Test No.

04

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Prelims/Mains TEST SERIES

Test Answer sheet

GENERAL STUDIES TEST - 04

ANSWERS AND EXPLANATION

Maximum Marks: 200

3

- Alluvial soils are widespread in the northern plains and the river valleys. These soils cover **about 40 percent** of the total area of the country.
  - They are **depositional soils**, transported and deposited by rivers and streams.
  - Through a narrow corridor in Rajasthan, they extend into the plains of Gujarat. In the Peninsular region , they are found in deltas of the east coast and in the river valleys.
  - In the Upper and Middle Ganga plain, two different types of alluvial soils have developed, viz. **Khadar and Bhangar** . Khadar is the new alluvium and is deposited by floods annually , which enriches the soil by depositing fine silts. Bhangar represents a system of older alluvium , deposited away from the flood plains. Both the Khadar and Bhangar soils contain calcareous concretions (Kankars).
  - The alluvial soils vary in nature from sandy loam to clay.
  - These soils are **more loamy and clayey** in the lower and middle Ganga plain and the Brahmaputra valley.
  - The sand content **decreases** from the west to east.
  - The colour of the alluvial soils varies from the **light grey to ash grey**. Its shades depend on the depth of the deposition, the texture of the materials, and the time taken for attaining maturity. Alluvial soils are intensively cultivated.
- **Hence option (b) is the correct answer.**

4.C

- **Erosional landforms due to Glaciers**
  - **Cirque or Corris**
    - They are deep, long, and wide troughs or basins with very steep concave to vertically dropping high walls at its head as well as sides.
    - They are simply bowl-shaped depression formed due to the erosional activity of glaciers.
    - When these depressions are filled with water, they are called Cirque lake or Corrie Lake, or Tarn Lakes.
  - **Hanging Valleys or U-shaped Valleys, Fjords/fiords**
    - The Glacier doesn't create a new valley like a river does but deepens and widens a pre-existing valley by smoothening away the irregularities.
    - These valleys, which are formed by the glacial erosions assume the shape of the letter 'U' and hence are called U-shaped Valleys or Hanging Valleys.
    - A fjord is a very deep glacial trough filled with seawater and making up shorelines.
    - A fjord is formed when a glacier cuts a U-shaped valley by ice segregation and abrasion of the surrounding bedrock and this valley gradually gets filled with seawater (formed in mountains nearby sea).
  - **Horns and Aretes**
    - Horns are sharp-pointed and steep-sided peaks.
    - They are formed by headward erosion of the cirque wall.
    - When the divide between two cirque walls gets narrow because of progressive erosions, it results in the formation of a saw-toothed ridge called Arete.
  - **NOTE:**
    - **Sea Stack:** Continued erosion, **under the attack of the wave**, can result in the total collapse of an arch. The seaward portion of the headland will remain as an isolated pillar of rock known as a stack . Like all other features, sea stacks are also temporary and eventually, the stack will also disappear. **Hence, option (c) is the correct answer.**

Q 3.D

- Wind and water are powerful agents of soil erosion because of their ability to remove soil and transport it. Soil erosion is essentially aggravated by faulty practices. **Over-grazing and shifting cultivation** in many parts of India have affected the natural cover of land and given rise to extensive erosion.
- **Contour bunding, Contour terracing, regulated forestry, controlled grazing, cover cropping, mixed farming,** and **crop rotation** are some of the remedial measures which are often adopted to reduce soil erosion.
- Ploughing along the contour lines can decelerate the flow of water down the slopes. This is called contour ploughing.
- Steps can be cut out on the slopes making terraces. Terrace cultivation restricts erosion.
- Large fields can be divided into strips. Strips of grass are left to grow between the crops. This breaks up the force of the wind. This method is known as **strip cropping**.
- Planting lines of trees to create shelter also works in a similar way. Rows of such trees are called **shelterbelts**. These shelter belts have contributed significantly to the stabilization of sand dunes and in stabilizing the desert in western India. **Hence option (d) is the correct answer.**

Q 4.D

- **Recent Context:** Pfizer and Moderna developed the Covid-19 vaccines by using mRNA technology.
- Messenger ribonucleic acid (mRNA), plays a vital role in human biology, especially in process known as protein synthesis. **mRNA is a single stranded molecule that carries genetic code from the DNA in a cell's nucleus to ribosomes in cytoplasm, the cell's protein making machinery. The mRNA is complimentary to one of the DNA strands of the gene. Hence, statement 1 is correct.**
- During protein synthesis, ribosome moves along the mRNA, reads its base sequence, and uses the genetic code to translate each three-base triplet, or codon, into its corresponding amino acid.
- **Moderna was able to create its vaccine within 45 days using the mRNA technology.** This technology helps to reduce time and also the cost of vaccine development.
- mRNA vaccines are a new type of vaccine which can provide protection against infectious diseases. To trigger an immune response, many vaccines put a weakened or inactivated germ into our bodies. Instead, mRNA Vaccines teach our cells how to make a protein or a piece of a protein that triggers an immune response inside our bodies. That immune response, which produces antibodies, is what protects us from getting infected if the real virus enters our bodies. **Hence, statement 2 is correct.**
- **mRNA technology found successful application in developing therapy to treat cystic fibrosis, which is a genetic disorder mostly of lungs**. **Hence, statement 3 is correct.**

Q 5.D

- The semi-evergreen forests are found in the less rainy parts of these regions. Such forests have a mixture of evergreen and moist deciduous trees. The undergrowing climbers provide an evergreen character to these forests. **Hence, statement 1 is correct.**
- This type occurs throughout the moister parts of southern tropics although it does not occupy large areas. It exists in the Andaman and the Western Ghats just north of Bombay near Goa and south of Cochin. It has also developed in the moderately heavy to heavy rainfall areas of the northeastern region and Bengal extending down the east coast of the peninsula to Puri in Orissa. **Hence, statement 2 is correct.**
- The annual rainfall in these forests is between 200- 250 cm, rarely less but frequently more. This type occurs on low hills and flat plateaus. **Hence, statement 3 is correct.**
- The main species are white cedar, Orchids, Rosewood, Indian chestnut, Kadam, Laurel, hillock, and kail. **Hence, statement 4 is correct.**

Q 6.D

- **Recent Context:** Recently the Cabinet Secretary, chaired a meeting of the National Crisis Management Committee (NCMC) in view of the **Cyclonic Storm Tauktae in the Arabian Sea.**
- **The National Crisis Management Committee functions under the Ministry of Home affairs** and is an intriguing part of the national disaster management system. National crisis management committee gave directions to the Crisis Management Group as deemed necessary.
- **The National Crisis Management Committee is headed by the Cabinet Secretary. The management of major crisis situations in the country and coordinating activities of various ministries in such a situation is also one of the functions of the Cabinet Secretariat.** and secretaries of all concerned ministries and departments as well as organisations are members of the committee.
- **Hence, option (d) is the correct answer.**

Q 7.B

- According to the new forest policy,1988, the Government will emphasize sustainable forest management in order to conserve and expand forest reserve on the one hand, and to meet the needs of local people on the other. The forest policy aimed at :
  - Bringing 33 percent of the geographical areas under forest cover. **Hence, statement 1 is not correct.**
  - Maintaining environmental stability and restoring forests where ecological balance was disturbed. ○ Conserving the natural heritage of the country, its biological diversity, and genetic pool. **Hence, statement 2 is correct.**
  - Checks soil erosion, an extension of the desert lands, and reduction of floods and droughts.
  - Increasing the forest cover through social forestry and afforestation on degraded land. **Hence , statement 3 is correct**.
  - Increasing the productivity of forests to make timber, fuel, fodder, and food available to rural population dependent on forests, and encourage the substitution of wood;
  - Creating a massive people's movement involving women to encourage the planting of trees, stop the felling of trees and thus, reduce pressure on the existing forest.

Q 8.C

- Earthquake waves are basically of two types - body waves and surface waves. Body waves are generated due to the release of energy at the focus and move in all directions traveling through the body of the earth. There are two types of body waves. They are called P and S-waves.
- P-waves are also called primary waves. **These move faster and are the first to arrive at the surface.** On the other hand, S-waves (called secondary waves) arrive at the surface with some time lag.
- The P-waves are similar to sound waves. While they travel through gaseous, liquid, and solid materials, **S-waves can travel only through solid materials.**
- P-waves vibrate parallel to the direction of the wave. This exerts pressure on the material in the direction of the propagation . As a result , it creates density differences in the material leading to stretching and squeezing of the material. Whereas S-waves vibrate perpendicular to the wave direction in the vertical plane. Hence, they create troughs and crests in the material through which they pass. **Hence, these waves are more destructive.** They cause the displacement of rocks, and hence, the collapse of structures occurs.
- **Hence, option (c) is the correct answer**

. Q 9.C

- A fringing reef is a coralline platform lying close to the shore extending outwards from the mainland. **Hence statement 1 is correct.**
- It is sometimes separated from the shore by a shallow lagoon. **Hence statement 2 is correct.**
- It is widest when fringing a protruding headland but completely absent when facing the mouth of a stream.
- The outer edge grows rapidly because of the splashing waves that continuously renew the supply of fresh food. The reefs may be about a mile wide, lying just above the level of low water and sloping steeply downwards on the seaward side to a depth of about 100 feet.

