in temperate grasslands is limited and most of it comes when evaporation is high. The soil is mostly porous. Thus, the conditions are not suitable for the growth of trees and the main natural vegetation is grass. Some areas in the temperate grasslands were originally covered with the deciduous forests, which have now been cleared and the land has been brought under extensive wheat farming. So there is a general absence of natural vegetation especially trees in the temperate grasslands.

7. The forests are economically very significant in the taiga region.
Ans: The natural vegetation in the taiga region are forests, usually known as taiga or virgin forests. The region has mainly evergreen coniferous trees. The important coniferous trees in the taiga region are pines, spruces, firs, maples and cedars. These are softwood trees and the wood is used in the making of paper, matchsticks, plywood, furniture, sport goods, etc. So the forests in the taiga region are economically very significant.

8. The lifestyle of tribals in the tundra region is fast changing.
Ans: The extremely cold climatic conditions do not encourage permanent settlements in the tundra region. The Inuits or Eskimos of North America, the Lapps of Scandinavia, the Samoyeds and Yakuts of Siberia used to lead a nomadic life. Hunting and fishing were their main occupations. They also traded in fur and other animal products. Now many of them live in permanent wooden houses having all modern amenities. Reindeer farms have been established. Glass houses have been set up for the cultivation of vegetables to meet the needs of local population. So the lifestyles of tribals are changing fast in the tundra region.

G. Answer the following questions.

1. What are the main economic activities in the hot and humid climate of equatorial region?
Ans: The hot and humid climate of equatorial region helps in the growth of trees, creepers, bushes and orchids. The main trees found in these forests are mahogany, rosewood, ebony, cinchona, rubber, coconut palm, cane, bamboos, etc. that yield valuable hardwood, which is widely used in the making of costly furniture.

The equatorial region has red and yellow soils of low fertility, as they get leached by heavy rainfall. The main crops grown by people in the Amazon Basin are yams, potatoes, manioc, rice, rubber, maize, etc. In the Congo Basin cassava, rubber, rice, cotton, tobacco, cocoa, oil palm, kola nuts, etc. are the main agricultural products. Rubber and sugarcane are grown in plantations by people living in the south-east Asian islands. Other crops include rice, tea, tapioca, coconut, oil palms, spices, coffee and tropical fruits like pineapple.

A migratory system of agriculture, variously known as milpa in Latin America, fang in parts of Africa, and ladang in Indonesia, is practised in the sparsely populated areas of equatorial region.

2. Compare the climate conditions of tropical grasslands region with the temperate grasslands region.
Ans: In the tropical grasslands region there are distinct wet and dry seasons. The mean temperature is high throughout the year, i.e. between 24 °C and 32 °C. The humidity is low and the air is hot, dry and dusty.
There are three main seasons:

- The cold dry season has high day temperature (26 °C to 32 °C), but relatively low temperature at night, usually 20 °C.
- The warm dry season experiences vertical sunrays and high temperature (32 °C to 38 °C) due to abundant insolation.
- The warm wet season receives about 80 per cent of the total rainfall.

The average annual rainfall is about 30 cm on the desert border and about 120 cm on the forest's edge. The amount of mean annual rainfall decreases from east to west.

On the other hand in the temperate grasslands summers are hot and winters are very cold. The average mean temperature is about 20 °C, which reaches the freezing point during the winter season. The cool temperate climate is characterized by high annual range of temperature due to its inland location. Moderate conditions prevail in the Southern Hemisphere due to marine influence. Sometimes the weather is disturbed by the strong winds of cyclonic storms. The dry warm winds chinook which can melt the snow in winter, blow from the east of Rockies.

The mean annual precipitation in temperate grasslands ranges between 25 cm and 75 cm. The winter precipitation in the Steppes and the Prairies is usually received in the form of snowfall. No month is absolutely dry, but most of the annual rain occurs during the summer season. The spring and the early summer rain is accompanied by thunderstorms. Rainfall decreases from west to east in Eurasia and from east to west in North America.

3. Describe the lifestyle and economic activities of nomadic herdsmen in the tropical desert region.

Ans: The tropical desert areas are agriculturally unproductive due to the shortage of water. The cultivation is mainly confined to oasis where it is carried on through irrigation either from streams or from underground sources. Millets, pulses, maize, beans, cotton, tobacco and fruits are the main crops. Date palms are also widely grown.

