Brahmastra Academy

Celebrating Knowledge Progressively

GEOGRAPHY

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TREND ANALYSIS
(2016-2014)

S.No.	Chapter Name	2016 (I)	2015 (II)	2015 (I)	2014 (II)
1	History	9	12	13	14
2	Geography	20	19	16	16
3	Indian Polity	8	6	5	1
4	Economy	6	6	4	4
5	General Knowledge	2	9	12	11
	Total	**45**	**52**	**50**	**50**

02

GEOGRAPHY

The Geography section is another important section of the NDA examination. Questions are asked from both the Indian and World Geography. Around 10-12 questions are asked from this section. The concepts include Earth, Atmosphere, Ocean structure, Biodiversity and Environment, Mountain, Rivers etc. It is to be noted here that some map based questions are also asked. The questions include location of important industries, ocean currents, location of rivers, natural vegetation types etc.

PART I
PHYSICAL AND WORLD GEOGRAPHY

THE UNIVERSE

- The study of universe is known as **Cosmology**. The universe is commonly defined as the totality of everything that exists including all physical matter and energy, the planets, stars, galaxies and the contents of intergalactic space. The universe comprises of billions of galaxies.
- In AD 140, **Ptolemy** propounded the theory that the Earth was the centre of the universe and the Sun and the other heavenly bodies revolved around it. In 1543, **Copernicus** said that the Sun is the centre of universe and not the Earth. **Kepler** supported Copernicus but said that the Sun is the centre of solar system and not the universe.

Evolution of Universe

The three main theories put forward to explain the origin and evolution of the universe are as follow

i. **Big Bang Theory** (proposed by Georges Lemaitre) Big Bang was an explosion that occurred 13.8 billion years ago, leading to the formation of galaxies of stars and other heavenly bodies.

ii. **Steady State Theory** Bondi, Gold and Fred Hoyle developed this theory and states that although the universe is expanding, it nevertheless does not change its appearance over time, it has no beginning and no end.

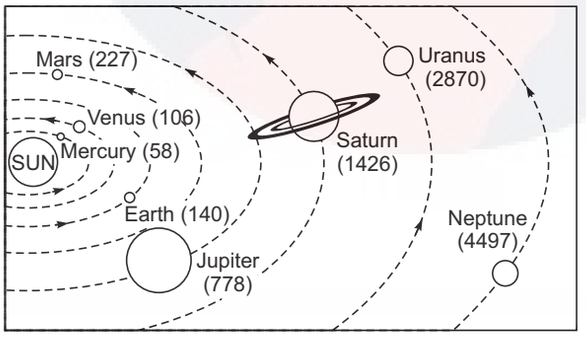
iii. **The Pulsating Theory** According to this theory, the universe is supposed to be expanding and contracting alternately i.e., pulsating. At present, the universe is expanding.

Galaxy

- The galaxies are made up of millions of stars held together by the force of gravity and these stars account for most of the masses of the galaxy. **Andromeda** is our nearest galaxy.
- Galaxy are giant assemblies of stars, planets, gases and dust. These stars occur in huge bunches or clusters. They are so big that they have sometimes been called *Islands Universe*. Milky way and Andromeda are two examples.
- Our own galaxy is called the *milky way* (or the Akash Ganga) and it contains about 300 billion stars and one of these is our Sun. Planets and other objects go round the Sun and make up the solar system with the Sun at the centre.
- In 1924, **Edwin Hubble** first demonstrated existence of galaxies beyond milky way.
- *Structurally, the galaxies are found in three forms which are as follow*
  - i. **Spiral** have a central nucleus with great spiral arms. *Milky way* and *Andromeda* are the examples.
  - ii. **Elliptical** without spiral arms.
  - iii. **Irregular** with no shape.

SOLAR SYSTEM

- The solar system comprises the Sun 8 planets (Pluto is not considered as planet), their Moon and other non-stellar objects, which are believed to have been developed from the condensation of gases and other lesser bodies.
- The Sun is at the centre of the solar system and all the planets revolve around it in elliptical orbit. It is the nearest star to the Earth. The size of solar system has been estimated to at about 10^5 AU.



Solar System

THE SUN

- The Sun accounts for more than 99% of the mass of the solar system and due to this, the Sun exerts immense gravitational pull to keep the planets rotating around it in definite elliptical orbit.
- The Sun is primarily made up of hydrogen (~72%) and helium (~26%). But trace amount of other gases and minerals are also present.
- Sun's light radiating surface is called photosphere above the photosphere is its chromosphere.
- Super-imposed on Sun's white light are hundred of dark lines called *Fraunhofer lines*. Each line indicates some elements present in the solar system.
- The Sun is continuously emitting streams of proton in all directions either as spiral streams, called *solar wind*. These winds are trapped by Earth's magnetic field called as *Aurora*.
- These Aurora are described as Aurora Borealis in Northern hemisphere and Aurora Australis in Southern hemisphere.
- The surface of the Sun changes continuously, where the bright spots and dark spots are found, these spots are known as plages and sunspots respectively. The sunspots are cold and dark region of the Sun.

Planets

- A planet is a heavenly body that moves in an orbit around a star, such as the Sun. There are 8 planets and all of them moves around a Sun in the fixed path.
- Only five planets Mercury, Venus, Mars, Jupiter and Saturn are visible to the naked eyes.
- Planets are divided into two groups namely; the inner planets and the outer planets. The inner planets are closer to the Sun and are smaller and rockier. Whereas outer planets are farther away, larger and made up mostly of gases.
- The inner planets (in order of distance from Sun, closest to farthest) are Mercury, Venus, Earth and Mars. After an asteroid belt comes the outer planets, Jupiter, Saturn, Uranus and Neptune.
- The four inner planets are called *terrestrial planets* because their surfaces are solid. They are made up mostly of heavy metals such as iron and nickel and have either no moons or few moons.

Below are brief descriptions of each of these planets

Mercury

- It is the innermost and smallest planet in the solar system. It is nearest to the Sun. Its rotation period is 59 days and revolution period is 88 days (fastest in solar system).
- It does not have atmosphere and satellite. It has the highest diurnal range of temperature and also has the shortest year.

Venus

- Also known as *Earth's twin, Morning Star and Evening Star*. It is brightest heavenly body after Sun and Moon because of 70% albedo. It is **Hottest Planet** in our solar system because of 97% CO_2.
- It is **Closest Planet** to Earth and slightly smaller than Earth (500 km less in diameter).
- It rotates in clockwise direction (East to West) unlike others. It has slowest rotation period, with a 243 days and an orbit around the Sun at 225 days.
- Its atmosphere is thick and contains carbon dioxide and nitrogen. The planet has no rings or moons and is being visited by European Space Agency's Venus Express Spacecraft.

Earth

- Earth is the third nearest planet to the Sun. It is the only planet with life. In size and make up the Earth is almost identical to Venus. It is the 5th largest planet of our solar system.
- Due to presence of water and landmasses, the Earth appears blue-green in colour from space, therefore, it is called *blue planet*.
- The Earth rotates round the Sun with the speed of 29.79 km/sec. Earth is covered with water mainly as it has 71% water and only 29% is landmass.
- According to radiometric dating and other evidence Earth formed about 4.54 billion years ago. It's circumference at pole is 40008 km and at equator is 40075 km. Its area is nearly 510 million sq km.
- Earth has only one moon, which is relatively large, terrestrial, planet like natural satellite, with a diameter about one-quarter of Earth's.
- The Earth is an oblate spheroid, a sphere flattened along the axis from pole to pole such that there is a buldge around the equator. Earth bulges at the equator and is flattened at the poles.
- The shape of Earth is also called Geoid. At equator our weight will be less and when we are at poles our weight will be more.

Mars

- It is the fourth terrestrial planet, which is known as *Red Planet* due to it appears as a reddish ball when looked through a telescope.
- Its revolution period is of 687 days and rotation period is 24.6 hours. Its atmosphere is a wispy mix of carbon dioxide, nitrogen and arogon.
- It has two tiny moons called *Phobos* and *Deimos*, both have sign of water so, there is possibility of life. It has no ring.
- Various space missions have been sent, e.g. Vikings, Pathfinder, Mars Odyssey, Mars Orbiter Mission. India sent Mangalyaan on Mars.

Jupiter

- It is largest of all planets almost 11 times of Earth. It is also called as *lord of the heavens*. A great red spot (a cyclone) is detected on it.
- Jupiter is the fastest spinning planet in our solar system rotating on average once in just under 10 hours, but its revolution period is of 12 years.
- It has thick atmosphere mostly made up of hydrogen and helium, perhaps surrounding a terrestrial core that is about Earth's size.
- It has 67 satellites, prominent are Europa, Ganymade and Callisto. Ganymade is the largest satellite of our solar system.
- NASA's Juno spacecraft was launched in 2011 and it arrived at Jupiter on 4th July, 2016.

Saturn

- Second largest planet (in size) after Jupiter. **Least dense** of all planet (30 times less dense than Earth).
- Its revolution period is of 29 years and rotation period is of 10.3 hours. It has 62 satellites (prominent is titan). It has system of ring (3 well defined).
- Saturn is being visited by the cassini spacecraft which flied closed to the planet's rings.

Uranus

- Identified as a planet in 1781 by William Herschel. It rotates from **North to South** as it is inclined at an angle of 98° to its orbit. It has retrograde rotation. It has revolution period of 84 years and rotation period of 10.8 years.
- Like Saturn it is also surrounded by a system of 9 faint rings and it has 21 satellites (*Miranda, Ariel* etc.)
- There are no spacecraft stated to visit Uranus. The last visitor was Voyager 2 in 1986.

Neptune

- Appears as 'Greenish Star' because of presence of 'Methane'. It has revolution period of 165 years and rotation period of 15.7 days.
- It was discovered by **JG Galle** of **Berlin** in 1846. Its prominent satellite are Trion and Neroid.
- Uranus and Neptune are called *Jovion twins*. The only spacecraft to ever visit it was NASA's Voyager 2 in 1989.

PLUTO

Pluto is no longer considered a planet in our solar system. Pluto orbits beyond the orbit of Neptune. It is much smaller than any of the official planets and now classified as a **dwarf planet**. It is the second largest dwarf planet in the solar system. In Roman mythology, Pluto (Greek Hades) is the God of the underworld.

Some Important Facts About Planets

- Biggest Planet – *Jupiter*
- Smallest Planet – *Mercury*
- Biggest Satellite – *Ganymede*
- Smallest Satellite – *Deimos*
- Blue Planet – *Earth*
- Green Planet – *Uranus*
- Brightest Planet – *Venus*
- Brightest Planet Outside Solar System – *Sirius (Dog Star)*
- Closest Star of Solar System – *Proxima Centauri*
- Coldest Planet – *Neptune*
- Evening Star – *Venus*
- Red Planet – *Mars*
- Slowest Revolution in Solar System – *Neptune*
- Slowest Rotation in Solar System – *Venus*
- Earth's Twin – *Venus*
- Only Satellite with an Atmosphere like Earth – *Titan*

Other Celestial Bodies of Solar System

Objects such as comets, asteroids, etc are scientifically important and can be just as visually spectacular as the planets and moons.

Comet

- Comet is a member of the Sun's family and contains dust, ice, carbon dioxide, ammonia, methane and more.
- Comet travels on a path or elliptical orbit around the Sun on a regular schedule.
- It has a head and a tail. Its tail originates once it gets closer to the Sun.
- It may have originated from a huge cloud the 'oort cloud' that is thought to surround the solar system.
- The brightest part of the comet is head (coma).
- Comets are named after their discover, e.g. Shoemaker—Levya's comets, Halley's comet etc. Halley's comet becomes visible to the naked eye every 76 years when it near to the Sun.

Asteroids

- Asteroids or minor planets circle in a broad belt between the orbits of Mars and Jupiter.
- It is the debris left over from the formation of inner planets. Also called 'Planetoids' or small planets. They are chunks of rock covered in frozen gases.

Meteors, Meteoroids and Meteorites

- A meteor is a meteoroid that has entered the Earth's atmosphere, usually making a fiery trail as it falls. It is sometimes called a *shooting star* or a *falling star*.
- Meteoroids are small bodies that travel through space. They are smaller than Asteroids, most are smaller than the size of a pebble.
- A meteorite is a piece of rock or metal that has fallen to Earth. These rare objects have survived a fiery fall through the Earth's atmosphere and have lost a lot of mass during that process. Meteorites are made up of rock and/or metals.

Moon

- The Moon is only satellite of the Earth. Only 59% of Moon surface is directly visible from Earth.
- It takes 27 days, 7 hours, 43 minutes and 11.47 seconds to complete one revolution around the Earth.
- Rotates on its axis in exactly the same time as that in revolution. That is why we see only one side of the Moon.

Phases of the Moon

- Due to its spherical shape, only one-half of the Moon gets illuminated by the Sun.
- Visible surface of Moon is not the same everyday because it revolves round the Earth.
- Visible shape of the Moon are referred to as the phases of the Moon, *which are as follow*
  - **New Moon** This is the phase when the Moon is between the Earth and the Sun and consequently the part of the Moon facing us is in complete darkness.
    (New Moon = No Moon)
  - **Full Moon** This occurs on the 14th day after the New Moon. The Moon at this time shows its fully lighted surface. (Full Moon = Complete Moon)
- When two full Moons occurs in a single month the second full Moon is called a *Blue Moon*.

Stars

- Stars are the most widely recognised astronomical objects and represent the most fundamental building blocks of galaxies.
- They are made up of hot burning gases, thus shine by their own light.
- Stars are born within the clouds of dust and scattered throughout most galaxies. A familiar example of such as a dust cloud is the Orion Nebula.
- There is group of stars called as *constellation*. They are formed as a recognisable pattern. e.g. Big Dipper, Ursa Minor, Scorpius, Pleiades etc.

The Movement of the Earth

- The Earth moves in space in two distinct ways Rotation and Revolution. *These distinct ways are as follow*
  - i. It rotates on its own axis from West to East (anticlockwise) once in every 24 hours. It causes day and night.
  - ii. It revolves around the Sun in an orbit once in every 365¼ days. It causes the seasons and the year.

Rotation of Earth

- Spins on its imaginary axis from West to East in 23 hours, 56 minutes and 40.91 seconds.
- The days and the nights are equal at the equator.
  The rotation of the Earth has the following implications such as
  - Causation of day and night.
  - Change in the direction of winds and ocean currents.
  - Rise and fall of tides everyday.

Revolution of Earth

- It is the Earth's motion in elliptical orbit around the Sun.
- It takes 365 days, 5 hours, 48 minutes and 45.51 seconds. It leads to one extra day in every fourth year. *The revolution of Earth results in*
  - changes of season.
  - variation of the length of the days and nights at different times of the year.
  - shifting of the wind belts.
- Figure shows the revolution of the Earth and its effects on seasons and the variations of lengths of day and night.

Equinox

- The equinoxes are the days, when days and night are equal. Under the situation, the Sun is vertically overhead at the equator.
- Equinox occurs on two days of the year, that is on 21st March and on 23rd September. The 21st March is known as *Vernal Equinox* and the 23rd September is known as *Autumnal Equinox*.

Summer Solstice

- After the March equinox, the Sun appears to move Northward and is vertically overhead at the Tropic of Cancer on 21st June. This is known as *Summer Solstice*.
- On 21st June, the Northern hemisphere will have its longest day and shortest night. The Southern hemisphere will have shortest day and longest night.

Winter Solstice

- On 22nd December, the Sun is overhead at the Tropic of Capricorn.
- This is the winter solstice, when the Southern hemisphere will have its longest day and shortest night.

SOME IMPORTANT FACTS

• Longest day in the Northern hemisphere	21st June
• Shortest day in the Northern hemisphere	22nd December
• Equal day and night in the Northern hemisphere	21st March and 23rd September
• Longest day in the Southern hemisphere	22nd December
• Shortest day in the Southern hemisphere	21st June
• Equal day and night in the Southern hemisphere	21st March and 23rd September

Seasons

- The Earth's seasons are not caused by the differences in the distance from the Sun throughout the year. The seasons are the result of the filt of the Earth's axis with respect to its orbital plane by 23.5° (23½ degree).
- They are the periods into which the year can be divided as a result of the climatic conditions, mainly due to the changes in duration and intensity of solar radiation.

There are four seasons such as

Spring	*Summer*	*Autumn*	*Winter*
When the Sun is directly overhead the equator. (21st March)	When the Sun is directly overhead the Tropic of Cancer- the North temperate zone experiences summer. (21st June)	When the Sun returns to the equator and the North temperate zone experiences the season of autumn. (23rd September)	The Sun is at the Tropic of Capricorn and the North temperate zone experiences winter. (22nd December)

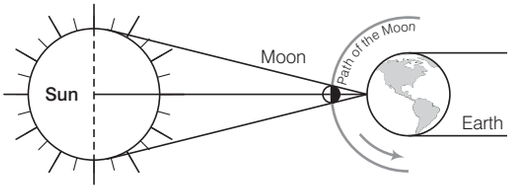
ECLIPSES

- An eclipse is an astronomical event that occurs when an astronomical objects is temporarily obscured, either by passing into the shadow of another body or by having another body pass between it. An eclipse is a type of SYZYGY.
- An eclipse occurs when the Sun, Moon and Earth are in a straight line.

There are two types of eclipses – Solar and Lunar eclipses, as follow

Solar Eclipse

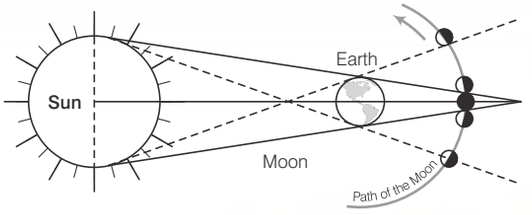
- When Moon comes between Sun and Earth. This eclipse can be partial or total.
- It will happen only on a new Moon day when the Moon is in line with the Sun. A solar eclipse doesn't occur on every new Moon day.



Solar Eclipse

Lunar Eclipse

When the Earth comes between Sun and Moon. It occurs only on a full Moon day but it doesn't occur on every full Moon day because the Moon is not in the same position in relation to that of the Earth and the Sun on every full Moon day.



Lunar Eclipse

Volcanism

- Volcanism includes all phenomena connected with the movement of heated material from the interior towards the surface of the Earth.
- A volcano is a vent or opening, through which heated materials consisting of gases, water, liquid lava, fragments of rocks are ejected from the highly heated interior to the surface of the Earth.
- *Volcanic eruptions are closely associated with several integrated processes such as*
  - Gradual increase in temperature with increasing depth, due to the heat generated by degeneration of radioactive elements inside the Earth.
  - Origin of magma due to the lowering of the melting point caused by reduction in pressure of overlying rocks due to fractures caused by splitting of plates.

Classification of Volcanoes

On the basis of mode of eruption

Central Eruption or Explosive Type Here, the magma comes with great force through the small vent and spread to a distant position. e.g. Hawaiian type, Strombolian type, Pelean type, Visuvius type, Volcanion type.

Fissure Eruption or Quiet Eruption Large quantities of lava quietly flow up from fissures and spread out over the surrounding areas. Successive flow of lava results in the growth of lava plateau. e.g. Deccan Plateau.

On the basis of periodicity of eruptions

Active Volcano Volcano which errupt periodically. e.g. Etna, Stromboli, Mayon.

Dormant Volcano Volcano which become quiet after their eruption for some time. e.g. Fujiyama, Krakatoa, Barren Island.

Extinct Volcano They have no indication of future eruption.

Various Volcanic Belts

Circum-Pacific Belt (Fire girdle of the pacific or the fire ring of the pacific) It extends across the Kamchatka Peninsula, Kurile Islands, the Islands of Japan, Philippines, New Guinea, New Zealand and the Soloman Islands.

Highest Volcanic Peaks Cotopaxi (South America), Fujiyama (Japan), Valley of ten thousand smokes (Alaska).

Mid-Continental Belt (Volcanic zones of convergent continental plate margins) It includes volcanoes of Alpine mountain chain, the Mediterranean sea and the fault zone of Eastern Africa of Stromboli, Vesuvias, Etna, Kilimanjaro etc.

Mid-Atlantic Belt In which the volcanoes are fissure eruption type, e.g. Iceland, Canary Islands, Cape Verde, Azores etc.

Latitude

- Latitude is the angular distance of a point on Earth surface from the centre of Earth, measured in degree. These lines are called parallels of latitude and on the globe they are circles. The circumference of the circles decreases from equator to pole and at the pole it converses to a point.
- The distance between any two parallels of latitude is always equal.
  One degree latitude = Approx 111 km
- The most important lines of latitudes are equator (0°), the Tropic of Cancer (23½°N), the Tropic of Capricorn (23½°S), the Arctic Circle (66½°N) and the Antarctic Circle (66½°S).

Longitude

- Longitude is the angular distance of a point on the Earth surface along the equator, East or West from the **Prime meridian**. On the globe, they from semi circles from pole to pole passing through the equator.
- Prime meridian is the semi circle from pole to pole, from which all the other meridians radiate Eastwards and Westwards upto 180°. In 1884, it has been decided that the zero meridian is one that passes through the Royal Astronomical Observatory at Greenwich near London.
- 180° meridian (International Date Line) is exactly opposite to the Prime meridian. Such points are called *antipodal points*.

Universal Time (Standard Time) and Time Zones

- To avoid confusion about having many local times within one country, a particular meridian is chosen for the whole country, whose time is known as *Standard Time*.
- The Indian Government has accepted the meridian of 82.5° East for standard time, which is 5 hour 30 minutes ahead of the Greenwich Mean Time.
- The Earth is divided in 24 longitudinal zones, each being 15° or 1 hour apart in time (360° = 24 hours, 360/24 =15° in 1 hour) or 1° in 4 minute are called *standard time zones*.
- Larger countries such as USA, Russia and Canada, which have greater East West stretch have to adopt several time zones for practical purposes. Russia has as many as 11 time zones.
- Both USA and Canada have five time zones, *viz*, the Atlantic, Eastern, Central, Mountain and Pacific time zones.

INTERNATIONAL DATE LINE

- It is the 180° meridian running over the Pacific Ocean deviating at *Fiji, Soama* and *Gilbert Islands*. This meridian is considered to be deviated at the land masses, so that the travellers do not feel inconvenient.
- One who crossing the Date Line from West to East repeat a day and travellers crossing it from East to West lose a day.

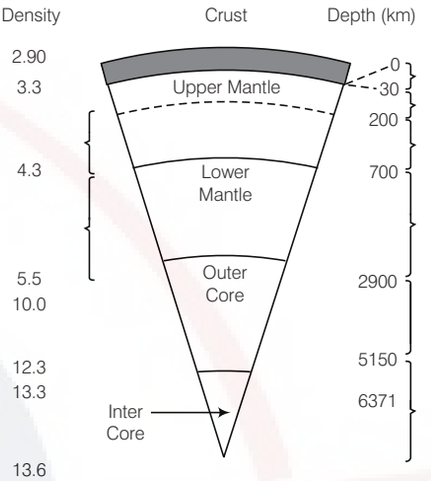
Important International Boundary Lines

Name of Boundary Line	*In Between Countries*
Radcliffe Line (1947)	India and Pakistan
Mc Mohan (1914)	India and China
Durand Line (1893) also called Zero Line	Pakistan and Afghanistan
Hindenburg Line	Germany and Poland
Maginot Line	France and Germany
Oder Neisse Line	Germany and Poland
Siegfried Line	Fortification between Germany and France
38th Parallel Line	North and South Korea
49th Parallel Line	USA and Canada
24th Parallel Line (Sir Creek)	Pakistan claims that it is the boundary between India and Pakistan in Rann of Kachchh

LITHOSPHERE

Interior Structure of the Earth

The interior of Earth is divided into three parts, which are as follow



Interior Structure of Earth

The Crust

- The crust is the outermost and the thinnest layer of the Earth. This layer has the least density and its thickness varies about 8 to 40 km.
- The rocks forming the crust of the Earth are rich in lighter minerals like silica and aluminium. Hence, this layer is also called as *Sial* (silica and aluminium). The average density of this layer is 2.7 gm/cm^3.

The Mantle

- It is about 2900 km in thickness, composed of minerals in a semi solid state.
- It is divided into further two layers – upper mantle and lower mantle. The upper part of the mantle is called the *Asthenosphere*, which is about 250 km thick.
- Due to presence of minerals like silica and magnesium in the rocks forming this layer of the Earth, the mantle layer is also known as *Sima* (silica and magnesium).

The Core

- The core is the innermost layer of the Earth and occupies its center. It is about 3500 km in radius.
- This layer is also known as *Nife* (nickel and iron), because this layer contain large concentration of iron and nickel.

- Density of this part of the Earth is 17.2 gm/cm^3 and is many times greater than the average density of the Earth (5.53 gm/cm^3).

DISCONTINUITIES

Crust, mantle and core are separated by transition zones called discontinuities. These discontinuities are due to difference in densities between layers.

- **Connard** This discontinuity in density lies between upper crust and lower crust.
- **Mohorovicic** This discontinuity separates crust and mantle.
- **Repetti** This discontinuity lies between upper mantle and lower mantle.
- **Gutenberg** This discontinuity separates core and mantle.
- **Lehman** This discontinuity separates upper core and lower core.

Composition of the Earth

- The Earth formed from the same cloud of matter that Sun is formed, but the planets acquired different compositions during the formation and evolution of the solar system.
- The Earth is composed mostly by Iron (32.1%), Oxygen (30.1%), Silicon (15.1%), Magnesium (13.9%), Sulfur (2.9%), Nickel (1.8%), Calcium (1.5%) and Aluminium (1.4%), with the remaining 1.2% consisting of trace amounts of other elements.

Continental Drift Theory

- This theory was given by **Alfred Wegener**, in 1915, to explain the origin and evolution of the continents and the oceans.
- According to this theory, about 250 million years ago, there was only one continent named *Pangaea* meaning *All Earth* and it was surrounded by one mass of water body, named 'Panthalass'.
- The present shape of the continents and oceans is due to the break up of Pangaea. This breaking process started about 200 million years ago.
- The Northern rift cuts Pangaea from East to West creating **Laurasia** in the North and **Gondwanaland** in South. A shallow sea called Tethys was situated between the *Laurasia* and the *Gondwanaland*.

Plate Tectonics Theory

- Plate tectonic is a scientific theory that describe the large-scale motions of Earth's lithosphere.
- The theory of plate tectonics states that the lithosphere is divided into several rigid segments, which include both oceanic and continental crusts. These segments are called plates and they are moving on the asthenosphere, which is not a liquid, but a solid which flows under stress.
- About 20 such plates have been identified. There are seven major plates such as Eurasia, Antarctica, North America, South America, Pacific, African and Indian Plate.
- Most of the Earth's seismic activity, volcanism and mountain building occur along with the folded and faulted regions of the plates.

Depending upon the type of movement, plate margins are of three types

i. **Divergent Plate Margin** (Constructive margins)
ii. **Convergent Plate Margin** (Destructive margins)
iii. **Parallel Plates Margin** (Conservative margin or Transform Boundary)

- Collision can occur between two oceanic plates, one oceanic and one continental plate or two continental plates. Due to collision three boundries appears

Divergent Plate Boundary	*Convergent Plate Boundary*	*Transform Fault Boundary*
When the plates move apart with the upwelling of material from the mantle, divergent plate boundary results.	A convergent plate boundary is one, where two plates collide, one plate bending downward and subducting below the other.	They are located, where plates slide past one another without the creation or destruction of crust.
Formation of the mid oceanic ridges are the example of divergent plate margin.	Deep oceanic trench is formed adjacent to the zone of subduction. Fold mountains are the result of convergent plate boundary.	San Andreos fault along the West coast of Mexico is a famous transform fault.

ROCKS

The solid part of the Earth's crust are called *rocks*. Rocks are made up of two or more minerals. A rock can be defined as an aggregate of minerals.

Rocks are classified in three main types depending on the process of their formation

(i) Igneous Rocks

- Formed due to the cooling, solidification and crystallisation of hot and molten magma.
- They are called as the primary rocks as all the other rocks are formed directly or indirectly from the igneous rocks.
- It is believed that the igneous rocks are formed during each period of geological history of Earth.
- They are hard, granular and crystalline rocks, less affected by chemical weathering.
- Moreover, it does not have any fossil or does not form any strata or layers of lava.

Classification of Igneous Rocks

On the basis of mode of occurrence

- **Intrusive Rocks** They are formed due to the solidification of rising magma below the surface of the Earth. *e.g.*, granite, lapolith, batholiths, sills etc.
- **Extrusive Rocks** They are formed due to cooling and solidification of hot and molten magma at the Earth surface. *e.g.,* Basalt, andesite etc.

On the basis of silica content

- **Acidic** It has more silica content. *e.g.*, granite.
- **Basic** It has less amount of silica content. *e.g.*, gabbro.

(ii) Sedimentary Rocks

- It is formed due to the aggregation and compaction of sediments derived from the older rocks, plants, animals and contains fossils of plants.
- The sedimentary rocks can be classified on the basis of the nature of sediments as mechanically, chemically and organically formed rocks.

(iii) Metamorphic Rocks

- These are the changed form of igneous and sedimentary rocks. These are the rocks, which change either in form or composition without disintegration.
- Already formed metamorphic rocks are metamorphosed and this process is called *metamorphosis*. The agents of metamorphism are heat, compression pressure and solution.

Sedimentary Rocks	***Metamorphic Rocks***
Limestone	Marble
Sandstone	Quartzite
Shale/Clay	Slate, Phyllite, Schist
Coal	Diamond or Graphite
Original Rocks	***Metamorphic Rocks***
Sandstone	Quartzite
Limestone	Marble
Shale and Mudstone	Slate
Granite	Gneiss
Coal	Graphite coal
Clay	Slate

Weathering

- Weathering refers to the disintegration and decay of rocks *in situ* under the influence of elements of weather such as changes in temperature, moisture and atmospheric gases.
- Insolation, frost, rainwater, atmospheric gases and the organisms are considered the chief agents of weathering.

There are three types of weathering

i. **Physical Weathering** (or mechanical weathering)
   (a) It involves rock disintegration without any change in the chemical constituents of the rocks.
   (b) The factors responsible for physical weathering are temperature change, crystallisation of water into ice, the pressure release mechanism.

ii. **Chemical Weathering** It involves the decomposition due to chemical changes. There are various chemical processes, which cause chemical weathering such as solution, oxidation, carbonation, hydration, hydrolysis and chelation.

iii. **Biological Weathering** Plants and animals including man largely control it.
   It is divided into three types such as
   (a) Faunal weathering
   (b) Floral weathering
   (c) Anthropogenic weathering

Erosion

The term erosion refers to the process of wearing away the land surface by mechanical action or the debris being transported by various agents of erosion. Rivers, glaciers, winds, marine waves, currents etc are the chief agents of erosion. The process of erosion is most important means of gradation.

Earthquakes

- It refers to the vibration of the Earth's surface caused by endogenetic forces of Earth.
- The magnitude or intensity of energy released by an earthquake is measured by the **Richter Scale**, whereas the damage caused is measured by modified **Mercalli Intensity Scale**.
- The place of origin of earthquake is called *focus*. The place on the ground surface, which is perpendicular to the focus or hypocentre is called *epicentre*.
- **Seismology** is the special branch of geology that deals with the study of earthquake.

Earthquake Waves

The waves generated by earthquake are called *seismic waves. They are classified into three types*

i. **Primary Waves** (P Waves) These are the waves of short wavelength and high frequency. They are longitudinal waves and can travel through solid, liquid and gases.

ii. **Secondary Waves** (S Waves) These are the waves of short wavelength and high frequency. They are transverse waves, which travel through all solid particles.

iii. **Surface Waves or Long Waves** (L Waves) They are the waves of long wavelength, confined to the skin of the Earth's crust. It causes most of the earthquake's structural damage.

Distribution of Earthquakes

Most of the world earthquake occur in

The zones of young fold mountain, the zones of folding and faulting, the zone of junction of continental and oceanic margin, the zone of active volcanoes and along different plate boundaries.

The traditional zones of earthquakes

Circum Pacific belt, Mid Continental belt and Mid Atlantic belt.

Tsunamis

- The seismic waves caused by the earthquakes travelling through sea water, generate high sea waves, this phenomena is known as *tsunami*. It is generated by the displacement of water.
- Sometime, tsunamis are reffered to as tidal waves. This once popular term derives from the most common appearance of tsunami, which is that of an extraordinarily high tide bore.
- Since the pacific ocean is girdled by the ring of earthquakes and volcanoes, tsunamis are more common in the pacific with a minimum frequency of two tsunamis per year.

Landforms

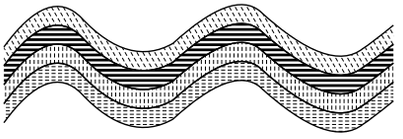
- A landform is a natural feature of the Earth's surface. Landforms are categorised by characteristic physical attributes such as elevation, slope, orientation, stratification, rock exposure and soil type.
- Landforms together make up a given terrain and their arrangement in the landscape is known as *topography*. Typical landforms includes mountains, plateaus, plains, islands, deserts and so on.

Mountain Buildings

Mountains are significant relief features of second order on the Earth's surface. A mountain may have several form namely; mountain ridge, mountain range, mountain chain, mountain group and cordillera.

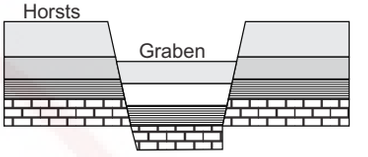
Based on their mode of formation four main types of mountain can be distinguished

i. **Fold Mountains** It is formed due to the compressive forces generated by endogenetic forces (earthquake, landslide etc.) Examples of Fold mountains are Himalayas, Alps, Andes, Rockies, Atlas etc.



Fold Mountains

ii. **Block Mountains** It is formed when great block of Earth's crust may be raised or lowered due to tectonic activities. The land between the two paralled faults either rises forming Block mountains or horsts or subsides into a depression termed as *Rift valley* or *Graben*. Examples of Block mountains are Narmada, Tapti and Damodar valley in India, the Vosges in France and Black forest in Germany (through which Rhine river flows).



Block Mountains

iii. **Volcanic Mountains** They are formed due to the accumulation of volcanic material. It is also called as *mountains of accumulation*. Examples of Volcanic mountains are Mt Fuji (Japan), Cotopaxi in Andes, Vesuvius and Etna in Italy, Mt Mayon (Philippines) etc.

iv. **Residual or Dissected Mountain** They are formed as a result of erosion of plateaus and high plains by various agents of erosion. Examples of Residual or Dissected mountains are Catskill mountains of New York, Sierras of Spain, Girnar and Rajmahal of India.

Some Important Mountain Ranges of the World

Mountain	*Location*	*Highest Peak*
Himalayas	Asia	Mount Everest
Andes	South America	Aconcagua
Rocky	North America	Mount Elbert
Great Dividing Range	Australia	Mount Kosciuszko
Karakoram	Asia	Austin Godwin/K2
Tian Shan	Asia	Jengish Chokusu
Altai	Asia	Belukha Mountain
Ural	Eurasia (Russia)	Mount Narodnaya
Atlas	Africa	Toubkal
Alps	Europe	Mount Blanc

PLATEAUS

Tabular upland having relief of more than 500 feet may be defined as plateau. Tibetan plateau (5000 m) is the highest plateau in the world.

According to their mode of formation and their physical appearance, plateau may be grouped into the following types

- **Tectonic Plateau** These are formed by Earth movements, which cause uplift and are normally of a considerable size and fairly uniform altitude.

- When plateau are enclosed by Fold mountains, they are known as Intermont Plateau.
- Examples of Tectonic Plateau are Tibetan Plateau between the Himalayas and the Kunlun and the Bolivian Plateau between two ranges of the Andes.

- **Volcanic Plateau** These are formed by accumulation of lava. e.g. Deccan Plateau (India), Columbia Plateau (USA).
- **Dissected Plateau** Through the continual process of weathering and erosion by running water, ice and winds, high extensive plateau are gradually worn down, and their surface made irregular as example is the Scottish Highlands.