Q 10.D

- The **cold weather season** begins from mid-November in northern India and stays till February. December and January are the coldest months in the northern part of India. The **temperature decreases from the south to the north.** The peninsular region does not have a well-defined cold season. There is hardly any noticeable seasonal change in temperature patterns during winters due to the moderating influence of the sea.
- The mean daily temperature remains below 21°C over most parts of northern India. The night temperature may be quite low. quite low, sometimes going below freezing point in Punjab and Rajasthan. There are three main reasons for the **excessive cold in north India** during this season:
  - States like Punjab, Haryana and Rajasthan being far away from the moderating influence of sea **experience continental climate.**
  - The snowfall in the nearby **Himalayan ranges creates a cold wave situation;**
  - Around February, **the cold winds coming from the Caspian Sea and Turkmenistan** bring cold waves along with frost and fog over the northwestern parts of India.
  - **Hence option (d) is the correct answer.**
- In the northern part of the country, a **feeble high-pressure region develops**, with light winds moving outwards from this area. Influenced by the relief, these winds blow through the Ganga valley from the west and the northwest. The weather is normally marked by a **clear sky, low temperatures, and low humidity** and feeble, variable winds.
- A characteristic feature of the cold weather season over the northern plains is the **inflow of cyclonic disturbances** from the west and the northwest. These low-pressure systems, originate over the Mediterranean Sea and western Asia and move into India, along with the westerly flow. They cause the much-needed **winter rains** over the plains and snowfall in the mountains. Although the total amount of winter rainfall locally known as '**mahawat**' is small, they are of immense importance for the **cultivation of 'rabi' crops.**

Q 11.B

- The climate type being described here is Siberian Type or The Cool Temperate Continental Climate.
- **The Cool Temperate Continental (Siberian) Climate is experienced only in the northern hemisphere where the continents within the high latitudes have a broad east-west spread.**
- **The Siberian Climate is conspicuously absent in the southern hemisphere because of the narrowness of the southern continents in the high latitudes.**
- **The climate of the Siberian type is characterized by a bitterly cold winter of long duration, and cool brief summer. Spring and autumn are merely brief transitional periods. The extremes of temperature are so great in Siberia that it is often referred to as the 'cold pole of the earth (the annual range of temperature is very high).**
- **Rainfall is quite well distributed throughout the year, with a summer maximum from convectional rain.**
- No other trees are as well adapted as the conifers to withstand such an inhospitable environment as the Siberian type of climate. The coniferous forest belts of Eurasia and North America are the richest sources of softwood for use in building construction, furniture, matches, paper and pulp, rayon, and other branches of the chemical industry.
- **As a consequence of this lumbering is a major economic activity here.**
- **Hence option (b) is the correct answer.**

Q 12.C

- Black soils are also known as the **'Regur Soil'** or the 'Black Cotton Soil'.
  - The black soils are generally **clayey, deep, and impermeable**. **Hence option (a) is correct.**
  - They swell and become sticky when wet and shrink when dried. So, during the dry season, this soil develops wide cracks. Thus, there occurs a kind of **'self ploughing'**. Because of this character of slow absorption and loss of moisture, the black soil **retains the moisture for a very long time. Hence option (b) is correct.**
  - The black soils are **rich** in lime, iron, magnesia, and alumina. **Hence option (d) is correct.**
  - They also contain potash. But they lack phosphorous, nitrogen, and organic matter. The color of the soil ranges from deep black to grey.
  - Black soil covers most of the Deccan Plateau which includes parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh, and some parts of Tamil Nadu. **Hence option (c) is not correct.**
- **Laterite Soils** have mainly developed in the higher areas of the Peninsular plateau.

Q 13.B

- The **Loo** is a **strong, dusty, gusty, hot and dry** summer wind from the west which blows over the **western Indo-Gangetic Plain region** of North India and Pakistan. It is especially strong in the months of May and June. Lying In the heart of the **ITCZ** in the northwest, these blow in the afternoon, and very often, they continue to well into midnight. The Loo **ends in late summer,** with the arrival of the Indian monsoon. **Hence option (b) is the correct answer.**
- Since it causes extremely **low humidity** and high temperatures, the Loo also has a **severe drying effect** on vegetation leading to widespread browning in the areas affected by it during the months of May and June. Direct exposure to these winds may even prove to be fatal.

Q 14.C

- **Longitude is an angular distance, measured in degrees along the equator east or west of the Prime (or First) Meridian.** On the globe, longitude is shown as a series of semi-circles that run from pole to pole passing through the equator. Such lines are also called meridians. **Hence, statement 1 is correct.**
- Unlike the equator which is centrally placed between the poles, any meridian could have been taken to begin the numbering of longitude. It was finally decided in 1884, by international agreement, to choose as the zero meridians the one which passes through the Royal Astronomical Observatory at Greenwich, near London. This is the Prime Meridian (0°) from which all other meridians radiate eastwards and westwards up to 180°.
- As the parallels of latitude become shorter poleward, so the meridians of longitude, which converge at the poles, enclose a narrower space. They have one very important function, t**hey determine local time in relation to G.M.T. or Greenwich Mean Time, which is sometimes referred to as World Time. Hence, statement 2 is correct.**

Q 15.C

- **The northern plains are formed by the alluvial deposits brought by the rivers – the Indus, the Ganga, and the Brahmaputra.**
- From the north to the south, these can be divided into three major zones: the Bhabar, the Tarai, and the alluvial plains. The alluvial plains can be further divided into the Khadar and the Bhangar.
- **Bhabar is a narrow belt ranging between 8-10 km parallel to the Shiwalik foothills at the break-up of the slope. As a result of this, the streams and rivers coming from the mountains deposit heavy materials of rocks and boulders, and at times, disappear in this zone. Hence option (c) is the correct answer.**
- South of the Bhabar is the Tarai belt, with an approximate width of 10-20 km where most of the streams and rivers re-emerge without having any properly demarcated channel, thereby, creating marshy and swampy conditions known as the Tarai. **This has a luxurious growth of natural vegetation and houses varied wildlife.**
- The south of Tarai is a belt consisting of old and new alluvial deposits known as the **Bhangar and Khadar respectively.**

Q 16.C

- **The central Highlands are bounded to the west by the Aravali range**. The Satpura range is formed by a series of scarped plateaus on the south, generally at an elevation varying between 600-900 m above the mean sea level. **This forms the northernmost boundary of the Deccan plateau.**
- **It is a classic example of the relict mountains which are highly denuded and form discontinuous ranges. Hence statement 2 is correct.**
- The extension of the Peninsular plateau can be seen as far as Jaisalmer in the West, where it has been covered by the longitudinal sand ridges and crescent-shaped sand dunes called barchans.
- **This region has undergone metamorphic processes in its geological history, which can be corroborated by the presence of metamorphic rocks such as marble, slate, gneiss, etc. Hence statement 1 correct.**
- The general elevation of the Central Highlands ranges between 700-1,000 m above the mean sea level and **it slopes towards the north and northeastern directions.**
- Most of the tributaries of the river Yamuna have their origin in the Vindhyan and Kaimur ranges. **Banas is the only significant tributary of the river Chambal that originates from the Aravalli in the west.**

Q 17.A

- **Intrusive volcanic landforms:** The intrusive igneous rocks or plutonic rocks are formed **when the Magma cools within the earth's crust** and does not erupt to the surface. Various forms of intrusive igneous rocks are formed due to the intrusive activity of volcanoes.

- **Laccoliths:**
  - These are large **dome-shaped** intrusive bodies connected by a pipe-like conduit from below. These are basically intrusive counterparts of an exposed domelike batholith. Example: The laccoliths of Henry mountains in Utah, USA.
- **Lopolith:**
  - As and when the lava moves upwards, a portion of the same may tend to move in a horizontal direction wherever it finds a weak plane. In case it develops into a **saucer shape**, concave to the sky body, it is called Lopolith. Example: The Bushveld lopolith of Transvaal, South Africa.
- **Phacolith:**
  - A Phacolith is a **lens-shaped** mass of igneous rocks occupying the crest of an anticline or the bottom of a syncline and being fed by a conduit from beneath. Example: Corndon Hill in Shropshire, England
- **Batholiths:**
  - These are a huge mass of igneous rocks, usually of granite, formed **due to cooling down and solidification of hot magma** inside the earth. They appear on the surface only after the denudation processes remove the overlying materials and may be exposed on the surface after erosion. Example: Wicklow mountains of Ireland; the uplands of Brittany, France.
- **Hence only pair 2 is correctly matched.**

Q 18.C

- Normally, temperature decreases with an increase in elevation in the troposphere. It is called normal lapse rate. At times, the situation is reversed and the normal lapse rate is inverted. It is called Inversion of temperature. In this situation, the temperature actually increases with elevation.
- During a temperature inversion, cold air is trapped beneath warm air, creating a pocket of stagnated air close to the Earth's surface.
- **A long winter night with clear skies and still air is an ideal situation for Temperature Inversion**
  - **Long Nights ensure that outgoing radiation is greater than the incoming radiation.**
  - **Clear skies without clouds allow the unobstructed escape of radiation.**
  - **Still air prevents the vertical mixing of air at lower levels and maintains the separation of cold air mass below and warm air mass above.**
- **Hence, statement 1 is correct.**
- **A temperature inversion in the polar areas is caused by the lack of surface heating by the Sun, which stays below the horizon during the winter (the Polar Night), and the continuous loss of heat from the surface through the emission of infrared radiation. This allows the temperatures near the surface to be colder than the air above.**
- Even during periods of sunlight in polar regions, the high albedo of snow in the visible part of the spectrum means relatively little solar radiation is absorbed. This facilitates temperature inversion throughout the year in polar areas. Temperature Inversion is also common in mountain valleys. **Hence, statement 2 is correct.**
- During a temperature inversion, the upward and downward movement of air is prevented and this results in stable conditions in the lower levels of the atmosphere.