The Bushmen of Kalahari desert in South Africa and the Aborigines of Australia practice food gathering and hunting. The Bedouins of Sahara and Arabian deserts are nomadic herdsmen rearing camels, horses, sheep and goats. They live in tents and migrate from place to place in search of water and pastures for their animals.

4. What are the advantages and disadvantages of the monsoon type of climate?

Ans: The monsoon type climate has advantages and disadvantages both.

The combination of heat and good rainfall in the summer season favours the growth of forests. The main trees found in these forests are teak, sal, deodar, mahogany, logwood, oil palm, etc. Economically these forests are more important than the equatorial forests due to high quality timber.

The lowlands and the river valleys have fertile soils and enough water supply and thus are intensively cultivated. Where the rainfall is less, irrigation is practised. The main crops are rice, wheat, maize, oilseeds, tea and coffee. Other important crops cultivated in the monsoon region are sugarcane, tobacco, cotton, jute, cocoa, indigo, cinchona and tropical fruits.

The monsoon region receives most of the rainfall from the south-west monsoon winds during the months from June to September. The rainy season has surplus water, while the summer and winter seasons have shortage of water. The distribution of rainfall is irregular and uncertain both in time and place. Hence, floods and droughts occur simultaneously in different parts of the region.

5. How do the natural vegetation withstand the dry summer conditions in the Mediterranean region?

Ans: The climate conditions in the Mediterranean region have three characteristics:

- Abundant sunshine throughout the year
- Warm and hot summer, and mild winter
- Wet winter and dry summer season

The natural vegetation depends on the moisture accumulated during the winter months and with this moisture it withstands the aridity of the summer season.

6. How have the people adapted themselves with the environmental conditions in the temperate grasslands?

Ans: The temperate grasslands of Eurasia are known as the Steppes whereas the temperate grasslands of North America, in Canada and USA are known as the Prairies. The Steppes and the Prairies experience extremes of temperature due to their continental location. Summers are hot and winters are very cold. Earlier the Red Indians of North America were nomadic hunters. In central Asia, nomadic herding of animals is the main occupation of tribal population. Now the nomadic way of life prevails only in remote and isolated areas. People of temperate grasslands have adapted themselves with the environmental conditions prevailing in these areas.

- In USA and Russia, extensive agriculture has developed where level land, large size of farms and shortage of labour have led to the use of machinery for all types of farm work.
- Wheat is the main crop grown in the temperate grasslands. Other crops are maize (corn), barley, oats and rye. Maize is cultivated in the warmer parts of the region.
- The pastoral industry has developed on a commercial scale in the temperate grasslands. The cattle are reared in the warmer and wetter parts, while sheep rearing is in colder and drier parts.
- USA, Canada, Argentina and Australia are major exporters of wheat. As these grasslands supply the food needs of the world, they are called the granaries of the world. Meat and dairy products are also exported on a large scale.

7. Compare the coniferous forests of taiga region with the evergreen forests in equatorial region.

Ans: The natural vegetation of taiga region are forests, usually known as taiga or virgin forests.

The region has mainly evergreen coniferous trees which do not shed their leaves. The important coniferous trees in the taiga region are pines, spruces, firs, maples and cedars. The trees have needle-shaped leaves, which prevent loss of moisture by transpiration. These are softwood trees and the wood is used in the making of paper, matchsticks, plywood, furniture, sport goods, etc.

The hot and humid climate of equatorial region helps in the luxuriant growth of trees, creepers, bushes and orchids in the evergreen forests. The forests have the largest number of plant species, Broad-leaved, tall, hardwood evergreen dense forests are found in this region, which form a continuous cover at a higher level. There are small plants forming a second layer, and a thick undergrowth of bushes. The main trees found in these forests are

mahogany, rosewood, ebony, cinchona, rubber, coconut palm, cane, bamboos, etc. The trees yield valuable hardwood, which is widely used in the making of costly furniture.

8. Why are the taiga and tundra regions not found in the Southern Hemisphere?
Ans: The taiga region occurs as a broad belt in Europe, Asia and North America. It extends from about 50°–55° N to about 65°– 70° N latitudes. This region lies between the temperate grassland in the south and the polar tundra in the north. In North America, the taiga region extends from Alaska (USA) across Canada to Hudson Bay in the east. In Europe and Asia, it extends from the Scandinavian peninsula across the Russian Siberia to the Bering Sea in the east. The taiga region is conspicuous by its total absence in the Southern Hemisphere as there are no landmasses in these latitudes.