PLAINS

A relatively low-lying and flat land surface with least difference between its highest and lowest points is called a *plain*. The plains are divided into structural, erosional and depositional plains.

Forms of Plain

Structural Plain Formed due to the uplift of a part of the sea floor. e.g. the Great Plain of USA.

Erosional Plain Formed when the elevated tract of land is worn down to a plain by the process of erosion. e.g. Plain of North Canada.

Depositional Plain Formed by filling up of sediments into depressions along the foothills, lakes and seas. e.g. Indo Ganga Plain.

DESERT

- A desert is a barren area of land where little precipation occurs and consequently living conditions are hostile for plant and animal life. About to one-third of land surface of the Earth is arid or semi-arid.
- Deserts are formed by weathering processes as large variations in temperature between day and night put strains on the rocks which consequently break in pieces.
- The major hot deserts of world are located on the western coasts of the continents between latitudes 15° and 30°N and South (S) because the effects of off-shore trade wind. Some of the examples are Sahara, Arabian, Great Australian Desert, etc.
- The cold deserts are located in the interior of the continents such as Gobi, Takla Makan etc and some are found at some distance from the sea, such as Atacama. This deserts are dry due to the effect of orographic barrier.

Major Desert of the World

Desert	*Location in Country*
Sahara	Algeria, Chad, Libiya, Mali, Mauritania, Niger, Sudan, Tunisia, Egypt, Morocco
Great Victoria Desert	Australia
Arabian	Saudi Arabia, Yeman, Syria
Kalahari	Botswana
Takla Makan	China
Sonoran	USA, Maxico
Namib	Namibia
Karakum	Turkmenistan
Thar	India, Pakistan
Somali	Somalia

ISLANDS

An island is any piece of land that is surrounded by water. A grouping of geographically or geologically related islands is called an *archipelago*. The various types of islands are named according to the way they were formed.

Types of Island

They are as follow

Continental Island It is simply an island that rests on the continental shelf. Because of this, these islands are always quite close to a given continent. Also, the water level around a continental island is very shallow, typically less than 600 feet. Canadian island of newfoundland is a continental island, as is Greenland. Great Britain is the largest continental island in Europe.

Volcanic Islands It are formed when volcanoes deep in the ocean rise above the water's surface.

Coral Island It is an island that forms a ring and partially or totally encloses a shallow body of water or lagoon. Coral islands, which are large collections of coral a top rock (usually volcanic) in the ocean. Lakshadweep island in Indian ocean is best example of coral islands.

Alluvial Islands It are formed by the outward flow of water depositing silt and gravel at the mouth of a river. New Moore island at the mouth of Ganga river in West Bengal is an *alluvial island*.

Barrier Islands It are formed by waves depositing sand on the shallow ocean bottom as they crash on the shoreline.

Tectonic Island It are formed by the result of tectonic activity. By the tectonic movement long island arcs (archipelagoes) are formed. Indonesia, Philippines, Japan groups of island are best example of it.

Agents of Erosion and Various Landforms

A landform is a natural feature of the Earth's surface. Moving water, wind, gravity and ice wear away rocks, sediments and soil from land's surface. Erosion and deposition work simultaneously and changes the face of landforms.

Landforms made by Different Agents of Erosion

Agents	*By Erosion*	*By Deposition*
Fluvial Action	V-Shaped Valley, Gorges and Canyons, Grooves, Pot Holes, Waterfalls, Plunge Holes, Rapids, Meanders, River Terraces, Benches, Peneplain	Alluvial Fans and Cones, Ox-bow Lakes, Delta, Estuarine, Flood Plain, Natural Levees, Alluvial Islands and Sandbars
Aeolian Action	Blow-outs or Deflation Hollows, Desert Pavements, Mushroon or Gara, Zeugen, Yardangs, Needles, Pediplains and Inselbergs, Demoiselles	Sand-Dunes, Loess and Sand Shadow
Glacial Action	U-Shaped Valley, Hanging Valley, Cirque, Aretes and Comb-ridges, Horn, CoL, Pass and Saddle, Nunatak, Crag and Tail, Fiord	Moraines, Till Plains, Drumlis, Eskers, Kames, Outwash Plains

LAKES

A lake is a body of water surrounded by land from all the sides. A lake can be fed and drained by rivers and streams.

Types of Lakes

Lakes can be classified as

Tarn Tarn lakes (also often classified as Alpine lakes) are usually associated with glacial regions areas that have been glaciated in the past. These follows form as the ice scours out the side of a hill, creating what is called *a cirque*. Tarn lakes from the last ice ages are evident along some slopes of the Adirondack Mountains and from more recent glaciation in the European Alps.

Rift Valley Lake Rift valley lakes occur in areas where rock is pulling apart. As a narrow wedge of land drops from the movement, a long, narrow lake often forms. The Rift valley, which cuts through Africa and Asia, contains the largest group of such lakes, including lake Nyasa.

Crater Lake Crater lakes form at a volcanic peak. When an extinct volcano collapses, it often leaves a somewhat circular depression; water from rain and runoff eventually fills the lake. Crater lake in Oregon is a good example of such a lake.

Deflation Lake Deflation lakes usually occur in deserts as the wind blows out depressions in the sand. If the hole reaches the local groundwater table, it can create an oasis. Such features dot the Sahara desert in Africa which are locally called Oasis.

Oxbow Lake Oxbow lakes are created by a curved river meander that was cut off by sediment or other means, creating a bowed shaped lake. The Mississippi River shows evidence of past Oxbow lakes.

Artificial Lake Artificial lakes are those usually formed by the damming of a river. These lakes are usually created to regulate the flow of a seasonal flooding river and many times offer a constant supply of potable (drinkable) water or generated electricity.

Important Lakes and their Countries

Lakes	*Countries*	*Lakes*	*Countries*
Caspian Sea	Kazakhstan, Turkmenistan, Iran, Azerbaijan, Russia	Great Slave Lake	Canada
Superior	Canada, United States	Balkhash	Kazakhstan
Victoria	Uganda, Kenya, Tanzania	Ladoga	Russia
Michigan	United States	Nicaragua	Nicaragua
Tanganyika	Burundi, Tanzania, Zambia	Great Salt Lake	United States
Baikal	Russia	Huron	Canada and USA
Great Bear Lake	Canada	Aral	Kazakhistan
Malanei Malawi	Tanzania, Malawi, Mozam bique	Great Slave	Canada

Major Rivers of the World

River	*Origin*
Nile	Victoria Lake
Amazon	Andes (Peru)
Yangtze	Tibetan Kiang Plateau
Mississippi Missouri	Itaska Lake (USA)
Yenisei	Tannu-Ola Mountains
Huang Ho	Kunlun Mountains
Ob	Altai Mountains, Russia
Congo	Lualaba and Luapula rivers
Amur	North-East China
Lena	Baikal Mountains
Mekong	Tibetan Highlands
Niger	Guinea

ATMOSPHERE

Atmosphere is a thick gaseous envelope surrounding the Earth from all sides and attached to Earth through the force of gravitation.

Significance of Atmosphere Acts as a filter because it absorbs the various unwanted radiation and source to various gases. It supports life forms in biosphere.

Extent of Atmosphere Almost 97% of effective atmosphere confines within the height 29 km of the Earth's surface. So, the vertical distribution of the atmosphere is not uniform and even not homogeneous. It extends between 16-29000 km from the sea level.

Composition of Gases The atmosphere is composed of gases, vapours and particulates. Nitrogen, oxygen, carbon dioxide are present. Gases such as helium, ozone and hydrogen etc are present in traces. Ozone gas absorbs the ultraviolet radiations and save the biosphere from its adverse impact.

Layers of Atmosphere

Troposphere

- It extends upto 16 km from the Earth's surface. Thickness varies from 8 km at the poles to 16 km at the equator. With every 165 m ascent, there is a drop of 1°C (or 6.4°C per km). This is called Normal Lapse Rate of Temperature.
- Tropopause separates troposphere from stratosphere. This layer accounts for practically the entire water vapour, all dust particles and most of the carbon dioxide contained in the atmosphere. Due to this all weather phenomena such as condensation, precipitation and storms, etc occur in the troposphere only.

Stratosphere

- The stratosphere extends upto about 50 km, where **stratopause** separates it from the mesosphere.
- In this layer, the temperature increases with increase in height. This phenomenon is known as *temperature inversion*. The temperature rises in this layer from about –60°C at the tropopause to 0°C at stratopause.
- The part of the stratosphere, in which there is a concentration of ozone is often called *ozonosphere*. It absorbs ultraviolet radiation, which is harmful for us.
- Stratosphere is free from dust particles and also from atmospheric turbulences. Hence, this layer is considered ideal for flying of jet aircrafts.

Mesosphere

- Mesosphere extends above the stratopause upto a height of about 80 km. In this layer, the temperature decreases with height like in the troposphere and it falls from about 0°C at its base to about –100°C at 80 km height.
- It is considered the coldest layer of the atmosphere. The upper limit of the mesosphere is marked by the **Mesopause**, a transitional layer separating it from the ionosphere.

Ionosphere

- Ionosphere is located above the mesosphere and extends upto about 600 km. This layer is also called as *ionosphere* because it contains electrically charged ions that reflect the radiowaves back to the Earth thus, making radio communication possible.
- Absorption of solar radiation by ionised particles cause an increase in temperature with increasing height in the ionosphere.
- Due to large concentration of ionised particles in this layer the ionosphere acts as a protective layer against meteorites, that are burnt in this layer.

Thermosphere

- The zone between the 85 km and 400 km above the surface is often called *thermosphere*. In this layer, the temperature increases with increasing altitude. The upper limit of the thermosphere, the **thermopause** is generally taken at an altitude of about 600 km.
- The day temperature at 600 km altitude exceed 1400°C while night temperature remain about 225°C. The upper part of the thermosphere contains only the lighter gases like helium and hydrogen.

Exosphere and Magnetosphere

- The outermost part of the atmosphere of the Earth is called *exosphere*. This zone of the atmosphere extends up to a height of about 900 km.
- The upper limit of the exosphere is uncertain as this layer acts as a transitional layer between the Earth's atmosphere and the space. The outer part of the exosphere is called *magnetosphere*.

Atmospheric Pressure

Air is an extremely compressible gas having its own weight. The pressure exerted by air due to its weight is called atmospheric pressure on the Earth's surface. Atmospheric pressure is neither the same for all the regions nor the same for one region all the time. It is affected by various factors such as altitude, temperature and Earth's rotation.

Influence on the Atmospheric Pressure

- **Altitude** Air pressure increases, when air descends due to the decrease in volume. When air rises its volume increases and the outward pressure of its molecule is spread over a larger area and its pressure decreases.
- **Temperature** The pressure of air rises, when its temperature falls. Low temperatures at the poles cause the air to contract–high pressure develops; whereas the high temperature along the equator cause the air to expand–low pressure develops.

Pressure Belts

The distribution of pressure is highly uneven and this is partly a result of variation in distribution of temperature. These are seven pressure belts on the globe. *These pressure belts are discussed below*

Equatorial Low Pressure Belt

- It is located on either side of the geographical equator in a zone extending between 5°N and 5°S. Its location is not stationary and there is a seasonal drift of this belt with the Northward (summer solstice) and Southward (winter solstice) migration of the Sun.
- It is thermally induced because of the intense heating of the ground surface by the almost vertical Sun rays.
- It represents the zone of convergence of North-East and South-East trade winds. This convergence zone is characterised by light and feeble winds. And because of the frequent calm conditions this belt is called as a belt of calm or doldrums.

Sub-Tropical High Pressure Belt

- It extends between 30° to 35° in both the hemispheres. It is not thermally induced, but dynamically induced as it owes its origin to the rotation of the Earth and sinking and settling down of winds.
- Here, the convergence of winds at higher altitude above this zone results in the subsidence of air from higher altitudes. Thus, decent of wind results in concentration of their volume and ultimately causes high pressure. This zone of high pressure is also called as *horse latitude*.

Sub-Polar Low Pressure Belt

- It extends between 60° to 65° in both the hemisphere. The low pressure belt does not appear to be thermally induced because there is low temperature throughout the year and as such there should have been high pressure belt instead of low pressure belt. Thus, it is dynamically induced.
- It is more developed and regular in Southern hemisphere than in Northern hemisphere because of the over dominance of water (ocean) in the Southern hemisphere.

Polar High Pressure Belt

High pressure persists at the poles throughout the year because of the prevalence of very low temperature all the year round.

Wind System

The pressure difference is the major cause of the genesis of the wind system. The air moves from high pressure to low pressure.

- The slope of pressure from high to low is called as pressure gradient, which is also called as barometric slope.
- The imaginary line joining the points having same pressure is called *isobars*. The direction of air movement should be perpendicular to the isobars because the direction of pressure gradient is perpendicular to the isobars, but the direction is deviated from the expected one due to *coriolis force* caused by the rotation of the Earth.

Wind Direction and Related Laws

- The coriolis force generated due to the rotation of Earth acts as a deflective force to the wind direction.
- Because of the coriolis force, all the winds are deflected to the right in the **Northern hemisphere** while they are deflected to the left in the **Southern hemisphere** with respect to the rotating Earth. This is referred to as **Ferrel's Law**. The coriolis force is absent along the equator, but increases progressively towards the poles.

Types of Winds

(i) Permanent Winds

These winds include trade wind, westerlies and polar winds, which are as follow

- **Trade Wind** These are steady currents of air blowing from the sub-tropical high pressure belt towards the equatorial low pressure belt. Under the influence of the coriolis forces they flow from the North-East in the Northern hemisphere and from South-East in the Southern hemisphere.
- **Westerlies** The permanent winds blowing from the sub-tropical high pressure belt to the sub-polar low pressure belt in both the hemisphere is called *westerlies*. The general direction of the westerlies is South-West to North-East in the Northern hemisphere and North-West to South-East in the Southern hemisphere.
- Because of the dominance of the land masses in the Northern hemisphere the westerlies become more complex and complicated and become less effective during summer seasons and more vigorous during winter seasons.
- **Polar Winds** It blows from polar high pressure belt to sub polar low pressure belt. They are North Easterly in Northern hemisphere and South Easterly in the Southern hemisphere.

(ii) Secondary Wind Movements

Seasonal Winds The winds, which reverse its direction completely every 6 months is called *seasonal winds*. The best example is monsoon winds.

Local Winds

Winds	*Nature*	*Region*
Land Breeze	Warm	Experienced along coastal areas. Land breeze blows from land to sea.
Sea Breeze	Cold	Experienced along coastal areas. Sea breeze blows from sea to land.
Chinook (snow eater)	Warm	Rockies (USA and Canada)
Sirocco	Hot	North Africa
Fohn	Warm	Alps/Europe
Khamsin	Hot	Egypt
Blizzard	Cold	Siberian, Canada, USA
Bora	Cold	Yugoslavia
Southerly Burster	Cold	Australia
Purga	Cold	Russian, Tundra
Bire	Cold	France
Cape Doctor	Cold	South Africans's coast
Harmattan (The Doctor)	Hot	Sahara to Guinea Coast (Ghana, Nigeria etc)
Zonda	Warm	Argentina, Chile/Andes
Brick Fielder	Hot	Australia
Samun	Hot	Iran
Levanter	Cold Wind	Spain
Norwester	Hot Wind	New Zealand
Leveche	Hot	Algeria, Morocco
Santa Ana	Warm	USA (California)
Berg	Warm	South Africa
Yoma	Warm	Japan
Karaburan	Hot	Tarim Basin
Black Roller	Hot/Dusty	North America
Kalbaisakhi	Hot	North India
Mistral	Cold	France to Mediterranean (Rhine valley)

Jet Stream

- The strong and rapidly moving circumpolar westerly air circulation in a narrow belt of a few 100 km width in the upper limit of troposphere is called *jet stream*. Their circulation path is wavy and meandering.
- The extent of the jet streams narrows down during the summer season because of their Northward shifting while these extend upto 20° North latitude during winter season.

Cyclone and Anti-Cyclone

Cyclone

- Cyclones are the centres of low pressure surrounded by closed isobars having increasing pressure outward and closed air circulation from outside towards the central low pressure in such a way that air blows inward in anticlockwise direction in the Northern hemisphere. Air blows inward in clockwise direction in the Southern hemisphere.

Anti-cyclone

- They are the wind system, which has the highest air pressure at the centre and lowest at the outer margins surrounded by circular isobars where wind blows from centre to outward in clockwise direction in Northern hemisphere from centre to outward in anticlockwise direction in Southern hemisphere.
- They are high pressure system and common in sub-tropical belts and practically absent in the equator region. They are generally associated with rainless fair weather and that's why they are called as *weatherless phenomena*.

Thunderstorms

Thunderstorms are local storms characterised by swift upward movement of air and heavy rainfall with cloud thunder and lighting. Structurally, thunderstorms consist of several convective cells, which are characterised by strong updraft of air.

Tornado

Tornadoes are very strong tropical cyclones of smaller size. In the Mississippi valley (US), they are called *twisters*. They are more destructive than cyclones as the speed of winds is very high, exceeding 320 km per hour.

Cyclones

Cyclone	*Region*
Typhoons	China Sea
Tropical Cyclones	Indian Ocean
Hurricanes	Caribbean Sea
Tornadoes	USA
Willy Willies	Northern Australia

Humidity and Related Aspects

Humidity of air refers to the content of the water vapour present in the air at a particular time and place. Humidity is measured by an instrument called *hygrometer*. Another instrument used for the same purpose is **sling psychrometer**.

The atmospheric humidity is expressed in a number of ways such as

Humidity Capacity The capacity of air of certain volume at certain temperature to retain maximum amount of moisture content.

Absolute Humidity The total weight of moisture content per volume of air at definite temperature is called *absolute humidity*.

Specific Humidity The mass of the water vapour in grams contained in a kilogram of air and it represents the actual quantity of moisture present in a definite air.

Relative Humidity It is the ratio of the amount of water vapour actually present in the air having definite volume and temperature (i.e. absolute humidity) to the maximum amount the air can hold (i.e. humidity capacity).

$$\text{Relative Humidity} = \frac{\text{Absolute Humidity}}{\text{Humidity Capacity}} \times 100$$

- **Condensation** is the change of physical state of matter from gaseous phase into liquid phase and is the reverse of vaporisation.
- When the relative humidity reaches 100%, the air is completely saturated. The air temperature is said to be as dew point.
- **Smog** (Smoke + Fog) is a form of fog that occurs in areas, where the air contains a large amount of smoke.
- **Fog** is made from the droplets of water suspended in the lower layer of the atmosphere. Fog is not considered as a form of precipitaion. Visibility of less than 1 km is the internationally recognised definition of fog.
- **Haze** is formed by water particles that have condensed in the atmosphere and visibility lie between 1 km to 2 km.
- **Frost** is the moisture on the ground surface that condenses directly into ice, i.e., when condensation occurs below freezing point.

Precipitation

On the basis of its origin, precipitation may be classified into three main types

Convectional Precipitation

- It occurs daily in the afternoon in the equatorial regions. It is of very short duration but occurs in the form of heavy rainfall.
- It occurs through thick, dark and extensive cumulonimbus clouds. It is accompanied by cloud, thunder and lightening.

Orographic Precipitation

- The wind ward slope receives the maximum amount of rainfall, whereas the leeward side receives less rainfall.
- The windward slopes of the mountains at the time of rainfall are characterised by cumulus clouds while leeward slope has stratus clouds. It can occur in any season.

Cyclonic Precipitation

- Rainfall associated with the temperate cyclone occurs, when two extensive air masses of different physical properties converge.
- In tropical regions two extensive air masses of similar physical properties converge to form tropical cyclones, wherein lifting of air is almost vertical and very often associated with convection.

Clouds

- Clouds are a mass of small water droplets or tiny ice crystals. These are classified according to their appearance, form and height.
- *There are four groups, which are as follow*
  - i. **High Clouds** 6000 metre to 12000 metre
  - ii. **Middle Clouds** 2100 metre to 6000 metre
  - iii. **Low Clouds** below 2100 metre
  - iv. Clouds of great vertical extent 1500 metre to 9000 metre

Types of Clouds

High Clouds	*Middle clouds*	*Low Clouds*	*Clouds with Great Vertical Extent*
Cirrus Composed of small ice crystal, white, wispy and fibrous in appearance.	**Alto cumulus** Composed of water droplets in layers and patches.	**Strato cumulus** Large globular masses, bumpy looking, soft and grey in appearance forming a pronounced regular and sometimes wavy pattern.	**Cumulus** Round topped and flat based forming a whitish grey globular mass, consists of individual cloud units.
Cirro cumulus Composed of ice crystals, but globular or rippled in appearance.	**Alto stratus** Composed of water droplets, forming sheets of grey or watery looking clouds.	**Nimbo stratus** Dark grey and rainy looking, dense and shapeless, often gives continuous rains.	**Cumulo nimbus** They have a great vertical extent, white or black globular masses, whose rounded tops often spread out in the form of anvil. It is characterised by convectional rain, lightning and thunder.
Cirro stratus Looks like a thin white almost transparent sheet, which causes the Sun and Moon to have halos.		**Stratus** These are low, grey and layered, almost fog like in appearance, bringing dull weather and often accompanied by drizzle.	

Climate

Weather refers to the sum total of the atmospheric conditions in terms of temperature, pressure, wind, moisture, cloudiness, precipitation and visibility of a particular place at any given time.

World Climatic Types

Climatic Zone	*Climatic Types*	*Rainfall*	*Natural Vegetation*
Equatorial Zone (10°N-10°S)	Hot, wet equatorial	Rainfall all the year	Equatorial rain forest– special term selva is used to Ebony, mahogany, dye woods are found.
Hot Zone (30°N-30°S)	(i) Tropical Monsoon	Heavy summer rain	Monsoonal forest– Teak sal, sisam, eucalyptus acacia
	(ii) Tropical Marine	Summer rain	savana (Tropical grassland)– grasses
	(iii) Sudan type	Rain mainly in summer	
	(iv) Desert	Little rain	Desert vegetation and scrub– cacti
	(a) Saharan type (b) Mid latitude type		
Warm Temperate Zone (30°N-45°S)	(i) Western margin (Mediterranean type)	Winter rain	Mediterranean forests– Oak, Pine fir, eucalyptus, giant sequoia, cedar
	(ii) Central Continental type (Steppe type)	Light summer rain	Steppe, temperate grass
	(iii) Eastern Margin	Heavier summer rain	Warm, wet forests– Parapine, Oak
	(a) China type		Parapine, oak
	(b) Gulf type		Walnut, Oak, hickory
	(c) Natal type		Parapine, eucalyptus, wattle
Cool Temperate Zone (45°N-65°S)	(i) Western Margin (British Type)	Rain in autumn and winter	Deciduous forest–Oak, elm, birch, poplar, chestnut, mapple
	(ii) Central Continental (Siberian Type)	Light summer rain	Coniferous forest– Pine fir, spruce larch
	(i) Eastern Margin (Lauritian Type)	Moderate summer rain	Mixed forest– Oak, beech, mapple
Cold Zone (65°N-90°S)	(ii) Arctic or Polar Mountain Climate	Very light summer rain Heavy rainfall (variable)	Tundra, mosses, lichens Alpine, fern, conifers

Grassland

A grassland is a region where the average annual precipitation is great enough to support grasses, and in some areas a few trees. Grassland biomes are large, rolling terrains of grasses, flowers and herbs. Latitude, soil and local climates for the most part determine what kinds of plants grow in a particular grassland.

Famous Grasslands of the World

Grasslands	*Countries*
Steppe	Eurasia
Pustaz	Hungary
Prairie	USA
Pampas	Argentina
Veld	South Africa
Downs	Australia
Cantebury	New Zealand

Isopleth

A line drawn on a map through all points having the same value of some measurable quantity.

Some Important Isopleth

Isopleth	*Reaction*
Isohels	Sunshine
Isohyets	Rainfall
Isonif	Snow
Isocline	Slope
Isotherms	Temperature
Isobars	Equal pressure
Isabath	Equal depth in sea
Isohaline	Salinity
Isohypse (or contour lines)	Elevation above sea-level
Isodapane	Equal transportation cost
Isobrants	Thunder storm at the same time

HYDROSPHERE

The water component of the Earth is called *hydrosphere*. It includes the oceans, seas, lakes, ponds, rivers and streams. The hydrosphere covers about 70% of the surface of Earth.

Composition of Hydrosphere

Storage Component	*Total Percentage of Water*
Oceans	97.6
Saline lakes and inland seas	0.008
Ice capes and glaciers	1.9
Ground water	0.5
Soil moisture	0.01
Lakes	0.009
Freshwater rivers	0.0001
Atmosphere	0.0009

Ocean

An ocean is body of saline water that comprises 72% of Earth's hydrosphere. The ocean contains 97% of Earth's water and oceanographers have stated that less than 5% of the world ocean has been explored.

Ocean of the World

Following are the major oceans, which are arranged in descending order by area

Pacific Ocean

- This ocean is the largest ocean or water body of the world and extended from Arctic Ocean to Antarctic Ocean. The ocean is bounded by Asia and Australia in the West and the South and North America in the East.
- The equator sub-divides the Pacific Ocean into North and South Pacific Ocean. The Marina Trench in the Western-North Pacific is the deepest point in the world (10911 metres).

Atlantic Ocean

- This ocean is second largest of the world's oceans and slightly more than half of the pacific ocean. The ocean occupies an elongated, S-shape basin which extending longitudinally between Eurasia and Africa to the East and South and North America to the West.
- The equatorial counter current sub-divides the ocean into North and South Atlantic Ocean at about 8° North.

Indian Ocean

- This ocean is third largest ocean in the world. It is bounded by Asia on the North, Africa on the West, Australia on the East and Antarctica on the South.
- The India ocean contains approximately 20% of the water on the Earth's surface.

Antarctic Ocean

It is the fourth largest ocean in the world. It is also known as Southern Ocean, the South Pole Ocean, is a large body of water encircling the continent of Antarctica. The ocean is particularly covered with ice.

Arctic Ocean

It is the smallest and shallowest of the world's five major oceans. It is located mostly in Arctic North Polar region and completely surrounded by Eurasia and North America. The ocean is partly covered by sea ice throughout the year and almost completely in winter.

Deepest Points of the Ocean

Ocean	*Deepest Point*
Pacific	Mariana Trench
Atlantic	Puerto Rico Trench
Indian	Java Trench
Arctic	Eurasian Basin

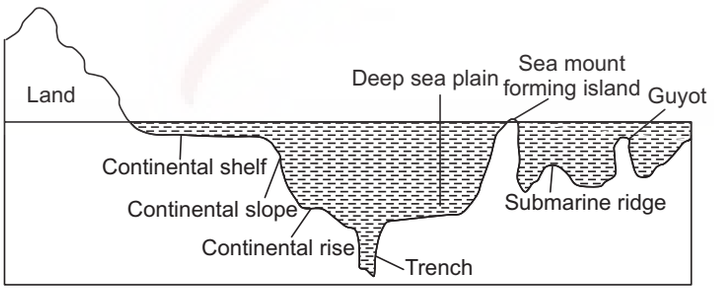
Relief Features of the Oceans

Continental Shelf

- The shallow sub-merged extension of the continent is called the continental shelf. It extends to a depth of 100 fathoms (1 fathoms = 1.8 m).
- **Average width** 70 km; **average slope** 17 feet/mile or about 1°. Continental shelf covers 7.5% area of the oceans. It extends over 13.3% of the Atlantic Ocean 5.7% of Pacific Ocean and 4.2% of Indian Ocean.
- If mountains extend along the coast, the shelf will be narrower. About 20% petrol and gas are found here. They also provide the richest fishing ground in the world.

Continental Slope

- Extends seawards from the continental shelf. It has depth of 200-2000 fathoms (3660 m) and average slope of 20 to 50 degrees.



Relief of the Ocean Basin

- The boundary between shelf and slope is known as Andesite Line, names, after the Andesite Rock. They cover about 8.5% of the total ocean area.

Continental Rise

It is an area at the foot of the slope, slightly rising due to the accumulation of debris transported over the slope. It has average slope of 0.5° to 1° and oil deposits are found here.

Abyssal or the Deep Sea Plains

- It is the deepest and most extensive part of the oceanic floor. It has average depth of 3000 m to 6000 m. It covers about 75.9% of total oceanic area.
- Parts of the Abyssal plains are occupied by raised ridges or submarine mountains and by very deep trenches or canyons.

Deeps/Trenches

- Trenches are narrow and steep sides depressions. It are formed, when two plates of the Earth's crust are moving together and one is being pushed down below the other.
- Marina trench (challenger deep) is the deepest trench in the world situated in the NW Pacific oceans, near Philippines. It is more than 11 km deep.

Oceanic Ridges

- Oceanic ridges are formed by the volcanic activity along the spreading boundary of plates.
- It is thousands of km long and hundreds of km wide mountain range on the oceanic floor.
- Their summits may rise above the sea level in the form of Islands i.e., Iceland, Azores Island.

Coral Reefs

It are formed due to accumulation and the compaction of skeletons of lime secreting organisms known as *coral polyps*. Corals are found mainly in the tropical oceans and seas because they require high mean annual temperature of ranging between 20°C to 25°C. Corals do not live in deeper waters due to lack of sufficient sunlight and oxygen.

CORAL BLEACHING

When corals are stressed by changes in conditions such as temperature, light or nutrients, they expel the symbiotic algae living in their tissues, causing them to turn completely white, this phenomenon is known as *coral bleaching.*

On the basis of nature, shape and mode of occurrence, the coral reefs is classified into three types

i. **Fringing Reefs** It develop along the continental margins or along the islands.
- The seaward slope is steep and vertical while the landward slope is gentle.
- They are usually attached to the coastal land, but occasionally they are separated from the shore by a shallow and narrow lagoon called 'Boat Channel'.
- This type of reefs are found near Rameshwaram in the Gulf of Mannar.

ii. **Barrier Reefs** Largest coral reefs off the coastal platform, but parallel to them.
- The reef lies at a distance away from the coast. Hence, a broad lagoon develops between the reef and the shore.
- The Great Barriers Reef of Australia is the largest barrier reef in the world.

iii **Atoll** A reef of narrow growing corals of horse shoe shape and crowned with plam trees is called *an atoll*.
- It is formed around an islands or in an elliptical form on a submarine platform.
- Funafuti atoll of Tuvalu is a famous atoll.

Salinity

It is defined as the total amount of solid material in grams contained in 1 kg of sea water and is expressed as part per thousand. The oceanic salinity not only affects the marine organism and plant community, but also affects the physical properties of the ocean such as *temperature, pressure, density, waves* and *currents*.

- Average salinity in Northern hemisphere is more than that of Southern hemisphere.
- **Iso-halines** represent the salinity distribution in the surface of the sea. These are the lines joining places having an equal degree of salinity.
- The main source of salinity is dissolution of the rocks of oceanic crust which contains salts.
- Poles have minimum salinity because of addition of fresh water in the form of icebergs and excessive snowfall. Variation in salinity causes vertical circulation of water.
- More saline water freezes slowly while the boiling point of saline water is higher than the fresh water. Salinity also increases the density of water.

Salinity : Controlling Factor

Controlling Factor	*Relation with Salinity*
Evaporation	Greater the evaporation, higher the salinity.
Precipitation	Higher the precipitation, lower the salinity.
Influx of river water	Big voluminous rivers pour down immense volume of fresh water into the oceans and salinity is reduced at the mouth.
Atmospheric pressure	Anticyclonic conditions with stable air and high temperature increases the salinity of the surface water of the ocean.
Circulation of oceanic water	Ocean currents affect the spatial distribution of salinity by mixing sea waters.

Salinity on an average decreases from equator to poles. The highest salinity is recorded near the tropics rather than the equator because of the heavy precipitation in the equatorial region.

World Top Saline Water Bodies

Water Bodies	*Salinity (in %)*	*Location*
Don Juan Pond	44	Antarctica
Lake Van	33.8	Turkey
Dead Sea	33.7	Jordan, Israel, Palestine
Great Salt Lake	27	USA

Distribution of Salinity

Generally, salinity decreases from equator towards the poles, but highest salinity is at sub-tropical high pressure belt, because of high temperature, high evaporation and low rainfall.

Waves

Waves are the oscillatory movements in water mainly produced by winds, manifested by an alternate rise and fall of the sea surface.

The waves are the important agents of erosion in the coastal regions, where they carve out various landforms like caves, bays, gulfs, capes and cliffs.

- Seismic waves or tsunamis are the waves caused by earthquakes in volcanic eruptions in the sea bottom.
- The tsunamis, which hit the coast in South-East Asia on 26th December, 2004, caused havoc in that region.

Ocean Currents

- An ocean current is a continuous, directed movement of ocean water generated by the forces acting upon it, such as breaking waves, wind, coriolis effect, temperature and salinity differences and tides caused by the gravitation pull of the Moon and the Sun.
- Ocean currents circulate in clockwise direction in Northern hemisphere and in anti-clockwise direction in Southern hemisphere.

  Ocean currents are of two types

  i. **Warm Currents** The ocean currents flowing from lower latitude to higher latitude are known as Warm Currents.

  ii. **Cold Currents** The ocean currents flowing from higher latitude to lower latitude are known as Cold Currents.
- At places where cold current and warm current meets fishing is very favourable. e.g. New found land is favourable for fishing due to meeting of Labrador Current and North Atlantic Drift.

Currents of North Pacific Ocean

Warm Currents

- **North Equatorial Current** It flows Westwards from the Western coast of Mexico to the Philippines.
- **Kuroshio Current** It is an extension of North Equatorial Current near Japan Coast. It flows towards North.
- **Alaska Current** It flows along the coast of British Columbia and the Alaska Peninsula.

Cold Currents

- **Oyashio Current** It flows down from bering sea towards Japan from North pole and it joins Kuroshio currents.
- **Okhotsk Current and Kuril Current** It flows down from sea of Okhotsk and joins Kuroshio current to the North of Japan.
- **West Wind Drift** It flows towards Alaska.
- **Californian Current** It is an extension of Alaskan currents. It joins finally North Equatorial current and completes clockwise circulation of water.

Currents of South Pacific Ocean

Warm Currents

- **East Australian Current or Great Barrier Current** It flows towards East coast of Australia from equator towards Pole.
- **South Equatorial Current** It originates due to South-East trade winds and flows Westwards and bifurcates near New Guinea.
- **Counter Equatorial Current** It extends upto Panama Bay. It flows exactly on equator from West to East.

Cold Currents

- **Peruvian Current** (Humboldt current) It flows from South towards equator on the coast of Chile and Peru.
- **West Wind Drift** It flows from Tasmania to Chile coast of South America.

Currents of North Atlantic Ocean

Warm Currents

- **North Equatorial Current** It is present between Equator and 10°N.
- **Cayenne Current** It flows adjacent to French Guinea and enters into Carribean Sea and Gulf of Mexico.
- **Florida Current** Cayenne current near Florida (US Coast) is called Florida Current.
- **Antilles Current** It flows to the East of West Indies and other islands.
- **Gulf Stream** It flows from US coast towards North West Europe under the influence of Westerly winds.
- **North Atlantic Drift** *Gulf Stream bifurcates into*
  - North Atlantic Drift (warm).
  - West Wind Drift (cold) and Canaries current (cold).

Cold Currents

- **Labrador Current** It orginates in Baffin Bay and Davis Strait and merges with *Gulf Stream* near Newfoundland. Newfoundland is a famous zone of fishing, commonly known as Grand Bank.
- **Irminger Current or Greenland Current** It flows between Greenland and Iceland and merges with North Atlantic drift.
- **Canaries Current** It flows along the Western coast of North Africa between Madeira Cape Verde and it joins North equatorial current.
- **West Wind Drift** It flows clockwise from West to East around Antarctica.