Q 19.D

- The climate of India is strongly influenced by monsoon winds. It is traditionally a seasonal reversing wind accompanied by corresponding changes in precipitation. The monsoons are experienced in the tropical area roughly between 20° N and 20° S. Monsoons are affected by various factors like
  - the differential heating and cooling of land and water;
  - the shift of the position of Inter-Tropical Convergence Zone (ITCZ);
  - the presence of the high-pressure area, east of Madagascar,
  - the intensity and position of this high-pressure area affects the Indian Monsoon,
  - the heating of the Tibetan plateau during summer
- **Characteristics of Monsoonal Rainfall:**
  - **The Monsoon, unlike the trades, are not steady winds but are pulsating in nature**, affected by different atmospheric conditions encountered by it, on its way over the warm tropical seas. Around the time of its arrival, the normal rainfall increases suddenly and continues constantly for several days. This is known as the '**burst**' of the monsoon. **Hence statement 1 is correct.**
  - Monsoonal rainfall is largely **governed by relief or topography.** The heavy rainfall in the northeastern states can be attributed to their hill ranges and the Eastern Himalayas. **Hence statement 2 is correct.**

- The **monsoon rainfall has a declining trend with increasing distance from the sea.** Kolkata receives 119 cm during the southwest monsoon period, Patna 105 cm, Allahabad 76 cm, and Delhi 56 cm. **Hence statement 3 is correct.**
- The monsoon rains occur in wet spells of a few days duration at a time. The wet spells are interspersed with rainless intervals known as '**breaks**'.
- Withdrawal or the retreat of the monsoon is a **more gradual process than the onset of Monsoon.** The withdrawal of the monsoon begins in the northwestern states of India by early September. **Hence statement 4 is correct.**

Q 20.C

- The months of October and November are known for **retreating monsoons, also known as North-East Monsoons.** By the end of September, the southwest monsoon becomes weak as the **low-pressure trough of the Ganga plain starts moving southward** in response to the southward march of the sun. The monsoon retreats from the western Rajasthan by the first week of September. It withdraws from Rajasthan, Gujarat, Western Ganga plain, and the Central Highlands by the end of the month. **Hence statement 1 is correct.**
- Unlike the sudden burst of the advancing monsoons, the withdrawal is rather gradual and takes about three months.
- The retreating southwest monsoon season is marked by **clear skies and a rise in temperature.** The land is still **moist**. Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive. This is commonly known as the **'October heat'**. The diurnal range of temperature increases due to a lack of cloud cover. In the second half of October, the mercury begins to fall rapidly, particularly in northern India. The weather in the retreating monsoon is dry in north India but it is associated with rain in the eastern part of the Peninsula. **Hence statement 3 is correct.**
- The widespread rain in this season is associated with the **passage of cyclonic depressions** which originate over the Andaman Sea and manage to cross the eastern coast of the southern Peninsula. These **tropical cyclones are very destructive.** The thickly populated deltas of the Godavari, Krishna and Kaveri are their preferred targets. A bulk of the **rainfall of the Coromandel Coast** is derived from these depressions and cyclones. Such cyclonic storms are less frequent in the Arabian Sea. **Hence statement 2 is not correct.**

Q 21.C

- **The normal cycle of Erosion:**
  - The cycle of erosion by fluvial processes (running waters or rivers) is called the normal cycle of erosion. The normal cycle of erosion begins with the upliftment of any landmass with reference to sea level. The rate of uplift in the beginning far exceeds the rate of erosion with the result of absolute relief (absolute altitude from sea level) and relative relief register increase. After some time upliftment of the land stops and erosion becomes more active. The land area, tectonically, remains stable i.e. there is crustal stability for a long period of time during which there is neither upliftment nor subsidence of land area.
  - There is progressive development of river valleys in sequential order and the whole land area progressively passes through three successive stages of **youth, mature and old (senile or penultimate), and is ultimately transformed into the low featureless plain** of the undulating surface.
  - Thus, the penultimate end product of a normal cycle of erosion is called **peneplain** which is characterized by an undulating surface with residual **convex-concave low hills** known as **'monadnocks, 'unakas' and 'mosores'**. **Hence, statements 1 and 2 are correct.**

Q 22.A

- The periodical rise and fall of the sea level, once or twice a day, mainly due to the attraction of the sun and the moon, is called a **tide.**
- **Tides based on Frequency:**
  - **Semi-diurnal tide:**
    - The most common tidal pattern**, featuring two high tides and two low tides each day**. The successive high or low tides are approximately of the same height.
  - **Diurnal tide:**
    - There is **only one high tide and one low tide during each day**. The successive high and low tides are approximately of the same height. **Hence statement 2 is not correct.**
  - **Mixed tide:**
    - Tides having **variations in height are known as mixed tides**. These tides generally occur along the west coast of North America and on many islands of the Pacific Ocean.

- **Tides based on the Sun, Moon, and the Earth Positions:**
  - **Spring tides:**
    - The position of both the sun and the moon in relation to the earth has direct bearing on tide height. **When the sun, the moon and the earth are in a straight line**, **the height of the tide will be higher**. These are called spring tides and **they occur twice a month**, one on **full moon period** and another **during the new moon period. Hence statement 1 is correct.**
  - **Neap tides:**
    - Normally, **there is a seven-day interval between the spring tides and neap tides.** At this time the **sun** and **moon** are at **right angles to each other** and the forces of the sun and moon tend to counteract one another. The Moon's attraction, though more than twice as strong as the sun's, is diminished by the counteracting force of the sun's gravitational pull.
- Once in a month, **when the moon's orbit is closest to the earth (perigee), unusually high and low tides occur**. During this time the **tidal range is greater than normal.** Two weeks later, **when the moon is farthest from Earth (apogee), the moon's gravitational force is limited and the tidal ranges are less than their average heights**.
- **When the earth is closest to the sun (perihelion), around 3rd January each year, tidal ranges are also much greater**, **with unusually high and unusually low tides. When the earth is farthest from the sun (aphelion), around 4th July each year, tidal ranges are much less than average.**
- **The time between the high tide and low tide,** when the water level is falling, is called the **ebb. Hence statement 3 is not correct.**
- The **time between the low tide and high tide,** when the tide is rising, is called the **flow or flood.**

Q 23.A

- **The Brahmaputra, one of the largest rivers of the world, has its origin in the Chemayungdung glacier of the Kailash range near the Mansarovar lake.**
- **Majuli, India's first island district, was declared in 2016. It is the World's largest river island and the site of the neo-Vaishnavite culture in Assam. It lies on the Brahmaputra river.**
- The Ganges river dolphin is primarily found in the Ganges and Brahmaputra rivers and their tributaries in India, Bangladesh, and Nepal, while the Indus river dolphin is now found only in the main channel of the Indus River in Pakistan. It is classified as Endangered as per IUCN.
- Spanning 9.15 km, the Dhola-Sadiya bridge is built across the Lohit river, which is a left-bank tributary of the Brahmaputra. It connects Assam and eastern Arunachal Pradesh. It is India's longest river bridge and located in Assam.
- **Hence option (a) is the correct answer.**

Q 24.D

- **Recent Context:** According to recent studies the levels of air pollutants such as fine particles (PM2.5) and nitrogen dioxide (NO2) are increasing in Kanpur and Delhi. The findings, led by the University of Birmingham and University College London (UCL), showed that the rise in PM2.5 and NO2 reflect increasing vehicle ownership, industrialization and the limited effect of air pollution policies to date. The study also found an increase in the air pollutant formaldehyde in Delhi, Kanpur and London.
- Nitrogen dioxide is not usually released directly into the air. Nitrogen dioxide forms when nitrogen oxide (NO) and nitrous oxides (NOx) react with other chemicals in the air to form nitrogen dioxide. **The main source of nitrogen dioxide resulting from human activities is the combustion of fossil fuels (coal, gas and oil) especially fuel used in cars. Natural sources of other nitrogen oxides include volcanoes and bacteria. Hence, statement 1 is correct.**
- The **National Air Quality Index** is a tool for effective communication of air quality status to people in terms, which are easy to understand**. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.** Eight pollutants namely particulate matter PM 10, PM2. 5, Ozone (O3), Sulphur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), lead (Pb) and ammonia (NH3) are assigned an air quality index (AQI) and thereafter an overall AQI is given daily indicating the value of the worst pollutant value for that area. **Hence, statement 2 is correct.**
- Nitrogen Dioxide (NO2) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NOx). **NO2 and other NOx interact with water, oxygen and other chemicals in the atmosphere to form acid rain.** Acid rain harms sensitive ecosystems such as lakes and forests. **Hence, statement 3 is correct.**