The tundra region is a vast lowland, lying along the shores of the Arctic Ocean. It lies beyond the Arctic Circle (66½° N) in the Northern Hemisphere and includes the extreme northern parts of North America, Europe and Asia. The tundra region is not in the Southern Hemisphere due to the absence of land in these latitudes.

H. On an outline map of the world, mark and label the following.

1. Natural regions – tropical and temperate grasslands, taiga and tundra regions, tropical monsoon region and Mediterranean region.
2. Patagonia, New Zealand, Greenland, Prairies, Pampas, Veld, Sahara, Selvas, Kalahari and Gran Chaco.

Ans: Map Work

20. STUDY OF MAPS

A. Fill in the blanks.

1. The exact approximation of the Earth is a **globe** .

2. The earliest globe was made by **Crates** in Greece.

3. The word map has been derived from the Latin word **mappo**.

4. The earliest known map on clay tablet shows a part of **Iraq** .

5. The term cadastral has been derived from the **French** word cadastre.

6. The topographical sheets are the **large** scale maps.

7. The relief map shows the **relief** features on earth.

8. The maps can be classified on the basis of **scale** and **function**.

B. Define the following terms.

1. Cadastral map: Cadastral maps include maps drawn on a large-scale to show accurately the extent and measurement of every field and plot of land. The village maps in our country, kept by the *patwaris*, may be cited as an example. The cadastral maps are useful for preparation of land use maps of a village or a town.

2. Topographical map: A Topographical map is a large-scale map and is based on the actual survey of the land. It shows the general surface features in detail comprising both the natural landscape and the cultural landscape. These maps are large enough to show the relief, drainage, swamps and forests, villages and towns, means of transport and communication, land use, etc. in detail.

3. Distribution map: The distribution map mostly presents one characteristic feature of a certain area such as the distribution of crops, minerals, soil, etc. The distributional themes can be natural like temperature, rainfall, flora, fauna, etc. or cultural, economic like agriculture, industries, etc.

4. Relief map: A relief map shows surface features like mountains, hills, plateaus, plains, peaks, valleys, ridges, etc. The relief map helps in choosing suitable sites for human settlements, for the layout of roads and railways, and for the construction of dams and canals. We can also get some idea about the possible land use in that region.

5. Wall map: A wall map shows the main features of a small or a large area in a bold manner. These maps are generally drawn on large size papers, so that a group of students in a classroom can use such maps.

6. Climatic map: A climatic map provides detailed information about the conditions of temperature, atmospheric pressure, rainfall, winds and other weather phenomena. The climatic maps can also help in finding out the natural vegetation and the agricultural products of a region. Such maps also help in selecting a suitable site for human settlement.

7. Historical map: A historical map shows the past events.

8. Social map: The distribution of tribes and races, their language, religion, festivals, culture, etc. are shown on the social maps.

C. Answer the following questions briefly.

1. What are the main tools used for the study of Geography?
Ans: The main tools used for studying Geography are globes, maps, charts and models.

2. Write a short note on the Survey of India.
Ans: The Britishers established the Survey of India in 1767. Col. Colin Mackenzie was the first Surveyor General of India. The Survey of India has published topographical maps in a number of series. In India, the Survey of India prepares the topographical maps, also called the topo sheets, for all parts of the country on scales like 1 : 50,000, 1 : 250,000 and 1 : 1,000,000.

3. How is a map more useful than a globe?
Ans: A map may be defined as the representation of the Earth as a whole or a part of it on a plane surface with conventional signs drawn to a scale. Although less accurate than a globe, a map has certain advantages which make it more useful than a globe. A map is useful in representing small areas as against the globe representing the entire Earth. The globe is not only difficult to handle but it is also impossible to show detailed information on its surface.

4. What does the map on the surface of a globe generally show?
Ans: The map on the surface of the globe shows the correct size, shape and location of the oceans and the continents. It also shows the correct position of places on the Earth in relation to one another. We get a better idea of the parallels of latitudes and the meridians of longitude on the globe.

5. What type of map is kept by patwaris in the villages and why?
Ans: The cadastral map is kept by patwaris in the villages. The cadastral maps are useful for preparation of land use maps of a village or a town. It shows accurately the extent and measurement of every field and plot of land.