Currents of South Atlantic Ocean

Warm Currents

- **South Equatorial Current** It flows between equator and 10°S.
- **Brazilian Current** It flows to the East coast of Brazil from equator towards pole.

Cold Currents

- **Falkland Current** It flows along the South-East coast of South America from South to North.
- **Benguela Current** It flows from South to North near the 'Cape of Good Hope'.
- **West Wind Drift** It is continuance of Brazilian and Falkland current.
- **Guinea Current** It flows near Coast of Guinea (Africa).

Current of the Indian Ocean

- The Asiatic Monsoon influences the currents of the North Indian Ocean, while the currents of South Indian ocean are influenced by the atmosphere's anticyclonic circulation.
- **North Equatorial Current** The current flows from East to West and upon reaching the East coast of Africa, a good portion turns Southward, crosses the equator and becomes the Mozambique current.
- **Mozambique Current** The Mozambique current flows South along the East coast of Africa from the vicinity of the equator to about 35°, where it becomes Agulhas Stream.
- **Agulhas Stream** The Agulhas stream flows Westward along the South-West of Madagascar and joins the Mozambique current along the East African coast.
- **West Wind Drift Current** It flows across the Indian ocean to the waters South-West of Australia.
- **North-East Monsoon Drift** It flows along the coast of India during winter.
- **South-West Monsoon Drift** It flows along the coast of India during Summer.
- **South Equatorial Current** It is a significant Pacific, Atlantic and Indian ocean current that flows East-West between the equator and about 20° South.
- **Somalia Current** It is an ocean boundary current that runs along the coast of Somalia and Aman in the Western Indian ocean and is analogous to the Gulf Stream in the Atlantic Ocean.

EL Nino and La-Nina

- EL Nino and La Nino are opposite phases of what is known as the EL Nino-Southern Oscillation (ENSO) cycle. The ENSO cycle is a scientific term that describes the fluctuation in temperature between the ocean and the atmosphere in East-Central Equatorial Pacific.
- EL Nino is considered as the warm phase of ENSO and La Nina is refered to as the cold phase of ENSO. These deviations from normal surface temperatures can have large-scale impacts not only on ocean processes but also on global weather and climate.

EL Nino

- It means 'The Little Boy' or 'Christ Boy' in Spanish. It was originally recognised by fishermen off the coast of South America in 1600s, with the appearance of usually warm water in the Pacific Ocean.
- The effects of EL Nino have been seen over North America during the upcoming winter season. Those Western and Central Canada and over the Western and Northern USA.

La Nina

- It means 'The Little Girl'. It presents a situation that can be described as roughly opposite of EL Nino.
- During the occurance of this condition sea surface temperature in the central and western pacific falls below the normal and this happens due to the South pacific sub-tropical high becoming exceptionally strong during the summer season.

Tides

- Rhythmic rise and fall of the water in the ocean or in sea is called a *tide*. When the level of the water in the oceans and seas rises, it is called a high tide and conversely, when the level of water falls down it is called the low tide.
- The tides are caused due to the gravitational pull of the Sun and the Moon on the surface of the Earth. The tide producing force of the Moon is much greater than that of Sun, because it is nearer to the Earth in comparison to the Sun.
- Movements of tides are mostly determined by the rotation of the Earth.

Types of Tides

On the basis of tidal range and other characteristics, tides are classified as

Spring Tide

The spring tides are of an unusually large magnitude. They occur twice every month at the new Moon and full Moon. On these two days, the Sun, Moon and the Earth are in a straight line. At this time, the Moon is said to be in SYZYGY.

Neap Tide

The neap tides are of a lower magnitude and they are produced in the first and third quarters of the lunar month when the lines joining the centres of the Earth, Sun and the Moon are almost at right angles to each other. In this position, the Moon is said to be in quadrature.

Apogean and Perigean Tide

Due to elliptical orbit of Moon, the distance between the Moon and Earth keeps changing. When the Moon in apogee, means maximum distance, it produces tides of relatively lower magnitude. On the other, when the distance between the Moon and Earth is minimum means in perigee position, it produces tides of higher magnitude.

TRANSPORTATION

Transportation is considered to be the lifeline of economy. It help to link the remotest parts of the country to one another and give an impetus to resource development.

Roadways

They are the most universal and varied form of communication. First country to establish a nationwide highway network of this kind was Germany.

Highways	*Characteristics*
Trans-Canadian Highway	It links Vancouver with St. John City
Alaskan Highways	It connects Anchorage city of Alaska with Edmonton city of Canada
Pan American Highway	It links cities of South America, Central America and the USA
Stuart Highway	Largest highway in Australia. It connects Darwin to Port Augusta

Railways

Railways are a mode of land transport for bulky goods and passengers over long distances.

Some of the important trans-continental railways are as follow

Trans-Continental Railways	*Characteristic*
Trans-Siberian Railways	It is longest rail track of the world. It connects Moscow to Vladivostok.
Trans-Canadian Pacific Railways	It connects Halifax to Vancouver.
Australian Trans-Continental Railways	It connects Sydney to Perth.
Trans-Asiatic Railway	It will connect 28 countries including India. According to its proposed route it will enter India through Tamu and Moreh in Manipur from Myanmar, then will enter Bangladesh through Mahisasan and again enter India through Gede, finally it will pass through Attari to Pakistan.
The Union and Pacific Railway	It connects New York to San Francisco.
The Orient Express	It connects Paris with Istanbul.
Trans-Andean Railways	It connects Valparaiso with Buenos Aires.

Waterways

Waterways play an important role in the transportation. It is the most suitable and cheapest for the international trade.

Major Sea Route of the World

Major Sea Route	*Characteristic*
North Atlantic Oceanic Route	It joins the developed regions of Western Europe with the developed region of North America.
South Atlantic Oceanic Route	It joins North America and Europe with South America.
North Pacific Oceanic Route	It joins East Asia and North America with each other
South Pacific Oceanic Route	It joins Australia, New Zealand, North America and Western Europe with each other.
Routes of Indian Ocean	The routes are used by the countries which fall in the vicinity of Indian ocean exports tea, jute etc.
Routes of Mediterranean Sea	It joins Asia and Australia continents with North Atlantic ocean routes. It joins together the maximum number of countries of the world.
Cape of Good Hope Route	This sea route joins Eastern Asia and Europe to Southern parts of Africa. This oceanic route has lost its importance with the construction of Suez canal.

Major Canal of the World

- **Suez Canal** This is the largest canal of the world connecting Red sea and Mediterranean sea, where ship navigation is possible. This canal, completed in 1869, separates the lower part of the Nile basin and the Sinai Peninsula.
- **Panama Canal** This canal has been constructed by cutting across the Panama isthmus, connecting the Pacific ocean and the Caribbean sea. On the pacific coast there is Panama port and the Caribbean coast there is Colon port.
- **Volga Canal System** This is an important navigable canal system of the world, with 11200 km navigable waterway. Volga river drains into the Caspian sea. Moscow region has been connected to this waterway through Volga-Moscow canal. Navigation is possible upto Black sea through Volga-Don canal.

- **St. Lawrence Waterway** This is connected with the Great lakes and makes possible 3760 km inland navigation for the sea-going ships in USA and Canada. It is due to this waterway that the ports of the Great Lakes region have been developed as full-fledged seaports.
- **Soo Canal** This canal joins the Lake Superior and Lake Huron.
- **Erie Canal** In USA, this canal connects Lake Erie and Lake Huron.
- **Welland Canal** This canal reduces the distance between Lake Erie and Lake Ontario.
- **Kiel Canal** This canal in Germany connects the North sea with the Baltic sea.
- **Stalin or White-Baltic Canal** This canal joins Baltic sea with the Baltic sea.
- **Rhine-Maine-Danube Canal** This canal connects North sea with Black sea.

Tribes of the World

- A tribe is a social group of people, large or small, who are connected to one another, a leader and an idea.
- There are an estimated one hundred and fifty million tribal individuals worldwide, constituting around 40% of indigenous individuals. Although nearly, all tribal people are indigenous, some are not indigenous to areas where they now live.

Distinctive Tribes

Tribe	*Residing Area*
Abhors	People of Mongolian blood living between Assam and Eastern tribes
Afridis	Tribes residing in the North-West Frontier (Pakistan)
Bantus	Negroes living in the Central and South Africa
Boers	The Dutch settlers of South Africa
Eskimos	Inhabitants of Greenland and of Arctic regions
Flemings	A term used for the people of Pelgium
Hamites	Inhabitants of North-West Africa
Khirgiz	People living in Central Asia
Kurds	Tribes living in Kurdistan (Iraq)
Magyars	Inhabitants of Hungary
Maoris	Inhabitants of New Zealand
Nagroes	Mostly found in Africa
Pygmies	Short-sized people found in Congo basin in Africa
Red Indians	Original inhabitants of North America
Semites	Caucasian people of ancient times
Zulus	People of South Africa living in certain part of Natal

PRACTICE EXERCISE

1. The Pole star is a part of
(a) orion (b) ursa major
(c) ursa minor (d) None of these

2. Shooting stars are called
(a) comet (b) asteroids
(c) meteors (d) None of these

3. Which is the farthest heavenly body visible to the naked eyes?
(a) Andromeda galaxy
(b) Pleides constellation
(c) Pluto
(d) Sirius star

4. Scorpio constellation is also known as
(a) Vrishchika (b) Vyadha
(c) Matsaya (d) None of these

5. Which constellation looks like a cluster of twinkling gems in night sky?
(a) Kruttika (Pleides)
(b) Scorpio (Vrishchika)
(c) Orion (Mirga)
(d) Ursa Minor (Dhurva Matsaya)

6. Consider the following statement(s)
1. Pluto is no more a planet.
2. Neptune and Uranus are called Jovian twins.
3. Sirius is the brightest star.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) 1, 2 and 3
(c) 2 and 3 (d) 1 and 2

7. Our Milky Way is ..... in shape.
(a) spiral (b) optical
(c) round (d) None of these

8. Which of the following statement(s) is/are correct regarding the stages of life of a star?
1. Black hole is the last stage of the life of star.
2. Black holes are formed when stars explode on crossing an upper limit of mass.
3. This upper limit is called Chandrashekhar limit as it was S Chandrashekhar who predicted this frist.

Select the correct answer using the codes given below.
(a) Only 2 (b) 2 and 3
(c) 1, 2 and 3 (d) 1 and 2

9. Which is not correct regarding Asteroids?
(a) They are minor planets made of rock
(b) They reveal a lot about the origin of universe
(c) Ceres is the largest asteroid
(d) They rotate in a belt between the orbits of the Earth and the Jupiter

10. Why do we see only one side of the moon?
(a) The Moon rotates on its axis in 24 hours
(b) The Moon rotates in exactly the same time as it takes to complete one revolution of The Earth
(c) The Moon's other side always remains dark
(d) None of the above

11. Which one of the following is the astronomical unit of distance which is equal to 3.26 light years?
(a) Parsec
(b) Splite
(c) Kilometre
(d) None of the above

12. Light year means
(a) distance travelled by light in one year
(b) a measurement of year
(c) the distance between the Earth and the Sun
(d) None of the above

13. Match the following

List I	List II
A. Ursa Major	1. Star
B. Sirius	2. Constellation
C. Milky Way	3. Satellite
D. Titan	4. Galaxy

Codes

	A	B	C	D
(a)	1	2	4	3
(b)	1	2	3	4
(c)	2	1	4	3
(d)	2	4	1	3

14. Select the incorrect statement?
(a) When the Sun, Moon and the Earth are in a straight line, in that order we have solar eclipse.
(b) Solar eclipse will take place only on a full Moon day.
(c) Solar eclipse will take place on a new Moon day.
(d) None of the above

15. One light year is equal to
(a) 9.46×10^{12} km or $300000 \times 365 \times 24 \times 60 \times 60$ km
(b) 10.9×10 km or $60000 \times 365 \times 24 \times 60 \times 60$ km
(c) 8.1×10 km or $61000 \times 365 \times 24 \times 60 \times 60$ km
(d) None of the above

16. Which of the following statements is incorrect regarding the movement of Sun?
(a) The Sun is over head on the Tropic of Cancer on 21st June.
(b) The Sun is overhead on the Tropic of Capricorn on 22nd December.
(c) When the Sun starts its movement towards the Northern hemisphere, people in India celebrate Uttrayan, Sankranti, Baisakhi.
(d) Spring Equinox falls on 23rd September.

17. What causes change in seasons?
(a) Revolution of the Earth and tilt of Earth's axis
(b) Tilt of Earth's axis alone
(c) Revolution of the Earth alone
(d) Neither the revolution nor the tilt

18. Pole star is always seen at one point in the sky whereas other stars are not, this is because
(a) pole star lies in the axis of spin of the Earth
(b) pole star lies on the North pole of the Earth
(c) it indicates North pole
(d) None of the above

19. Halley's comet appears once in a period of
(a) 56 years
(b) 46 years
(c) 66 years
(d) 76 years

20. The evidence which proved that comets are the members of our Solar system is
(a) the shape of their orbit
(b) their composition
(c) their structure
(d) their brightness

21. Russia has 11 time zones because
(a) it has a huge East-West expanse.
(b) it has very long route trains.
(c) it has a very cold climate.
(d) None of the above

22. Which is the nearest planet to the Earth?
(a) Venus (b) Mercury
(c) Mars (d) Jupiter

23. Which is the nearest planet to the Sun?
(a) Venus (b) Mercury
(c) Earth (d) Mars

24. Which is the biggest planet of our Solar system?
(a) Jupiter (b) Saturn
(c) Mars (d) None of these

25. Which planet has a unique type of ring?
(a) Jupiter (b) Saturn
(c) Uranus (d) Venus

26. Which appears as 'Greenish Star'?
(a) Neptune (b) Saturn
(c) Jupiter (d) Earth

27. Which one of these planets has fastest revolution period in our Solar system?
(a) Mercury (b) Venus
(c) Uranus (d) Earth

28. Which is known as Red Planet?
(a) Mars (b) Jupiter
(c) Saturn (d) Pluto

29. Eighth planet of our Solar System (according to distance from the Sun) is
(a) Saturn (b) Pluto
(c) Neptune (d) Venus

30. The closest star of our Solar system is
(a) Proxima Centuri (b) Sirius
(c) Ludo (d) None of these

31. Asteroids circle between
(a) Mars and Jupiter
(b) Earth and Venus
(c) Jupiter and Saturn
(d) None of the above

32. Comet has a
(a) head and tail (b) light
(c) flame (d) None of these

33. 'Charon' is the only satellite of
(a) Pluto (b) Jupiter
(c) Venus (d) Neptune

34. What is the transfer of heat through horizontal movement of air called?
(a) Advection (b) Conduction
(c) Convection (d) Radiation

35. Which planet is second in size after Jupiter?
(a) Saturn (b) Earth
(c) Pluto (d) Venus

36. How old is our Sun?
(a) 15 billion years (b) 25 billion years
(c) 5 billion years (d) 10 billion years

37. The Sun's glowing surface is known as
(a) photosphere (b) chromosphere
(c) hydrosphere (d) None of these

38. How many years does the Sun take to complete a revolution galactic circle?
(a) 220 million years
(b) 240 million years
(c) 224 million years
(d) 225-250 million years

39. The Sun is made up of
(a) hydrogen (b) helium
(c) nitrogen (d) Both 'a' and 'b'

40. ..... is taking place on the Sun.
(a) Fission (b) Fusion
(c) Reaction (d) None of these

41. Comets are celestial bodies moving around the Solar system in
(a) elliptical orbit usually accompanied by a long shining tail
(b) hyperbolic orbit and a long tail
(c) some time elliptical and hyperbolic orbit and shine head
(d) None of the above

42. 'Pathfinder' mission has been sent to explore at
(a) Mars (b) Venus
(c) Neptune (d) Pluto

43. Which of the following bears the name of 'The ocean of storms and the sea of tranquility'?
(a) Mars (b) Moon
(c) Earth (d) None of these

44. The planets are kept in motion in their respective orbits by
(a) gravitation and centrifugal force
(b) rotation
(c) its size and shape
(d) None of the above

45. Which planet of the Solar system rotates on its axis at the fastest rate?
(a) Saturn (b) Jupiter
(c) Venus (d) Mercury

46. What is the name of hot, dry winds in rockies (also called 'snow eater')?
(a) Chinook (b) Foehn
(c) Blizzard (d) None of these

47. The Solar Eclipse achieves totality only in limited geographical regions because
(a) the size of all shadow of the Moon on the Earth is small compared to the cross section of the Earth
(b) trajectories of the Earth around the Sun and the Moon around the Earth are not perfect circles
(c) Sun rays can reach most of the peripheral regions of the shadow of the Moon due to atmospheric refraction
(d) None of the above

48. Tides are highest when
(a) the Sun, Moon and the Earth are in one line
(b) the Sun and the Earth are in one line
(c) the Earth and the Moon are in one line
(d) None of the above

49. Who was the first person to land on the Moon?
(a) Neil Armstrong and Edwin Aldrin
(b) Neelam Sanjeeva Reddy and Einstein
(c) Stephen Hawkins and Kingsley
(d) None of the above

50. Moon light takes ..... to reach the Earth.
(a) 1.3 second (b) 2.1 second
(c) 3.2 second (d) 6.2 second

51. The Moon is called a satellite of the Earth because
(a) it revolves around the Earth
(b) it is a natural satellite
(c) it is the nearest heavily body to the Earth
(d) None of the above

52. The orbits of planets around the Sun or satellites around the Earth can be
(a) anti-clockwise and elliptical
(b) circular and elliptical
(c) elliptical and parabolic
(d) parabolic and elliptical

53. Lunar eclipse does not occur every month because
(a) the Moon revolves around the Sun.
(b) the Earth revolves around the Sun.
(c) the Moon's orbit is not all the time in the same plane as of the Earth.
(d) None of the above

54. What are Sun Spots?
(a) Dark patches on the surface of the Sun resulting from a localised fall in the temperature to about 4000°C
(b) It has a large fusion area
(c) Wide area of Sun
(d) None of the above

55. Maximum length of a day on the poles is
(a) 24 hours (b) 48 hours
(c) 3 months (d) 6 months

56. Mt Stromboli also nicknamed as Lighthouse of the Mediterranean is located in
(a) Italy (b) France
(c) Andaman (d) Germany

57. What is the distance between the Earth and the Sun?
(a) 149 million km (b) 111 million km
(c) 168 million km (d) 192.3 million km

58. At the core of the Earth, the temperature is estimated to be around
(a) 1000°C (b) 1200°C
(c) 2600°C (d) 6000°C

59. The most abundant element found on the Earth is
(a) nitrogen (b) oxygen
(c) silicon (d) hydrogen or iron

60. Which of the following pairs of elements is supposed to constitute the internal core of the Earth?
(a) Magnesium and Lead
(b) Iron and Chromium
(c) Iron and Copper
(d) Nickel and Iron

61. The heavier silicates named 'Sima', 'Silica' and 'Magnesium' are most abundant in the
(a) crust (b) core
(c) mantle (d) None of these

62. The Earth rotates around its axis pointing towards the
(a) Sun (b) Moon
(c) Pole Star (d) None of these

63. Tectonic force is related to the building of various features of
(a) ocean floor (b) mountains
(c) Earth's crust (d) Earth's surface

64. The speed of rotation of the Earth is the highest
(a) along the Equator
(b) along the Tropic of Cancer
(c) along the Tropic of Capricorn
(d) at the North Pole

65. Match the following

List I	List II
A. Winter Solstice	1. 21st March
B. Autumnal Equinox	2. 21st June
C. Summer Solstice	3. 23rd September
D. Vernal Equinox	4. 22nd December

Codes

	A	B	C	D
(a)	1	2	3	4
(b)	1	3	4	2
(c)	4	3	2	1
(d)	2	3	1	4

66. The Earth completes a revolution in
(a) 365 days 17 hours 8 minutes and 9.54 seconds
(b) 365 days 18 hours 6 minutes and 7.54 seconds
(c) 365 days 23 hours 59 minutes and 58.97 seconds
(d) 365 days 5 hours 48 minutes and 45.5 seconds

67. The path along which the Earth revolves around the Sun is called
(a) the Earth's orbit (b) elliptic path
(c) celestial path (d) None of these

68. Which one of the following is generally found in sedimentary rocks?
(a) Basalt (b) Silica
(c) Shale (d) Magnesium

69. When the Earth is nearest to the Sun in its orbit, it is called to be in
(a) solstice (b) aphelion
(c) perihelion (d) equinox

70. The Sun appears to rise in the East and set in the West because of
(a) the rotation of the Earth from West to East
(b) the revolution of the Earth
(c) movement of the Sun
(d) None of the above

71. The distance between the Earth and the Sun is great during
(a) aphelion
(b) summer solstice
(c) winter solstice
(d) None of the above

72. What does equinox mean?
(a) The two periods of the year when day and night are equal
(b) The climate of the place
(c) Revolution of the Earth
(d) None of the above

73. Choose the incorrect option regarding the ocean currents
(a) They transport water from one part of ocean to another
(b) Currents circulate in anti clockwise direction in Southern hemisphere
(c) Currents circulate in clockwise direction in Northern hemisphere
(d) None of the above

74. The hottest time of the day is
(a) between 2 pm and 4 pm (at 3 pm)
(b) between 1 pm to 2 pm
(c) between 12 noon and 1 pm
(d) None of the above

75. The longest day falls on
(a) 21st June (b) 25th June
(c) 26th June (d) 28th June

76. The shortest day falls on Northern hemisphere on
(a) 24th March
(b) 22nd December
(c) 24th September
(d) 22nd September

77. Which of the following statements is not true?
(a) Rotation of the Earth causes variation in the duration of day and night.
(b) Revolution of Earth causes change of the seasons.
(c) Rotation of the Earth causes day and night.
(d) Rotation of the Earth affects the movements of winds and ocean currents.

78. Which of the following pairs is not correctly matched?
(a) 66° 30′ S latitude : Arctic Circle
(b) 180° E or 180° W longitude : International Date Line
(c) 0°E or 0°W longitude : Equator
(d) 23° 30′ N latitude : Tropic of Cancer

79. The extent of Equatorial region is
(a) 12°N to 12°S (b) 10°N to 10°S
(c) 5°N to 5°S (d) None of these

80. When it is 12 noon at Greenwich, what is the time at New York (74° W)?
(a) 7.04 am (b) 8.04 am
(c) 9.04 am (d) None of these

81. Which one of the following continents lies at 20° N and 80°E?
(a) Africa (b) Asia
(c) North America (d) Europe

82. Which one of the latitudes forms a great circle?
(a) 0° (equator) (b) $23\frac{1}{2}^{\circ}$
(c) $66\frac{1}{2}^{\circ}$ (d) 90°

83. When a ship crosses date line from West to East,
(a) it gains one day
(b) it loses one day
(c) it loses half a day
(d) it gains half a day

84. International date line passes through
(a) Bering Strait (b) Pacific Ocean
(c) Greenwich (d) London

85. A ship coming from Japan on Monday, crosses the International date line. The next day in New York will be
(a) Monday (b) Sunday
(c) Wednesday (d) Tuesday

86. World is divided into ... time zones.
(a) 15 (b) 24 (c) 90 (d) 100

87. USA is divided into ... time zones.
(a) 9 (b) 10
(c) 15 (d) None of these

88. Which are the four major components of the atmosphere?
(a) Oxygen, Nitrogen, CO_2 and Water Vapour
(b) Oxygen, Nitrogen, CO_2 and Hydrogen
(c) Oxygen, Nitrogen, CO_2 and Neon
(d) Nitrogen, Oxygen, Argon and Minor Gases

89. The amount of insolation received at a place on the surface of the Earth depends upon
(a) its climate
(b) the longitude of the place
(c) its latitude
(d) the altitude of the place

90. From which of the following latitudes do the trade winds blow towards the Equator?
(a) 30° N and 30° S (b) 45° N and 40° S
(c) 40° N and 35° S (d) 60° N and 65° S

91. North-West anti-trade winds between latitude 40° and 50° are called
(a) cyclone (b) westerlies
(c) monsoon (d) planetary winds

92. 'Jet Streams'; what is true regarding with it?
1. High velocity winds
2. Blow from West to East
3. Blow in the mesosphere
4. Blow in the upper troposphere near the tropopause

Select the correct answer using the codes given below.
(a) 1, 2, 3 (b) 1, 3, 4
(c) 1, 2, 4 (d) 2, 3, 4

93. The trade winds are also called
(a) tropical easterlies
(b) tropical westerlies
(c) whirlwinds
(d) monsoon winds

94. In atmosphere, the atmospheric pressure
(a) increases with height
(b) decreases with height
(c) first increases and then decreases
(d) remains constant with height

95. In the Equatorial areas the winds system is known as
(a) monsoon winds (b) trade winds
(c) westerlies winds (d) doldrum winds

96. The sea breeze blows during
(a) day from land to sea
(b) day from sea to land
(c) night from sea to land
(d) night from land to sea

97. When it rains, the relative humidity in the atmosphere is
(a) 50% (b) 10% (c) 75% (d) 100%

98. What is the amount of albedo in the atmosphere?
(a) 50% (b) 42% (c) 15% (d) 34%

99. Which of the following constituents of atmosphere is/are important from the climate point of view?
1. Nitrogen 2. Oxygen 3. CO_2

Select the correct answer using the codes given below.
(a) 2 and 3 (b) 1 and 2
(c) 1, 2 and 3 (d) Only 3

100. Winds blow
(a) in the region of low pressure
(b) from region of low pressure to region of high pressure
(c) from a region of high pressure to region of low pressure
(d) in regions of high pressure

101. Winds variously known as roaring forties, furious fifties and stormy sixties are
(a) polar winds (b) trade winds
(c) westerlies (d) cyclone

102. Which one of the following is the correct sequence of atmospheric layers?
(a) Tropopause, Troposphere, Ionosphere, Stratosphere
(b) Troposphere, Tropopause, Stratosphere, Ionosphere
(c) Stratosphere, Ionosphere, Tropopause, Troposphere
(d) Ionosphere, Troposphere, Stratosphere, Tropopause

103. Lapse rate is related to the decrease of air
(a) temperature of 6.5°C at every 1000 m.
(b) humidity with an ascent of 450 feet
(c) wind velocity with an ascent of 400 feet
(d) pressure with an ascent of 600 feet

104. Which one of the graphs is used for measuring relative humidity in the air?
(a) Hydrograph (b) Barograph
(c) Hygrograph (d) Seismograph

105. Trade winds blow in the Northern Hemisphere from
(a) North-East to South-East
(b) North-East to South-West
(c) South-East to North
(d) None of the above

106. The Tropical Cyclones : Hurricanes and Typhoons develop and mature
(a) over the water bodies only
(b) over the mountains
(c) over the plain areas
(d) None of the above

107. Match the following

Wind	Country
A. Purga	1. Russian tundra belt
B. Brickfielder	2. Australia
C. Norwester	3. New Zealand
D. Tornadoes	4. Coastal US

Codes

	A	B	C	D		A	B	C	D
(a)	1	2	3	4	(b)	2	3	4	1
(c)	3	2	1	4	(d)	3	4	2	1

108. Warm winds blowing down the Eastern slopes of Rockies are known as
(a) westerlies (b) mistral
(c) chinook (d) nor-Westers

109. Koppen divided world's climate into .....major groups.
(a) six (b) five
(c) fourteen (d) ten

110. Extreme type of climate is found in
(a) Savanna (b) Pampas
(c) Tundra (d) Taigas

111. Coniferous trees are a characteristic feature of ..... climate.
(a) Savanna type (b) Monsoon type
(c) Tundra type (d) Taiga type

112. Which of the climatic regions is similar to the Mediterranean type?
(a) The Taiga type
(b) The China type
(c) The Tropical Savanna
(d) The Subtropical Steppe

113. Wood pulp comes from
(a) equatorial region
(b) coniferous forest region
(c) temperate region
(d) mediterranean region

114. 'Mahogany' trees are found in the region of
(a) tropical evergreen forests
(b) mediterranean forests
(c) tropical monsoon forests
(d) coniferous forests region

115. 'Pampas' region is found in
(a) Africa (b) Australia
(c) North America (d) South America

116. Reindeer is a common animal found in the
(a) Steppe region
(b) Tundra region
(c) Temperate region
(d) Grassland region

117. Which is the characteristic of Taiga forests?
(a) Broad leaves (b) Dense leaves
(c) Pointed leaves (d) Canopy leaves

118. Which of the following environments supports the growth of Mangrove Swamp?
(a) Tidal flat (b) Monsoon
(c) Equatorial (d) Tundra

119. 'Lichens and Mosses' are the characteristic vegetations of
(a) hot desert region
(b) mediterranean region
(c) tundra region
(d) temperate region

120. The Congo and Amazon basin fall in the
(a) equatorial region
(b) warm temperate region
(c) mediterranean region
(d) cool temperate region

121. The Mediterranean climate is characterised by
(a) high temperature and heavy rainfall
(b) hot summer and cold winter
(c) dry summer and humid winter
(d) very cold winter but not hot summer

122. Existence of hot deserts on the Earth is because of
(a) lying in trade wind belt
(b) flow of hot ocean currents
(c) flow of monsoon in tropical region
(d) high pressure of these regions

123. Which of the following regions is characterised by high temperature, heavy rainfall and dense vegetation?
(a) Hot grassland region
(b) Monsoon region
(c) Steppe
(d) Equatorial region

124. Tropical Savanna Grasslands are found in
(a) Venezuela, Sudan and Kenya
(b) North-West Europe
(c) Scandinavia and Canada
(d) India, Philippines and North Chile

125. The natural vegetation of Savanna consists of
(a) tall grass (b) scrub jungle
(c) short grass (d) trees

126. 'Taiga' refers to
(a) deciduous forest of Canada
(b) monsoon forest of China
(c) euqatorial forest of Amazon
(d) coniferous forest of Russian Siberia

127. The extensive treeless tracts of North America which are covered with tall coarse grass are called
(a) Pampas (b) Savanna
(c) Prairies (d) Tundras

128. The Ilanos and Campos of South America are examples of
(a) coniferous forest regions
(b) deciduous regions
(c) equatorial regions
(d) Savanna regions

129. Teak and Sal are the principal trees in the forests known as
(a) dry deciduous
(b) tropical moist deciduous
(c) dry evergreen
(d) tropical moist evergreen

130. The greatest diversity of animal and plant species occurs in
(a) tropical moist forests
(b) temperate deciduous forests
(c) deserts and Savanna
(d) equatorial forests

131. High Velds are the temperate grasslands of
(a) Africa (b) South Africa
(c) Australia (d) Europe and Asia

132. The Mediterranean lands are called the world's
(a) grazing lands (b) orchard lands
(c) forest lands (d) paddy lands

133. The tropical rain forests are dense and varied because of
(a) very little interference from man
(b) their remote and inaccessible locations
(c) poor economic development
(d) an abundance of moisture and warm temperature throughout the year

134. Temperate forests (mid-latitudes) include the trees of
(a) olive, maple, oak
(b) pine, fir, spruce
(c) teak, sal, bamboo
(d) rosewood, mahogany, rubber

135. Tropical deciduous forests are those
(a) which contain only a few species
(b) which do not contain valuable trees
(c) which contain generally short, stunted trees
(d) which shed their leaves during dry season

136. Originally there was only one land mass called
(a) Panthalasia (b) Gondwanaland
(c) Pangaea (d) None of these

137. Pangaea split into two parts is called
(a) Laurasia and Gondwanaland
(b) America and Europe
(c) India and China
(d) None of the above

138. Continental Drift Theory is given by
(a) Wegener (b) Karl Marx
(c) Hawkins (d) Malthus

139. Which one of these is the example of old mountain?
(a) Aravalli mountain range
(b) Himalaya range
(c) Andes
(d) None of the above

140. Volcanic mountain is made up of erruption of
(a) volcano
(b) continental drift theory
(c) thunderstorm
(d) None of the above

141. Match the following

List I	List II
A. The Gobi	1. North Africa
B. Thar Desert	2. India
C. Atacama Desert	3. North Chile
D. Takla Makan	4. Mongolia
E. Sahara	5. China

Codes

	A	B	C	D	E
(a)	4	2	3	5	1
(b)	1	2	3	4	5
(c)	3	5	1	2	4
(d)	5	4	3	2	1

142. The igneous rocks are formed due to
(a) granitisation
(b) disintegration of Magma
(c) accumulation of sediments at bottom of sea
(d) altering of metamorphic rocks

143. Earthquakes and volcanoes occur mostly in
(a) plateau region
(b) folded and faulted region
(c) deep and sea plains
(d) None of the above

144. Match the following

List I		List II
A.	Phobos	1. Asteroid
B.	Titan	2. Mars
C.	Nebula	3. Neptune
D.	Ceres	4. Saturn
		5. Stars

Codes

	A	B	C	D		A	B	C	D
(a)	5	3	2	1	(b)	2	4	5	1
(c)	4	2	1	5	(d)	2	3	1	5

145. Match the following

List I		List II
A.	Cinchona	1. Coir
B.	Rubber	2. Quinine
C.	Coconut	3. Latex
D.	Acacia	4. Tannin

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	1	4	(b)	2	1	3	4
(c)	4	3	1	2	(d)	4	1	3	2

146. Match the following

List I (Export Items)		List II (Countries Exporting)
A.	Copper	1. Argentina
B.	Petroleum	2. Brazil
C.	Meat	3. Uruguay
D.	Coffee	4. Venezuela
		5. Chile

Codes

	A	B	C	D		A	B	C	D
(a)	5	4	1	2	(b)	3	5	2	4
(c)	1	3	2	5	(d)	4	5	2	1

147. Match the following

List I (Lines on Map)		List II (Denotes)
A.	Isobaths	1. Same magnetic declination
B.	Isorymes	2. Equal travel line from a common centre
C.	Isochrones	3. Equal depth
D.	Isogonals	4. Equal frost

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	3	2	(b)	3	4	2	1
(c)	2	3	1	4	(d)	1	3	4	2

148. Which one of the following is not a site for in-situ method of conservation of flora?
(a) Biosphere Reserve
(b) Botanical Garden
(c) National Park
(d) Wildlife Sanctuary

149. Which of the following is the chief characteristic of mixed farming?
(a) Cultivation of both cash crops and food crops
(b) Cultivation of two or more crops in the same field
(c) Rearing of animals and cultivation of crops together
(d) None of the above

150. Consider the following statement(s)
1. Jet streams are responsible for Western disturbances in India.
2. Polar front jet is related to Rossby waves.
3. Rossby waves are better observed in Northern hemisphere than in Southern hemisphere.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) 1 and 2
(c) 1 and 3 (d) All of these

151. Consider the following crops of India
1. Cow pea 2. Green gram
3. Pigeon pea

Which of the above is/are used as pulse, fodder and green manure?
(a) 1 and 2 (b) Only 2
(c) 1 and 3 (d) All of these

152. Dalbergia species is associated with which one of the following?
(a) Cashew nut (b) Coffee
(c) Tea (d) Rosewood

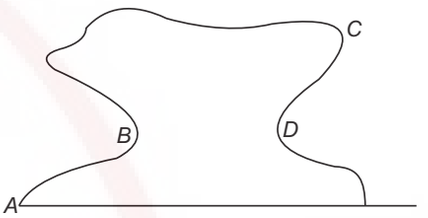
153. Which one of the following African countries is not land-locked?
(a) Benin (b) Chad
(c) Lesotho (d) Mali

154. The Earth's crust is the thinnest
(a) under the mountain ranges.
(b) under continental masses.
(c) at ocean bottoms.
(d) at mid-oceanic ridges.

155. Consider the following statement(s)
1. International Date Line is drawn zigzag to avoid landmass.
2. International Date Line is 180°W as well as 180°E of Greenwich.
3. A ship sailing westward from Greenwich when crossing International Date Line would put back the date by a day.