Q 25.D

- The whole of India has a monsoon type of climate. But the combination of elements of the weather, however, reveals many regional variations. These variations represent the **sub-types of the monsoon climate.** There are different schemes of classification of the climate of which Koeppen's scheme of classification is a major one.
- **Koeppen** based his scheme of Climatic classification on **monthly values of temperature and precipitation.** He identified **five major climatic types**, namely:
  - Tropical climates
  - Dry climates, where precipitation is very low in comparison to temperature, and hence, dry. If dryness is less, it is semi-arid (S); if it is more, the climate is arid(W).
  - Warm temperate climates
  - Cool temperate climates
  - Ice climates
- Koeppen used letter symbols to denote climatic types as given above. Each type is further sub-divided into sub-types on the basis of seasonal variations in the distributional pattern of rainfall and temperature.
- **Climatic Regions of India According to Koeppen's Scheme Type of Climate:**

Type of Climate	**Area**
Amw - Monsoon with short dry season	West coast of India south of Goa
As – Monsoon with dry summer	**Coromandel coast of Tamil Nadu**
Aw – Tripical savannah	**Most of the Peninsular plateaus (including Dandakaranya plateau)**, south of the Tropic of Cancer
Bwhw – Semi-arid steppe climate	North-western Gujarat, some parts of western Rajasthan and Punjab
Bwhw – Hot desert	Extreme western Rajasthan
Cwg – Monsoon with dry winter	Ganga plain, eastern Rajasthan, northern Madhya Pradesh, most of North-east India
Dfc – Cold humid winter with short summer	Arunachal Pradesh
E – Polar type	**Jammu and Kashmir, Himachal Pradesh and Uttarakhand**

- **Hence option (d) is the correct answer.**

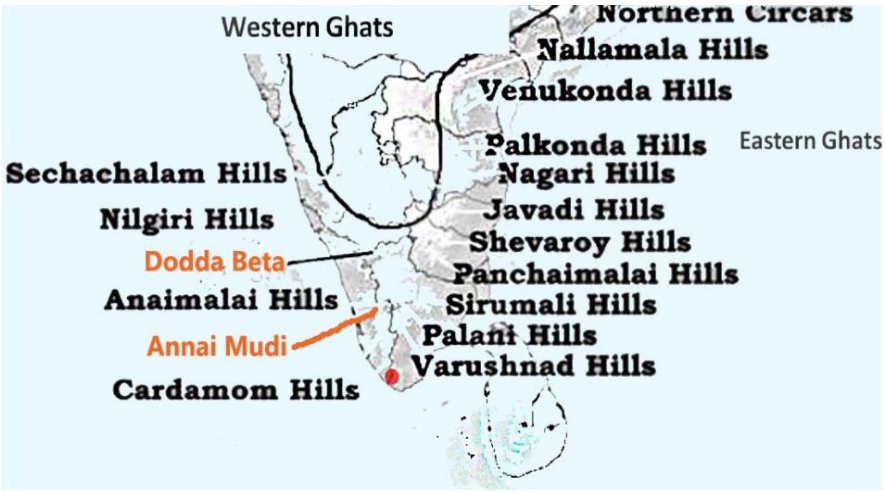
Q 26.D

- Precipitation gives soil its moisture content which makes the chemical and biological activities possible. Excess water helps in the downward transportation of soil components through the soil and deposits the same down below.
- In soil science, **eluviation** is the **transport of soil material** from upper layers of soil to lower levels by downward precipitation of water across soil horizons, and **accumulation of this material** (illuvial deposit) in lower levels is called **illuviation.**
- In climates like wet equatorial rainy areas with high rainfall, not only calcium, sodium, magnesium, potassium, etc. but also a major part of silica is removed from the soil. Removal of silica **from the soil** is known as **desilication**.
- **Hence only pair 3 is correctly matched.**

Q 27.C

- The Eastern Ghats is a chain of highly broken and detached hills starting from the Mahanadi in Odisha to the Vagai in Tamil Nadu. It runs parallel to the east coast of India leaving broad plains between their base and the coast. It loses Its hilly character between the Godavari and the Krishna rivers and occupied by Gondwana formations. KG Basin is located here.
- **The Garhjat Hills** also known as Odisha highlands is a mountain range formed by a series of low lying hills, plateaux, ridges and meadows that stretch into Odisha from the Utkal Plains in the Chotanagpur region of Jharkhand and the Chhattisgarh Plains.
- **The Javadi Hills** is an extension of the Eastern Ghats spread across parts of Vellore and Tiruvannamalai districts of the state of Tamil Nadu in southeastern India.
- **The Sirumalai Hills range** is the last mountain range in the Eastern Ghats. It is a dense forest region with a moderate climate.

- **The Shevaroy Hills** are a towering mountain range in Tamil Nadu. It is one of the major hill stations in the Eastern Ghats. Apart from the Natural forest coffee and citrus fruits, most notably oranges are grown in abundance.



Q 28.D

- **Earth flow:** It is promoted by excessive water received mostly through rainfall so that the materials are oversaturated.
- **Mudflow**: It differs from earth flow in that former may be noticed by the observer while the latter cannot be noticed because earth flow is not very common. The water content is more in mud flow than in debris flow and earth flow. Mudflow is most common along valley sides of alluvial rivers and the debris (mud) so produced is transported by the rivers. The necessary conditions which promote mudflow include:
  - steep and vertical slope,
  - presence of unconsolidated materials on the upper surface so that these, when mixed with water, become viscous fluid and slippery,
  - intermittent supply of sufficient water as a lubricant, and
  - absence of vegetation.
- **Hence option (d) is the correct answer.**

Q 29.D

- **Arid Soils** are generally **sandy** in structure and **saline** in nature. Due to the dry climate, high temperature, and accelerated evaporation, they lack moisture and humus.
- Nitrogen is **insufficient** and the phosphate content is normal. These soils are rich in minerals but the main limitation is the lack of water. The soils exhibit poorly developed horizons.
- **Lower horizons** of the soil are occupied by **'kankar' layers** because of the increasing calcium content downwards. The 'Kankar' layer formation in the bottom horizons restricts the infiltration of water, and as such when irrigation is made available, the soil moisture is readily available for sustainable plant growth.
- Arid soils are characteristically developed in western Rajasthan, which exhibits characteristic arid topography. **Hence option (d) is the correct answer.**
- If irrigated these soils give high agricultural returns. The availability of water from the Indira Gandhi canal has transformed the agricultural landscape of desert soils of western Rajasthan. These soils are mainly devoted to bajra, pulses, guar, fodder and less water requiring crops.

Q 30.D

- **Recent Context:** Hospitals across the country have started to report a number of cases of mucormycosis, an invasive fungal infection affecting patients who have recently recovered from COVID-19.
- Mucormycosis, commonly called black fungus (a direct reference to the blackening that is characteristic of the disease.), is an aggressive and invasive fungal infection **caused by a kind of fungus called mucormycete, which is abundant in the environment. Unsanitary conditions in hospitals can also augment the risk of this infection.** It mainly affects people who have health problems or take medicines that lower the body's ability to fight germs and sickness. **Hence, statement (a) is correct.**
- **While it is not contagious, it can cause a lot of damage internally and can be fatal if not detected early** (the treatment of this disease is available and possible if detected early). **Hence, statement (b) is correct.**

- **Mucormycosis frequently infects the sinuses, brain, or lungs.** While infection of the oral cavity or brain are the most common forms of mucormycosis, the fungus can also infect other areas of the body such as the gastrointestinal tract, skin, and other organ systems. **Hence, statement (c) is correct.**
- **Antibiotics are used to treat or prevent some types of bacterial infections.** They are not effective against viral infections, such as the common cold or flu. **Antibiotics do not kill fungi** - they kill other types of germs (called bacteria). In fact, you are more prone to getting a fungal infection if you take antibiotics. **Hence, statement (d) is not correct.**