6. How does an atlas map differ from a wall map?
Ans: An atlas map is a small-scale map. It shows a fairly large area at a glance and presents a bird's eye view of a region but it does not show the details given on a topo sheet. It gives a general picture about the physical, climatic and the economic conditions of different regions.
A wall map shows the main features of a small or a large area in a bold manner. It is generally drawn on a large size paper, so that a group of students in a classroom can use it.

7. What is the main purpose of a geological map?
Ans: A geological map shows the rocks that form the crust of the Earth and their mode of occurrence and disposition.

8. What can be shown on a population map?
Ans: A population map shows the distribution and the density of population in different parts. It helps us to understand the relationship between the rural-urban distribution, sex ratio, growth of population, etc. It also includes demographic, occupational, socio-cultural and economic aspects of a country.

D. Answer the following questions.

1. What are the limitations of a globe?
Ans: A globe is an exact approximation of the Earth. A globe is not useful in representing small areas on the Earth. The globe is not only difficult to handle but it is also impossible to show detailed information on its surface.

2. What achievements helped in improving the accuracy of maps?
Ans: The following achievements provided wealth of information to the geographers for improving the quality and the accuracy of maps:

- The recognition of the Earth as a spheroid
- The Poles, Equator and Tropics
- The development of the system of grid
- The formulation of map projections
- The calculation of the size of the Earth
- The division of the Earth into climatic zones

3. Map is not an invention of modern age. Give reasons.
Ans: Maps are not an invention of the modern age. They were in existence even in the ancient times. The earliest maps were highly pictorial representing the ideas by a rough sketch or picture without any scale or accuracy regarding the relative size or position. The history of maps dates back to 4500 years. The earliest known map, that is still preserved, shows a portion of Iraq. This map is in the form of a small baked clay tablet. It was made about 2500 years BC.

4. Distinguish between large-scale and small-scale maps.
Ans: The large-scale maps show a very small area with much details. The lay-out maps of the villages and the guide maps of the cities are the large-scale maps. On the other hand, the small-scale maps show a very large area with less details. The maps in the atlas or the wall maps used in the classroom are mostly small-scale maps.

5. What is the significance of accurately surveyed information?
Ans: Accurately surveyed information given in a map gives it a sense of authenticity. Topographical maps are based on the actual survey of the land. It shows the general surface features in detail comprising both the natural landscape and the cultural landscape. These maps are large enough to show the relief, drainage, swamps and forests, villages and towns, means of transport and communication, land use, etc. in detail.

6. What are main uses of a political map?
Ans: A political map shows the boundaries between different countries, or boundaries between the different political units within a country. These maps can also be used as base maps for the purpose of showing various cultural, historical and economic activities.

7. Write at least four uses of a map.
Ans: Uses of a map:

- It is with the help of maps and diagrams that many complicated landforms can be easily explained.
- The maps are useful to travellers and tourists as they can guide them to locate and reach their destination.
- In military operations, the topographical sheets render timely help.
- The government needs maps for all administrative purposes. Maps are also useful for planning the development of a country.

8. What are the purposes of military and historical maps?
Ans: The strategic points, routes of movements, battle plans, etc. are shown on the military maps. A military map is a topographic map that shows the details of an area. It mentions about the street names, important buildings and other elements of an urban or rural landscape important for military operations.

Past events are shown on the historical maps. A historical map drawn or printed in the past that describes the about the geography or geographical ideas of the time and place in which it was produced. A historical map can be a modern map made to illustrate some past geographical situation or event. It provides valuable information about a place at a particular point of time. Some of the most interesting historical maps are those depicting battles or wars. There is so much we can learn about any country and the world through historical maps.

21. Directions and Scale

A. Fill in the blanks.

1. The top of a wall map shows the **North** direction.

2. The Sun always sets in the **West** and rises in the **East**.

3. The numerator in R.F. shows the **map** distance.

4. The Great Bear is also known as the **Sapta Rishi Mandal**.

5. The Grid north is the direction of **north-south** grid lines.

B. Distinguish between the following.

1. True North and Magnetic North

True North	Magnetic North
The True North is fixed and is also known as the Geographic North. It is easy to find out the location of the True North-South line with the help of a given magnetic declination.	The Magnetic North Pole is not a fixed point as it changes from place to place and from time to time. The Magnetic North may be west or east of the True North.

2. Map distance and Ground distance

Map Distance	Ground Distance
The distance between any two points on a map is called the map distance.	The distance between the same two corresponding places on the ground is called the ground distance.