Which of the statement(s) given above is/are correct?
(a) 1 and 2 (b) 1 and 3
(c) 1, 2 and 3 (d) Only 3

156. The below diagram is of a mushroom rock. In which of the points in the diagram is the intensity of wind strongest?



(a) A (b) B (c) C (d) D

157. What is the reason for the major hot deserts of the world lying in the Western part of the tropical latitude?
(a) They are influenced by trade winds
(b) They lie in the rain-shadow area of the mountains
(c) They are influenced by monsoon winds
(d) They are influenced by dry winds

158. What does the imaginary line passing through Lake Ontario, Lake Erie, Lake Huron and Lake Superior represent?
(a) The Southern boundary of Canada
(b) The Northern limit of iron and steel industry of USA
(c) The internal waterway route to USA
(d) The internal waterway route to Canada

159. What is the process that tends to build up the land surface by deposition of solid material in its lower areas, known as?
(a) Abrasion (b) Agglomeration
(c) Aggradation (d) Attrition

160. Consider the following statements related to stratification of atmospheric layers
1. All storms and cloudiness are restricted to stratosphere.
2. Cirrus clouds are formed on the top layers of troposphere.
3. Stratosphere is also an 'isoclinal layer'.

Which of the statements given above are correct?
(a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1, 2 and 3

161. Which one of the following is the correct order in which the gases from the atmosphere disappear as one moves away from the surface of the Earth?
(a) Carbon dioxide—Oxygen—Nitrogen
(b) Oxygen—Nitrogen—Carbon dioxide
(c) Carbon dioxide—Nitrogen—Oxygen
(d) Nitrogen—Oxygen—Carbon dioxide

162. Consider the following statement(s)
1. The difference between the moisture-holding capacity of air and its actual humidity is called saturation deficit.
2. The temperature to which air has to be cooled in order to reach saturation is called dew point.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

163. Consider the following statement(s)
1. The Earth's rotation axis is not at 90° to its orbital plane.
2. The Earth's rotation axis is inclined at 23.5°.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

164. Which one of the following separates North and South Islands of New Zealand?
(a) Foveaux Strait (b) Bass Strait
(c) Cook Strait (d) Torres Strait

165. Tropical cyclone of Philippines is termed as
(a) Typhoon (b) Willy-willies
(c) Hurricane (d) Baguio

166. Consider the following statement(s)
1. The vernal equinox falls on 21st March.
2. On equinox, the Sun is directly overhead at the equator.
3. The changes in the day length on equinox result from the changes in the tilt of the Earth with respect to the Sun.

Which of the statement(s) given above is/are correct?
(a) 1 and 2 (b) Only 1
(c) 1, 2 and 3 (d) 2 and 3

167. On planet Earth, there is no centrifugal force at the
(a) Equator
(b) Tropic of Cancer
(c) Tropic of Capricorn
(d) Poles

168. From which one of the following is the percentage of reflected amount of radiation highest?
(a) Wet ground (b) Thick cloud
(c) Forest (d) Snow cover

169. Consider the following statement(s)
1. Different plant species grow together.
2. Light cannot penetrate into the lower strata full of undergrowth.

Which of the following types of vegetation is characterised by the above?
(a) Equatorial moist evergreen
(b) Tropical deciduous
(c) Mediterranean
(d) Warm temperate broad leaved deciduous

170. Which one of the following is difference in local time between the places located at 165° East and 165° West?
(a) 0 hour (b) 12 hours
(c) 22 hours (d) 24 hours

171. Which of the following is not correctly matched?
(a) Prime Meridian : 0°
(b) International Date Line : 180°
(c) Arctic Circle : $66\frac{1}{2}°$ N
(d) Tropic of Cancer : $23\frac{1}{2}°$ S

172. Which among the following planets is smaller in size than the Earth?
(a) Neptune (b) Venus
(c) Saturn (d) Uranus

173. Match the following

List I (Volcanoes)		List II (Countries)
A.	Mount Etna	1. India
B.	Kilimanjaro	2. USA
C.	Katmai	3. Tanzania
D.	Barren Island	4. Italy

Codes

	A	B	C	D		A	B	C	D
(a)	1	3	2	4	(b)	4	2	3	1
(c)	1	2	3	4	(d)	4	3	2	1

174. Which one of the following instruments is used for measuring the humidity of the air?
(a) Wind vane
(b) Aneroid barometer
(c) Wet and dry bulb thermometer
(d) Maximum and minimum thermometer

175. Most of the communication satellites today are placed in a geostationary orbit. In order to stay over the same spot on the Earth, a geostationary satellite has to be directly above the
(a) Tropic of Cancer
(b) Either North or South Pole
(c) Equator
(d) Tropic of Capricorn

176. The Earth revolves around the Sun in an elliptical path and the Sun is located at one focus of the ellipse. Imagine a situation in which the Earth goes around the Sun on a circular path. Which one among the following would result in under that situation?
(a) It would not make any difference
(b) Difference between seasons will be reduced
(c) The Earth would become very hot
(d) The Earth would become very cold

177. Which one of the following statements regarding water cycle is correct?
(a) Transpiration by plants does not contribute to cloud formation.
(b) Only evaporation of surface water of rivers and oceans is responsible for cloud formation.
(c) Rainfall does not contribute in maintenance of underground water table.
(d) Underground water may also be connected to surface water.

178. Which one of the following statements is not correct?
(a) Weight of a body is different on different planets.
(b) Mass of a body on the Earth, on the Moon and in empty space is the same.
(c) Weightessness of a body occurs when the gravitational forces acting on it are counter-balanced.
(d) Weight and mass of a body are equal at sea level on the surface of the Earth.

179. Which one of the following has geographical position of 0° latitude and 0° longitude?
(a) In the South Atlantic ocean
(b) In the Mediterranean sea
(c) In Ghana, a West African country
(d) At Greenwich Observatory in England

180. Nights are cooler in the deserts than in the plains because
(a) sand radiates more quickly than the Earth
(b) the sky remains clear most of the time
(c) sand absorbs heat more quickly than the Earth
(d) None of the above

181. Which one of the following provides the force needed to drive the atmospheric circulation?
(a) Higher biotic content of the tropical latitudes and lower biotic content of the polar latitudes
(b) The energy content between high insolation tropical latitudes and the low insolation polar latitudes
(c) Higher rotational speed of lower latitudes and lower rotational speed of higher latitudes
(d) Equatorial radius of the Earth is longer than the polar radius

182. The climate in the North-Eastern part of Eastern Europe is generally
(a) warmer than the climate of Western Europe
(b) colder than the climate of the land to the North
(c) wetter than the climate of the lands bordering the Mediterranean sea
(d) cooler and drier than the climate of most countries on the Balkan Peninsula

183. Which one of the following statements about the atmosphere is correct?
(a) The atmosphere has definite upper limits but gradually thins until becomes imperceptible.
(b) The atmosphere has no definite upper limits but gradually thins until becomes imperceptible.
(c) The atmosphere has definite upper limits but gradually thickens until becomes imperceptible.
(d) The atmosphere has no definite upper limits but gradually thickens until becomes imperceptible.

184. What is a Cloudburst?
(a) It refers to sudden and copilot rainfall over a small area, which often lasts for only a few minutes
(b) It refers to 50 minute rain over period of time
(c) It is caused by rapid condensation of very high clouds
(d) It refers to a thunderstorm with light rain

185. The windward slopes of coastal mountains which are at right angles to wind blowing from the sea are wetter than the leeward slopes. This is because
(a) they are nearer the sea
(b) the winds have to rise to cross them
(c) descending winds are warm
(d) the sea is warmer than the land

186. Arrange the following ocean zones from top to bottom.
(a) Epipelagic, Mesopelagic, Bathipelagic, Abyssopelagic
(b) Mesopelagic, Epipelagic, Bathipelagic, Abyssopelagic
(c) Epipelagic, Bathipelagic, Mesopelagic, Abyssopelagic
(d) None of the above

187. Which one among the following sequences of water bodies, from lower to higher salinity concentration, is correct?
(a) Gulf of California - Baltic sea - Red sea - Arctic sea
(b) Baltic sea - Arctic sea - Gulf of California - Red sea
(c) Red sea - Gulf of California - Arctic sea - Baltic sea
(d) Arctic sea - Gulf of California - Baltic sea - Red sea

188. Which one among the following best explains the reason for the Eastern and Western boundaries of the Pacific ocean experiencing frequent earthquake?
(a) There are deep ocean trenches along these margins
(b) High mountain stretch along the continental margins adjacent to this ocean
(c) These margins coincide with the plate margins
(d) The currents of the vast Pacific Ocean continue to dash against the continental margins

189. The river bank is weakest where the river turns. This is because water
(a) gets concentrated on the inner bank of the turn, making it denser.
(b) effectively bounces off the outer bank as it turns exerting an extra pressure on the bank
(c) flows faster as it turns
(d) reacts more effectively with the bank at a turn

190. What is the similarity between Milwaukee Deep, Java Trench and Challenger Deep?
(a) They all are trenches in the Pacific ocean
(b) They are the deepest points of the Atlantic, Indian and Pacific oceans, respectively
(c) They all are trenches in the Indian ocean
(d) They all are deeps of the Atlantic ocean

191. On the planet Earth, most of the fresh water exists as ice caps and glaciers. Out of the remaining fresh water, the largest proportion
(a) is found in atmosphere as moisture and clouds
(b) is found in freshwater lakes and rivers
(c) exists as groundwater
(d) exists as soil moisture

192. What are Rogue waves?
(a) Waves that do not move horizontally but remain stationary
(b) Waves of unusually large size for the prevailing wind condition
(c) Waves produced due to the combination of low air pressure and onshore winds
(d) Waves produced due to the combination of high air pressure and offshore winds

193. Consider the following condition(s)
1. Podzol soils
2. Annual temperature range 38°C
3. Annual precipitation about 300 mm which is fairly uniform distributed throughout the year

Which of the following vegetation(s) prevails in above conditions?
(a) Thorn shrub
(b) Coniferous forest
(c) Temperate grassland
(d) Monsoon forest

194. Why does South-East Asia have the largest concentration of peasant population at the global scale?
(a) The area is dominated by shifting cultivation due to favourable terrain character
(b) Intensive subsistence farming is practised in the region

(c) The region has favourable and healthier climate
(d) The region has a large forested area, which is cleared for cultivation of various crops

195. Which of the statements given below is correct?
(a) Human geography covers all those aspects of geography, which are not directly concerned with physical geography.
(b) Human geography is the study of inter-relationship between human being and their environment.
(c) Human geography deals with the description and explanation of human phenomena around the variable Earth surface.
(d) Human geography does not cover technical matters of cartography.

196. Which one of following ethnic groups does not belong to Mongoloids?
(a) The Yakuts
(b) The Samoyeds
(c) The Red Indian of North America
(d) The Bantus

197. Which of the following is the chief characteristic of 'mixed farming'?
(a) Cultivation of both cash crops and food crops
(b) Cultivation of two or more crops in the same field
(c) Rearing of animals and cultivation of crops together
(d) None of the above

198. Give the correct sequence from West to East
(a) Czech Republic Slovakia, Austria, Hungary
(b) Austria, Czech Republic Hungary, Slovakia
(c) Hungary, Austria, Czech Republic Slovakia
(d) Czech Republic Austria, Hungary, Slovakia

199. Give the correct sequence of Islands West to East
(a) Java, Bali, Sulawesi, Irianjaya
(b) Irianjaya, Bali, Sulawesi, Java
(c) Sulawesi, Java, Irianjaya, Bali
(d) Bali, Irianjaya, Java, Sulawesi

200. River Danube flows in which of the following nations?
(a) Austria, Hungary, Serbia, Slovakia
(b) Croatia, Albania, Hungary, Czech Republic
(c) Austria, Hungary, Serbia and Montenegro, Bulgaria
(d) Czech Republic Switzerland Poland, Maldova

201. "Each day is more or less the same, the morning is clear and bright with a sea breeze; as the Sun climbs high in the sky, heat mounts up, dark clouds form, then rain comes with thunder and lightning, but rain is soon over." Which of the following regions is described in the above passage?
(a) Savannah (b) Equatorial
(c) Monsoon (d) Mediterranean

202. Farmers are requested to mix lime with soil while farming their fields. This is because
(a) lime is very helpful in maintaining the water content in the soil.
(b) lime decreases the acidity of soil.
(c) lime decreases the basicity of soil.
(d) high concentration of lime is necessary for the plant growth.

203. Match the following

List I (Currents)	List II (Features)
A. Kuroshio current	1. Warm current in the Atlantic ocean
B. Peru current	2. Cold current in the Atlantic ocean
C. Labrador current	3. Warm current in the Pacific ocean
D. Florida current	4. Cold current in the Pacific ocean

Codes

	A	B	C	D		A	B	C	D
(a)	3	4	2	1	(b)	3	2	4	1
(c)	1	4	2	3	(d)	1	2	4	3

204. The intensity of Sun ray on the Earth depends on
(a) altitude (b) nature of terrain
(c) wind (d) latitude

205. Which of the following statement(s) is/are correct?
1. Cyclone is a low pressure system.
2. The wind movement is clockwise in the cyclone of Northern Hemisphere.

Select the correct answer using the codes given below.
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

206. Which one of the following processes of weathering belongs to both mechanical and chemical weathering?
(a) Crystallisation (b) Exfoliation
(c) Hydration (d) Carbonation

207. The current produced by upwelling of cold water off the coast of Chile and Peru is known as
(a) El-Nino
(b) Humboldt current
(c) Agulhas current
(d) Canary current

208. Which of the following statement(s) is/are correct?
1. The major constituent mineral of granite rock is quartz.
2. The major constituent mineral of sandstone rock is feldspar.
3. The major constituent mineral of limestone rock is dolomite.

Select the correct answer using the codes given below.
(a) Only 3 (b) 1 and 2
(c) All of these (d) None of these

209. The phenomenon of 'trade winds' takes place due to
(a) conduction of heat
(b) convection of heat
(c) radiation
(d) None of the above

210. Doldrums is a
(a) tropical wind belt
(b) tropical wind deflection belt
(c) sub-tropical wind belt
(d) tropical no-wind belt

211. Which one among the following is a primary rock?
(a) Sedimentary (b) Igneous
(c) Metamorphic (d) None of these

212. Which one among the following is the largest temperate desert of the world?
(a) Patagonian desert
(b) Taklamakan desert
(c) Iranian desert
(d) Turkmen desert

213. Sirocco is a name used to mean
(a) a local wind (b) a volcano
(c) an island (d) an ocean current

214. Which of the following is/are the chief characteristic(s) of commercial grain farming of the middle latitude grasslands?
1. The size of farms are generally large.
2. Cultivation is highly mechanised.
3. It is a type of extensive farming.

Select the correct answer using the codes given below
(a) 1 and 2 (b) Only 2
(c) 1, 2 and 3 (d) 1 and 3

215. Match the following

	List I (Deserts)		List II (Countries)
A.	Kalahari	1.	Angola
B.	Namib	2.	Sudan
C.	Nubian	3.	Botswana
D.	Atacama	4.	Chile

Codes

	A	B	C	D		A	B	C	D
(a)	4	2	1	3	(b)	3	2	1	4
(c)	4	1	2	3	(d)	3	1	2	4

216. Which one among the following statements relating to an anticyclone is correct?
(a) Anticyclone is a wind system with a high pressure centre.
(b) In anticyclone, the movement of wind is inward.
(c) The contribution of an anticyclone towards determining weather of an area is quite significant.
(d) The movement of wind is clockwise in an anticyclone of Southern hemisphere.

Directions (Q. Nos. 217-219)
The following items consist of two statements, Statement I *and Statement* II. *You have to examine these two statements carefully and select the answers to these items using the codes given below.*

Codes
(a) Both the statements are individually true and Statement II is the correct explanation of Statement I.
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I.
(c) Statement I is true, but Statement II is false.
(d) Statement I is false, but Statement II is true.

217. **Statement I** Decay and disintegration of rock *in situ* is called weathering.
Statement II Mechanical weathering is mainly caused by temperature variation.

218. **Statement I** The Mediterranean climate is highly suitable for fruit production.
Statement II Cool and moist winters in Mediterranean regions enable ample production of fruits.

219. **Statement I** In the Northen Hemisphere, the ocean currents flowing from Equator towards the North pole and from pole towards the Equator are deflected to their right.
Statement II This happens due to rotation of the Earth on the axis from West to East.

220. Jet streams are usually found in the
(a) ozonosphere (b) mesosphere
(c) tropopause (d) ionosphere

221. The exceptionally high and low tides that occur at the time of the New Moon or the Full Moon when the Sun, the Moon and the Earth are approximately aligned are called
(a) spring (b) fall
(c) neap (d) diurnal

222. No tress are found in Tundra biome near polar region of Northen hemisphere. This is due to
(a) snowfall inhibits plant respiration
(b) frozen ice beneath the surface soil (permafrost) restricts root growth
(c) less wind movement and inadequate sunlight
(d) low temperature which restricts development of reproductive organs

223. Why do the summer monsoon winds blow from South-Western direction in the Northen hemisphere?
(a) The general direction of wind from the Indian ocean is South-Western
(b) The presence of the doldrums around the Equator
(c) The low pressure conditions in North-West India
(d) Due to the effect of coriolis force

224. If the Earth's axis were perpendicular to the plane of its orbit, which one among the following would not have happened?
(a) The North pole will always lie in dark
(b) Days and nights would be equal throughout the year
(c) No change of seasons will take place
(d) The Sun will be perpendicular to the equator

225. The surface temperature of the Sun is nearly
(a) 2000 K (b) 4000 K
(c) 6000 K (d) 8000 K

226. Hot deserts like Sahara, Arabia, etc receive very negligible amount of rainfall. This is because they
(a) do not receive moisture bearing wind from the oceans
(b) are the most rocky and barren areas of the Earth
(c) are located on the tropical high pressure belt of the atmosphere
(d) are not on the path of the monsoons

227. The latitude is the angular distance of a point of the Earth's surface, North or South of the Equator as measured from the
(a) centre of the Earth
(b) Equator
(c) Tropic of Cancer or the Capricorn
(d) poles

228. Consider the following statement(s) about comets
1. Most comets have elongated elliptical orbits that take them close to the Sun for a part of their orbit and then out into the further reaches of the Solar system for the remainder.
2. If a comet is travelling fast enough, it may leave the Solar system.

Which of the statement(s) given above is/are correct?
(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

229. Which of the following statement(s) is/are correct?
1. In comparison to the Jupiter, planet Earth displays eclipse more frequently.
2. On Mars, only partial solar eclipses are possible.

Select the correct answer using the codes given below.
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

230. Which among the following statements characterise El-Nino?
1. It occurs at irregular intervals.
2. It carries warmer water.
3. It carries less saline water.
4. Its atmospheric equivalent is Southern oscillation.

Select the correct answer using the codes given below.
(a) 1 and 2 (b) 2 and 3
(c) 3 and 4 (d) All of these

231. Consider the following statement(s)
1. In a cyclone, the direction of wind flow is counter clockwise in the Northern hemisphere.
2. The tropical cyclone fades away when it reaches land because there is no large supply of warm moist air.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

232. Which among the following statement(s) about the North Atlantic Drift is/are correct?
1. It keeps the West coast of Northern Europe ice free.
2. It is responsible for the warm air mass which interacts with the cold air mass from the Polar region and causes rainfall in Western Europe.
3. It meets the Labrador current near Vancouver Island and causes dense fog.

Select the correct answer using the codes given below.
(a) 1, 2 and 3 (b) 1 and 2
(c) Only 2 (d) 1 and 3

233. Which one among the following explains the earthquakes of the Eastern margins of Asia?
(a) Subduction of Pacific plate under Asiatic plate
(b) Subduction of African plate below European plate
(c) Subduction of Indian plate under Asiatic plate
(d) Subduction of American plate under the Pacific plate

234. Unlike other meridians, International Date Line is drawn zig-zag in order to
(a) permit certain land areas and groups of islands to have the same calendar day
(b) facilitate the sailors to adjust time in their watch
(c) adjust the day in calendar while sailing from East to West and *vice-versa*
(d) make 180°E and 180° W coterminous

235. The time difference between two cities, City A (30′ N 60′ E) and City B (30′ N 80′ E) would be
(a) 80 min (b) 0 min
(c) 20 min (d) 34 min

236. Consider the following statement(s)
1. The tropical year is shorter than the sidereal year.
2. The solar day is longer than the sidereal day.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

237. Consider the following statement(s) about rocks
1. Shale becomes slate through metamorphosis.
2. Shale is converted to slate when it is subjected to tremendous pressure and high temperature.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

238. Which one of the following is the correct sequence of the four stages of water movement in a hydrological cycle?
(a) Evaporation, Condensation, Precipitation, Infiltration
(b) Evaporation, Precipitation, Condensation, Infiltration
(c) Infiltration, Evaporation, Condensation, Precipitation
(d) Condensation, Precipitation, Evaporation, Infiltration

239. Match the following

List I (Agents of Erosion)	List II (Topographical Features)
A. Running water	1. Cirque
B. Glacier	2. Barchan
C. Wind	3. Rift valley
D. Underground water	4. Doline
	5. Gorge

Codes

	A	B	C	D
(a)	5	1	2	4
(b)	5	2	1	3
(c)	4	2	1	5
(d)	3	4	1	2

240. Match the following

List I (Grasslands)	List II (Countries)
A. Pampas	1. Venezuela
B. Veld	2. Australia
C. Downs	3. South Africa
D. Lianos	4. Argentina

Codes

	A	B	C	D
(a)	4	3	2	1
(b)	4	2	3	1
(c)	1	3	2	4
(d)	1	2	3	4

241. Cloudy nights are warmer than clear nights because of
(a) greenhouse effect
(b) depletion of ozone layer
(c) insolation
(d) terrestrial radiation

242. The interval between two high tides is approximately
(a) 4 h (b) 6 h (c) 12 h (d) 24 h

243. If it is 12 noon in a city located on 90° W longitude, then what would be the time in a city located on 105° W longitude?
(a) 13 : 00 h (b) 12 : 30 h
(c) 11 : 30 h (d) 11 : 00 h

244. As we proceed from equator to poles, the daily range of temperature tends to
(a) decrease (b) increase
(c) be constant (d) fluctuate

245. Doldrums are characterised by
(a) uniform low pressure
(b) uniform high pressure
(c) high wind velocity
(d) low humidity

246. Match the following

List I (Landforms)	List II (Agent of Erosions/ Depositions)
A. Inselbergs	1. River
B. Stalagmite	2. Glacier
C. Delta	3. Underground water
D. Moraines	4. Wind

Codes

	A	B	C	D
(a)	4	2	1	3
(b)	3	1	2	4
(c)	1	2	3	4
(d)	4	3	1	2

247. Glaciated regions are associated with
(a) V-shaped valley (b) U-shaped valley
(c) sand dunes (d) stalactites

248. Which of the following statement(s) is/are correct?
1. Lunar eclipse takes place when the Earth comes directly between the Sun and the Moon.
2. Solar eclipse happens when the Moon comes directly between the Sun and the Earth.
3. Lunar eclipse takes place when the Sun comes directly between the Earth and the Moon.
4. Solar eclipse happens when the Earth comes directly between the Sun and the Moon.

Select the correct answer using the codes given below
(a) 1, 2 and 3 (b) 3 and 4
(c) 1 and 2 (d) Only 2

QUESTIONS FROM
NDA/NA EXAM (2012-2016)

2012 (I)

1. The equatorial rainforest is also known as
(a) Savanna (b) Campos
(c) Selvas (d) Llanos

2. The Earth's surface receives maximum energy at 12 noon but the maximum temperature never occurs at 12 noon. State which of the following reasons are correct?
1. Transformation of solar energy into heat requires sometime.
2. The loss of energy through long-wave radiations from the Earth's surface exceeds the energy received from the Sun at 4:00 pm.
3. Energy received by the Earth from solar radiations continues to exceed the energy lost by outgoing long-wave radiations from the Earth's surface upto 4:00 pm.

Select the correct answer using the codes given below.
(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) All of these

3. The cyclonic storm occurring over the Caribbean sea is known as
(a) Typhoon (b) Willy-Willy
(c) Hurricane (d) Cyclone

4. Where do you find the Isle of Youth?
(a) Near Cuba
(b) Near Bahamas
(c) Near Jamaica
(d) Near Saint Lucia

5. The Suez Canal, the Strait of Hormuz and the Strait of Gibraltar are important because they
(a) prevent attacks on bordering nations
(b) prohibit the movement of ships carrying nuclear weapons
(c) unite Russian access to warm water points
(d) control access to vital trade routes

6. In which one among the following areas of South-East Asia, there is largest concentration of peasant population?
(a) Areas of intensive shifting cultivation
(b) Highland areas where the climate is cooler and healthier
(c) Cleared lowlands in forest areas
(d) Areas where the grain farming is practised

7. Which one among the following groups is referred to as types of precipitation?
(a) Fog, Dew and Rain
(b) Air, Water and Soil
(c) Fog, Water and Rain
(d) Dew, Soil and Rain

8. The largest number of temperate cyclones originate mostly over the
(a) Indian ocean
(b) North Atlantic ocean
(c) North Pacific ocean
(d) Arctic ocean

9. Match the following

List I
(Map Showing Ocean Current)

List II
(Name of Ocean Current)

1. Kuroshio 2. Humbolt
3. Benguela 4. Oyashio

Codes

	A	B	C	D
(a)	2	1	3	4
(b)	4	3	1	2
(c)	4	1	3	2
(d)	2	3	1	4

10. Which one among the following statements is not correct?
(a) More than 50% of world's animal species are found in tropical rain forest.
(b) One-third of land surface is arid or semi-arid.
(c) Floating plants (phytoplankton) in the ocean produce over half the world's oxygen.
(d) World's important deserts are located across the Equator.

11. Which one among the following statements regarding Chinook winds is not correct?
(a) They rise from the Pacific ocean.
(b) After crossing the Rockies, they descend to the East of the mountains.
(c) They bring rainfall in the Prairies.
(d) These winds are beneficial to wheat cultivation.

2012 (II)

12. Telescopes are placed in space to view distant galaxies primarily to
(a) get closer to the observed objects
(b) avoid the absorption of light or other radiations in the atmosphere of the Earth
(c) avoid light pollution from the Earth's populated areas
(d) avoid steering the telescope against the Earth's motion

13. Which one among the following rocks does not belong to the same group?
(a) Shale (b) Limestone
(c) Slate (d) Sandstone

14. Match the following

List I (Rivers)	List II (Seas)
A. Volga	1. Sea of Azov
B. Dnieper	2. Black sea
C. Rhine	3. Caspian sea
D. Don	4. Mediterranean sea

Codes

	A	B	C	D
(a)	1	4	2	3
(b)	1	2	4	3
(c)	3	2	4	1
(d)	3	4	2	1

15. Which of the following statement(s) is/are correct?
1. Inter-Tropical Convergence Zone is a low pressure belt which forms an important zone of contact over Northern India and Pakistan.
2. Inter-Tropical Convergence Zone invites inflow of winds from different directions.

Select the correct answer using the codes given below.
(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

16. Consider the following statement(s) regarding El-Nino effect on Indian monsoon
1. The surface temperature goes up in the Southern Pacific ocean and there is deficient rainfall in India.
2. The Walker Circulation shifts Eastward from its normal position and reduces monsoon rainfall in India.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

17. Wide range and variability in rainfall, torrential in character, reversal of winds and uncertain arrival are the characteristics of
(a) westerlies (b) trade winds
(c) monsoon (d) anti-trade winds

18. Mackeral sky is associated with cloud type
(a) alto-cumulus (b) strato-cumulus
(c) cirro-cumulus (d) cumulo-nimbus

19. The average surface temperature of the Earth's surface is
(a) 10° C (b) 15° C
(c) 8° C (d) 5° C

20. Ferrel's law is related to deflection of
(a) cold air-mass
(b) hot air-mass
(c) monsoon air-mass
(d) trade wind and ocean currents

21. The grassland region of South Africa is known as
(a) Selvas (b) Downs
(c) Veldt (d) Llanos

2013 (I)

22. Which of the following statement(s) is/are true?
1. The angle of the axis in relation to the plane, in which the Earth revolves around the Sun is not constant.
2. The amount of energy given off by the Sun changes with the transparency of the atmosphere.

Select the correct answer using the codes given below.
(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

23. Which one among the following countries was least affected by the tsunami that hit the Indonesian ocean on 26th December, 2004?
(a) Indonesia (b) Malaysia
(c) Sri Lanka (d) India

24. Which of the following statement(s) regarding hurricanes is/are correct?
1. They develop over the ocean between 8° – 15° N.
2. They are almost absent in the South Atlantic ocean.
3. They do not develop close to the equator.

Select the correct answer using the codes given below.
(a) Only 1 (b) 2 and 3
(c) 1 and 3 (d) All of these

Directions (Q. Nos. 25-27) *The following items consist of two statements, Statement* I *and Statement* II. *You have to examine these two statements carefully and select the answers to these items using the codes given below.*

Codes
(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

25. **Statement I** Insolation is greatest, when the Sun is directly overhead and the Sun's rays are vertical.

Statement II When the Sun is lower in the sky, the same amount of solar energy spreads over a greater area of ground surface, so insolation is lower.

26. **Statement I** Evapotranspiration helps in classifying the climatic types.

Statement II Only temperature affects evapo transpiration, hence it can be used for classifying the climatic types.

27. **Statement I** There is a large-scale fluctuation of oil flow from oil wells prior to earthquakes.

Statement II Tectonic stress accumulates to a certain level, the pore pressure within a deep oil bearing stratum reaches its breaking strength causing oil to sprout along the oil wells.

28. Radioactive decay provides an internal source of heat for the Earth. This helps in the formation of which type of rocks?
(a) Igneous (b) Sedimentary
(c) Metamorphic (d) All of these

29. The Sun emits energy in the form of electromagnetic radiation. The following help in the generation of solar energy. Arrange them in the right sequence beginning from the starting of the cycle.
1. Hydrogen is converted to helium at very high temperatures and pressures.
2. The energy finds its way to Sun's surface.
3. A vast quantity of energy is generated by nuclear fusion.

The correct sequence is
(a) 1, 2, 3 (b) 2, 3, 1
(c) 3, 2, 1 (d) 1, 3, 2

30. The greatest seasonal contrast of insolation on the Earth is in which of the following latitudinal zones?
(a) Equatorial (b) Tropical
(c) Temperate (d) Polar

31. When the winds blow from all sides to the center low in an anti-clockwise direction, then this phenomenon is known as
(a) anti-tropical cyclones of Southern hemisphere
(b) temperate cyclones of Northern hemisphere
(c) tropical cyclones of Northern hemisphere
(d) tropical cyclones of Southern hemisphere

32. Which of the following statement(s) relating to tsunami is/are correct? As the tsunamis leave the deep water of the open sea and travel towards shallow water,
1. the speed is reduced considerably.
2. they attain enormous height.
3. they appear as a gentle rise and fall of the sea.

Select the correct answer using the codes given below
(a) 1 and 2 (b) 2 and 3
(c) Only 1 (d) All of these

2013 (II)

Directions (Q. Nos. 33-34) *The following items consist of two statements, Statement* I *and Statement* II. *You are required to examine these two statements carefully.*

Codes

(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

33. **Statement I** The process of decay and disintegration of rocks *in situ* is called weathering.

Statement II Weathering takes place both mechanically and chemically.

34. **Statement I** Doldrums is a calm belt between 5° N and 5° S of the equator.

Statement II The Sun rays strike almost vertically over the equator throughout the year.

35. Which of the following statements about tornadoes are correct?
Tornadoes usually spin
1. anti-clockwise in the Northern hemisphere.
2. clockwise in the Southern hemisphere.
3. clockwise in the Northern hemisphere.
4. anti-clockwise in the Southern hemisphere.

Select the correct answer using the codes given below
(a) 1 and 3 (b) 1 and 2
(c) 2 and 4 (d) 2 and 3

36. Which of the following statement(s) is/are correct?
1. Air close to the Earth's surface is heavier.
2. Air close to the Earth's surface contains larger quantity of water vapour and dust particles.

Select the correct answer using the codes given below
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

37. The term 'albedo' implies the
(a) capacity to absorb solar radiation
(b) capacity to modify the path of solar radiation
(c) proportion of the shortwave solar radiation reflected by a surface
(d) mount of solar radiation returned to air by a surface

38. Which of the following is the main characteristic of Mediterranean climate?
(a) High temperature throughout the year
(b) Rainfall throughout the year
(c) Rain in winter season
(d) Convectional rain

39. Which one among the following atmospheric gases filters out most of the ultraviolet radiation of the Sun?
(a) Oxygen (b) Nitrogen
(c) Helium (d) Ozone

40. Which one among the following is not a factor that affects direction of wind?
(a) Friction
(b) Pressure gradient
(c) Magnetism
(d) Coriolis effect

41. Which of the following are the results of El-Nino?
1. Reduction in the amount of planktons which further reduces the number of fish in the sea.
2. Irregularities in the evaporation of sea water.
3. Distortion of equatorial atmospheric circulation.

Select the correct answer using the codes given below.
(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) All of these

42. 'Esker' is a geomorphic feature developed by
(a) mechanical weathering
(b) river action
(c) glaciofluvial deposits
(d) aeolian deposits

43. It is known that the atmosphere is divided into some layers. In which one among the following layers, is the percentage composition of helium gas maximum?
(a) Troposphere
(b) Stratosphere
(c) Exosphere
(d) Ionosphere

44. The rigid lithospheric slabs are known as 'Plates'. What would be the result, if the oceanic plate collides with the continental plate?
1. Oceanic plate is forced below the continental plate.
2. Continental plate is forced below the oceanic plate.
3. Continental and oceanic plates never collide.

Select the correct answer using the codes given below
(a) Only 1 (b) Only 2
(c) 1 and 2 (d) All of these

45. Consider the following layers of the atmosphere
1. Troposphere
2. Stratosphere
3. Mesosphere
4. Thermosphere

Which one among the following is the correct sequence of the layers with increasing altitude from the Earth's surface?
(a) 1, 2, 3, 4 (b) 2, 1, 3, 4
(c) 3, 2, 1, 4 (d) 4, 2, 3, 1

46. What would be the date and local time of a place located at 88°30' E longitude when the local time at 0° longitude is 19 : 00 hours, of 28th February, 2013?
(a) 23 : 54 h of 28th February
(b) 00 : 54 h of 1st March
(c) 23 : 30 h of 28th February
(d) 00 : 44 h of 1st March

2014 (I)

47. Consider the following surface winds
1. Doldrums 2. Trade winds
3. Westerlies 4. Polar winds

Which one among the following is the idealised global pattern of these winds from the Equator to the Pole?
(a) 1 , 2 , 3 , 4 (b) 1 , 3 , 2 , 4
(c) 2 , 1 , 4 , 3 (d) 3 , 1 , 2 , 4

48. Taungup Pass is a mountain corridor connecting India with
(a) Afghanistan (b) China
(c) Pakistan (d) Myanmar

49. The summer and winter seasons in a year are caused by
(a) aphelion (farthest) and perihelion (nearest) positions of the Earth from the Sun during the annual revolution
(b) rotation of the Earth on its axis
(c) variation in solar insolation
(d) revolution of the Earth on its inclined axis

Directions (Q. Nos. 50-53) *The following five* (5) *items consist of two statements, Statement* I *and Statement* II. *You have to examine these two statements carefully and select the answers to these items using the codes given below.*

Codes

(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

50. **Statement I** Minerals are formed by slow cooling of the Magma.
Statement II Very small crystals are formed when lava cools quickly on the surface.

51. **Statement I** The hills with dense vegetation cover do not experience heavy soil erosion.
Statement II The vegetation cover helps infiltration of rainwater and binding of soils.

52. **Statement I** The decrease of air temperature with increasing altitudes in the atmosphere is called the vertical temperature gradient.
Statement II In Troposphere, air temperature decreases with increasing altitude due to radiation from the Earth.