Q 31.B

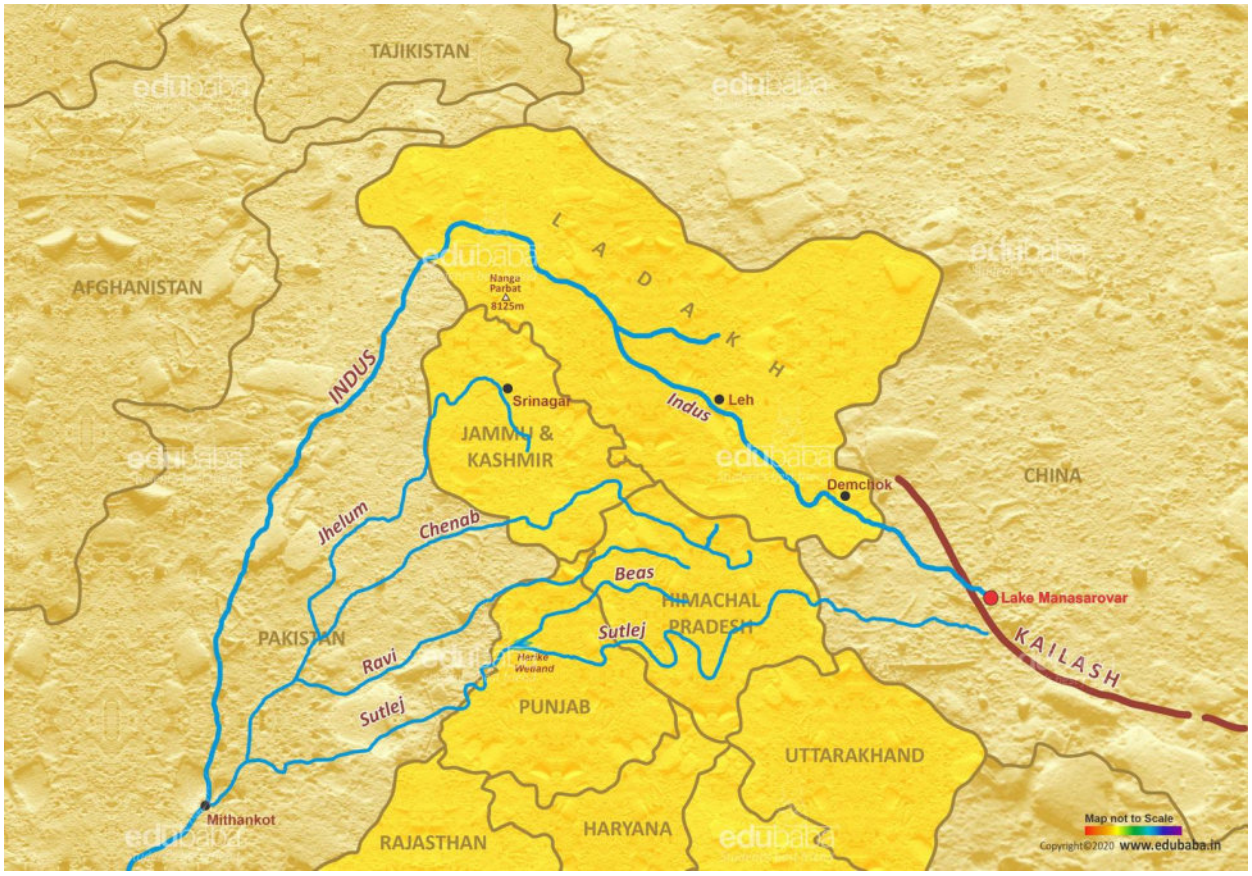
- The sources of information about the interior of the earth are divided into direct sources and indirect sources:
  - **Direct Sources**
    - The most easily available solid earth material is surface rock or the rocks we get from mining areas. **Gold mines** in South Africa are as deep as 3 - 4 km.
    - **Volcanic eruption** forms another source of obtaining direct information. As and when the molten material (magma) is thrown onto the surface of the earth, during volcanic eruption it becomes available for laboratory analysis.
  - **Indirect Sources**
    - Mining activity provides us with information about temperature and pressure which increases with the increasing distance from the surface towards the interior in deeper depths.
    - Another source of information is the meteors that at times reach the earth. However, it may be noted that the material that becomes available for analysis from **meteors**, is not from the interior of the earth. The material and the structure observed in the meteors are similar to that of the earth.
    - The other indirect sources include gravitation, magnetic field, and **seismic activity (earthquakes)**. Seismic activity helps us in analysing the composition of the interior of the earth based on the seismic waves.
- **Hence option (b) is the correct answer.**

Q 32.C

- The gravitation force (g) is not the same at different latitudes on the surface. It is greater near the poles and less at the equator. This is because of the distance from the center at the equator being greater than that at the poles.
- The gravity values also differ according to the mass of the material. The uneven distribution of mass of material within the earth influences this value. The reading of gravity at different places is influenced by many other factors. These readings differ from the expected values. Such a difference is called a gravity anomaly.
- **Hence both statements 1 and 2 are correct.**

Q 33.C

- **The Indus is also known as the Sindhu is the westernmost of the Himalayan rivers in India.** It originates from a glacier near Bokhar Chu) in the Tibetan region at an altitude of 4,164 m in the Kailash Mountain range. **Hence statement 3 is correct.**
- The Indus receives a number of Himalayan tributaries such as the Shyok, the Gilgit, the Zaskar, the Hunza, the Nubra, the Shigar, the Gasting, and the Dras. It finally emerges out of the hills near Attock where it receives the Kabul river on its right bank. The other important tributaries joining the right bank of the Indus are the Khurram, the Tochi, the Gomal, the Viboa, and the Sangar. They all originate in the Sulaiman ranges (Pakistan). **Hence statement 2 is not correct.**
- The Indus flows in India only through Jammu and Kashmir. Chenab, Beas, and Ravi rivers originate in Himachal Pradesh. Jhelum originates from Verinag spring in Jammu and Kashmir. Sutlej river originates in Tibet from Rakshas Tal.
- Before the partition of India all 5 tributaries of Indus used to flow through Punjab (Punjab literally means 'Land of five glasses of water) but today only Ravi, Beas, and Sutlej flow through the state. No tributary of Indus or the river itself flows through Uttarakhand. **Hence statement 1 is not correct.**



Q 34.C

- The low-pressure storm systems developing in the mid and high latitudes (35° latitude and 65° latitude in both hemispheres), beyond the tropics, are called the middle latitude or extratropical cyclones, or frontal cyclones. The passage of the front causes abrupt changes in the weather conditions over the area in the middle and high latitudes. Extratropical cyclones form along the polar front. Initially, the front is stationary. In the northern hemisphere, warm air blows from the south and cold air from the north of the front. When the pressure drops along the front, the warm air moves northwards and the cold air moves towards the south setting in motion an anticlockwise cyclonic circulation. The cyclonic circulation leads to a well-developed extratropical cyclone, with a warm front and a cold front.
- **Since fronts can be formed on both land and sea, extratropical cyclones can also be formed on land and sea as their occurrence requires the formation of fronts. Hence statement 1 is correct.**
- **Under the influence of westerlies, the extratropical cyclones move in the west to east direction. Hence statement 2 is not correct.**
- **The pattern of wind direction in extratropical cyclones is anticlockwise in the northern hemisphere and clockwise in the southern hemisphere. Hence, statement 3 is correct.**

Q 35.B

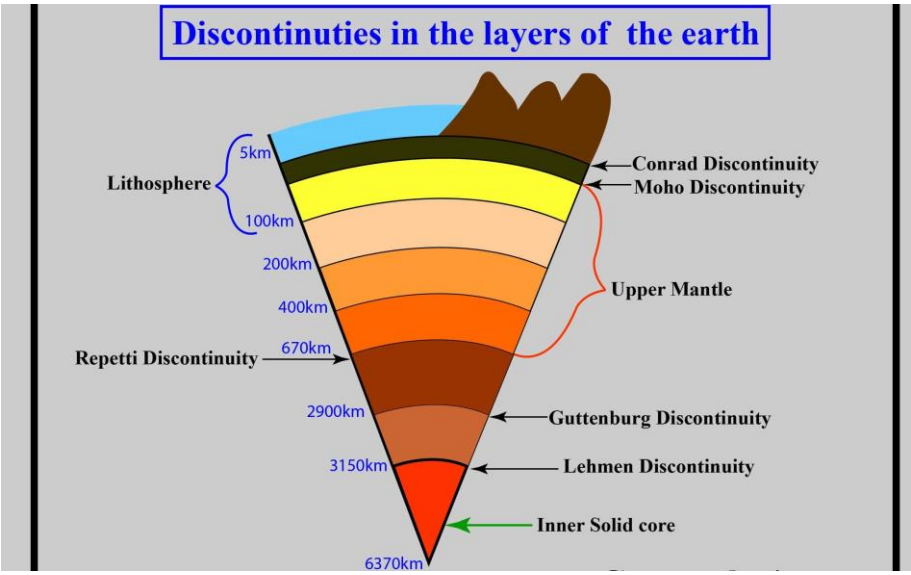
- **Recent context:** The Minister of Petroleum and Natural Gas recently flagged off the first supply of UCO (Used Cooking Oil) based Biodiesel blended diesel under the Expressions of Interest (EOI) scheme for Indian Oil's Tikrikalan Terminal, Delhi.
- **Biodiesel is a liquid fuel that is created by chemically processing vegetable oil and altering its properties to make it perform more like petroleum diesel fuel.**
- **Biodiesel is an alternative fuel, similar to conventional or 'fossil' diesel.** It can be produced from vegetable oils, animal fats, tallow and waste cooking oil, soybean oil. Biodiesel is a renewable, clean-burning diesel, a replacement that can be used in existing diesel engines without modification.
- **Biodiesel has many environmentally beneficial properties:**
  - **The main benefit of biodiesel is that it can be described as 'carbon neutral'. This means that the fuel produces no net output of carbon in the form of carbon dioxide (CO_2).** This effect occurs because when the oil crop grows it absorbs the same amount of CO_2 as is released when the fuel is combusted.
  - Biodiesel contains practically no sulphur.
  - **Also biodiesel is rapidly biodegradable and completely non-toxic**, meaning spillages represent far less of a risk than fossil diesel spillages.