3. Primary divisions and Secondary divisions on a linear scale

Primary Divisions on Linear Scale	Secondary Divisions on Linear Scale
The straight line representing the linear scale is divided into certain conveniently calculated parts. These are called the primary divisions. The value of each primary division should be, as far as possible, a round number, say a multiple of 5, 10, 100, etc.	One of the primary divisions, generally the first one from the left hand side, is further divided into certain conveniently calculated parts. These are called the secondary divisions. The secondary divisions, which are subdivisions of one primary division should be to the left of the zero on the linear scale.

4. True bearing and Magnetic bearing

True Bearing	Magnetic Bearing
The angular distance of any point on the map with respect to the True North is called the true bearing. The true bearing is always constant.	The angular distance of any point on the map with respect to the Magnetic North is called the magnetic bearing. Magnetic bearing varies from place to place and from time to time due to the irregularities.

C. Answer the following questions briefly.

1. What is the significance of direction on a map?

Answer: On a map, the direction is shown with the help of an arrow pointing towards the top of the map. The top of the map always shows the North direction. If we know the North direction, then it is easy to find out the other directions, namely South, East and West. Direction is a relative term and it is always expressed in relation to a given point. For example, Kolkata is towards the east of Mumbai.

2. Name the four cardinal and four intermediate directions.

Answer: The four cardinal directions are East (E), West (W), North (N) and South (S). The four intermediate directions are Northeast (NE), Southeast (SE), Northwest (NW) and Southwest (SW).

3. How can you quickly find the direction of North during the day?

Answer: An easy and quick way to find out the direction is by facing the rising Sun. The Sun always rises in the East and sets in the West. Thus, when we are facing the rising Sun, we are actually facing the East direction. The West direction is to our back. The left hand will point to the North direction and the right hand will point to the South direction.

4. How can you quickly find the direction of North during the night?

Answer: In the Northern Hemisphere, the position of the True North can be found with the help of the Pole Star. A constellation of seven stars known as the Great Bear or the Sapta Rishi Mandal can be easily recognised in the northern skies. The Great Bear constellation keeps revolving around the Pole Star in such a way that the two stars in the front (called the pointer stars) always point towards the Pole Star. The Pole Star is located vertically above the North Pole.

5. Name the ways in which the scale can be shown on a map.

Answer: There are three ways in which the scale can be shown on a map:

a. By a Statement
b. By a Representative Fraction or R.F.
c. By a Linear scale or a Graphic scale

6. What is the difference between the statement of scale and the R.F.?

Answer: In the statement method, the scale is expressed in words, such as two centimetres is to five kilometres or 2 cm : 5 km. In this statement, 2 cm is the map distance and 5 km is the ground distance. However, in the Representative Fraction or R.F. method, the scale on a map is expressed in the numerical fraction. In this method, the ratio between the map distance and the ground distance is always given as a fraction, whose numerator is always 1.

7. What is the difference between numerator and denominator of R.F.?

Answer: In an R.F. the numerator (1) is the map distance and the denominator (1,00,000) is the ground distance.

8. What is magnetic declination?

Answer: The angle between the True North-South line and the Magnetic North-South line is called the magnetic variation or the magnetic declination.

D. Answer the following questions.

1. Describe the methods which help us in finding the directions.

Answer: The methods which help us in finding the directions are as follows:

a. **With the help of Rising Sun:** An easy and quick way to find out the direction is by facing the rising Sun. The Sun always rises in the East and sets in the West. Thus, when we are facing the rising Sun, we are actually facing the East direction. The West direction is to our back. The left hand will point to the North direction and the right hand will point to the South direction. This method can be used only during the day.

b. **With the Help of the Pole Star and the Great Bear:** In the Northern Hemisphere, the position of the True North can be found with the help of the Pole Star. A constellation of seven stars known as the Great Bear or the Sapta Rishi Mandal can be easily recognised in the northern skies. The Great Bear constellation keeps revolving around the Pole Star in such a way that the two stars in the front (called the pointer stars) always point towards the Pole Star. The Pole Star is located vertically above the North Pole. This method of finding the North direction is possible at night and in the Northern Hemisphere only, as the Great Bear constellation is not visible in the southern skies.

c. **With the Help of a Magnetic Compass:** A better way of finding the North direction is with the help of a magnetic compass fitted with a magnetic needle. The needle of the magnetic compass will always point towards the Magnetic North-South line or the Magnetic North Pole, which is different from the True North-South line or the True North Pole.