53. **Statement I** Chemical weathering processes are found more active in hot and humid environment.
Statement II High temperature and rainfall help in the process of decomposition of rocks.

54. Tuareg is a pastoral nomad living in the desert of
(a) Kalahari (b) Sahara
(c) Arabia (d) Patagonia

55. Match the following

List I (Regions)	List II (Characteristic Vegetations)
A. Selvas	1. Tropophytes
B. Savanna	2. Mosses and lichens
C. Tundra	3. Epiphytes
D. Monsoon land	4. Grasses and trees

Codes

	A	B	C	D
(a)	3	2	4	1
(c)	1	2	4	3

	A	B	C	D
(b)	1	4	2	3
(d)	3	4	2	1

56. Why is hydrolysis an effective form of chemical decomposition of bedrock in humid tropics?
1. Humid tropics experience high temperature and humidity.
2. There is high diurnal range in temperature.

Select the correct answer using the codes given below
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

57. Lapland is a cultural region largely within the Arctic Circle in the North of the Scandinavian Peninsula. Who inhabited the Lapland?
(a) Sami people (b) Padaung people
(c) Hamar people (d) Himba people

58. What is the correct sequence from the smallest to the largest grain of the following types of clastic rocks?
(a) Shale, sandstone, conglomerate, siltstone
(b) Shale, siltstone, sandstone, conglomerate
(c) Conglomerate, sandstone, shale, siltstone
(d) Sandstone, siltstone, conglomerate, shale

59. The Faroe is a group of islands lying in the Atlantic ocean between Scotland and Iceland. This island group is also known as
(a) Island of Sheep
(b) Island of Goats
(c) Island of Cows
(d) Island of Buffaloes

2014 (II)

60. Movements of tides are mostly determined by
(a) albedo effect
(b) wind velocity
(c) rotation of the Earth
(d) revolution of the Earth

61. Quartzite is metamorphosed from
(a) limestone (b) plutonic rock
(c) sandstone (d) shale

62. The permanent wind that blows from the horse latitude to the equatorial region is known as
(a) westerly (b) trade wind
(c) doldrum (d) easterly

63. Which one of the following is a warm ocean current?
(a) Labrador current (b) Kuroshio current
(c) Peru current (d) Benguela current

64. If a news is broadcast from London at 1 : 45 pm on Monday, at what time and on what day it will be heard at Dhaka (90° E)?
(a) 7 : 45 pm on Monday
(b) 7 : 45 am on Monday
(c) 7 : 45 pm on Tuesday
(d) 7 : 45 am on Sunday

65. A topographical map with scale 1 : 50000 indicates 1 cm to
(a) 50 km (b) 500 m
(c) 50 m (d) 5 km

66. Match the following

List I (Geographical Features)	List II (Types of Geographic Process)
A. Cirque	1. Erosional feature of wind
B. Yardang	2. Depositional feature of glacier
C. Barkhan	3. Depositional feature of wind
D. Drumlin	4. Erosional feature of glacier

Codes

	A	B	C	D
(a)	4	1	3	2
(c)	2	3	1	4

	A	B	C	D
(b)	4	3	1	2
(d)	2	1	3	4

67. **Statement I** Grand banks are one of the major fishing grounds of the world due to the presence of a vast continental shelf.
Statement II Planktons grow in the shallow waters.

Codes

(a) Both the statements are individually true and Statement II is the correct explanation of Statement I.
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I.
(c) Statement I is true, but Statement II is false.
(d) Statement I is false, but Statement II is true.

68. Which of the following statement(s) is/are correct?
1. The tropical cyclones of China Sea are called 'typhoons'.
2. The tropical cyclones of the West Indies are called 'tornadoes'.
3. The tropical cyclones of Australia are called 'willy-willies'.
4. Formation of an anticyclone results in stormy weather condition.

Select the correct answer using the codes given below

(a) Only 3 (b) 1, 2 and 4
(c) 1 and 3 (d) All of these

69. Rotterdam of the Netherlands is largely famous for

(a) textiles (b) dairying
(c) shipbuilding (d) paper industry

70. Which of the following sequences is correct for rainfall?

(a) Slow ascent of air → Slow condensation → Heavy downpour
(b) Rapid ascent of air → Large raindrops → Heavy downpour
(c) Pressure decreased → Air compressed → Heavy downpour
(d) Descent of air → Air warmed → Heavy downpour

2015 (I)

71. To a perpendicular to the plane of ecliptic, the Earth's axis of rotation makes an angle of $23\frac{1^\circ}{2}$. If this angle is zero degree, which one among the following would result?

(a) There would have been no season.
(b) The length of day and night would have been the same throughout the year.
(c) The length of the day and night would have been the same all over the Earth.
(d) All of the above

72. 'Yakutsk' are the nomadic herders of

(a) Gobi (b) Sahara
(c) Tundra (d) Kalahari

73. The luxuriant growth of natural vegetation in tropical rainforest is due to

1. fertile soil.
2. hot and wet climate throughout the year.
3. intense sunlight for photosynthesis.
4. seasonal change to facilitate nutrient absorption.

Select the correct answer using the codes given below.

(a) 1 and 4 (b) 2 and 3
(c) 1, 2 and 3 (d) All of these

74. Match the following

List I (Regions)	List II (Vegetations)
A. Selvas	1. Conifers
B. Savannas	2. Mosses and lichens
C. Taiga	3. Epiphytes
D. Tundra	4. Grasses and trees

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	2	1	4
(c)	3	4	1	2	(d)	4	2	1	3

75. Rain shadow effect is associated with

(a) cyclonic rainfall
(b) orographic rainfall
(c) convectional rainfall
(d) frontal rainfall

76. Which one of the following weather conditions indicates a sudden fall in barometer reading?

(a) Stormy weather
(b) Calm weather
(c) Cold and dry weather
(d) Hot and sunny weather

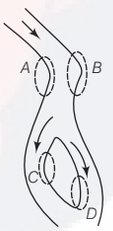
77. Match the following

List I (Islands)	List II (Locations)
A. Continental island	1. Mauritius
B. Coral island	2. Madagascar
C. Volcanic island	3. Andaman and Nicobar islands
D. Mountain island	4. Maldives

Codes

	A	B	C	D		A	B	C	D
(a)	2	4	1	3	(b)	2	1	4	3
(c)	3	1	4	2	(d)	3	4	1	2

78. Consider the following diagram



In which one among the following lettered areas of the diagram would erosion most likely change the shapes of the riverbed?

(a) A (b) B (c) C (d) D

79. Match the following

List I (Clouds)	List II (Characteristics)
A. Cirrus	1. Rain giving
B. Stratus	2. Feathery appearance
C. Nimbus	3. Vertically growing
D. Cumulus	4. Horizontally spreading

Codes

	A	B	C	D		A	B	C	D
(a)	3	1	4	2	(b)	3	4	1	2
(c)	2	4	1	3	(d)	2	1	4	3

2015 (II)

80. Which one of the following pairs of properties of typical air masses is correct?

Air Mass		Source Region
(a) Maritime Equatorial	:	Warm oceans in the equatorial zone
(b) Maritime Tropical	:	Warm oceans in the tropical zone
(c) Continental Tropical	:	Less warm oceans in the tropical zone
(d) Continental Polar	:	Moist oceans in the polar zone

81. According to the Geo-scientists, the shape of the Earth is

1. round
2. spherical
3. close to that of a sphere
4. an oblate ellipsoid

Select the correct answer using the codes given below

(a) 2, 3 and 4
(b) 1, 2 and 3
(c) 1 and 2
(d) 3 and 4

82. Which one of the following statements is not correct?

(a) Temperatures decrease from the equator to poles.
(b) Temperatures in equatorial regions change substantially from January to July.
(c) Large land masses located in the Sub-arctic and Arctic zones develop centres of extremely low temperatures in winter.
(d) Highlands are always colder than surrounding lowlands.

83. Match the following

List I (Low-Latitude Climates)	List II (Characteristics)
A. Wet Equatorial	1. Uniform temperatures, mean near 27°C
B. Monsoon and trade wind coastal	2. Marked temperature cycle with very high temperature before the rainy season
C. Wet-dry tropical	3. Temperatures show an annual cycle with high temperature in the high-Sun season
D. Dry tropical	4. Strong temperature cycle, with intense temperature during high-Sun season

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	1	2	3	4
(c)	2	4	3	1	(d)	1	3	2	4

84. An upfold in rock is
(a) graben
(b) horse
(c) anticline
(d) syncline

85. Which one of the following gases is found in highest quantity in Exosphere?
(a) Hydrogen
(b) Helium
(c) Nitrogen
(d) Oxygen

86. Which one of the following combinations of stalactites and stalagmites occurrences is correct?
(a) Stalactites hang as icicles of different diameters and stalagmites hang from the floor of the caves.
(b) Stalactites hang as icicles of different diameters and stalagmites rise up from the floor of the caves.
(c) Stalactites rise up from the floor of the caves and stalagmites hang as icicles of different diameters.
(d) Stalactites hang as icicles of different diameters and stalagmites also hang as icicles of different diameters.

87. Which one of the following describes the Lithosphere?
(a) Upper and lower mantle
(b) Crust and upper mantle
(c) Crust and core
(d) Mantle and core

2016 (I)

88. Spruce and cedar are tree varieties of
(a) equatorial forest
(b) temperate coniferous forest
(c) monsoon forest
(d) temperate deciduous forest

89. 'Sal' tree is a
(a) tropical evergreen tree
(b) tropical semi-evergreen tree
(c) dry deciduous tree
(d) moist deciduous tree

90. Which of the following statements in the context of Northern hemisphere is/are correct?
1. Vernal equinox occurs on 21st March.
2. Summer solstice occurs on 22nd December.
3. Autumnal equinox occurs on 23rd September.
4. Winter solstice occurs on 21st June.

Select the correct answer using the codes given below.
(a) Only 1 (b) 1 and 3
(c) 2 and 4 (d) 1, 2 and 3

91. During solar eclipse,
(a) the Earth comes in between the Sun and the Moon
(b) the Moon comes in between the Sun and the Earth
(c) the Moon comes exactly halfway between the Earth and the Sun
(d) the Sun comes in between the Earth and the Moon

Directions (Q. Nos. 92-94) *The following five items consist of two statements, Statement I and Statement II. Examine these two statements carefully and select the answers to these items using the codes given below.*

Codes
(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

92. **Statement I** There is high salinity in Red sea.

Statement II Rate of evaporation is high in Red sea.

93. **Statement I** Volcanic eruption is accompanied by earthquakes.

Statement II Volcanoes erupt water vapours and dust particles in the atmosphere.

94. **Statement I** Plantation farming has mostly been practised in humid tropics.

Statement II The soil of humid tropics is highly fertile.

ANSWERS

Practice Exercise

1	c	2	c	3	a	4	a	5	a	6	b	7	a	8	c	9	d	10	b
11	a	12	a	13	c	14	b	15	a	16	d	17	c	18	a	19	d	20	b
21	a	22	a	23	b	24	a	25	b	26	a	27	a	28	a	29	c	30	a
31	a	32	a	33	a	34	a	35	a	36	c	37	a	38	d	39	d	40	b
41	a	42	a	43	b	44	a	45	b	46	a	47	a	48	a	49	a	50	a
51	a	52	a	53	c	54	a	55	a	56	a	57	a	58	d	59	b	60	d
61	c	62	c	63	c	64	a	65	c	66	d	67	a	68	d	69	c	70	a
71	a	72	a	73	d	74	a	75	a	76	b	77	a	78	a	79	c	80	a
81	b	82	a	83	a	84	a	85	a	86	b	87	a	88	a	89	c	90	a
91	b	92	c	93	a	94	b	95	b	96	b	97	d	98	d	99	a	100	c
101	c	102	b	103	a	104	c	105	b	106	a	107	a	108	c	109	b	110	c
111	d	112	b	113	b	114	a	115	d	116	b	117	c	118	a	119	c	120	a
121	c	122	a	123	d	124	a	125	a	126	d	127	c	128	d	129	b	130	d
131	b	132	b	133	d	134	a	135	d	136	c	137	a	138	a	139	a	140	a
141	a	142	b	143	b	144	b	145	a	146	a	147	b	148	b	149	c	150	d
151	d	152	d	153	a	154	d	155	c	156	b	157	a	158	a	159	c	160	a
161	a	162	a	163	c	164	c	165	a	166	a	167	d	168	d	169	a	170	c
171	d	172	b	173	d	174	c	175	c	176	b	177	a	178	b	179	a	180	b
181	b	182	d	183	c	184	a	185	c	186	a	187	b	188	c	189	b	190	b
191	c	192	b	193	b	194	b	195	c	196	c	197	c	198	b	199	a	200	a
201	b	202	b	203	a	204	d	205	a	206	c	207	b	208	d	209	d	210	d
211	b	212	a	213	a	214	c	215	d	216	a	217	b	218	a	219	a	220	c
221	a	222	b	223	d	224	a	225	c	226	a	227	b	228	a	229	b	230	d
231	c	232	b	233	a	234	a	235	a	236	d	237	c	238	a	239	a	240	a
241	d	242	c	243	a	244	a	245	a	246	d	247	b	248	c				

Questions from NDA/NA Exam (2012-16)

1	c	2	a	3	c	4	a	5	d	6	a	7	a	8	b	9	a	10	d
11	d	12	b	13	c	14	c	15	b	16	c	17	c	18	a	19	b	20	d
21	c	22	b	23	b	24	a	25	b	26	c	27	a	28	d	29	d	30	b
31	c	32	d	33	b	34	b	35	b	36	c	37	c	38	c	39	d	40	c
41	d	42	c	43	c	44	a	45	a	46	b	47	a	48	d	49	d	50	b
51	a	52	a	53	b	54	b	55	d	56	a	57	a	58	b	59	a	60	c
61	c	62	b	63	b	64	a	65	b	66	b	67	b	68	c	69	c	70	b
71	d	72	c	73	b	74	c	75	b	76	a	77	a	78	b	79	c	80	a
81	d	82	b	83	b	84	c	85	a	86	b	87	b	88	b	89	c	90	b
91	b	92	a	93	b	94	c												

PART II INDIAN GEOGRAPHY

GEOGRAPHIC PROFILE

India occupies a South-Central position in the Asian Continent, looking across the Arabian Sea to Arabia and Africa on the West and across Bay of Bengal to Myanmar, Malaysia and the Indonesian Archipelago on the East. Geographically, the Himalayan ranges keep India apart from the rest of Asia. India derives her name from river Indus.

Location

It is often described as a tropical country although the territorial limits of the Indian mainland extend between 8° 4′ N and 37° 6′ N latitudes and 68° 7′ E and 97° 25′ E longitudes.

Area and Extent

- India ranks **seventh** in the world in terms of area after Russia, Canada, USA, China, Brazil and Australia.
- It has a total land area of about 3287263 sq km, which is 2.42% of world's area.
- It is second largest in terms of population and holds 17.4% of the total world population.
- India is the second largest country in Asia both in terms of area as well as population, after China.

The States having Common Frontiers with Neighbouring Countries

Country	*States*
Pakistan (4)	Jammu & Kashmir, Punjab, Rajasthan, Gujarat
Afghanistan (1)	Jammu & Kashmir
China (5)	Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh
Nepal (5)	Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Sikkim
Bhutan (4)	Sikkim, West Bengal, Assam, Arunachal Pradesh
Myanmar (4)	Arunachal Pradesh, Nagaland, Manipur, Mizoram
Bangladesh (5)	West Bengal, Meghalaya, Assam, Tripura, Mizoram

- In India, the Tropic of Cancer (23.5°N latitude) passes through 8 states (Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand, West Bengal, Tripura and Mizoram).
- State with longest coastline is Gujarat.
- Active volcanoes are **Barren Island** in Andaman and Nicobar Islands.
- Southern most point is **Indira Point or** Pygmalion point in Great Nicobar.
- Southern most tip of mainland is Kanyakumari.

Indian Standard Time (IST)

- India has only one standard time. India is 5.5 hours ahead of GMT/UTC, 4.5 hours behind Australian Eastern Standard Time and 10.5 hours ahead of American Eastern Standard Time.
- The $82\frac{1^\circ}{2}$ E longitude that passes through Naini near Allahabad city is choosen as standard longitude for Indian Standard Time.
- The IST crosses through the five states of India, they are; Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Odisha and Andhra Pradesh.
- The country's East-West distance is more than 2933 km, which covers over 29° of longitude, resulting the sun rising and setting almost two hours earlier on India's eastern border than in the Rann of Kutch (Gujarat) in the far West.

Area and Population

- Rajasthan is the largest state (in terms of area) in India.
- Goa is the smallest state (in terms of area) in India.
- India's population density is 382 as per census 2011. There is diversity in population density in India. Main reason behind the diversity is agricultural productivity and structures of settlements.
- Uttar Pradesh is the largest state (in terms of population) in India.
- Sikkim is the smallest state (in terms of population) in India.
- Andaman and Nicobar group of islands is the largest Union Territory (in terms of area) in India.
- Lakshadweep is the smallest Union Territory (in terms of area) in India.
- Delhi is the largest Union Territory (in terms of population) in India.
- Lakshadweep is the smallest Union Territory (in terms of population) in India.

Physical Outline

- Madhya Pradesh is the largest plateaus state in India.
- Rajasthan is the largest desert state in India.
- Madhya Pradesh has maximum forest cover.
- Total number of islands in India is 248; 233 in Bay of Bengal and 25 in Arabian Sea.
- Eastern coast is known as Coromandal Coast.
- Western coast is known as Malabar Coast.

Transport and Urbanisation

- Uttar Pradesh is the most urbanised state while Meghalaya is the least urbanised state.
- Maharashtra has maximum urban population while Sikkim has least urban population.
- Longest National Highway in India is NH-44, which connects Srinagar to Kanyakumari (3745 km).
- Total length of railway in India is 63273 km.

GEOLOGICAL FORMATION

Geological survey of India divides geological formations of India into four groups

The Archean System or Pre-Cambrian Rocks

- It comprises of *Gneiss* and *Schist* series rocks more than 3 billion year old and Dharwar rocks 2-3 billion year old.
- These represent the initial crustal strata and thus, are rich in metallic minerals like iron, manganese, gold etc.
- Archeans are referred to the oldest rocks on the Earth's crust. Archean rocks are all azoic or unfossiliferous, devoid of any sediment and any form of life.
- It is found in Aravalli's mountain, 2/3rd of Deccan Peninsula and parts of North-East.

It includes the following two rock systems

(i) **Gneisses and Schist System** This system contains the first formed rocks on Earth. These rocks in the peninsula are found primarily in Tamil Nadu, Andhra Pradesh, Karnataka, Odisha, Meghalaya, Madhya Pradesh and Chhattisgarh.

(ii) **Dharwar System** It is later than Archean and about 2.3 billion year old. It is first metamorphic sedimentary rocks in India. Dharwar rock are rich in iron ore, manganese, lead, zinc, gold etc.

The Purana Rock System

In India, the word 'Purana' has been used in place of Proterozoic. *This rock system includes two divisions, which are as follow*

(i) **Cuddapah System** It consists of Cuddapah series of rocks around 1-1.5 billion year old. These rocks are predominantly sedimentary in their characteristics and consist of sandstones and limestones etc. These rocks are also found in **Southern Chhattisgarh** and **Odisha**.

(ii) **Vindhyan System** Vindhyan series of rocks 0.5-1 billion year old. The Vindhyan series is associated with the Central Highlands of Indian plateau. This system ranges from regions of South-Eastern Rajasthan to Bundelkhand and Bihar.

Dravidian System

- The Dravidian system consists of rocks aged between 300-500 millions of years.
- Most of the rocks of this system have been covered by later rock developments and thus, are rarely visible.
- Thick deposits of this series have been found at places in the states of Jammu & Kashmir, Himachal Pradesh and Uttarakhand though most of the rocks of these states are younger and belong to the next series.

Aryan System

- It comprised the rock formations ranging from upper carboniferous to recent.
- The Gondwana series of rocks are of sedimentary nature, distinctively include fossils of living organisms and they comprise of 98% of the coal reserves of the country and are largely found in Damodar valley in Jharkhand, Mahanadi valley in Odisha, Godavari valley in Southern Madhya Pradesh, Maharashtra and Andhra Pradesh.

RELIEF AND PHYSIOGRAPHIC DIVISIONS

- Physiography is that branch of geography, which studies the present relief features of the Earth's surface or of natural features in their causal relationships.
- The physiographic diversity of India embraces fold mountains, flat plains and one of the oldest plateaus of the world.

India is divided into five physiographic units, which are as follow

i. The Great Himalayas of North
ii. Great Indian Plain
iii. Peninsular Plateau
iv. Coastal Plains
v. Islands

The Great Himalayas of North

- The Northern mountain wall is a series of high mountain ranges stretching over the Northern borders of India.
- The geologically young and structurally fold mountain ranges, the Himalayas run in a West-East direction from the Indus to the Brahmaputra.
- They form an arc, which covers a distance of about 2500 km. Their width varies from 400 km in Kashmir to 150 km in Arunachal Pradesh.
- The altitudinal variations are greater in the Eastern half than those in the Western half.

The Himalayas Range is classified into five longitudinal series of mountains

i. **Trans-Himalayas** North of the Greater Himalayas lie the Trans-Himalayas or the Tibet Himalayas. This section is older than Himalayas. This range acts as a watershed between rivers flowing towards South and those flowing towards North. These ranges are about 40 km wide and rise in height upto 5000 m. They include the *Karakoram, Zaskar* and *Ladakh* ranges.

ii. **Greater Himalayas or Himadri** The Northern most important range is known as the Greater or Inner Himalayas or the Himadri.

iii. **Himachal Himalaya** The range lying to the South of the Himadri, forms the most rugged mountain system and is known as Himachal or middle Himalayas.

iv. **Shiwaliks** The outer most range of the Himalayas is called the Shiwaliks. They extend over a width of 10-50 km and have an altitude varying between 900 and 1100 m. These ranges are composed of unconsolidated sediments brought down by rivers from the main Himalayan ranges located in North.

v. **The Purvanchal** After crossing the Dihang gorge, the Himalayas take a sudden Southward turn and form a series of comparatively low hills in the shape of crescent with it's convex side pointing towards the West. These hills are known as Purvanchal.

Important Peaks in Himalayas

Peak	*Situation*	*Height (Mtr)*
Mt. Everest	Nepal-Tibet	8848
K2 or Godwin Austin	India	8611
Kanchanjunga	Nepal-India	8586
Dhaulagiri	Nepal	8187
Nanga Parvat	India	8126
Annapurna	Nepal	8091
Nanda Devi	India	7817
Mt. Kamet	India	7756

IMPORTANT PEAKS

- Highest mountain peak in India K2 or Godwin Austin, lies in illegally occupied Kashmir or Pakistan occupied Kashmir.
- Highest peak of India in Himalaya is Kanchenjunga.
- Highest peak in Eastern Ghats is Jindhagada Peak in Andhra Pradesh.
- Highest peak in Western Ghats is Anamudi in Tamil Nadu.
- Highest peak of Satpura range is Dhupgarh.
- Highest peak of Nilgiris is Doda Betta.
- Highest peak in Andaman and Nicobar Islands is Saddle Peak.
- Highest peak of Naga hills is Saramati Peak.

Mountain Passes of India

Name	*State*	*Features*
Banihal Pass	Jammu and Kashmir	Banihal pass is a pass across the Pir Panjal range at 2832 m. This mountain range separates the Kashmir valley in the Indian State of Jammu and Kashmir from the outer Himalaya and plains to the South.
Changla Pass	Jammu and Kashmir	Highest mountain pass in Ladakh. The Chanla is on the route to Pangong lake from Leh.
Khardung La	Jammu and Kashmir	Khardung La is historically important as it lies on the major caravan route from Leh to Kashgar in Central Asia.
Namika La	Jammu and Kashmir	Namika La is one of two high passes between Kargil and Leh, the other is the even higher Fotu La pass.
Zoji La Pass	Jammu and Kashmir	Zoji La is a high mountain pass in India, located on the Indian National Highway-1 between Srinagar and Leh in the Western sections of mountain range.
Bara-lacha La	Himachal Pradesh	Also known as Bara-lacha pass. Highest mountain pass in Zaskar range connecting Lahaul district in Himachal Pradesh to Ladakh in Jammu and Kashmir.
Rohtang Pass	Himachal Pradesh	It is a high mountain pass on Eastern Pir Panjal range of the Himalayas around 51 km from Manali. It connects the Kullu of Himachal Pradesh, India.
Shipki La	Himachal Pradesh	The river Sutlej enters India through this pass.
Jelep La	Sikkim	Jelep La is a high mountain pass between India and Tibet in East Sikkim district of Sikkim. The famous Menmecho lake lies below the Jelep La pass.
Nathu La	Sikkim	It connects the Indian State of Sikkim with China's tibet Autonomous region.
Lipulekh Pass	Uttarakhand	It is a Himalayan pass connecting the Kumaon region of Uttarakhand in the Pithoragarh district in India with the old trading town of Talakot in Tibet.

The Great Indian Plain

- This plain is known as Indus-Ganga-Brahmaputra plain. It extends for a distance of about 3200 km and its width varies from 150 km to 300 km.
- These plains are almost featureless and attains a maximum height of 204 m. The land around Ambala, acts as the water divide in this plain.

On the basis of characteristics of these plains, they are divided into following four parts

i. **Bhabar Region** This region is found along the foothills of Shiwaliks from Indus to Tista without any break. It width is 8 to 16 km. Since, it is made up of stones and pebbles, it is highly porous which make rivers disappear beneath the ground in this region.

ii. **Terai Region** This region is found to the South of the Bhabar region. The underground streams of the Bhabar re-emerge on the surface and give birth to marshy area. This is the region of dense forests and high bio-diversity.

iii. **Khadar Region** This region is made up of new alluvium. This region is generally found in the delta regions, e.g. the Ganga-Brahmaputra delta.

iv. **Bhangar Region** This region is higher part of the plains, where the flood water cannot reach. It is made up of old alluvium. It is often seen in the structure of a terrace.

The Peninsular Plateau

- The Peninsular plateau is a kind of triangular shape and composed of the old **crystalline**, **igneous** and **metamorphic** rocks.
- It was formed due to the breaking and drifting of the Gondwanaland and thus, making it a part of the oldest landmass.
- This region of the country is surrounded on three sides by water and thus, is a Peninsular plateau. The plateau has broad and shallow valleys and rounded hills.
- Narmada river, which flows into a Rift valley, divides the region into two parts namely, the central highlands in its North and the Deccan plateau in its South.

Divisions of Peninsular Plateau

i. **The Central Highland** These highlands of the plateau lie to the North of the Narmada River covering a major area of Malwa plateau.

ii. **The Deccan Plateau** This plateau is a triangular land, lying to the South of the river Narmada. It is made up of lava flows in the cretaceous era through fissure eruptions.

Some of the Important Plateau

Plateau	*Characteristic*
Meghalaya Plateau	◆ Separated from main block of the Penninsular Plateau by a gap called Garo-Rajmahal Gap. ◆ The plateau comprises Garo, Khasi, Jaintia and Mikir hills.
Bundelkhand Upland	◆ Located to the South of Yamuna River between Central India plateau and the Vindhyan scrap lands. ◆ The plateau is composed of granites and gneiss rocks.
Telangana Plateau	◆ Located West of Andhra Pradesh. ◆ The plateau is chiefly made of ancient pre-cambrian gneiss. ◆ The plateau is drained by Godavari and Krishna Rivers.
Mysore Plateau	◆ Located in Karnataka and consists of Dharwar system of volcanic rocks, crystalline schists and granites.
Chotanagpur Plateau	◆ It covers mostly Jharkhand, Chhattisgarh and Purulia (West Bengal). ◆ It is store-house of minerals and a large-scale mining of iron, manganese, coal, uranium etc. ◆ The plateau is an example of Pat Land.
Malwa Plateau	◆ It is mostly covered Western Madhya Pradesh and South-Eastern Rajasthan. ◆ It forms a triangular shape and is typical for two drainage system i.e. Mahi and Narmada.
Marwar Uplands	◆ It lies to East of Aravalli ranges in Rajasthan. ◆ They are made up of sandstones and limestones of the Vindhyan period. ◆ Chambal and its tributary Banas flows in this region.

Hill Ranges of Peninsular India

The Aravalli Ranges It runs North-East to South-West for 800 km from Delhi through Rajasthan to Palanpur in Gujarat. Gurushikhar (1722 m) is the highest peak of the range, located in Abu hills of Rajasthan.

The Vindhyan Ranges It runs parallel to the Narmada Rift valley as an escarpment in an East-West direction from Jobat in Gujarat to Sasaram in Bihar for a distance of 1200 km.

The Satpura Ranges It is a series of seven mountains that run in the East-West direction in between Narmada and Tapi rivers. It is an example of block mountain. Amarkantak is important peak lying in the Maikal range at Madhya Pradesh, Chhattisgarh border and is the source of river Narmada and Son.

The Eastern Ghats The Eastern ghats stretch from the South of Mahanadi valley to the Nilgiris in the South. The Eastern ghats are comparatively broader and do not form a continuous water divide.

The Western Ghats or Sahyadris It run continuously for 1600 km from Maharashtra to Kanyakumari and can be crossed through passes only. Highest mountain peak in Western ghat is Anamudi. The Western ghats are higher than the Eastern ghats.

The Coastal Plains

- The Peninsular plateau is flanked by stretch of narrow coastal strips, running along the Arabian sea on the West and the Bay of Bengal on the East.
- It include plains along **Kachchh** and Kathiawar regions of Gujarat to Konkan plains of Maharashtra-Goa, Karnataka plains and the Southern Malabar plains along Kerala coast.

On the basis of location the coastal plains are divided into two parts

1. Eastern Coastal Plains

- It runs through river Suvarnrekha to Kanyakumari. The eastern coastal plains are more wide than its western counterpart. Because of deposition of sediments in form of Delta by the rivers Mahanadi, Godavari, Krishna and Cauvery.
- *It is mainly divided into three parts, which are as follow*
  - i. **Utkal Plain** It runs from Ganga plain to Mahanadi.
  - ii. **Andhra Plain** Utkal plain to Pulicat lake.
  - iii. **Tamil Nadu Plain** It is also known as granary of South.
- The coastal plains of Andhra Pradesh and Odisha are known as Utkal coast, the coastal plains of Krishna-Godavari Delta to Kanyakumari are known as Coromandel Coast.

2. Western Coastal Plains

- It runs from Kanyakumari to Rann of Kutchh. The average width is 64 km and it is wide at the mouth of Narmada and Tapti rivers.
- *The coastal plains are divided into five parts*
  - i. **Kathiawar Plain** Rann of Kutch to Daman.
  - ii. **Malabar/Kerala Coast** Manglore to Kanyakumari.
  - iii. **Konkan Coast** Daman to Goa.
  - iv. **Karnataka/Kanara Coast** Goa to Manglore.
  - v. **Gujarat Plains** East to Kutch and Kathiawar.

RAJASTHAN DESERT

- Also known as **Thar** or **Great Indian desert**, which covers Western Rajasthan and the adjoining part of Pakistan. Desert proper is called Marusthali.
- The Eastern part of the Marusthali is rocky, while its Western part is covered by shifting sand dunes locally known as Dharian.
- The Eastern part of Thar desert upto Aravalli range is semi-arid plain, which is known as Rajasthan Bagar.
- It is drained by a number of seasonal streams creating fertile tracts locally known as Rohi.

The Islands

- Apart from the large number of islands in the near proximity of the Indian coast, there are two main groups of islands in the Indian Ocean far away from the coast.
- One of them is the Lakshadweep islands in the Arabian sea and the other is the group of islands known as *Andaman and Nicobar Islands* in the Bay of Bengal.
- These islands have gained much importance in view of increasing interest of superpowers of the world in the geopolitics of Indian Ocean.

Lakshadweep Islands

These islands group lies close to the Malabar coast of Kerala. This group of 25 islands is composed of small coral islands. The islands North of 11° N latitude are known as *Aminidivi Islands* and those South of it are Cannanore Islands.

Andaman and Nicobar Islands

Andaman and Nicobar archipelago has been formed by the extension of the tertiary mountain chains of **Arakan yoma.** These islands lie close to equator, and experience equatorial climate and have thick forest cover. Some of the islands are fringed with coral reefs. The entire group of Islands is divided into two broad categories–The Andamans in the North and the Nicobars in the South. The Great Andaman group of Islands in the North is separated by the **Ten Degree Channel** from the Nicobar group in the South.

DRAINAGE SYSTEM OF INDIA

- India is blessed with hundreds of large and small rivers, which drains the length and breadth of the country.
- Those Himalayan rivers, which originated before the formation of Himalaya are known as Antecedent rivers, such as-Indus, Brahmaputra and Sutlej.
- Water drains in two direction of the main water divide line of India. 90% of land water drains into Bay of Bengal and the rest drains into Arabian sea.

Accordingly, the Indian rivers are divided into following two major groups

- i. The Himalayan rivers
- ii. The Peninsular rivers

The Himalayan Rivers

The Himalayan river system is divided into three major river system

(i) Indus River System

- The Indus, also known as **Sindhu**, is the Western most of Himalayan rivers in India. It is one of the largest river basins of the world covering an area of 1165000 sq km (in India it is 321289 sq km) and a total length of 2880 km (in India 1114 km).
- It originates from a glacier near *Bokhar Chu* in the *Tibetan* region near *Mansarovar lake*. In Tibet, it is known as Singi Khamban or Lion's mouth.
- In Jammu and Kashmir, its Himalayan tributaries are Zanskar, Dras, Gartang, Shyok, Shigar, Nubra, Gilgit etc. Its most important tributaries, which join Indus at various places are Jhelum, Chenab, Ravi, Beas and Sutlej.

(ii) The Ganga River System

- The Ganga system is the second major drainage system of India. It rises in the Gangotri glacier near Gaumukh (3900 m) in the Uttarakhand. Here, it is known as the Bhagirathi. At Devprayag, the Bhagirathi, meets the Alaknanda, hereafter, it is known as *the Ganga*.
- The Alaknanda has its source in the Satopanth glacier above Badrinath. The Alaknanda consists of the Dhauli and the Vishnu Ganga, which meet at Joshimath or Vishnu Prayag.
- The other tributaries of Alaknanda such as the Pindar joins it at Karna Prayag, while Mandakini or Kali Ganga meets it at Rudra Prayag. It is 2525 km long of which 1450 km is in Uttarakhand and Uttar Pradesh, 445 km in Bihar and 520 km in West Bengal.
- The left bank tributaries of Ganga are Ramganga, Gomti, Kali or Sharda, Gandak, Kosi, Mahanadi. The right bank tributaries of Ganga are Yamuna and Son. Yamuna joins the Ganga at Allahabad.
- *Kosi* is called as '*Sorrow of Bihar*' while Damodar is called as '*Sorrow of Bengal*' as these cause floods in these regions. Hooghly is a distributory of Ganga flowing through Kolkata.

(iii) The Brahmaputra River System

- It is one of the largest river of the world. It is known as Tsangpo in Tibet, Dihang or Siang in Arunachal Pradesh, Brahmaputra in Assam and Jamuna in Bangladesh. Brahmaputra forms largest number of riverine islands. Majuli is the largest riverine island in the world.
- The combined stream of Ganga and Brahmaputra forms the biggest delta in the world, the Sunderbans, covering an area of 58752 sq km. Its major part is in Bangladesh.
- Brahmaputra is volume wise largest river of India, whereas lengthwise Ganga is the longest in India. Tributaries of river are Manas, Subanshri, Dibang, Lohit.