- Biodiesel has a higher flash point than fossil diesel and so is safer in the event of a crash. **Hence statement 2 is correct.**

- **Some drawbacks of Biodiesel are as follows:**
  - it is likely to produce less power with high fuel consumption than diesel as the gross calorific value (energy content) of biodiesel is lower than petroleum diesel.
  - Blending of biodiesel with petroleum fuel are widely used in the diesel engine. High viscosity of the fuels causes fuel flow and ignition problems in unmodified Chlorine(CI) engines and also decreases the power output.
- **The National Policy on Biofuels-2018 8 envisages an indicative target of 20% blending of ethanol in petrol and 5% blending of bio-diesel in diesel by 2030. Hence statement 1 is not correct.**
  - **The policy allows production of ethanol from damaged food grains like wheat, broken rice etc. which are unfit for human consumption.**
  - The policy also allows conversion of surplus quantities of food grains to ethanol, based on the approval of National Biofuel Coordination Committee.

Q 36.B

- In geology, the word "discontinuity" is used for a surface at which seismic waves change velocity. One of these surfaces exists at an average depth of 8 kilometers beneath the ocean basin and at an average depth of about 32 kilometers beneath the continents. At this discontinuity, seismic waves accelerate. This surface is known as the Mohorovicic Discontinuity or often simply referred to as the "Moho." **The Mohorovicic Discontinuity, or "Moho," is the boundary between the crust and the mantle. Hence option (b) is the correct answer.**
- The Mohorovicic Discontinuity marks the lower limit of Earth's crust. As stated above, it occurs at an average depth of about 8 kilometers beneath the ocean basins and 32 kilometers beneath continental surfaces.
- **Gutenberg discontinuity:** The Gutenberg Discontinuity is situated inside the earth at a depth of about 2900 kilometers below the surface. The Gutenberg discontinuity **separates the core and the mantle of the earth.**
- **Conrad discontinuity:** The Conrad discontinuity (named after the seismologist Victor Conrad) is considered to be the border between **the upper continental crust and the lower one.**
- **Lehmann discontinuity:** The boundary between **the inner and outer core,** which occurs at a depth of roughly 5,100 km (about 3,200 miles), is known as the Lehmann discontinuity.



Q 37.B

- An earthquake in simple words is the shaking of the earth. It is a natural event. It is caused due to release of energy, which generates waves that travel in all directions.
- **The point where the energy is released is called the focus of an earthquake, alternatively, it is called the hypocentre**. The energy waves traveling in different directions reach the surface. **Hence, statement 1 is not correct.**
- The point on the surface, nearest to the focus, is called the epicenter. It is the first one to experience the waves. It is a point directly above the focus.
- Tsunamis are waves generated by tremors and are not a type of earthquake. **The effect of the tsunami would occur only if the epicenter of the tremor is below oceanic waters and the magnitude is sufficiently high**. **Hence, statement 2 is correct.**

Q 38.C

- A large number of hypotheses were put forth by different philosophers and scientists regarding the origin of the earth. One of the earlier and popular arguments was **by German philosopher Immanuel Kant**. Mathematician Laplace revised it in 1796. It is known as the Nebular Hypothesis. **Hence statement 2 is correct.**
- The hypothesis considered that the planets were formed out of a cloud of material associated with a youthful sun, which was slowly rotating. Nebular Hypothesis is used for explaining the origin of the Solar system. **Hence statement 1 is correct.**
- Later in 1900, Chamberlain and Moulton considered that a wandering star approached the sun. As a result, a cigar-shaped extension of the material was separated from the solar surface. As the passing star moved away, the material separated from the solar surface continued to revolve around the sun and it slowly condensed into planets.

Q 39.B

- **Recent Context:** The government has recently approved the **Production Linked Incentive (PLI) Scheme 'National Programme on Advanced Chemistry Cell (ACC) Battery Storage'** for achieving manufacturing capacity of Fifty (50) Giga Watt Hour (GWh) of ACC and 5 GWh of "Niche" ACC with an outlay of Rs.18,100 crore.
- **ACCs are the new generation of advanced storage technologies that can store electric energy either as electrochemical or as chemical energy and convert it back to electric energy as and when required.** The consumer electronics, electric vehicles, advanced electricity grids, solar rooftop etc. which are major battery consuming sectors are expected to achieve robust growth in the coming years.
- **The administrative department of this Production Linked Incentive (PLI) Scheme is Department of Heavy Industry, which comes under the Ministry of Heavy Industries and Public Enterprises. Hence, statement 1 is not correct.**
- **Advance and efficient batteries are critical inputs for the electric vehicles sector thus ACCs will certainly provide much needed boost to the development of this sector .All the demand of the ACCs is currently being met through imports in India.** The National Programme on Advanced Chemistry Cell (ACC) Battery Storage will reduce import dependence. It will also support the Atmanirbhar Bharat initiative. **Hence, statement 2 is correct.**

Q 40.A

- Karst regions have a bleak landscape, occasionally broken by precipitous slopes. There is a general absence of surface drainage as most of the surface water has gone underground. Streams rising on other rocks only flow over limestone for a short distance and then disappear underground. For the greater part of their course, they cut their way along the joints and fissures of the rock wearing out a system of underground channels. The surface valleys are therefore dry. When the water penetrates to the base of the limestone and meets non-porous rocks it re-emerges onto the surface as a spring or resurgence. **Hence option (a) is the correct answer.**
- **Zeugen region:** These are tabular masses that have a layer of soft rocks lying beneath a surface layer of more resistant rocks. The sculpting effects of wind abrasion wear them into a weird-looking 'ridge and furrow landscape. Mechanical weathering initiates their formation by opening up joints of the surface rocks. Wind abrasion further 'eats' into the underlying softer layer so that deep furrows are developed. The hard rocks then stand above the furrows as ridges or Zeugen**. Hence option (b) is not correct.**
- **Inselberg region:** This is a German word meaning island mountain. They have isolated residual hills rising abruptly from the level ground. They are characterized by their very steep slopes and rather rounded tops. They are often composed of granite or gneiss and are probably the relics of an original plateau that has been almost entirely eroded away. Inselbergs are typical of many desert and semi-arid landscapes in old age e.g. those of northern Nigeria, Western Australia, and the Kalahari Desert. **Hence option (c) is not correct.**
- **Coombes region:** The landforms of chalk are rather different from those of other limestones. There is little or no surface drainage and valleys that once contained rivers are now dry. These are often called coombes. **Hence option (d) is not correct.**

Q 41.C

- **Arunachal Himalayas extend from the east of the Bhutan Himalayas up to the Diphu pass in the east.** The general direction of the mountain range is **from southwest to northeast**. **Some of the important mountain peaks of the region are Kangtu and Namcha Barwa.**
- **These ranges are dissected by fast-flowing rivers from the north to the south, forming deep gorges**. The **Brahmaputra** flows through a deep gorge after crossing Namcha Barwa.

- Some of the important rivers are the **Kameng, the Subansiri, the Dihang, the Dibang, and the Lohit**. These are **perennial with a high rate of fall, thus, having the highest hydroelectric power potential in the country.**
- An important aspect of the Arunachal Himalayas is the **numerous ethnic tribal community inhabiting these areas.** Some of the prominent ones from west to east are the **Monpa, Abor, Mishmi, Nyishi, and the Nagas.**
- **Most of these communities practice Jhumming.** It is also known as **shifting or slash and burn cultivation.** This region is rich in biodiversity which has been preserved by the indigenous communities.
- **Hence option (c) is the correct answer.**

Q 42.A

- On the basis of relief, alignment of ranges, and other geomorphological features, the Himalayas can be divided into the following sub-divisions:
  - Kashmir or Northwestern Himalayas
  - Himachal and Uttarakhand Himalayas
  - Darjeeling and Sikkim Himalayas
  - Arunachal Himalayas
  - Eastern Hills and Mountains.
- **The Kashmir Himalayas are famous for Karewa formations, which are useful for the cultivation of Zafran, a local variety of saffron. Hence pair 1 is correctly matched.**
- The Kashmir valley is an oval-shaped intermountain valley fill, comprising of unconsolidated gravel and mud. A succession of plateaus is present above the Plains of Jhelum and its tributaries. These plateau-like terraces are called 'Karewas' or 'Vudr' in the local language.
- The two distinguishing features of the **Himachal and Uttarakhand Himalayan region from the point of view of physiography are the 'Shiwalik' and 'Dun formations'. Hence pair 2 is correctly matched**.
- Duns are longitudinal valleys created when the Eurasian plate and the Indian plate collided as a result of folding. Among lesser Himalayas and shiwaliks, they are formed. The valleys are accumulated with coarse alluvium passed down by Himalayan rivers. Some important duns located in this region are the **Chandigarh Kalka dun, Nalagarh dun, Dehra Dun, Harike dun, and the Kota dun, etc**. **Dehra Dun is the largest of all the duns** with an approximate length of 35-45 km and a width of 22-25 km.
- **The Arunachal Himalayas and the Darjeeling and Sikkim Himalayas are conspicuous by the absence of the Shiwalik formations. In place of the Shiwaliks here, the 'duar formations' are important. Hence pair 3 is not correctly matched.**
- The Dooars or Duars are the alluvial floodplains in eastern-northeastern India that lie south of the outer foothills of the Himalayas and north of the Brahmaputra River basin.
- Duar formations have also been used for the development of tea gardens. Sikkim and Darjiling Himalayas are also known for their scenic beauty and rich flora and fauna, particularly various types of orchids.