2. Explain the different ways of showing scale on a map.

Answer: There are three ways in which the scale can be shown on a map:

a. **By a Statement:** In the statement method the scale is expressed in words, such as two centimetres is to five kilometres or 2 cm : 5 km. In this statement 2 cm is the map distance and 5 km is the ground distance.

b. **By a Representative Fraction or R.F.:** In the Representative Fraction or R.F. method, the scale on a map is expressed in the numerical fraction. In this method, the ratio between the map distance and the ground distance is always given as a fraction, whose numerator is always 1. Thus, in the R.F., the numerator (1) is the map distance and the denominator (1,00,000) is the ground distance. Thus, the R.F. of the map is expressed as Map distance/Ground distance.

c. **By a Graphic Scale or Linear Scale:** In the graphic scale or linear scale, the map distance is represented on the map with the help of a straight line, which is divided into a number of equal parts and is marked to show what these divisions represent on the actual ground. The length of the straight line representing the linear scale depends on the size of the map, and is usually between 12 cm and 20 cm.

3. What are the advantages and disadvantage of R.F.?

Answer: The advantage of expressing the scale on a map in terms of the R.F. is that one can find distance on a map made in a foreign country, even if he is not familiar with the units of linear measurement of that country. Hence, this method of expressing the scale on a map has a universal application. The disadvantage of expressing the scale on a map in terms of the R.F. is that if the map is photographically enlarged or reduced, the R.F. will no longer be correct.

4. How is linear scale more useful than the statement of a scale?

Answer: The linear scale has a great advantage of remaining correct even after the reduction or enlargement of a map by the photographic method. The primary and the secondary divisions actually help in measuring and calculating the ground distance directly from the map. However, statement of scale has two limitations:

a. It can only be understood and used by those who are familiar with the units of measurement given in the statement of scale.
b. If a map is enlarged or reduced from the given original map, the scale of the new map will change. This can cause problem in the measurement of distances on the new map.

5. How is Grid North different from True North?

Answer: The Grid North is the direction of the North-South grid lines. It coincides with the True North only along the meridian of origin on the topographical map.

6. Why is R.F. more useful than the statement of a scale?

Answer: In the Representative Fraction or R.F. method, the scale on a map is expressed in the numerical fraction. The advantage of expressing the scale on a map in terms of the R.F. is that one can find distance on a map made in a foreign country, even if he is not familiar with the units of linear measurement of that country. Hence, this method of expressing the scale on a map has a universal application. Whereas, In the statement method the scale is expressed in words. Thus, it has two limitations.

a. It can only be understood and used by those who are familiar with the units of measurement given in the statement of scale.
b. If a map is enlarged or reduced from the given original map, the scale of the new map will change. This can cause problem in the measurement of distances on the new map.

7. All scales on a map are linear scales. Give reasons.

Answer: In India, we follow the metric system of measurement. In this system, the distances are measured in kilometres (km), metres (m) and centimetres (cm). We normally measure the straight-line distance on the ground and also on the map. The distance between any two points on a map is called the map distance. The distance between the same two corresponding places on the ground is called the ground distance. The ratio between the map distance and the ground distance is called the scale of the map. Thus, all scales on a map are linear scales, i.e. they show distances.

8. What are the main uses of Graphic scale?

Answer: The graphic scale or linear scale can be used for the following two purposes:

a. **To measure distance between two points on the map:** Take a sheet or strip of paper with a sharp edge. Place it on the map and mark the points as A and B, between which the distance is to be measured. Now place this strip on the scale and read the ground distance from it with the help of primary and secondary divisions.
b. **To measure out a certain length from the scale:** Suppose the ground distance required to be measured is 60 km. Take a strip of paper with sharp edge and place it along the scale. Mark on this strip the distance of 60 km from the scale. One end points at zero and the other at 60 km mark. This distance can also be measured with the help of dividers.

22. REPRESENTATION OF RELIEF FEATURES THROUGH CONTOURS

A. Fill in the blanks.

1. The elevations and depressions are technically called the **relief** of the Earth.

2. In a model, the vertical scale is **exaggerated** as compared to the horizontal scale.

3. The contour line on a map is a line of **constant** height above the mean sea level.

4. The **horizontal distance** depends upon the slope of the land.

5. The contour line with zero value represents the **coastline**.