The Peninsular River

- The peninsular drainage system is older than the Himalayan one. A large number of the Peninsular rivers are seasonal, as their flow is dependent on rainfall.
- *The peninsular river system is divided into East flowing rivers and West flowing rivers, they are as follow*

i. **East Flowing Rivers** Most of the major rivers of Penninsula flow Eastwards and drains into the Bay of Bengal. These rivers makes delta at their mouths. *They are as follow*

East Flowing Rivers

Rivers	*Source*	*Length*	*Tributaries*
Mahanadi	North foothills of Dandakarnaya	857 km	Seonath, Hasdeo, Ib, Mand, Tel, Ong and Jonk.
Godavari	Trimbak plateau of North Sahyadri near Nashik	1465 (longest river of Peninsular India.	Penganga, Wardha, Wainganga Indravati, Sabari, Manjira.
Krishna	North of Mahabaleshwar in the Western ghat	1400 km	Bhima, Tungabhadra, Ghat Pradha, Malaprabha, Musi and Koyna.
Kaveri	Rise in Brahmgiri range in Western ghat	800 km	Horongi, Hemavati, Shimsa, Arkavati, Kabani, Bhavani and Amravati etc.

ii. **West Flowing Rivers** (or Estuaries Forming Rivers) The two most important rivers such as Narmada and Tapti are the only long rivers of the West flowing penninsula rivers. These two rivers make Estuaries rather than making a Delta, because of their swift flow and steep slopes.

Some of the West flowing rivers are as follow

West Flowing Rivers

River	*Source*	*Length*	*Characteristic*
Sabarmati	Mewar in Aravalli range	320 km	It falls into Gulf of Khambat and its tributaries are Hathmati, Sedhi, Wakul.
Mahi	Rises from Vindhyan range	533 km	Flows in Madhya Pradesh, Rajasthan and Gujarat.
Narmada	Amarkantak plateau	1312 km	Tributaries : Hiran, Tawa, Banjar, Shar, Shakkar and Burhner. It flows into Gulf of Khambat. It flowes through Madhya Pradesh, Maharashtra and Gujarat.
Tapi	Rises near Multai on the Satpura range in Betul district	724 km	Also known as 'twin' or handmaid of Narmada. Main Tributaries: Purna, Betul, Arunavati, Ganjal etc.
Luni	Rises from Aravalis	495 km	Also called *salt river*. It is finally lost in the marshy grounds at the head of the Rann of Kutch.

Important River Projects and their Beneficiary States

Project	*River*	*Purpose*	*Beneficiary States*
Bhakra Nangal Project	Sutlej	Power and irrigation	Punjab, Himachal Pradesh, Haryana and Rajasthan
Damodar Valley	Damodar	Power, irrigation and flood control	Jharkhand and West Bengal
Hirakud	Mahanadi	Power and irrigation	Odisha
Tungabhadra Project	Tungabhadra	Power and irrigation	Andhra Pradesh and Karnataka
Nagarjunasagar Project	Krishna	Power and irrigation	Andhra Pradesh, Telangana
Gandak River Project	Gandak	Power and irrigation	Bihar, Uttar Pradesh, Nepal (joint venture of India and Nepal)
Kosi Project	Kosi	Flood control, Power and irrigation	Bihar and Nepal
Farakka Project	Ganga, Bhagirathi	Power, irrigation, avoid accumulation of slit to improve navigation	West Bengal
Beas Project	Beas	Irrigation and power	Rajasthan, Haryana, Punjab and Himachal Pradesh
Indira Gandhi Canal Project (Rajasthan Canal Project)	Sutlej, Beas and Ravi	Irrigation	Rajasthan, Punjab and Haryana
Chambal Project	Chambal	Power and irrigation	Madhya Pradesh and Rajasthan
Kakrapara Project	Tapi	Irrigation	Gujarat
Ukai Project	Tapi	Power and irrigation	Gujarat
Tawa Project	Tawa (Narmada)	Irrigation	Madhya Pradesh
Poochampad Project	Godavari	Irrigation	Telangana
Malaprabha Project	Malaprabha	Irrigation	Karnataka
Durgapur Barrage	Damodar	Irrigation and navigation	Karnataka, West Bengal and Jharkhand
Mahanadi Delta Project	Mahanadi	Irrigation	Odisha
Iddukki Project	Periyar	Hydroelectricity	Kerala
Ramganga Multipurpose Project	Chuisot stream near Kalagarh	Power and irrigation	Uttarakhand
Matatilla Project	Betwa	Multipurpose power and irrigation	Uttar Pradesh and Madhya Pradesh
Tehri Dam Project	Bhilangana, Bhagirathi	Hydroelectricity	Uttarakhand
Rihand Scheme	Rihand	Hydroelectricity	Uttar Pradesh
Kundah Project	Kundah	Hydroelectricity and irrigation	Tamil Nadu
Mandi Project	Beas	Irrigation	Himachal Pradesh
Shivasamudram Project	Cauveri	Irrigation	Karnataka
Tata Hydel scheme	Bhima	Hydroelectricity	Maharashtra
Mahi Project	Mahi	Irrigation	Gujarat
Thein Project	Ravi	Irrigation	Punjab

Lakes

- Chilka lake is the largest brackish water lake in India and Wular lake in Kashmir is largest fresh water lake.
- Loktak lake of Manipur is the largest fresh water lake of North-East India.
- Largest man-made lake of India is Govind Vallabh Pant Sagar and it water reservior of Rihand Water Project.
- Lonar lake in Maharashtra is believed to made because of fall of asteroid while Ukai lake is man-made lake of Tapti river.

Famous Lakes of India and their Location

Lake	*Location*
Chilka Lake	Odisha
Sambhar Lake	Rajasthan
Hussain Sagar Lake	Andhra Pradesh
Dal Lake	Jammu & Kashmir
Wular Lake	Jammu & Kashmir
Didwana Lake	Rajasthan
Koleru Lake	Andhra Pradesh
Pulicat Lake	Kerala
Sheshnag Lake	Jammu & Kashmir
Manasbal Lake	Jammu & Kashmir
Ashtamudi Lake	Kerala

Important Indian Towns on Rivers

Town	*River*	*Town*	*River*
Jamshedpur	Subarnarekha	Ahmedabad	Sabarmati
Delhi	Yamuna	Patna	Ganga
Kanpur	Ganga	Kota	Chambal
Surat	Tapi	Jabalpur	Narmada
Ferozpur	Sutlej	Panji	Mandavi
Allahabad	At the confluence of the Ganga and Yamuna	Ujjain	Kshipra
Varanasi	Ganga	Guwahati	Brahmaputra
Haridwar	Ganga	Kolkata	Hooghly
Badrinath	Alaknanda	Cuttack	Mahanadi
Ludhiana	Sutlej	Hyderabad	Musi
Srinagar	Jhelum	Nashik	Godavari
Ayodhya	Saryu	Lucknow	Gomti

Important Waterfalls of India

Waterfall	*Height (km)*	*River*	*State*
Kunchikal	455	Varani	Karnataka
Jog/Gersoppa	260	Sharavati	Karnataka
Rakim Kund	168	Gaighat	Bihar
Chachai	127	Bihad	Madhya Pradesh
Keoti	98	Mahanadi	Madhya Pradesh
Sivasamudram	90	Cauveri	Karnataka

The Climate of India

- India has tropical monsoon type of climate. It is greatly influenced by the presence of himalayas in the North as they block the cold masses from Central Asia. It is because of himalayas that the monsoons shed their water in India.
- The **Tropic of Cancer** (23.5°N) divide India into two climatic zones, namely; the Northern zone and the Southern zone.
- The warm temperature or the subtropical climate of the Northern zone gives it cold winter seasons and hot summer seasons.
- The Southern tropical climate zone is warmer than the North and does not have a clear cut winter season.
- The Southern zone has the mid-day Sun almost vertically overhead at least twice every year and the Northern zone does not have the mid-day Sun vertically overhead during any part of the year.

Climatic Regions of India

Climate Type	*Areas*	*Characteristics*
Tropical Rain Forests Climate	Western ghats, West Coastal plains, Parts of Assam and Tripura.	High temperature throughout the year, heavy seasonal rainfall, annual rainfall 200 cm annually (May to November)
Tropical Savanna Climate	Most of Peninsular region (except leeward side of Western ghats)	Dry winters, annual rainfall varies from 76 cm to 150 cm
Tropical Semi-Arid Steppe Climate	Rainshadow belt running Southward from Central Maharashtra to Tamil Nadu	Low rainfall varies from 38 cm to 80 cm and temperature from 20° to 30°C
Tropical and Sub-tropical Steppes Climate	Punjab, Haryana and Kutch region	Temperature varies from 12°C-35°C
Tropical Desert Climate	Western parts of Barmer, Jaisalmer and Bikaner districts of Rajasthan and parts of Kuchchh	Scanty rainfall (mostly in form of cloud burst), high temperature
Humid Sub-tropical Climate with dry winters	South of Himalayas	Mild winters and extremely hot summers
Mountain Climate	Mountainous region (above 6000 m or more)	Rainfall varies from 63.5 cm to 254 cm. (mostly during South-West Monsoon)

Factors Influencing the Climate of India

Nine factors that influence climate of India are as follow

i. **Location and Latitudinal Extent** The Tropic of Cancer passes through the middle of the country. The region to the South of Tropic of Cancer experiences tropical climate, whereas the region to the North of the Tropic of Cancer experiences warm temperate climate.

ii. **Distance from Sea** The areas near to the sea experience maritime climate, whereas the areas away from the sea experience continental climate.

iii. **The Northern Mountain Range** The Northern Himalayan range protects India from the bitterly cold and dry winds of Central Asia during winter. Moreover, it acts as a physical barrier for the rain bearing South-West monsoon.

iv. **Physiography** The physiography has great impact on the major elements of climate such as temperature, atmospheric pressure, direction of wind and amount of rainfall.

v. **Monsoon Wind** It is the most dominating factor of Indian climate. The South-West summer monsoon from the Arabian sea and the Bay of Bengal bring rainfall to the entire country. Besides the North-East winter monsoon travelling from land to sea causes rainfall along the Coromandel coast after acquiring moisture from the Bay of Bengal.

vi. **Upper Air Circulation** Warm air rises over a warm region. That is called a convection and it creates low pressures. That air then cools down with altitude by the adiabatic effect and move aside. That is called an advection or 'upper air circulation'. This advection affects the climate of India.

vii. **Tropical Cyclones and Western Disturbances** The tropical cyclones generated in Arabian sea and Bay of Bengal during the South-West monsoon and the retreating monsoon seasons influence the weather conditions of the Peninsular India.

WESTERN DISTURBANCES

These are the depressions generated over the Mediterranean sea and enter India after crossing over Iraq, Iran, Afghanistan and Pakistan under the influence of Westerly jet stream. After reaching India, they move Eastwards, causing light rain in the Indo-Gangetic plains and snowfall in Himalayan belt.

viii. **El Nino and La Nina** El Nino is a narrow warm current, which occasionally appears off the coast of Peru in December by temporarily replacing the cold Peru current. The warming of tropical Pacific waters affect the global pattern of pressure and wind systems including the monsoon winds in the Indian ocean. La Nina is the reverse of El Nino. It is a harbinger of heavy monsoon showers in India.

ix. **Southern Oscillation** Whenever the surface level pressure is high over the Indian ocean, there is low pressure over the Pacific ocean and *vice-versa*. This inter-relation of high and low pressure over the Pacific and the Indian ocean is called Southern Oscillation.

Seasons in India

Indian climate is characterised by distinct seasonality Indian Meteorological Department (IMD) has recognised the following four distinct seasons.

Winter Season

- This season starts by late November respresentating clear skies, fine weather, light northerly winds, low humidity and temperatures and large day time variations of temperatures.
- The rains during this season generally occur over the Western Himalayas, extreme North-Eastern parts of Tamil Nadu and Kerala.

Summer Season

- This season begins all over the country in March and by April the average daily temperature of 30-35°C is reached.
- Central Indian land becomes very hot and humid, the temperature reaches to 40°C at many locations.
- Only 1% rainfall of total Indian rainfall mostly by storms by convective current is received.

Rainy Season

- This season starts from June and stays to last September. During this season, there is high heat, high humidity and extensive cloud.
- There are several spells of moderate to heavy rainfall throughout the country. Most of the rainfall is through South-West Monsoon.

Autumn Season

- This season starts from mid-September and stays to November. In this season, there is no cloud but sometime severe and devastating tropical cyclone hit the coastal regions.
- Rainfall occurs due to retreating monsoon and it causes rainfall in Tamil Nadu, some parts of Andhra Pradesh and Kerala.

SOIL

- Soil is formed when rocks are broken down by the action of wind, water and climate. This process is called *weathering*. The characteristic features of a soil depend upon the rocks from which it has been formed.
- Soil forms different layers of particles of different sizes. Each layer is different from the other in texture, colour and chemical composition. Even the thickness of each layer is not the same. A vertical section that shows different layers of soil is called a *soil profile*. Each layer is called a *horizon*.

Major Soils of India

On the basis of genesis, colour, composition and location, the soils of India have been classified into the following types

Alluvial Soils

- They cover the largest area in India (40%) and are the most important soils from agricultural point of view.
- Alluvial soils are widespread in the Northern plains and the river valleys. Through a narrow corridor in Rajasthan, they extend into the plains of Gujarat.
- Geologically, the alluvium is divided into new alluvium which is known as *khadar* and old alluvium, as *bhangar*.
- The newer alluvium is sandy and light coloured, whereas, older alluvium is more clayey, dark coloured and contains lime concretions. The conglomerate deposits in piedmont area are generally known as *bhabar*.
- These soils are suitable for rice, wheat, sugarcane, oil-seeds and jute cultivation.

Black Soils/Regur Soils

- The principal region of black soils is the Deccan plateau and its periphery. They are formed from Deccan basalt trap rocks and occur in areas under the monsoon climate, mostly of semi-arid and sub-humid types.
- The soils are characterised by dark grey to black colour, high swelling and shrinkage, plasticity, deep cracks during summer and poor status of organic matter, nitrogen and phosphorus while they are rich in lime, iron, magnesia and alumina. Impeded drainage and low permeability are the major problems. Cotton is most commonly grown on this soil.

Red and Yellow Soils

These soils are derived from granite, gneiss and other metamorphic rocks. These soils are formed under well drained condition. The soils are higher textured and contain low soluble salts. They are slightly acidic to slightly alkaline, well drained with moderate permeability. They are also poor in nitrogen, phosphorus, lime, humus etc.

Laterite Soils

Laterite soil is peculiar to India and some of the tropical countries where there are high temperatures and heavy rainfall with alternate dry and wet periods. During rainfall silica is leached downwards and iron and aluminum oxides remains in the top layers.

Desert Soils

- In the North-Western part of India, desert soils occur over major parts of Rajasthan, South of Haryana and Punjab and Northern part of Gujarat. The region consists of sand dunes and undulating sandy plains.
- The soils in the plains are mostly derived from alluvium and are pale brown to yellow-brown and fine sandy to loamy fine sand and are structureless.
- The clay contents low and presence of alkaline Earth carbonates is an important feature. By increasing the water holding capacity, the productivity of the soils can be increased, which involves addition of organic matter and clay.

Swampy/Peaty Soils

- Peaty soils originate in areas of heavy-rainfall, but inadequate drainage facility.
- These soils are usually found at the foot hills and extend in strips of varying widths at the foot of Himalayas in Jammu & Kashmir, Uttarakhand, Uttar Pradesh, Bihar and West Bengal.
- Karewa soil found in the Jammu & Kashmir and zaffran cultivation is done on it.

Saline Soils

- The soils are salt affected and unless and until reclamation measures are taken up, the soils cannot become productive. In India, areas around 7 million hectares are salt affected distributed in different states.
- Saline soils are formed due to accumulation of soluble salts which consists of chlorides and sulphates of calcium and magnesium.

Forest Soils

Forest soils are formed in the forest areas, where sufficient rainfall is available. The soils vary in structure and texture depending on the mountain environment where they are formed.

Soil Erosion and Degradation

- The destruction of the soil cover is described as soil erosion, while decrease in its fertility is **soil degradation**. Wind and water are powerful agents of soil erosion because of their ability to remove soil and transport it.
- **Wind erosion** is significant in arid and semi-arid regions. In regions with heavy rainfall and steep slopes, erosion by running water is more significant.

Types of Soil Erosion

- *Soil erosion can be divided into three types, which are as follow*
  - i. **Run-off Erosion** It is due to rills and gullies. The worst affected areas are those of Chambal, Betwa and Ken rivers.
  - ii. **Sheet Erosion** It is the main problem in Rajasthan, where sandy soil is removed by run-off process.
  - iii. **Splash Erosion** It is the problem of broad leaf dense forest in the region of Madhya Pradesh, North-East India and Chhotanagpur.
- *Way to prevent soil erosion*
  - Afforestation
  - Agroforestry
  - Contour farming
  - Terrace farming

NATURAL VEGETATION OF INDIA

India is a land of great variety of natural vegetation. Cultivated crops and fruits, orchards form part of vegetation but not natural vegetation. First classification of Indian vegetation was given by Champion and Seth.

Indian vegetation can be divided into the following groups

Tropical Forests

Tropical forests are divided into–Moist Forest and Dry Forest, which are as follow

(i) Moist Forest

Moist forest can be classified as

Tropical Wet Evergreen Forests

- It is found in the areas where the annual rainfall exceeds 250 cm and annual temperature is about 25°-27°C. The average annual humidity exceeds 77% and the dry season is distinctly short.
- It includes areas—the Western side of the Western ghats, a strip running from North-East to South-West direction across Arunachal Pradesh, upper Assam, Nagaland, Andaman and Nicobar Island etc. Species of trees found in this forests are white cedar, mesua, jamun, hopea, mahogony, ebony, etc.

Tropical Semi-Evergreen Forests

- These are found in the region where the annual rainfall is 200-250 cm.
- The mean annual temperature varies from 24°-27°C and the relative humidity is about 75%.
- It includes areas—Western coast, Assam lower slopes of the Eastern Himalayas, Odisha and Andamans.
- Species of trees—aini, semul, kadam, rosewood, kusum etc.

Tropical Moist Deciduous Forests

- These are found in the areas having rainfall of 100 to 200 cm per annum, mean annual temperature of about 27°C and the average relative humidity of 60 to 70%.
- It include areas—along the Western ghats surrounding the belt of evergreen forests, a strip along the Shivalik range including Terai and Bhabar from 77°E to 88°E, hills of Eastern Madhya Pradesh, Chhattisgarh, Chhotanagpur and part of Odisha and West Bengal.
- Species of trees found in this forests are teak, sal, laurel, white chuglam, badam, mahua and bamboo etc.

Littoral and Swamp Forests

- These forests occur in and around the deltas, estuaries and creeks. Species of trees found are—sundari, rhizophora, screw pines, sonneratia etc.
- These forests can survive and grow both in fresh as well as brackish water. These forests account for 7% of the world's total mangrove area.

(ii) Dry Forest

Dry forest can be classified as

Tropical Dry Evergreen Forests

- These are found along the coasts of Tamil Nadu, these forests occur in short stature.
- Annual rainfall is about 100 cm and the mean annual temperature is about 28°C. The mean humidity is about 15%.
- Species of trees found here are khirni, jamun, tamarind, neem etc.

Tropical Dry Deciduous Forests

- These are similar to moist deciduous forests and shed their leaves in dry season. These are most dominant natural vegetation in India.
- These forests can grow in areas of even less rainfall of 100-150 cm per annum.
- Species of trees— teak, axlewood, tendu, palas, bel etc.

Tropical Thorn Forests

- These forests generally occur in the area of low rainfall and high temperature. Species of trees found are khair, neem, babul, cacti, palas etc.
- The areas are North-Western parts of the country including Rajasthan, South-Western Punjab, Western Haryana, Kutch etc.

Sub-tropical Forest

Sub-tropical forest are of three types

(i) Sub-tropical Broad-leaved Hill Forests

- These forests occur in the Eastern Himalayas to the East of 88°E longitude at altitudes varying from 1000 to 2000 m.
- The mean annual rainfall is 75 cm to 125 cm, average annual temperature is 18°-21°C. They form luxurious forests of evergreen species.
- Species of trees—oaks, chestnuts, sals and pines (on lower and higher margin respectively) etc.
- They also occur in the Nilgiri and Palni Hills at 1070-1525 m above sea level. These forests are generally called *shola*.

(ii) Sub-tropical Moist Pine Forests

- They are found at the height of 1000 to 2000 m above sea level in the Western Himalayas between 73°E and 88°E longitudes.
- **Chir** is the most dominant tree.

(iii) Sub-tropical Dry Evergreen Forests

- Found in the Bhabar, the Shiwaliks and the Western Himalayas upto about 1000 m above sea-level, rainfall is between 50 to 100 cm.
- Olive, Acacia, Modesta and Pistacia are the important species of trees.

Temperate Forest

Temperate forest futher divided into three types

(i) Montane Wet Temperate Forests

- The forests grow at a height of 1800 to 3000 m above sea level. The mean annual rainfall is 150 cm to 300 cm, the mean annual temperature is about 11°C-14°C and the average relative humidity is over 80%.
- Species of trees—deodar, chilaune, Indian chestnut, birch, blue pine etc. They are found in the higher hills of Tamil Nadu and Kerala, in the Eastern Himalayan region to the East of 88°E longitude.

(ii) Himalayan Moist Temperate Forests

- These forests are mainly composed of coniferous species such as pines, cedars, silver, firs, spruce etc.
- These forests occur in the temperate zone of the Himalayas between 1500 and 3300 m. Rainfall varies from 150 cm to 250 cm.

(iii) Himalayan Dry Temperate Forests

- These are coniferous forests with xerophytic shrubs. Deodar, chilgoza, oak, olive etc are the main trees.
- Such forests are found in the inner dry ranges of the himalayas.

MANGROVES

Mangroves are very specialised forest ecosystem of tropical and sub-tropical regions of the world bordering sheltered sea-coasts. They occur all along the Indian coastline in the sheltered estuaries, tidal creeks, backwaters, salt marshes and mudflats.

Mangroves are dominated by salt tolerant halophytic plants of diverse structure, and are invaluable **marine nurseries** for a large variety of fish and other marine fauna. They support a large variety of birds, amphibians and many other local arboreal, benthic and water creatures. Mangroves have a dense network of aerial roots, which help to aerate the root system and anchor the tree. Sundari is widespread in sunderbans, screw pines, canes and palms are common in deltas, cracks are often lined **with Nipa.**

MANGROVES IN INDIA

Region	–	State/UT
Sunderbans	–	West Bengal
Godavari and Krishna	–	Andhra Pradesh
Ratnagiri	–	Maharashtra
Gulf of Kutch	–	Gujarat
Condapur	–	Karnataka
Vembanad	–	Kerala
Kaveri delta	–	Tamil Nadu
Mahanadi delta and Bhitarkanika	–	Odisha
Andaman and Nicobar	–	Andaman and Nicobar

AGRICULTURE IN INDIA

- India is a vast country endowed with a great variety of natural environments and thus, provides conditions for a large number of crops to be grown in various parts.
- Crops grown in the country are grouped into a number of categories on the basis of the growing season, role of particular crop in rural economy and some other considerations.

Types of Farming

Various geographical, physical and socio-economic factors are responsible for giving birth to different types of farming in different parts of the country.

Subsistence Farming

Farmers cultivate small and scattered holdings with the help of draught animal and family members. The tools and techniques used are primitive and simple and main focus is on food crops. The farmers and his family members consume the entire farm production.

Plantation Farming

It involves growing and processing of a single cash crop purely meant for sale. It is capital intensive and the other necessary things needed are vast estate, managerial ability, technical know- how, fertilizer, good transport facilities, processing factory etc. This type of agriculture is mainly practiced in *Assam, sub-Himalayan West Bengal* and in *Nilgiri, Anaimalai* and *Cardamom hills* in *South*.

Shifting Agriculture

It is practised by the tribals in the forest areas of Assam, Meghalaya, Nagaland, Manipur, Tripura, Mizoram, Arunachal Pradesh, Odisha, Madhya Pradesh and Andhra Pradesh. In this type of agriculture, a piece of forest land is cleared mainly by tribal people by felling and burning of trees and crops are grown. Dry paddy, buck wheat, maize, small millets, tobacco and sugarcane are the main crops grown under this type of agriculture. This is a very primitive method of cultivation which results in large scale deforestation and soil erosion especially on the foot hill sides.

Organic Farming

A new trend of farming in which all inputs used for farming are natural no chemical are used. Green manures and compost are used. Emphasis has been given on mixed farming, crop rotation. Sikkim is the first organic state in India.

Cropping Seasons

Three types of cropping seasons are found in India.

i. **Kharif** It requires much water, long hot weather for their growth, grown in June with the arrival of South-East monsoon. e.g. rice, jowar, maize, cotton, groundnut, jute, tobacco, bajra, sugarcane, pulses etc.

ii. **Rabi** Grown in winter, required cool climate during growth and warm climate during ripening of seeds and maturation. Sowing is done in November and harvested in April-May. e.g. wheat, gram and oilseeds like, mustard and rapeseed etc.

iii. **Zaid** A brief cropping season practised in irrigated areas. Sown in February- March, harvested in June. e.g. urad, moong, melons, water melons.

MAJOR CROPS

- With varied types of climate relief, soil and with plenty of sunshine and long growing season, India is capable of growing almost each and every crop.
- Crops requiring tropical, sub-tropical and temperate climate can easily be grown in one or the other part of India.

Major Crops of India

Crops	*Temperature (0°C)*	*Rainfall (cm)*	*Soil*	*Distribution*
Cash Crops				
Cotton	21-30	50-75	Black Soil	Gujarat, Maharashtra, Punjab
Jute	24-35	125-200	Sandy or Clayed Loams, Deep Rich	West Bengal, Odisha, Bihar, Assam
Sugarcane	20-26	150	Loamy Soil	Uttar Pradesh, Maharashtra, Tamil Nadu
Tobacco	15-38	50	Friable Sandy Soil	Uttar Pradesh, Andhra Pradesh, Gujarat, Karnataka
Food Crops				
Rice	24-27	150	Clayed and Loamy Soil	West Bengal, Andhra Pradesh, Uttar Pradesh, Punjab
Wheat	10-15	5-15	Light, Sandy, Clayed Loamy Soil	Uttar Pradesh, Punjab, Haryana, Rajasthan
Jowar	27-32	30-65	Black Clayed Loamy Soil	Maharashtra, Karnataka, Madhya Pradesh
Bajra	25-35	40-50	Loamy Soil	Rajasthan, Uttar Pradesh, Haryana, Maharashtra, Gujarat
Plantation Crops				
Tea	24-30	150-250	Loamy Forest Soil	Kerala, Tamil Nadu, West Bengal, Assam
Coffee	16-28	150-250	Friable Forest Loamy Soils	Karnataka, Kerala, Tamil Nadu
Rubber	25-35	300	Loamy Soils	Kerala, Karnataka, Tamil Nadu

RESOURCES

A resource is a source or supply from which benefit is produced. It is an economic or productive factor required to accomplish an activity or as means to undertake an enterprise and achieve desired outline. *On broadly view, actually there are only two resources. They are*

Mineral Resources

- A mineral is an aggregate of two or more than two elements. A mineral has a definite chemical composition, atomic structure and is formed by inorganic processes. In economic geography, the term mineral is used for any naturally occurring material that is mined and is of economic value.
- Minerals generally occur in the Earth's crust in the form of ore. The availability and per capita consumption of minerals is taken as an important indicator to assess the economic development of a country.

Metallic Mineral Mines

Metallic Mineral	*Mines*
Iron	Kemmangundi, Sandur and Hospet (Karnataka), Barbil-Koira (Odisha), Bailadila and Delhi-Rajhara (Chhattisgarh), North Goa
Manganese	Found in Karnataka, Odisha, Madhya Pradesh, Maharashtra
Chromite	Found in Odisha, Bihar, Karnataka, Maharashtra and Andhra Pradesh
Copper	Malanjkhand Belt (Balaghat, Madhya Pradesh), Khetri-Singhana Belt (Jhunjhun), Singhbhum (Jharkhand)
Bauxite	Found in Odisha, Gujarat, Jharkhand, Maharashtra, Chhattisgarh
Gold	Kolar and Hutti (Karnataka), Ramgiri in Anantapur (Andhra Pradesh)

Non–Metallic Mineral Mines

Non-Metallic Mineral	*Mines*
Limestone	Found in Andhra Pradesh, Rajasthan, Madhya Pradesh, Gujarat, Chhattisgarh
Dolomite	About 90% of the dolomite is found in Madhya Pradesh, Chhattisgarh, Odisha, Gujarat, Karnataka, West Bengal
Asbestos	Rajasthan, Andhra Pradesh and Karnataka
Gypsum	Found in Rajasthan, Jammu & Kashmir
Graphite	Ocurs in Kalahandi, Bolangir (Odisha) and Bhagalpur (Bihar)

Energy Resources

India is a fast growing country and therefore, the demand for the energy is also continuously growing. India has exploited almost all the sources of energy such as hydroelectricity, thermal energy, nuclear energy, solar energy, wind energy etc.

Energy Resources in India

- The natural resources for electricity generation in India are unevenly dispersed and concentrated in a few pockets. Hydro resources are located in the Himalayan foothills and in the North-Eastern Region (NER).
- Coal reserves are concentrated in Jharkhand, Odisha, West Bengal, Chhattisgarh, parts of Madhya Pradesh, whereas lignite is located in Tamil Nadu and Gujarat.
- North Eastern Region, Sikkim and Bhutan have vast untapped hydro potential estimated to be about 35000 MW in NER, about 8000 MW in Sikkim and about 15000 MW in Bhutan.

Conventional Sources of Energy

The conventional sources of energy are generally known as non-renewable sources of energy. They are being used since a long time. Conventional sources of energy are coal, petroleum, natural gas, cattle dung cake, hydel power.

Thermal Energy

- Thermal electricity is produced with the help of coal, petroleum and natural gas. About 65% of the total electricity produced is thermal in character.
- Thermal electricity has special significance in those areas, where geographical conditions are not very favourable for generation of hydroelectricity. It accounts for more than half of the installed capacity in 14 states.

ULTRA MEGA POWER PLANTS (UMPPs)

It is one of the initiatives of the Central Government to develop power projects with capacity of 4000 MW, with a view to providing to all at a responsible rate and ensuring fast capacity addition under tariff based international competitive bidding route.

Hydel Electricity

- Hydroelectric power play a significant role in view of the energy crisis, which India is currently facing.
- The hydroelectric power generation in India made a humble start at the end of the 19th century, with the commissioning of electricity supply in Darjeeling during 1897, followed by a hydropower station at Sivasamudram in Karnataka during 1902.

Non-Conventional Sources of Energy

- Most of non-conventional energy are renewable in nature. The non-conventional energy sources include solar energy, wind energy, biomass energy, fuel cell, electric vehicles, tidal energy, hydrogen energy and geothermal energy.
- The renewable energy programme started with the establishment of the Department of Non-conventional Energy Sources in 1982 in India. Indian Renewable Energy Development Agency was set-up in 1987.
- In 1992, DNES was converted into Ministry of Non-conventional Energy Sources, which is renamed in 2006 as Minister of New and Renewable Energy (MNRE). The minister, now has taken up some programmes on various new technologies.

Atomic Energy

Nuclear power is fourth largest source of electricity in India after, thermal, hydroelectricity and conventional source of power.

The Major Atomic Power Stations

Power Station	*Location*
Tarapur	Maharashtra
Rawatbhata	Rajasthan
Kalpakkam	Tamil Nadu
Narora	Uttar Pradesh
Kakrapara	Gujarat
Kaiga	Karnataka
Kudankulam	Tamil Nadu
Banswara	Rajasthan (UC)

Solar Energy

- India being a tropical country is well endowed with plenty of solar energy.
- In India, the solar energy is exploited through both the thermal and photovoltaic routes for a variety of applications like cooking, water heating, drying of the farm products, water pumping, street lighting etc.

Wind Energy

- Wind is an important non-conventional energy resource. It is cheap, pollution free, eco-friendly and can be developed away from the sources of fossil fuels.
- For generation of wind energy, a wind speed of more than 5 km per hour is considered to be suitable.

Geothermal Energy

- It is the heat energy in the Earth's interior. In the Earth's crust, for instance, the temperature rises by 1°C for every 30 m.
- This energy can be tapped for our needs. However, such energy is largely concentrated in volcanic regions of the Earth and deep drilling techniques are not yet economical.

Tidal Energy

- Among the various forms of energy contained in the seas and oceans, tidal energy, has been developed on a commercial scale.
- India has a long coastline with the estuaries and gulfs, where tides are strong enough to move turbines for electrical power generation.

INDUSTRIES

The industries sector is regarded as the growth engine of the economic development of a nation an particularly in India being an emerging economy.

Industries in India

Industries	*Details*
Cotton Textile Industry	✦ The first modern cotton textile mill was established in Bombay in 1854 by local parsi entrepreneurs with the name of Bombay spinning and weaving company that is why Mumbai is called cotton polis of India, Ahmedabad is called Manchester of India, Coimbatore is called Manchester of South India and Kanpur is called Manchester of Uttar Pradesh. ✦ **Distribution** Maharashtra (Mumbai, Sholapur, Pune, Kolhapur, Satara, Wardha, Aurangabad and Amravati), Gujarat (Ahmedabad, Vadodra, Rajkot, Surat, Bhavnagar, Porbandar, Maurvi and Viramgam). Tamil Nadu (Chennai, Tirunelveli, Madurai, Tuticorin, Salem, Virudhnagar and Pollachi), Karnataka (Bengaluru, Belgaum, Mangaluru, Chitradurga, Gulbarga and Mysore), Uttar Pradesh (Kanpur, Etawah, Modinagar, Moradabad, Bareilly, Agra, Meerut and Varanasi), Madhya Pradesh (Indore, Gwalior, Ujjain and Bhopal), Rajasthan (Kota, Jaipur, Sriganganagar, Bhilwara and Udaipur).
Woolen Textiles Industry	✦ The first woolen textiles mill was set-up in 1876 at Kanpur. ✦ Jammu and Kashmir is a large producer of handloom woolen goods. ✦ **Distribution** Punjab (Dhariwal, Amritsar, Ludhiana, Ferozpur), Maharashtra (Mumbai), Uttar Pradesh (Kanpur, Mirzapur, Agra, Tanakpur)
Jute Textiles Industry	✦ First modern jute mill was set-up in 1855 at Rishra near Kolkata. ✦ India is the largest producer of raw jute and jute good production, whereas it is second largest exporter of jute goods after Bangladesh. ✦ **Distribution** West Bengal, Bihar, Uttar Pradesh, Andhra Pradesh, Assam, Odisha, Tripura and Chhattisgarh.
Silk Textile Industry	✦ India is the second largest producer of natural silk, after China and is the only country producing all four varieties or natural silk *viz* Mulberry, Tasar, Eri and Muga of which Golden yellow Muga silk is unique in India. ✦ **Distribution** Karnataka is the leading producer followed by West Bengal, Bihar, Assam etc.
Rubber Industry	✦ The first factory of synthetic rubber was set-up at Bareilly. ✦ **Distribution** Bareilly (Uttar Pradesh), Baroda (Gujarat) Synthetic Rubber Units, Mumbai, Ahmedabad, Amritsar-Reclained Rubber Units.
Tea Industry	✦ Tea cultivation in India was first started in the mid-19th century in Darjeeling, Assam and Nilgiris. ✦ Nearly 98% of the tea production comes from Assam, West Bengal, Tamil Nadu and Kerala, while the rest of it comes from Karnataka, Tarai region of Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur and Tripura.
Sugar Industry	✦ Uttar Pradesh is the leading producer of sugar. **Distribution** Uttar Pradesh (Gorakhpur, Deoria, Basti, Gonda, Meerut, Saharanpur, Muzaffarnagar, Bijnor and Moradabad), Bihar (Darbhanga, Saran, Champaran and Muzaffarpur), Punjab (Phagwara and Dhuri), Haryana (Ambala, Rohtak and Panipat), Maharashtra (Nashik, Pune, Satara, Sangli, Kolhapur and Solapur) and Karnataka (Munirabad, Shimoga and Mandya).
Paper Industry	✦ The first Paper mill in the country was set-up at Serampore (Bengal) in 1832, which failed. In 1870, a fresh venture was started at Ballygunj near Calcutta. ✦ Raw material : Bamboo (70%), Salai wood (12%), Sabai (9%), Bagasses (4%) and Waste paper and Rags (5%). ✦ **Ditribution** Madhya Pradesh (Nepanagar), Hindustan Paper Corp, Vellore, Mysore Paper mill, Bhadravati, Maharashtra, (Mumbai, Pune, Ballarpur and Kamptee produce Paper and Vikhroli), Andhra Pradesh (Rajahmundry and Sirpur), Madhya Pradesh (Indore, Bhopal and Shahdol), Karnataka.
Iron and Steel	✦ **Distribution** Bhadrawati (Karnataka), Jamshedpur (Jharkhand), Durgapur, Burnpur (West Bengal), Bokaro (Jharkhand, Bhadrawati) (Karnataka), Rourkela (Odisha), Bhilai (Chhattisgarh), Salem (Tamil Nadu) and Visakhapatnam (Andhra Pradesh).
Ship	✦ **Distribution** Cochin Shipyard, Mumbai (Mazgaoze Dock), Hindustan Shipyard at Visakhapatnam and Kolkata (Gorden Reach workshop). For Indian Navy, only at Mazgaon.
Aircraft Industry	✦ **Distribution** Hindustan Aeronautics India Limited was formed by merging two aricraft factories at Bengaluru and Kanpur. Four other factories are at Nashik, Lucknow, Koraput (Odisha) and Hyderabad.
Refineries	✦ **Distribution** Gujarat (Koyali, Tamnagar, Vadinagar), Assam (Digboi, Bongaigaon, Guwahati, Naharkatiya), West Bengal (Haldi), Mumbai, Visakhapatnam, Mathura, Kochi, Bihar (Barauni), etc.
Fertilizer Industry	✦ The Fertilizer Corporation of India (FCI) was set-up in 1961. ✦ National Fertilizer Limited (NFL) was set-up in 1974. ✦ **Distribution** Sindri (Bihar), Nangal, Trombay, Gorakhpur (Uttar Pradesh), Durgapur, Namrup, Cochin, Rourkela, Neyveli, Varanasi, Vadodra, Kanpur, Visakhapatnam and Kota.