Q 43.A

- The rate of change of pressure with respect to distance is the pressure gradient. The pressure gradient results in a net force that is directed from high to low pressure and this force is called the pressure gradient force.
- Coriolis force is an apparent force that arises because of the earth's spin around its axis. It deflects the wind to the right direction in the northern hemisphere and to the left in the southern hemisphere. The Coriolis force acts perpendicular to the direction of motion and increases with increasing wind velocity i.e., the more the velocity, more is the wind deflection.
- **Geostrophic wind is the wind that blows parallel to the isobars when the Coriolis force is balanced by the pressure gradient force. Since the Coriolis force is zero at the equator there are no geostrophic winds at the equator. Hence option (a) is the correct answer.**
- **The katabatic wind is the generic term for downslope winds flowing from high elevations of mountains, plateaus, and hills down their slopes to the valleys or plains below.**
- Katabatic winds exist in many parts of the World and there are many different names for katabatic winds depending on where they are located and how they are formed. For example, during the night the slopes get cooled and the dense air descends into the valley as a katabatic wind.
- Anabatic wind also called upslope wind is a local air current that blows up a hill or mountain slope facing the Sun. During the day, the Sun heats such a slope (and the air over it) faster than it does the adjacent atmosphere over a valley or a plain at the same altitude. This warming decreases the density of the air, causing it to rise. More air rises from the valley or plains to replace it, producing an anabatic wind.

Q 44.B

- **Recent Context:** International Union for Conservation of Nature **(IUCN) has released a report titled "Nature in a Globalised World: Conflict and Conservation" that focuses on the complex relationship between nature and armed conflict.** IUCN therefore explores the complex relationships between nature and conflict to inform policies to better advance both peace building and conservation.
- **This is the first report in the IUCN flagship report series Nature in a Globalised World. The purpose of this series is to help bring the importance of nature conservation into mainstream political and economic decision-making.**
- **Key highlights of the report:**
  - Major threats posed by the conflict include direct killing of wildlife, degradation of ecosystems, disruption of conservation efforts.
  - Armed conflicts were particularly prevalent in some of the world's most biodiverse regions. For instance, India-Pakistan and India-China border conflicts are being fought in the Himalayan Biodiversity hotspot bio diverse regions.
  - Conflicts were less frequent within the boundaries of natural resources and other protected areas.
- **Major Recommendations:**
  - Conservation, restoration and sustainable management of resources can help reduce the pressures that derive conflict by improving the condition and productivity of landscape.
  - Establishing safeguards for staff in protected area and other conservationists.
  - Sanctions against those who commit environmental war.
  - Coordinate the law enforcement effort across sectors and scales to strengthen prevention and mitigation.
- **Hence, option (b) is the correct answer.**

Q 45.D

- **Gorges and Canyons:**
  - Gorges and canyons represent **very deep and narrow valleys** having **very steep valley side slopes** say wall-like steep valley sides. It is difficult to draw a line of distinction between these two types of valleys. Normally, a very deep and narrow valley is called a gorge and an extended form of the gorge is called a canyon.
  - Gorges are formed due to **active downcutting** of the valleys through the mechanism of pothole drilling during the juvenile (youth) stage of the fluvial cycle of erosion. **Hence, statement 1 is correct.**
  - Gorges are also formed **due to the recession of waterfalls**. The waterfall flows over resistant hard/cap rock. A deep plunge pool is formed at the base of the waterfall due to erosion. The hard rock above is undercut by erosion of the underlying soft rock. Eventually, the overhang collapses. This collapse causes the waterfall to retreat upstream leaving steep cliffs instead of river banks. A gorge of recession is formed. Most of the Himalayan rivers have carved out deep and narrow gorges. **Hence, statement 2 is correct.**
  - Canyons are an extended form of gorges. Canyons represent very deep, narrow but long valleys. **Hence, statement 3 is correct.**

Q 46.B

- **Nor Westers** are dreaded evening thunderstorms in **Bengal and Assam.** Their notorious nature can be understood from the local nomenclature of '**Kalbaisakhi**', a calamity of the month of Baisakh. These localized events are generally associated with **thunderstorms accompanied by strong squally winds and torrential rainfall**. Kalbaisakhi is a common occurrence during April and May. **Hence option (b) is the correct answer.**
- Kal Baisakhi **originates in the Chhotanagpur Plateau**, in and around the cities of Ranchi and Jamshedpur. The first sign of nor'wester is a low bank of dark cloud in the northwest region, the upper outline of which has the appearance of an arch. It approaches slowly at first and then rapidly with a strong gust or squall. Kal Baisakhi originates over Bihar and Jharkhand area moves eastwards and strikes West Bengal and Odisha.
- Kal Baisakhi definitely brings destruction in terms of **lightning, thunderstorm, hailstorm,** and rainfall. However, it is extremely helpful for **pre-Kharif crops** like jute, paddy, tea plantations and a large number of vegetables and fruits. It gives the much-desired relief after mid-day heat and pours well on the thirsty soil for the development of crops. In Assam, these storms are known as 'Barodoli Chheerha'.

Q 47.C

- **Recent Context:** The Ministry of Culture reaffirmed that reprinting of about 100 sets of sacred Mongolian Kanjur to be completed by Culture Ministry next year for distribution in the main centers of Buddhism in Mongolia.
- **Mongolian Kanjur, the Buddhist canonical text in 108 volumes is considered to be the most important religious text in Mongolia.**
- In the Mongolian language 'Kanjur' means 'Concise Orders'- the words of Lord Buddha in particular. It is held in high esteem by the Mongolian Buddhists and they worship the Kanjur at temples and recite the lines of Kanjur in daily life as a sacred ritual. The Kanjur are kept almost in every monastery in Mongolia.
- **Mongolian Kanjur has been translated from Tibetan. The language of the Kanjur is Classical Mongolian.**
- The Ministry of Culture has taken up the project of reprinting of 108 volumes of Mongolian Kanjur under the National Mission for Manuscripts (NMM).
- **Hence, option (c) is the correct answer.**

Q 48.D

- The Mediterranean Sea, an intercontinental sea that stretches from the Atlantic Ocean on the west to Asia on the east and separates Europe from Africa. It has often been called the incubator of Western civilization. The northern shores of the eastern Mediterranean are highly complex and, unlike the southern shores, have variable-fold mountains that offered favorable sites for the development of the Mediterranean civilizations. **Ibiza, one of the Balearic Islands**, in the western Mediterranean Sea off the east coast of Spain. **Hence option 1 is correct.**
- The north coast of Africa bordering the eastern Mediterranean is low-lying and of monotonous uniformity except for the Cyrenaica highlands in Libya, which lie to the east of the Gulf of Sidra. **The largest islands of the eastern Mediterranean are Crete and Cyprus,** both of which are mountainous. **Hence options 2 and 3 are correct.**

- In the map shown above, the three islands in the question can be seen in the three rectangles, from left to right, they are **Ibiza, one of the Balearic Islands, Crete, and Cyprus.**

Q 49.B

- The Great Indian Desert(Thar Desert) lies to the **Northwest of the Aravali Hills. Hence statement 1 is not correct.**
- It lies in the Indian state of **Rajasthan and extends to Gujarat, Punjab, and Haryana. It is further extended to the Pakistani province of Sindh.**
- On the basis of the orientation, the desert can be divided into two parts: the northern part is sloping towards Sindh and the southern towards the Rann of Kachchh
- **Most of the rivers in this region are ephemeral. The Luni river** flowing in the southern part of the desert is of some significance. Low precipitation and high evaporation make it a water-deficit region.
- There are some streams that disappear after flowing for some distance and present a typical case of inland drainage by joining a **lake or playa.**

- The lakes and the playas have brackish water which is the main source of obtaining salt.
- Some of the well pronounced desert land features present here are **mushroom rocks, shifting dunes, and oasis (mostly in its southern part). Hence statement 2 is correct.**

Q 50.D

- The total forest cover (TFC) of India is 712,249 square kilometers (sq km) i.e. 21.67% according to the biennial India State of Forest Report (ISFR 2019). **Hence statement 1 is correct.**
- It is important to note that the forest area and the actual forest cover are not the same. The forest area is the area notified and recorded as the forest land irrespective of the existence of trees, This is based on the records of the State Revenue Department.
- The actual forest cover is the area occupied by forests with a canopy. It is based on aerial photographs and satellite imageries. **Hence statements 2 and 3 are not correct.**
- The top five states that have shown an increase in forest cover include Karnataka (1,025 sq km) > Andhra Pradesh (990 sq km) > Kerala (823 sq km) > J&K (371 sq km) > Himachal Pradesh (334 sq km).
- Area-wise Madhya Pradesh has the largest forest cover in the country followed by Arunachal Pradesh, Chhattisgarh, Odisha, and Maharashtra. In terms of forest cover as a percentage of total geographical area, the top five States are Mizoram (85.41%), Arunachal Pradesh (79.63%), Meghalaya (76.33%), Manipur (75.46%), and Nagaland (75.31%).
- Mangrove cover has been separately reported in the ISFR 2019 and the total mangrove cover in the country is 4,975 sq km. An increase of 54 sq Km in mangrove cover has been observed as compared to the previous assessment of 2017. Top three states showing mangrove cover increase are Gujarat (37 sq km) followed by Maharashtra (16 sq km) and Odisha (8 sq km).