Industries	*Details*
Heavy Machinery	✦ **Distribution** Durgapur, Mumbai, Ranchi, Visakhapatnam, Tiruchirappalli and Naini.
Machine Tool Industry	✦ It forms the basis for the manufacturing of industrial, defence equipments, automobiles, railway engines and electrial machinery. ✦ **Distribution** Hyderabad, Bengaluru, Pinjore (Haryana), Kalamassery (Kerala), Secunderabad, Ajmer and Srinagar.
Heavy Electrical Equipments	✦ **Distribution** Bengaluru, Bhopal, Jammu, Tiruchirappalli, Ramchandrapuram (Hyderabad) and Jagdishpur (Uttar Pradesh).
Photo Films Industry	✦ The Hindustan Photo Films Manufacturing Company at Udhagamandalam (Tamil Nadu) is the only factory in the public sector, producing photo paper and films.
Glass Industry	✦ **Distribution** Uttar Pradesh (Firozabad, Balijoi, Hathras, Naini, Shikandrabad), Maharashtra (Mumbai, Telogaon, Pune Sitarampur), Tamil Nadu (Tiruvottiyur) and Karnataka (Bolgaon, Bengaluru).

TRANSPORT

Transport is a mean for movement of people, animals and goods from one location to another. There are various mode of transport such as road, rail, air, water etc. Transport is important because it enables trade between different regions, which is essential for the development of societies.

Railways

- India has the second largest railway network in Asia and the third largest in the world after the USA and China. *The Indian railway operate in three different gauges, which are as follow*

Gauge	*Routes* (km)
Broad Gauges (l. 676 m)	55000
Meter Gauges (l. 000 m)	6809
Narrow Gauges (0.761 and 0.610 m)	2463

- It is the largest public sector undertaking of the country and it is the world's second largest railway network under single management. The first Indian railway line in India was operated for public traffic in 1853 between Mumbai and Thane over a distance of 34 km.
- The second train ran between Howrah and Hooghly in 1854. The first electric train in India was 'Deccan Queen', it was introduced in 1929 between Bombay and Poona.
- The headquarters of Indian railway is in New Delhi. The fastest train in India is the Agra-Delhi Gatimaan Express, whose maximum speed is 160 km/hr.
- India has 16 railway zones. Indian railways has the second biggest electrified system in the world after Russia.
- The first metro rail was introduced in Kolkata on 24th October, 1984. The two stations connected were Dumdum and Belgachia.
- Beside Kolkata, metro rail is in operation in Chennai, Delhi, Bengaluru, Gurgaon and Mumbai.
- The oldest steam engine 'Fairy Queen' still runs on rail. Uttar Pradesh has largest railway network in India. Howrah Junction is busiest railway junction of India.
- Railway track electrification was introduced in early 1920s. The first two sections from Victoria Terminus to Kurla and from Victoria Terminus to Bandra were electrified.
- Anil Kakadhar Committee was constituted for Rail Safety in 2011.

Vivek Express It has the longest train route in India connecting Dibrugarh and Kanyakumari. It is 8th longest in the world. Previously Himsagar Express (Jammu-Kanyakumari) was the longest express.

Konkan Railways It runs from Mangaluru to Roha (40 km South of Mumbai). Konkan railway connects Maharashtra, Karnataka and Goa. It has total length of 741 km. Almost 10% of the line passes through tunnels.

Metro Rail Metro rail is running in Kolkata, Delhi, Chennai, Jaipur, Bengaluru, Gurgaon and Mumbai.

Roadways

In 1943, Nagpur plan classified the roads into four categories

i. National Highway ii. State Highway
iii. District Roads iv. Village Roads

- Indian road network is the third largest in the world. India has a road network of over 4.42 million km.
- National highways are constructed and maintained by Central Public Works Department (CPWD).

National Highways

NH1	New Delhi-Ambala-Jalandhar-Amritsar	NH10	Delhi- Fazilka
NH2	Delhi-Mathura-Agra-Kanpur Allahabad-Varanasi-Kolkata	NH11	Jaipur - Bikaner
NH3	Agra-Gwalior-Nashik -Mumbai	NH12	Jabalpur-Jaipur
NH4	Thane -Chennai (*via* Pune -Belgaum)	NH24	Delhi-Lucknow
NH5	Kolkata-Chennai	NH27	Allahabad-Varanasi
NH6	Kolkata -Dhule	NH28	Barauni-Lucknow
NH7	Varanasi -Kanyakumari	NH29	Gorakhpur-Varanasi
NH8	Delhi-Mumbai (*via* Jaipur-Baroda-Ahmedabad)	NH47A	Kundanoor-Willington Island in Kochi
NH9	Mumbai-Vijayawada		

Some of the important information regarding the National Highways

- NH5 and NH17 run along the Eastern and the Western coast respectively.
- NH15 represents the border road in Rajasthan desert.
- NH47A is the shortest highway in the Indian highway network.
- NH44 is the longest highways in India, which covers 3745 km and connects Srinagar to Kanniyakumari.

National Highway Development Programme (NHDP)

National Highway Development Programme consists of following projects

- The Golden Quadrilateral Project involves connectivity of
  - Delhi to Kolkata (NH2)
  - Delhi to Mumbai (NH8, NH76 and NH79)
  - Mumbai to Chennai (NH4, NH7 and NH46)
  - Chennai to Kolkata (NH5, NH6 and NH60)
- North-South and East-West Corridors
  - North-South corridor connects Srinagar to Kanyakumari.
  - East-West corridor connects Porbandar (Gujarat) to Silchar (Assam).
- North-South and East-West corridors cross each other at Jhansi (Uttar Pradesh).
- Maximum length of highway is present in Uttar Pradesh.

Airways

- JRD Tata was the first person to take a solo flight from Mumbai to Karachi in 1931. In 1935, the 'Tata Air Lines' started its operation between Mumbai and Thiruvananthapuram and in 1937 between Mumbai and Delhi.
- In 1953, all the private airline companies were nationalised and Indian Airlines and Air India came into existence. International Airports Authority of India and National Airports Authority were merged on 1995 to form Airports Authority of India.

International Airports in India

International Airports	*City*
Rajiv Gandhi Airport	Hyderabad
Calicut International Airport	Calicut
Chhatrapati Shivaji International Airport	Mumbai
Kempegowda International Airport	Bengaluru
Dabolim Airport	Goa
Netaji Subhash Chandra Bose International Airport	Kolkata
Thriuvananthapuram International Airport	Thiruvananthapuram
Lokpriya Gopinath Bordoloi International Airport	Guwahati
Sardar Vallabhbhai Patel International Airport	Ahmedabad
Indira Gandhi International Airport	Delhi
Chennai International Airport	Chennai
Sri Guru Ramdas Jee International Airport	Amritsar
Cochin International Airport	Cochin (Kerala)
Coimbatore International Airport	Coimbatore (Tamil Nadu)
Lal Bahadur Shastri Airport	Varanasi (Uttar Pradesh)
Chaudhary Charan Singh Airport	Lucknow (Uttar Pradesh)
Ambedkar Airport	Nagpur (Maharashtra)

Waterways

Major Waterways of India

Numbers	*Stretches of the Waterway*	*Specifications*
NW1	Allahabad-Haldia (1620 km)	Along Ganga river
NW2	Sadiya- Dhubri (891 km)	Along Brahmaputra river
NW3	Kottapuram-Kollam (168 km)	Along Champakara and Udyogmandal canal
NW4	Bhadrachalam to Rajahmundri and Wazirabad to Vijaywada (1095 km)	Along Godavari and Krishna river
NW5	Mangalgarhi to Paradeep and Talcher to Dhamara (623 km)	Along Mahanadi and Brahmini river system
NW6	Lakhipur to Bhanga (121 km)	Along Barak river

Ports in India

- The Waterways Authority in India divides Indian ports into three categories, major, minor and intermediate.
- India has about 200 ports, with 13 major and the rest intermediate and minor. Project Sagarmala has been concieved for development of ports.

Eastern Coast Ports

Ports of Eastern Coast	*Important Fact*
Kolkata	Oldest port, India's reverine port having two dock system.
Paradip	It handles iron ore and some amounts of coal and dry cargo.
Chennai	All weather port having deep drafted berth, oil jetties, iron ore terminals etc.
Visakhapatnam	Seaport and well known for its outstanding performance. It serves the Bhilai and Rourkela steel plant
Tuticorin	Artificial deep sea harbour, all weather port offer direct weekly container service to USA.
Ennore	First corporatised major port in India.

Western Coast Ports

Ports of Western Coast	*Important Fact*
Mumbai	It handles maximum traffic, natural harbour, it handles mostly petroleum and dry cargo.
Kandla	Tidal port and important traffic handled are crude oil, petroleum, edible oil, foodgrains.
Marmagao	It handles iron ore. It has a naval base.
New Mangaluru	It is an all weather port.
Cochin	Major natural port in Willingdon Island.
Jawaharlal Nehru	It is called as Nhava Sheva.

- Largest port of India is Jawaharlal Nehru port in Mumbai. The largest natural port is in Visakhapatnam.
- Kandla in Gujarat is a tidal port. It has been made into a free trade zone.
- New Mangaluru port is also called the 'Gateway of Karnataka'.
- Mumbai port is the busiest port of India and Mundra port is largest private port of India.

DEMOGRAPHIC PROFILE OF INDIA

Population

- Population geography is closely related to demography. It is concerned with the study of demographic processes and their consequences in and environmental context.
- **Population denstity** It is the number of person living in particular area. It shows population pressure on land resources.
- There are various factors that affect the distribution and density of population such as physical factors (land forms, vegetation, soils and water supply), climatic factors (temperature, rainfall, etc), availability of natural resources, means of transport and communication, etc.
- Population growth refers to the change in population. It can be measure in terms of absolute numbers and in percentage. Basic components of population growth are fertility, mortality and migration.

Demographic Characteristics

- India's population is unevenly distributed. Plains have more population than the mountains, deserts and forested lands.
- According to 2011 census, India is home to 121.01 crore population. Among states Uttar Pradesh is most populous state in India with population of 19.95 crore. On the other hand, Sikkim shares least proportion of population.
- India's average population density is 382 persons per sq. km. Arunachal Pradesh (17) has lowest population density whereas Bihar (1102) has highest density of population. Among Union Territories Delhi (11297) has highest population density and Andaman and Nicobar (46) has lowest population density.

Growth of Population

There are four phases identified for the growth of population in demographic history of India, which are as follow

1. Period of stagnant growth rate (before 1921)
2. Period of steady growth (1921-1951)
3. Period of rapid growth (1951-1981)
4. Period of declining growth rate (after 1981)

The declining growth rate of population during 2001-2011 was 17.64%. Kerala registered the lowest growth rate of 4.86% whereas Daman and Diu registered the highest growth rate of 53.54%.

Migration

A migrant is one who is enumerated in census at a place other than the place of his birth. In India, heavy pressure of population, poverty, high incidence of unemployment, etc are important factors responsible for migration.

Rural-Urban Composition

According to 2011 census, 68.84% of total population lives in rural areas and only 31.16% lives in urban areas, Goa is the most urbanised state where 62.17% of population lives in urban areas. Himachal Pradesh has mostly rural population.

Sex Ratio

Sex ratio refers to the number of females per thousands males. According to 2011 census, India has recorded the sex ratio of 943. Kerala has highest sex ratio i.e. 1084 per thousands males.

Top Five Sex Ratio States/UTs in India

State/UTs	*Sex Ratio (According to 2011 Census)*
Kerala	1084
Puducherry	1037
Tamil Nadu	996
Andhra Pradesh	993
Chhattisgarh	991

Literacy

The literacy rates in the country as a whole is 74.04%. In the rural and urban areas, the literacy rate are 68.9% and 84.9% respectively. Kerala has highest literacy rate.

Top Five Literacy Rate States/UTs in India

State/UTs	*Literacy Rate (According to 2011 Census)*
Kerala	94%
Lakshadweep	91.85%
Mizoram	91.33%
Goa	88.70%
Tripura	87.10%

Pollution

Environmental pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings.

Pollutants It are substances, which cause pollution and they could be in any from solid, liquid or gaseous.

- A primary pollutant is an air pollution emitted directly from a source.
- A secondary pollutants is not directly emitted as such, but forms, when other pollutants (primary pollutants) react in the atmosphere.

Air Pollution

When air is contaminated by unwanted substances which have a harmful effect on both the living and the non-living. It is referred to as air pollution.

Causes of Air Pollution

Four causes of air pollution are as follow

i. Petroleum refineries release poisonous gases like sulphur.
ii. Dust is produced from cement factories as stone crushers and hot mix plant.
iii. The thermal power plant produce fly ash, SO_2 and hydrocarbons etc.
iv. Automobiles produce-unburnt hydrocarbons, CO_2, NO_2 and lead oxides etc.

Noise Pollution

- Noise is defined as unwanted sound which pleases the listeners, is music and that, which causes pain and annoyance, is noise.
- A decibel is the standard for the measurement of noise, the zero on a decibel scale is at the threshold of heaving, the lowest sound pressure that can be heard, on the scale according to smith, 20 db is whisper, 40 db is the noise in a quiet office, 60 db is normal conversation, 80 db is the level, at which sound becomes physically painful.

Radioactive Pollution

Radioactive pollution, like any other kind of pollution, is the release of something unwanted into the environment and in this case, the unwanted thing is radioactive material.

Causes of Radioactive Pollution

Six causes of radioactive pollution are as follow

i. Production of nuclear weapons
ii. Decommissioning of nuclear weapons
iii. Mining of radioactive ore
iv. Coal ash
v. Medical waste and
vi. Nuclear power plants

Water Pollution

According to definition of WHO, water pollution occurs, when foreign materials either from natural or other sources are added to water supplies and may be harmful to life, because of their toxicity, reduction of normal oxygen level of water, aesthetically unstable effects and spread of epidemic diseases.

Climate Change

- It may be indicated by geological record in the long-term by changes in the landforms in intermediate terms and by vegetation changes in short-term.
- Small variations in climate can also be observed from the period during which reliable instrumental records have been available. e.g. the increase of CO_2 and the 1°C warming trend witnessed between 1850 and 1940.

Greenhouse Effect and Global Warming

- The greenhouse gases (sometimes abbreviated GHG) in the atmosphere that absorbs and emits radiation within the thermal infrared range. The process is the fundamental cause of the greenhouse effect.
- The primary greenhouse gases in the Earth's atmosphere are water vapour, carbon dioxide, methane, nitrous oxide and ozone.
- In the solar system, the atmosphere of Venus, Mars and Titan also contain gases that cause greenhouse effects.

- **Global Warming** is the increase of Earth's average surface temperature due to effect of greenhouse gases, such as carbon dioxide emissions from burning fossil fuels or from deforestation. This is a type of greenhouse effect.

Ozone Layer Depletion

- The ozone layer is located within the stratosphere, about 24 km above the Earth's surface. The layer consist of ozone gas molecules that are formed as the sunlight reacts with oxygen.
- The ozone layer is very important as it protecs life on Earth by filtering the Sun's dangerous ultraviolet radiation.
- Due to increased pollution on Earth, chemicals such as Chloro Fluro Carbons (CFCs) are destroying this protective ozone layer, which could lead to increased health risks and damage agricultural and acquatic ecosystem.

NATIONAL PARK AND WILDLIFE SANCTUARIES

- India has network of 700 protected areas out of which 103 National Parks, 528 Wildlife Sanctuaries, 65 Conservation Reserves and 4 Community Reserves.
- Madhya Pradesh and Andaman and Nicobar Islands have the maximum number of National Parks (9 each). Andaman and Nicobar Islands has 96 (maximum in India) and Maharashtra has 41 wildlife sanctuaries.

Important Sanctuaries and National Parks

Name	*Location*	*Reserve For*
Achanakmar Sanctuary	Chhattisgarh	Tiger, boar, cheetal, sambhar and bison
Bandhavgarh National Park	Madhya Pradesh	Tiger, panther, cheetal, nilgai and wild boar
Bandipur Sanctuary	Karnataka and Tamil Nadu	Elephant, tiger, panther, sambhar, deer and birds
Banerghatta National Park	Karnataka	Elephant, cheetal, deer and grey partridge and green pigeon
Bhadra Sanctuary	Karnataka	Elephant, cheetal, panther, sambhar and wild boar
Chandraprabha Sanctuary	Uttar Pradesh	Blackbuck, nilgai, cheetal and sambhar
Corbett National Park	Uttarakhand	Tiger, leopard, elephant and sambhar (named in memory of Jim Corbett)
Dachigam Sanctuary	Jammu and Kashmir	Kashmiri stag
Dandeli Sanctuary	Karnataka	Tiger, panther, elephant, cheetal, sambhar and wild boar
Dudhwa National Park	Uttar Pradesh	Tiger, panther, sambar, cheetal, nilgai and barking deer
Gandhi Sagar Sanctuary	Madhya Pradesh	Cheetal, sambhar, chinkara and wild birds
Ghana Bird Sanctuary	Rajasthan	Water birds, black-buck, cheetal and sambar
Gir Forest National Park	Gujarat	India's biggest wildlife sanctuary famous for Gir lions
Gautam Buddha Sanctuary	Bihar and Jharkhand	Tiger, leopard, sambhar, cheetal and barking deer
Jaldapara Sanctuary	West Bengal	Rhinoceros
Kaziranga National Park	Assam	One-horned rhinoceros, gaur, elephant, leopard and wild buffalo
Khangchendzonga National Park	Sikkim	Snow leopard, musk deer and Himalayan boar
Nagarhole National Park	Karnataka	Tiger, elephant, Indian bison
Namdapha Sanctuary	Arunachal Pradesh	Elephant, panther, sambhar, tiger, cheetal and king cobra
Pachmarhi Sanctuary	Madhya Pradesh	Tiger, panther, boar, sambar, nilgai and barking deer
Simlipal Sanctuary	Odisha	Elephant, tiger, leopard, gaur and cheetal
Sunderban Tiger Reserve	West Bengal	Tiger, deer, wild boar, crocodile and Gangetic dolphin
Sonai Rupa Sanctuary	Assam	Elephant, sambhar, wild boar and one- horned rhinoceros
Tungabhadra Sanctuary	Karnataka	Panther, cheetal, sloth bear and four-horned antelope
Valvadore National Park	Gujarat	Wolf and black buck
Vedanthangal Bird Sanctuary	Tamil Nadu	Important bird sanctuary
Wild Ass Sanctuary	Gujarat	Wild ass, wolf, nilgai and chinkara

BIOSPHERE RESERVES IN INDIA

- The biosphere reserve programme was launched by the UNESCO in 1971, under the aegis of its Man and Biosphere (MAB) programme, to provide a global network of protected areas for conserving natural communities.
- There are 18 biosphere reserves in India of which of 10 are recognised by UNESCO, and are part of world network of Biosphere Reserve based on the UNESCO Man and Biosphere programme.

Ramsar Convention

An international treaty done in 1971 in Iran. Its purpose is conservation and sustainable use of wetlands. India has signed this treaty and in India there is 26 Ramsar sites.

Biosphere Reserves of India

Name	*States*	*Type*	*Area* (km^2)
Great Rann of Kutch	Gujarat	Desert	12454
Gulf of Mannar (UNESCO)	Tamil Nadu	Coasts	10500
Sunderbans (UNESCO)	West Bengal	Gangetic Delta	9630
Cold Desert	Himachal Pradesh	Western Himalayas	7770
Nanda Devi (UNESCO)	Uttarakhand	West Himalays	5860
Nilgiri (UNESCO)	Tamil Nadu, Kerala and Karnataka	Western Ghats	5520
Dihang-Dibang	Arunachal Pradesh	East Himalayas	5112
Pachmarhi (UNESCO)	Madhya Pradesh	Semi-Arid	4926
Panna	Madhya Pradesh	Cultiment area of Ken river	2998
Seshachalam Hills	Andhra Pradesh	Eastern Ghats	4755.997
Simlipal (UNESCO)	Odisha	Deccan Peninsula	4374
Achanakamar- Amarkantak (UNESCO)	Madhya Pradesh, Chhattisgarh	Maikala Range	3835
Manas	Assam	East Himalayas	2837
Kangchenjunga	Sikkim	East Himalayas	2620
Agasthyamalai (UNESCO)	Kerala, Tamil Nadu	Western Ghats	1828
Great Nicobar (UNESCO)	Andaman and Nicobar Islands	Islands	885
Dibru-Saikhowa	Assam	East Himalayas	765
Nokrek (UNESCO)	Meghalaya	East Himalayas	47.48

Difference between National Park, Sanctuary and Biosphere Reserve

National Park	*Sanctuary*	*Biosphere Reserve*
A reserved area for preservation of its natural vegetation, wildlife and natural beauty.	A reserved area for preservation of endangered species.	Multi-purpose protected area to preserve genetic diversity in representative ecosystem.
Boundaries are fixed by legislation.	Boundaries are not sacrosanct.	Boundaries are fixed by legislation.

PRACTICE EXERCISE

1. Though Dwarka and Itanagar are 2 hours apart, people at both places have the same time on their watches which of the following explains this?
(a) They are about 30° apart in longitudes
(b) One hour is the same as 25° longitudinal distance
(c) India has adopted the time of $82\frac{1^\circ}{2}$ E longitude as its standard time
(d) None of the above

2. The Indian Standard Time is ahead of GMT by
(a) $5\frac{1}{2}$ hours (b) $6\frac{1}{2}$ hours
(c) $4\frac{1}{2}$ hours (d) None of these

3. India extends between
(a) 68° E and $97\frac{1^\circ}{2}$ E
(b) 67° E and $98\frac{1^\circ}{2}$ E
(c) 65° E and $90\frac{1^\circ}{2}$ E
(d) None of the above

4. Which is the exact example of residual mountains?
(a) Nilgiri (b) Satpura
(c) Himalaya (d) Aravalli

5. Damodar valley lies in the area of
(a) block mountain
(b) volcanic mountain
(c) newfold mountain
(d) Chotanagpur plateau

6. Himalaya is a
(a) fold mountain
(b) block mountain
(c) volcanic mountain
(d) None of the above

7. Which of the rivers given below flows Westwards and disappears in the desert of Thar?
(a) Luni (b) Narmada
(c) Tapi (d) Mahi

8. Consider the following types of natural vegetation
1. Deciduous forests
2. Thorny bushes
3. Evergreen forests

What is the correct sequence of the occurrence of these vegetations, as we move through : Jodhpur, Nagpur, Thiruvananthapuram?

Codes

	A	B	C
(a)	1	2	3
(c)	1	3	2

	A	B	C
(b)	2	3	1
(d)	2	1	3

9. Match the following

List I (Type of Powers)	List II (Locations of Power Plant)
A. Nuclear	1. Srisailam
B. Geothermal	2. Kalpakkam
C. Hydro	3. Ahmedabad
D. Solar	4. Manikaran

Codes

	A	B	C	D
(a)	2	4	1	3
(c)	2	1	4	3

	A	B	C	D
(b)	3	1	4	2
(d)	3	4	1	2

10. Match the following

List I	List II
A. Damodar	1. Punjab
B. Nagarjuna	2. Odisha
C. Bhakra	3. West Bengal
D. Hirakud	4. Andhra Pradesh
	5. Madhya Pradesh

Codes

	A	B	C	D
(a)	4	3	2	1
(c)	3	5	2	1

	A	B	C	D
(b)	3	4	1	2
(d)	3	4	2	1

11. Match the following

List I	List II
A. Hirakud	1. Sutlej
B. Pong	2. Mahanadi
C. Bhakra Nangal	3. Beas
D. Tungabhadra	4. Kaveri
	5. Tungabhadra river

Codes

	A	B	C	D
(a)	3	2	5	1
(c)	2	4	1	3

	A	B	C	D
(b)	2	4	3	5
(d)	2	3	1	5

12. Match the following

List I	List II
A. Pepper	1. Kashmir valley
B. Coffee	2. Brahmaputra valley
C. Tea	3. Annamalai hills
D. Saffron	4. Coorg

Codes

	A	B	C	D
(a)	3	4	2	1
(c)	2	3	4	1

	A	B	C	D
(b)	4	2	3	1
(d)	3	2	1	4

13. Match the following

List I	List II
A. Kanha	1. Jharkahand
B. Jim Corbett	2. Madhya Pradesh
C. Ranthambore	3. Uttarakhand
D. Palamau	4. Maharashtra
	5. Rajasthan

Codes

	A	B	C	D
(a)	2	3	5	1
(c)	4	3	5	2

	A	B	C	D
(b)	2	3	1	4
(d)	3	2	4	5

14. Match the following

List I (Minerals)	List II (Places)
A. Mica	1. Gudur
B. Petroleum	2. Bonai
C. Iron ore	3. Kothagudem
D. Coal	4. Digboi
	5. Chaibasa

Codes

	A	B	C	D
(a)	1	4	2	3
(c)	4	1	2	3

	A	B	C	D
(b)	2	5	1	4
(d)	3	5	2	4

15. Match the following

List I	List II
A. Jharia	1. Gems and Jewellery
B. Mughal Sarai	2. Major port
C. Haldia	3. Marshalling yard
D. Surat	4. Mining

Codes

	A	B	C	D
(a)	1	2	3	4
(c)	2	1	3	4

	A	B	C	D
(b)	4	3	1	2
(d)	4	3	2	1

16. Match the following

List I	List II
A. Black soil	1. Uttar Pradesh
B. Red soil	2. Assam
C. Laterite soil	3. Tamil Nadu
D. Alluvial soil	4. Maharashtra

Codes

	A	B	C	D
(a)	2	3	1	4
(c)	1	2	3	4

	A	B	C	D
(b)	3	2	4	1
(d)	4	3	2	1

17. Match the following

List I (States)	List II (Trees)
A. Assam	1. Rosewood
B. Himachal Pradesh	2. Bamboo
C. Karnataka	3. Deodar
D. Kerala	4. Sandalwood

Codes

	A	B	C	D		A	B	C	D
(a)	2	1	3	4	(b)	4	3	2	1
(c)	2	3	4	1	(d)	3	2	4	1

18. Match the following

List I (Regions)	List II (Soils)
A. Malwa plateau	1. Alluvial
B. Dharwar plateau	2. Laterite
C. Punjab plains	3. Red
D. Western ghats	4. Regur

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	4	3	1	2
(c)	4	2	1	3	(d)	3	1	4	2

19. Match the following

List I (States of India)	List II (Population Characteristics)
A. Kerala	1. Highest population density
B. Maharashtra	2. Highest percentage of population growth
C. Uttar Pradesh	3. Highest percentage of urban population
D. West Bengal	4. Largest population size
	5. Reverse sex-ratio

Codes

	A	B	C	D		A	B	C	D
(a)	1	2	3	4	(b)	1	2	4	3
(c)	4	3	2	1	(d)	5	3	4	1

20. Which of the following correctly states the location of Cold desert of India?
(a) To the North-East of Karakoram range
(b) To the West of Pir Panjal range
(c) To the South of Shiwalik range
(d) To the West of Aravalli range

21. Consider the following statements
1. Black soil in India relates its genesis to Deccan trap.
2. Dhoopgarh is the highest peak of Indian Peninsula.
3. Kudremukh peak is associated with rich iron-ore reserves.

Which of the statements given above are correct?
(a) 2 and 3 (b) 1 and 2
(c) 1 and 3 (d) All of these

22. If there were no Himalayan ranges, what would have been the most likely geographical impact on India?
1. Much of the country would experience the cold waves from Siberia.
2. Indo-gangetic plain would be devoid of such extensive Alluvial soils.
3. The pattern of monsoon would be different from what it is at present.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) 1 and 3
(c) 2 and 3 (d) All of these

23. Following are the characteristics of an area in India
1. Hot and arid climate.
2. Annual rainfall 80 cm.
3. Annual range of temperature 0°C to 45°C.

Which one among the following crops are you most likely to find in the area described above?
(a) Chillies (b) Cotton
(c) Ginger (d) Tobacco

24. Consider the following statements and find the correct statements related to transportation in India
1. NH-31 connects Indian mainland with its North-Eastern region.
2. Sikkim and Arunachal Pradesh are only states having no railway connectivity.
3. All the railway connectivity except toy train services in hilly regions are operated under Southern railway zone.
4. The union capital territory of Delhi has total road length more than the total road length in Tamil Nadu.

Which of the statements given above are correct?
(a) 1 and 2 (b) 1 and 4
(c) 1, 2 and 3 (d) All of these

25. The latitudes that pass through Kutch also pass through
(a) Odisha
(b) Arunachal Pradesh
(c) Mizoram
(d) Haryana

26. Amongst the following Indian states, which one has the minimum total forest cover?
(a) Sikkim (b) Goa
(c) Haryana (d) Kerala

27. According to Census 2011, which one of the following Indian states has the maximum population in India after Uttar Pradesh?
(a) West Bengal (b) Maharashtra
(c) Bihar (d) Tamil Nadu

28. Consider the following statement(s)
1. India is the only country in the world producing all the five known commercial varieties of silk.
2. India is the largest producer of sugar in the world.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

29. Gandhi Sagar dam is a part of which one of the following?
(a) Chambal project
(b) Kosi project
(c) Damodar Valley project
(d) Bhakra Nangal project

30. Rivers that pass through Himachal Pradesh are
(a) Beas and Chenab
(b) Beas and Ravi
(c) Chenab, Ravi and Sutlej
(d) Beas, Chenab, Ravi, Sutlej and Yamuna

31. In India, during the last decade the total cultivated land for which one of the following crops has remained more or less stagnant?
(a) Rice (b) Oilseeds
(c) Pulses (d) Sugarcane

32. In India, the ports are categorised as major and non-major ports. Which one of the following is a non-major port?
(a) Kochi (Cochin) (b) Dahej
(c) Paradip (d) New Mangaluru

33. In India, how many states share the coastline?
(a) 7 (b) 8 (c) 9 (d) 10

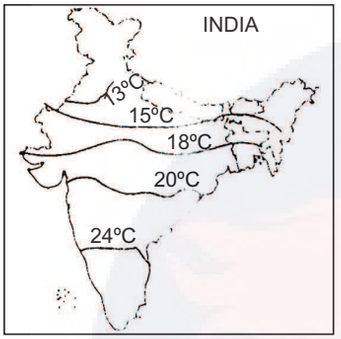
34. With which one of the following rivers is the omkareshwar project associated?
(a) Chambal (b) Narmada
(c) Tapi (d) Bhima

35. Which one of the following rivers does not originate in India?
(a) Beas (b) Chenab
(c) Ravi (d) Sutlej

36. The Dul Hasti Power Station is based on which one of the following rivers?
(a) Beas (b) Chenab
(c) Ravi (d) Sutlej

37. Which one of the following is not a lagoon?
(a) Ashtamudi lake (b) Chilika lake
(c) Periyar lake (d) Pulicat lake

38. Consider the following statement(s) regarding the rough outline map of India shown in the figure



1. Temperature decreases as we move from South to North.
2. Peninsular India has more than 20°C temperature over a large area.
3. Andhra Pradesh has more than 20°C temperature over a large area.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Only 3 (d) All of these

39. Locate the places in the following map

A. Kollam B. Tuticorin
C. Ongole D. Nellore

Codes
(a) A-2, B-3, C-4, D-1
(b) A-4, B-1, C-2, D-3
(c) A-1, B-4, C-3, D-2
(d) A-1, B-3, C-4, D-2

40. Arrange the following Military Training Institutes in India in terms of their geographical location from North to South.
1. Indian Military Academy
2. Officers' Training Academy
3. National Defence Academy
4. National Defence College
5. College of Defence Management

Codes
(a) 1, 3, 5, 4, 2 (b) 1, 4, 3, 5, 2
(c) 4, 5, 3, 2, 1 (d) 3, 4, 1, 2, 5

41. The Tropic of Cancer does not pass through
(a) Odisha (b) Tripura
(c) Chhattisgarh (d) Rajasthan

42. What is the sequential order of vegetation types observed while moving from Assam valley to Rajasthan plains?
(a) Tropical Wet Evergreen
Tropical Moist Deciduous
Tropical Dry Deciduous
Tropical Thorn Forest
(b) Tropical Thorn Forest
Tropical Dry Deciduous
Tropical Moist Deciduous
Tropical Wet Evergreen
(c) Tropical Moist Deciduous
Tropical Wet Evergreen
Tropical Dry Deciduous
Tropical Thorn Forest
(d) Tropical Dry Deciduous
Tropical Thorn Forest
Tropical Moist Deciduous
Tropical Wet Evergreen

43. Which of the following regarding Revised Macro Management of Agriculture Scheme (2008-2009) is/are correct?
1. Allocate funds to States and Union Territories on a criterion based on gross cropped area and area under small and marginal holdings.
2. The assistance is provided to the States and Union Territories as 100% grant.

Select the correct answer using the codes given below.
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

44. What is the reason for India being as major producer of different varieties of fruits and vegetables?
(a) Its large population size
(b) Its large land area
(c) Variation in its agro-climatic conditions
(d) Diversity in socio-cultural phenomenon

45. Match the following

List I (Industries)	List II (Locations)
A. Petrochemicals	1. Ranchi
B. Aluminium	2. Hyderabad
C. Electronics	3. Vadodara
D. Heavy Engineering	4. Koraput

Codes

	A	B	C	D		A	B	C	D
(a)	3	4	2	1	(b)	1	2	4	3
(c)	3	2	4	1	(d)	1	4	2	3

46. Chambal river is a part of
(a) Sabarmati basin (b) Ganga basin
(c) Narmada basin (d) Godavari basin

47. Shimsha, Hemavati, Arkavati are the tributaries of which one of the following rivers?
(a) Tapti (b) Tungabhadra
(c) Kaveri (d) Krishna

48. Which one of the following is the international aircraft identification mark (registration prefix) for India?
(a) AT (b) VT (c) IX (d) VX

49. Which among the following is the correct sequence of rivers starting from North to South?
(a) Bhima—Godavari—Penganga—Tungabhadra
(b) Godavari—Penganga—Tungabhadra—Bhima
(c) Penganga—Godavari—Bhima—Tungabhadra
(d) Penganga—Bhima—Godavari—Tungabhadra

50. Match the following

List I (Himalayan Peaks)	List II (States)
A. Nanga Parbat	1. Jammu & Kashmir
B. Nanda Devi	2. Sikkim
C. Kanchenjunga	3. Uttarakhand

Codes

	A	B	C		A	B	C
(a)	1	2	3	(b)	1	3	2
(c)	2	3	1	(d)	3	1	2

51. Which one among the following is the most important source of fish catch in India?
(a) Deep-sea fisheries
(b) Coastal fisheries
(c) Inland natural fisheries
(d) Inland cultural fisheries

52. The Western coasts of India receive very high rainfall in summer mainly due to
(a) tropical location (b) nearness to sea
(c) Western ghats (d) Himalayas

53. The Gulf of Mannar is situated along the coast of
(a) Tamil Nadu (b) Kerala
(c) Karnataka (d) Andhra Pradesh

54. The river with highest tidal bore in India is
(a) Kaveri (b) Mahanadi
(c) Hooghly (d) Krishna

55. Which one among the following is a correct sequence of the Indian ports from North to South?
(a) Haldia, Kandla, Paradeep, Kochi
(b) Kandla, Haldia, Paradeep, Kochi
(c) Kandla, Haldia, Kochi, Paradeep
(d) Kochi, Kandla, Haldia, Paradeep

56. Which one among the following is a correct sequence of production of coal in the Indian states in descending order?
(a) Jharkhand, Madhya Pradesh, West Bengal, Meghalaya
(b) West Bengal, Madhya Pradesh, Jharkhand, Meghalaya
(c) Jharkhand, West Bengal, Meghalaya, Madhya Pradesh
(d) Madhya Pradesh, Jharkhand, West Bengal, Meghalaya

57. Match the following

List I (Minerals)	List II (States)
A. Bauxite	1. Andhra Pradesh
B. Mica	2. Odisha
C. Copper	3. Madhya Pradesh
D. Zinc	4. Rajasthan

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	3	2	(b)	2	1	3	4
(c)	4	3	1	2	(d)	2	3	1	4

58. **Statement I** The semi-arid tracts of India stretching from Eastern Rajasthan in the North to South Central Tamil Nadu are agriculturally less productive.

Statement II The semi-arid tracts are homeland to a large number of Central Indian Scheduled Tribes population.

Codes
(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

59. Which of the following statement(s) regarding the Deccan Traps is/are correct?
1. Intense volcanic activity in the form of fissure eruption took place towards the end of Cretaceous period.
2. The volcanic lava spread out in horizontal sheets.
3. The Regur soil found here is rich in nitrogen.

Select the correct answer using the codes given below.
(a) Only 1 (b) Only 3
(c) 1 and 2 (d) All of these

60. Consider the following statement(s)
1. The Himalayan vegetation varies according to both altitude and climatic conditions.
2. There are mainly two types of tropical forests that are found in the Himalayas—the tropical rainforests and the tropical deciduous forests.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

61. What is the general direction of cyclones formed in the Bay of Bengal?
(a) East to West (b) West to East
(c) West to South (d) North to South

62. Match the following

List I (Peaks in the Eastern Himalaya)	List II (Locations in the Map)
A. Makalu	
B. Kanchenjunga	
C. Namcha Barwa	
D. Mount Everest	

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	2	4	3	1
(c)	1	4	3	2	(d)	1	3	4	2

63. The Narmada river in the Peninsular plateau flows Westward with a remarkably straight channel. It is because the
(a) slope gradient in this part controls the river channel pattern
(b) river carries a huge amount of water which has created a straight channel course
(c) river forms the boundary between the Central highlands and the Deccan Plateau
(d) river flows through the trough of a Rift valley inclined Westward

64. Which one among the following is the best reason for the marked increase in the agricultural production in India in the past decades?
(a) Increases in the area under cultivation
(b) Conversion of barren land into agricultural land
(c) Use of improved agricultural methods and technologies
(d) Priority status given by the successive governments to agricultural sector over the industry sector

65. Which one among the following is not a reason for practising tank irrigation in the Peninsular India?
(a) The undulating relief and hard rocks.
(b) Little percolation of rain water due to impervious rock structure.
(c) Most of the rivers of Peninsular India are perennial.
(d) There are many streams which become torrential during rainy season.

66. Identify from the following states of India through which the Tropic of Cancer passes and arrange them from East to West.
1. Gujarat 2. West Bengal
3. Uttar Pradesh 4. Jharkhand
5. Madhya Pradesh 6. Bihar
7. Chhattisgarh

The correct sequence is
(a) 2, 5, 7, 4, 1 (b) 2, 4, 7, 5, 1
(c) 3, 2, 6, 7, 5 (d) 3, 7, 4, 6, 2

67. Which one among the following is not a source of renewable energy?
(a) Hydroelectricity (b) Solar energy
(c) Fuel cell (d) Wind energy

68. Consider the following statement(s) regarding Andaman and Nicobar Islands
1. It enjoys equatorial climate.
2. This is the only place in India where a volcano is located.
3. This is the only place in India where coral bed is found.

Which of the statement(s) given above is/are correct?
(a) Only 1 (b) 1 and 2
(c) 2 and 3 (d) All of these

69. Which of the following has/have been declared as National Waterways in India?

1. The Allahabad-Haldia stretch of river Ganga.
2. The Sadiya-Dhubri stretch of river Brahmaputra.
3. The Cherla-Rajahmundry stretch of river Godavari.

Select the correct answer using the codes given below.

(a) 1 and 2 (b) 2 and 3
(c) Only 1 (d) All of these

70. Which of the following statement(s) is/are correct?

1. Mumbai receives more rainfall than Pune because it is located at the windward side of Western ghats.
2. Vidarbha region experiences semi-arid climate as it is located in a rain shadow region.
3. In India monsoon reaches Kashmir valley at the last.

Select the correct answer using the codes given below.

(a) Only 1 (b) 1 and 2
(c) 2 and 3 (d) All of these

71. Match the following

List I (Places Indicated in the Map)	List II (Seismic Zones)
A. 1	1. Zone V
B. 2	2. Zone IV
C. 3	3. Zone III
D. 4	4. Zone II

Codes

	A	B	C	D		A	B	C	D
(a)	2	1	3	4	(b)	2	3	1	4
(c)	4	3	1	2	(d)	4	1	3	2

72. Iron-ore from Kudremukh is most likely to be exported through

(a) Goa (b) Kochi
(c) Mangaluru (d) Ennore

73. Which of the following statement(s) regarding South-West monsoon in India is/are correct?

1. Monsoon reaches the Malabar coast first.
2. Rajasthan does not get rainfall from South-West monsoon.
3. South-West monsoon retreats when the permanent wind belts start shifting to the South.

Select the correct answer using the codes given below.

(a) Only 3 (b) 1 and 2
(c) 1 and 3 (d) All of these

74. Consider the following statement(s)

1. In India, the largest concentration of roads is found in the Northern plains.
2. The ratio of surfaced road to the total road length is lower in the Northern plains.

Which of the statement(s) given above is/are correct?

(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

75. Match the following

List I (Types of Vegetation)	List II (States)
A. Mangrove	1. Madhya Pradesh
B. Scrub	2. Karnataka
C. Teak	3. Rajasthan
D. Coniferous	4. Arunachal Pradesh

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	3	2	(b)	2	1	3	4
(c)	4	3	1	2	(d)	2	3	1	4

76. Which one of the following does not characterise the Himalayas?

(a) Various parallel ranges of the Himalayas form a convex arc
(b) There exist syntaxial bends at both the terminals of the Himalayas.
(c) Indus, Sutlej and Brahmaputra rivers are examples of antecedent drainage.
(d) The Himalayas are wider in the East than in the West.

77. Which among the following statements provides the best evidence that a river is flowing through a Rift valley?

(a) The Chambal valley is marked by bad land topography.
(b) River Tapi does not have Delta but Estuary only.
(c) River Mahanadi flows through a gorge at Satkosia.
(d) River Colorado has the Grand Canyon along its valley.

78. Arrange the following states on the basis of ascending dates of the onset of monsoon

1. Uttar Pradesh 2. West Bengal
3. Kerala 4. Rajasthan

The correct sequence is

(a) 2, 3, 1, 4 (b) 3, 2, 1, 4
(c) 3, 1, 2, 4 (d) 1, 2, 3, 4

79. Which of the following are West flowing rivers?

1. Krishna 2. Narmada
3. Mahanadi 4. Sabarmati

Select the correct answer using the codes given below.

(a) 2 and 4 (b) 1 and 3
(c) 1 and 4 (d) 2 and 3

80. During the Indian monsoon season

(a) the Westerly jet stream alone exists in the Indian region
(b) the Easterly jet stream alone exists in the Indian region
(c) both Westerly and Easterly jet streams exist in the Indian region
(d) both Westerly and Easterly jet streams disappear

81. The large states of Inda in the order of area are

(a) Rajasthan, Madhya Pradesh, Maharashtra
(b) Madhya Pradesh, Rajasthan, Maharashtra
(c) Maharashtra, Rajasthan, Madhya Pradesh
(d) Madhya Pradesh, Maharashtra, Rajasthan

82. Identify the wrong statement.

(a) The Mandovi-Zuari creek in Puducherry is an important embayment in the coastline
(b) The Parasnath hill in situated in Hazaribagh plateau
(c) The Kaimur hill belongs to the Vindhyas
(d) Mahendragiri is the highest peak of Eastern Ghats

83. Between which mountain ranges does Leh lie?

(a) Deosai and Karakoram
(b) Shiwaliks and Pir Panjal
(c) Zanskar and Ladakh
(d) Pir Panjal and Zanskar

84. The Amindivi and Cannanore Islands are separated from Minicoy Island by

(a) Ten Degree channel
(b) Nine Degree channel
(c) Eight Degree channel
(d) Duncan passage

85. Identify the incorrect statement about the Karnataka plateau
(a) It has an average elevation of 600-900 metres
(b) It is composed of volcanic lava flow of Deccan Trap in its Northern part
(c) It has two distinct physiographic features-Malnad and Maidan
(d) The highest peak is Kalsubai

86. Which one of the following is the correct sequence of the given hills starting from the North and going towards the South
(a) Nallamala hills-Nilgiri hills-Javadi hills-Annamalai hills
(b) Annamalai hills-Javadi hills-Nilgiri hills-Nallamalai hills
(c) Nallamala hills-Javadi hills-Nilgiri hills-Annamalai hiils
(d) Annamalai hills-Nilgiri hills-Javadi hills-Nallamala hills

87. Which one of the following statements is not correct regarding the Himalayas?
(a) Himalayas have nappe and recumbent folds
(b) Himalayas rose up from the Tethys sea
(c) Himalayas contain three mountain ranges-Shiwaliks, Great Himalayas and Kunlun ranges
(d) The orogeny took place in the Tertiary era

88. Which one of the following characteristics is not relevant to Ganga river?
(a) It is a braided river with numerous channels
(b) It has multiple intertwined sand-bars
(c) It has extensive gully erosion
(d) It deposits enormous sediments annually into the Bay of Bengal

89. Consider the following fact(s) about Central Highland
1. It slopes towards North and North-East direction.
2. Its Eastern extension is formed by Rajmahal hills.
3. Satpura forms its boundary in South.
4. Madhya Bharat plateau is part of it.

Which of the statement(s) given above is/are correct?
(a) 1 and 4 (b) 1 and 3
(c) Only 2 (d) All of these

90. Which of the following is not correct with respect to Chilika lake?
(a) It is the largest brackish water lagoon of Asia
(b) It experiences seasonal fluctuations of water level
(c) It is situated South of the Mahanadi delta
(d) It is situated North of the Mahanadi delta

91. In the Kaveri river water dispute, which one of the following groups of states are concerned
(a) Kerala and Karnataka
(b) Karnataka, Andhra Pradesh and Maharashtra
(c) Kerala, Karnataka, Tamil Nadu and Union Territory of Puducherry
(d) Kerala, Goa, Karnataka and Tamil Nadu

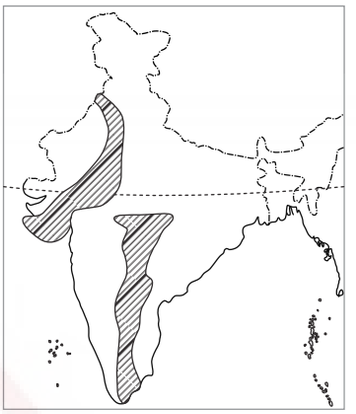
92. Through which one among the following groups of states does the river Narmada flow?
(a) Gujarat and Madhya Pradesh
(b) Gujarat, Madhya Pradesh and Maharashtra
(c) Gujarat, Madhya Pradesh and Uttar Pradesh
(d) Gujarat, Rajasthan and Uttar Pradesh

93. Which type of climate prevail in the long corridor (leewards side) of the Western ghats Nilgiri hills?
(a) Tropical wet and dry climate
(b) Tropical wet and dry with winter rain
(c) Tropical semi-arid steppe
(d) Sub-tropical monsoon rainforest

94. Which of the following are the major factors responsible for the monsoon type of climate in India?
1. Location
2. Thermal contrast
3. Upper air circulation
4. The Himalayan mountains

Select the correct answer using the codes given below.
(a) 1 and 4
(b) 2, 3 and 4
(c) 1, 2 and 3
(d) All of the above

95. The shaded area as marked on the given map represents



(a) humid sub-tropical climatic region
(b) tropical wet and dry climatic region
(c) semi wet and dry climatic region
(d) sub-tropical dry climatic region

96. Identify the wrong statement
(a) Khadar soils are more sandy in composition than Bhangar soils
(b) Regur is an Intrazonal soils
(c) Red soil an Intrazonal soil
(d) The areas affected by wind erosion on the extensive scale in Northern Haryana and Punjab are called Chhos

97. Which states in India are the largest producers of sugarcane?
(a) Bihar and Uttar Pradesh
(b) Uttar Pradesh and Rajasthan
(c) Andhra Pradesh and Jammu & Kashmir
(d) Punjab and Himachal Pradesh

98. Which one of the following areas of India produces largest amount of cotton?
(a) North-Western India and Gangetic West Bengal
(b) North Western and Western India
(c) Western and Southern India
(d) Plains of Northern India

99. Which one of the following statements is not correct?
(a) Maximum number of cotton and textile mills are located in Gujarat.
(b) Carpet industry is chiefly in the state of Uttar Pradesh.
(c) Cotton textile industry provides jobs to the maximum number of people.
(d) The first cotton mill was set-up at Fort Gloster in Calcutta.

QUESTIONS FROM
NDA/NA EXAM (2012-2016)

2012 (I)

1. Karam is a festival celebrated to worship Karam Devta, the God of Power. Which one among the following tribal communities in India traditionally celebrates this festival?
(a) Santhals (b) Karbi
(c) Meenas (d) Bhils

2. Consider the following coal mines of India
1. Bokaro 2. Adilabad
3. Raniganj 4. Bishrampur
Select the correct sequence of the above from East to West.
(a) 1, 3, 4, 2 (b) 3, 1, 4, 2
(c) 3, 1, 2, 4 (d) 1, 3, 2, 4

3. Match the following

List I (Ports)	List II (Special Features)
A. Kandla	1. Deepest landlocked protected port
B. Kochi	2. Located at mouth of lagoon
C. Visakhapatnam	3. Tidal port
D. Kolkata	4. Inland riverine port

Codes

	A	B	C	D		A	B	C	D
(a)	3	1	2	4	(b)	3	2	1	4
(c)	4	1	2	3	(d)	4	2	1	3

4. Which one among the following agricultural crops/groups of crops may be grown in abundant in lowlands and river deltas of fertile Alluvial soil where there is high summer temperature and rainfall varies from 180 cm to 250 cm?
(a) Wheat and sugarcane
(b) Cotton
(c) Maize and coarse crops
(d) Rice, jute and tea

5. The Damuda series of Gondwana system has three stages, namely, Raniganj, Barren rocks and Barakar. The middle stage is called Barren because
(a) it consists of coal and not iron
(b) it consists of iron and not coal
(c) it consists of neither coal nor iron
(d) it is a sedimentary layer consisting of shale and clay

6. Match the following

List I (Mountain Passes)	List II (States)
A. Zoji La	1. Himachal Pradesh
B. Lipulekh	2. Sikkim
C. Shipki La	3. Uttarakhand
D. Nathu La	4. Jammu & Kashmir

Codes

	A	B	C	D		A	B	C	D
(a)	2	1	3	4	(b)	2	3	1	4
(c)	4	1	3	2	(d)	4	3	1	2

7. The Indian Standard Time (IST) is based on
(a) 90° E meridian
(b) 82 ½ ° E meridian
(c) 75° E meridian
(d) 0° meridian

8. Arrange the following tropical forest groups in the correct order of sequence based on area covered in India beginning from the largest covered area
1. Moist deciduous
2. Dry deciduous
3. Wet evergreen
4. Semi-evergreen
The correct sequence is
(a) 1, 2, 3, 4 (b) 3, 4, 2, 1
(c) 1, 3, 2, 4 (d) 4, 3, 2, 1

9. Which one among the following is the major reason for low agricultural productivity in dry regions of India?
(a) Constraints of financial resources
(b) Rural indebtedness
(c) Dependence on erratic monsoon
(d) Small size of landholdings

2012 (II)

10. The Deccan Trap formation was caused by
(a) shield eruption
(b) composite eruption
(c) caldera eruption
(d) flood basalt eruption

11. In which among the following terrains, the bore wells and canals can be dug easily?
(a) Gneiss, granites and basaltic terrain of Peninsular India
(b) Rolling and dotted hilly terrain of North-East India
(c) Soft alluvium of the Northern plains
(d) Confined aquifer below the normal water table

12. Match the following

List I (Himalayan Peaks)	List II (States)
A. K2	1. Uttarakhand
B. Nanda Devi	2. Jammu & Kashmir
C. Tara Pahar	3. Sikkim
D. Kanchenjunga	4. Himachal Pradesh

Codes

	A	B	C	D		A	B	C	D
(a)	2	4	1	3	(b)	2	1	4	3
(c)	3	1	4	2	(d)	3	4	1	2

13. Which of the following statement(s) is/are correct?
1. The local time of Itanagar (Arunachal Pradesh) is about two hours ahead than Dwarka (Gujarat).
2. The local time at Chennai (Tamil Nadu) and Lucknow (Uttar Pradesh) is almost same.
3. The local time of Mumbai (Maharashtra) is one hour ahead than Kolkata (West Bengal).
Select the correct answer using the codes given below.
(a) 1 and 2 (b) Only 2
(c) 1 and 3 (d) All of these

14. Match the following

List I	List II
A. Narora	1. Tamil Nadu
B. Maharana Pratap Sagar	2. Uttar Pradesh
C. Tarapur	3. Himachal Pradesh
D. Kalpakkam	4. Maharashtra

Codes

	A	B	C	D		A	B	C	D
(a)	2	4	3	1	(b)	1	3	4	2
(c)	2	3	4	1	(d)	1	4	3	2

15. In India, the tropical Savannah (AW) type of climate prevails largely in
(a) Rajasthan desert region
(b) Peninsular plateau region
(c) Jammu & Kashmir region
(d) North-Eastern region

16. The Nokrek Biosphere Reserve is located in
(a) Arunachal Pradesh
(b) Assam
(c) Sikkim
(d) Meghalaya

17. Where is Aghil Pass located?
(a) Nepal Himalayas
(b) Sikkim Himalayas
(c) Eastern Himalayas
(d) Trans-Himalayas

2013 (I)

18. The 'Golden Quadrilateral' which connects Delhi, Mumbai, Chennai and Kolkata passes through
(a) Amritsar, Ahmedabad, Pune, Patna
(b) Jaipur, Porbandar, Hyderabad, Varanasi
(c) Vadodara, Pune, Visakhapatnam, Varanasi
(d) Nagpur, Bhopal, Surat, Amritsar

19. Delhi-Mumbai Industrial Corridor connects the political and business capital of India. Arrange the states from highest to lowest in terms of the length of the corridor passing through them.
(a) Maharashtra, Gujarat, Rajasthan, NCR of Delhi
(b) NCR of Delhi, Uttar Pradesh, Rajasthan, Maharashtra
(c) Rajasthan, Gujarat, Maharashtra, NCR of Delhi
(d) None of the above

20. Which among the following areas is conducive for well irrigation?
(a) Rocky and uneven surface of Peninsular India
(b) Dry tracts of Rajasthan and Gujarat
(c) Brackish groundwater region of Uttar Pradesh
(d) Deltaic regions of Mahanadi, Godavari and Krishna

21. Humid climate, ready market and availability of cheap and skilled labour are the conditions conducive for the production of cotton cloth. Which of the following states of India will have the highest cotton cloth production?
(a) Gujarat (b) Karnataka
(c) Maharashtra (d) Punjab

22. The diagram given below shows the schematic relations of temperature and precipitation of tropical climatic type over land.

Arrange the climatic types in the correct sequence from left to right.

1. Monsoon
2. Wet and dry tropics
3. Arid and semi-arid
4. Rainy tropics

The correct sequence is
(a) 1, 4, 2, 3 (b) 4, 3, 2, 1
(c) 2, 1, 3, 4 (d) 3, 2, 1, 4

23. The requirement of water is highest, in which one among the following industries?
(a) Iron and steel (b) Oil refining
(c) Paper from wood (d) Rayon

24. In India, increase in population and diversion of agricultural land for non-agricultural purposes have resulted in the decrease of
(a) forested land
(b) cultivable wasteland
(c) net sown area
(d) double cropped area

2013 (II)

25. Match the following

List I (Minerals)	List II (Locations in Map)
A. Mica	
B. Chromite	
C. Magnesite	
D. Zinc	

Codes

	A	B	C	D		A	B	C	D
(a)	1	2	3	4	(b)	1	3	2	4
(c)	4	2	3	1	(d)	4	3	2	1

26. Which of the following statements are correct?
1. Assam produces nearly 80% of jute in India.
2. Jute grows well on loamy soil.
3. Hot and humid conditions are ideal for growing jute.
4. Jute is commonly cultivated with wheat in rotation.

Select the correct answer using the codes given below.
(a) 1, 2 and 3 (b) 2, 3 and 4
(c) 2 and 3 (d) 1 and 4

27. The Indian Standard Time is ahead of Greenwich Mean Time (GMT) by
(a) 3 h and 30 min (b) 4 h and 30 min
(c) 5 h and 30 min (d) 6 h and 30 min

28. Match the following

List I (Landforms of Peninsular India)	List II (Predominant Rocks)
A. Marwar upland	1. Quartzites, shales, schists
B. Bundelkhand upland	2. Sandstone, shale, limestone
C. Meghalaya upland	3. Granite and gneiss
D. Maharashtra plateau	4. Basalt

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	1	4	(b)	2	1	3	4
(c)	4	3	1	2	(d)	4	1	3	2

29. Jawahar tunnel on Jammu-Srinagar highway passes through
(a) Pir Panjal range
(b) Karakoram range
(c) Zanskar range
(d) Dhauladhar range

2014 (I)

30. Which one among the following is the coral group of islands of India?
(a) Andaman (b) Nicobar
(c) Minicoy (d) Lakshadweep

31. Which of the following(s) is/are correct relating to the North-Eastern Region Community Resource Management Project for upland areas?
1. It is a livelihood and rural development project aimed to transform the lives of the poor and marginalised tribal families in North-East India.
2. This project is initiated exclusively by the North-Eastern Council.

Select the correct answer using the codes given below.
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

32. **Statement I** The Kullu valley in Himachal Pradesh receives copious snowfall during winter.

Statement II The Kullu valley receives moisture-bearing wind of the Western disturbances during winter.

Codes

(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

33. Which of the following is/are the most likely cause/causes of sheet-flood found in western part of Rajasthan?
1. Scanty rainfall
2. Sudden high intensity rain
3. Loose sandy soil with scanty vegetation

Select the correct answer using the codes given below.
(a) Only 1 (b) 1 and 2
(c) 2 and 3 (d) All of these

34. Mulching, an agronomic measure of soil conservation, is very effective because it
1. protects soil from gully erosion.
2. protects soil from sheetwash and wind erosion.
3. helps soil to retain moisture and nutrients.

Select the correct answer using the codes given below.
(a) Only 1 (b) 1 and 2
(c) 2 and 3 (d) All of these

35. Considering the locations of mountains in India, which one among the following is in right sequence from South to North?
(a) Doddabetta, Kailash, Dhaulagiri, Vindhyachal
(b) Doddabetta, Vindhyachal, Dhaulagiri, Kailash
(c) Dhaulagiri, Kailash, Doddabetta, Vindhyachal
(d) Dhaulagiri, Vindhyachal, Doddabetta, Kailash

36. Which one among the following lakes is situated on the West coast of India?
(a) Chilika (b) Ashtamudi
(c) Pulicat (d) Kolleru

2014 (II)

37. Which one of the following pairs of power projects is not correctly matched?
(a) Papanasam—Hydropower
(b) Neyveli—Hydropower
(c) Ukai—Thermal power
(d) Rana Pratap Sagar— Hydropower

38. Which one of the following is the correct sequence of oil refineries in India in respect of their time of establishment (starting from the earliest)?
(a) Barauni—Haldia—Guwahati— Mathura
(b) Barauni—Mathura—Guwahati—Haldia
(c) Guwahati—Haldia—Mathura— Barauni
(d) Guwahati—Barauni—Haldia— Mathura

39. Match the following

List I (Textile Industries)	List II (Places)
A. Woollen textile	1. Sualkuchi
B. Cotton textile	2. Rishra
C. Silk textile	3. Ludhiana
D. Jute textile	4. Davangere

Codes

	A	B	C	D		A	B	C	D
(a)	3	4	1	2	(b)	2	1	4	3
(c)	2	4	1	3	(d)	3	1	4	2

40. The place located at the confluence of Alaknanda and Bhagirathi rivers is
(a) Badrinath (b) Rishikesh
(c) Rudraprayag (d) Devprayag

2015 (I)

41. Which one of the following statements is not correct?
(a) Kerala is the largest producer of natural rubber in India.
(b) Neyveli is an important thermal power generating area of Tamil Nadu.
(c) Ratnagiri bauxite mining area is located in Karnataka.
(d) Assam is the only largest tea producing state in India.

42. Match the following

List I (Paper Industry Centres)	List II (States)
A. Kamptee	1. Karnataka
B. Rajahmundry	2. Maharashtra
C. Shahdol	3. Andhra Pradesh
D. Belagola	4. Madhya Pradesh

Codes

	A	B	C	D		A	B	C	D
(a)	1	4	3	2	(b)	2	3	4	1
(c)	1	3	4	2	(d)	2	4	3	1

43. Which one of the following irrigation canals is the most important in terms of area coverage in Haryana?
(a) Bhakra canal
(b) The Western Yamuna canal
(c) Jawaharlal Nehru canal
(d) Gurgaon canal

44. Match the following

List I (Places)	List II (Industries)
A. Jabalpur	1. Petro-chemical industry
B. Bengaluru	2. IT industry
C. Mathura	3. Paper industry
D. Ballarpur	4. Automobile industry

Codes

	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	2	1	4
(c)	4	2	1	3	(d)	3	1	2	4

45. The newly formed state of Telangana is surrounded by
(a) 5 states (b) 4 states
(c) 6 states (d) 3 states

46. Match the following

List I (National Parks/ Wildlife Sanctuaries)	List II (States)
A. Chandra Prabha	1. Uttarakhand
B. Silent Valley	2. Chhattisgarh
C. Valley of Flowers	3. Uttar Pradesh
D. Indravati	4. Kerala

Codes

	A	B	C	D		A	B	C	D
(a)	2	1	4	3	(b)	3	4	1	2
(c)	2	4	1	3	(d)	3	1	4	2

47. Which one of the following Indian states has the highest proportion of area under forest cover?
(a) Sikkim (b) Madhya Pradesh
(c) Meghalaya (d) Mizoram

48. Which of the following statements with regard to the Western coastal plain of India are correct?
1. It is a narrow belt.
2. It is an example of submerged coastal plain.
3. It provides natural conditions for development of ports.
4. It has well-developed deltas.

Select the correct answer using the codes given below.
(a) 1, 2 and 3 (b) 1 and 2
(c) 3 and 4 (d) All of these

2015 (II)

49. Which one of the following is not a sea port?
(a) Paradeep
(b) Haldia
(c) Dhamra
(d) Diamond Harbour

50. Identify the place that is not an oilfield.
(a) Naharkatiya (b) Kalol
(c) Ledo (d) Ankleshwar

51. The Manas National Park is situated in the state of
(a) Madhya Pradesh
(b) Jharkhand
(c) Assam
(d) West Bengal

52. Match the following

List I (Manufacturing Sites)	List II (Industries)
A. Ludhiana	1. Auto parts
B. Kanpur	2. Woolen garments
C. Varanasi	3. Leather
D. Vijayawada	4. Handloom

Codes

	A	B	C	D		A	B	C	D
(a)	1	4	3	2	(b)	2	3	4	1
(c)	2	4	3	1	(d)	1	3	4	2

53. Which one among the following places is not an iron ore mining area?
(a) Badampahar
(b) Zawar
(c) Bailadila
(d) Anantpur

54. Match the following

List I (Forest Conservation Types)	List II (Places)
A. National Park	1. Dudhwa
B. Sanctuary	2. Bhitarkanika
C. Biosphere Reserve	3. Chilika
D. Tiger Reserve	4. Nokrek

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	1	4	3	2
(c)	2	4	3	1	(d)	1	3	4	2

55. The IST meridian $82\frac{1}{2}^{\circ}$E passes through a number of states in India. Which one of the following sets of states is correct in this respect ?
(a) Uttarakhand, Uttar Pradesh, Chhattisgarh and Andhra Pradesh
(b) Uttar Pradesh, Jharkhand, Chhattisgarh and Odisha
(c) Uttarakhand, Uttar Pradesh, Madhya Pradesh and Chhattisgarh
(d) Uttar Pradesh, Odisha, Andhra Pradesh and Chhattisgarh

56. Match the following

List I (Places)	List II (Normal Vegetation Types)
A. Western ghats	1. Tropical Moist Deciduous
B. Himachal Pradesh	2. Tropical Evergreen
C. Haryana and Punjab	3. Himalayan Moist
D. Chotanagpur Plateau	4. Tropical Thorny

Codes

	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	1	4	3	2
(c)	2	4	3	1	(d)	1	3	4	2

57. The term 'Regur' is used to mean
(a) Laterite soil (b) Deltaic soil
(c) Red soil (d) Black cotton soil

2016 (I)

58. Deserts, fertile plains and moderate mountains are the characteristics of which one of the following regions?
(a) South-Western border along sea
(b) Coromandel coast
(c) North-Eastern frontier
(d) North-Western India

59. The 'Amarkantak hills' is the source of which of the following rivers?
1. Narmada 2. Mahanadi
3. Tapti 4. Son
Select the correct answer using the codes given below.
(a) 1 and 2 (b) Only 2
(c) 1, 3 and 4 (d) 1, 2 and 4

60. In India, glacial terraces known as 'Karewas' are found in
(a) Sapt Kosi valley
(b) Jhelum valley
(c) Alakananda valley
(d) Teesta valley

61. Structurally, the Meghalaya region is a part of
(a) Shiwalik range (b) Deccan plateau
(c) Greater Himalaya (d) Aravalli range

62. The Nagarjuna Sagar project is located on which one of the following rivers?
(a) Godavari (b) Krishna
(c) Kaveri (d) Mahanadi

63. Consider the following statement(s)
1. Rajmahal highlands consist of lava flow deposits.
2. Bundelkhand gneiss belong to the oldest Archaean rocks of India.
Which of the statement(s) given above is/are correct?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

64. Which one of the following is a conventional energy source?
(a) Tidal energy (b) Geothermal energy
(c) Solar energy (d) Biomass-energy

65. **Statement I** India has wide variation in population density.
Statement II Factors like agricultural productivity and history of settlements have greatly influenced the population density pattern in India.
Codes
(a) Both the statements are individually true and Statement II is the correct explanation of Statement I
(b) Both the statements are individually true, but Statement II is not the correct explanation of Statement I
(c) Statement I is true, but Statement II is false
(d) Statement I is false, but Statement II is true

66. In Thar region, the shifting sand dunes are locally known as
(a) Dhrian (b) Daurs
(c) Dhoros (d) Dhaya

67. Which of the following pairs is/are correctly matched?

List I (National Parks)	List II (Famous for)
1. Ranthambhore	Tiger
2. Periyar	Elephant
3. Manas	Lion
4. Gir	Rhinoceros

Select the correct answer using the codes given below.
(a) 1, 2 and 3 (b) 1 and 2
(c) 1 and 4 (d) Only 2

68. Jelep La pass is located in
(a) Punjab Himalaya
(b) Sikkim Himalaya
(c) Kumaon Himalaya
(d) Kashmir Himalaya

ANSWERS

Practice Exercise

1	*c*	2	*a*	3	*d*	4	*d*	5	*d*	6	*a*	7	*a*	8	*d*	9	*a*	10	*b*
11	*d*	12	*a*	13	*a*	14	*a*	15	*d*	16	*d*	17	*c*	18	*b*	19	*d*	20	*a*
21	*c*	22	*d*	23	*b*	24	*c*	25	*c*	26	*c*	27	*b*	28	*a*	29	*a*	30	*d*
31	*c*	32	*b*	33	*c*	34	*b*	35	*d*	36	*b*	37	*c*	38	*d*	39	*b*	40	*b*
41	*a*	42	*a*	43	*c*	44	*c*	45	*a*	46	*b*	47	*c*	48	*b*	49	*c*	50	*b*
51	*c*	52	*c*	53	*a*	54	*c*	55	*b*	56	*a*	57	*b*	58	*b*	59	*c*	60	*a*
61	*a*	62	*a*	63	*d*	64	*c*	65	*d*	66	*b*	67	*c*	68	*b*	69	*a*	70	*b*
71	*c*	72	*c*	73	*d*	74	*d*	75	*d*	76	*d*	77	*b*	78	*b*	79	*a*	80	*b*
81	*a*	82	*a*	83	*c*	84	*b*	85	*d*	86	*c*	87	*c*	88	*c*	89	*d*	90	*d*
91	*c*	92	*b*	93	*c*	94	*b*	95	*c*	96	*d*	97	*a*	98	*c*	99	*a*		

Questions from NDA/NA Exam (2012-16)

1	*a*	2	*b*	3	*b*	4	*d*	5	*b*	6	*d*	7	*b*	8	*a*	9	*c*	10	*d*
11	*c*	12	*b*	13	*a*	14	*c*	15	*b*	16	*d*	17	*d*	18	*c*	19	*d*	20	*d*
21	*a*	22	*d*	23	*c*	24	*c*	25	*c*	26	*c*	27	*c*	28	*a*	29	*a*	30	*d*
31	*c*	32	*d*	33	*c*	34	*d*	35	*b*	36	*b*	37	*b*	38	*d*	39	*a*	40	*d*
41	*c*	42	*b*	43	*b*	44	*c*	45	*a*	46	*b*	47	*d*	48	*a*	49	*d*	50	*c*
51	*c*	52	*b*	53	*b*	54	*a*	55	*d*	56	*a*	57	*d*	58	*d*	59	*d*	60	*b*
61	*b*	62	*b*	63	*c*	64	*d*	65	*b*	66	*a*	67	*b*	68	*b*				