Q 51.D

- **The Indian Desert is a land of undulating topography dotted with longitudinal dunes and barchans**. This region receives **low rainfall below 150 mm per year;** hence, it has an arid climate with low vegetation cover. It is because of these characteristic features that this is also known as **Marusthali.**
- **The Barchans are crescentic or moon-shaped dunes that occur individually or in groups.**
- They occur transversely to the wind, so that their thorns thin out and become lower in direction of the wind due to their reduced frictional retardation of the winds around the edges.
- **The windward side is convex and gently sloping while the leeward side is concave and steep.**
- **The sand is driven up the windward side, and on reaching the crest, slips down the leeward side so that the dune advances**. The rate of advancement varies from 25 feet a year to 50 feet a year depending upon the height of the dunes.

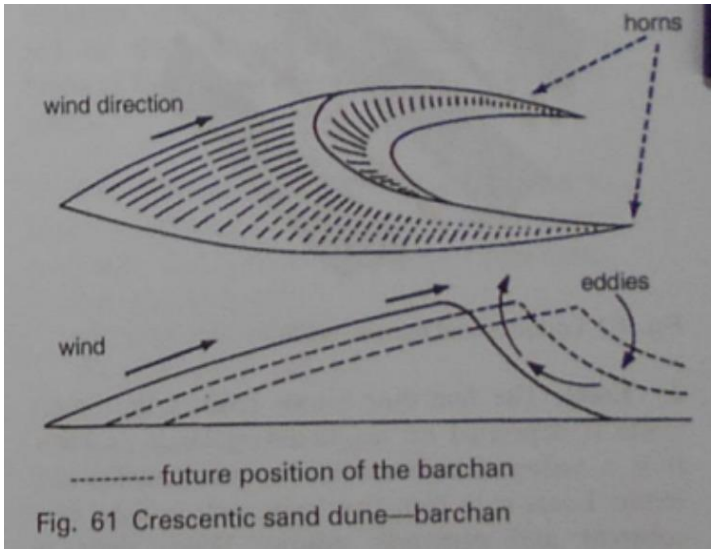


Fig. 61 Crescentic sand dune—barchan

- **Hence option (d) is the correct answer.**

Q 52.A

- **India has a long coastline of 7516.6 km**. On the basis of the location and active geomorphological processes, **it can be broadly divided into two: (i) the western coastal plains; (ii) the eastern coastal plains.**
- **The western coastal plains are an example of a submerged coastal plain. Hence statement 1 is correct.** Because of this submergence, it is a narrow belt and provides natural conditions for the

development of ports and harbors. **Kandla, Mazagaon, JLN port Navha Sheva, Marmagao, Mangalore, Cochin, etc. are some of the important natural ports located along the west coast.**

- Extending from the Gujarat coast in the north to the Kerala coast in the south, the west coast may be divided into the following divisions – the **Kachchh and Kathiawar coast in Gujarat, the Konkan coast in Maharashtra, Goan coast, and Malabar coast in Karnataka and Kerala respectively.**
- **The western coastal plains are narrow in the middle and get broader towards north and south. Hence statement 2 is correct.**
- **The rivers flowing through this coastal plain do not form any delta. Hence statement 3 is not correct.** The slope of rivers of the western coast is very steep. Therefore, these rivers flow not in different parts but in one part. And hence they do not form any delta.
- The Malabar coast has got certain distinguishing features in the form of **'Kayals' (backwaters),** which are used for fishing, inland navigation, and also due to its special attraction for tourists. Every year the famous **Nehru Trophy Vallamkali (boat race) is held in Punnamada Kayal in Kerala.**

Q 53.C

- Minerals occur in different types of rocks. Some are found in igneous rocks, some in metamorphic rocks while others occur in sedimentary rocks. Generally, metallic minerals are found in igneous and metamorphic rock formations that form large plateaus. **Hence statement 1 is correct.**
- Iron-ore in north Sweden, copper and nickel deposits in Ontario, Canada, iron, nickel, chromites, and platinum in South Africa are examples of minerals found in igneous and metamorphic rocks. Sedimentary rock formations of plains and young fold mountains contain non-metallic minerals like limestone. **Hence statement 2 is correct.**
- Limestone deposits of the Caucasus region of France, manganese deposits of Georgia and Ukraine, and phosphate beds of Algeria are some examples. Mineral fuels such as coal and petroleum are also found in the sedimentary strata.

Q 54.C

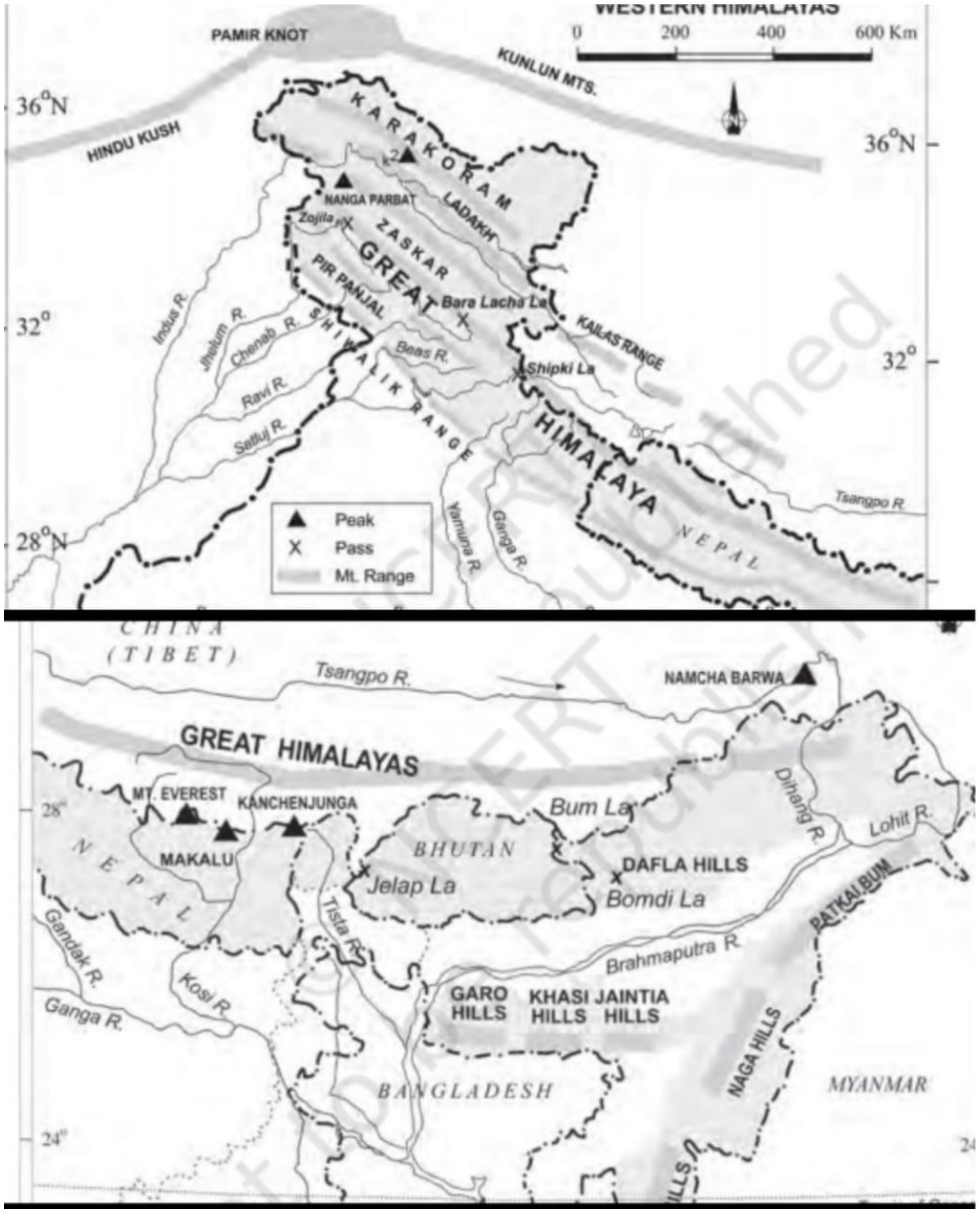
- Antarctica, fifth in size among the world's continents. Its landmass is almost wholly covered by a vast ice sheet. Often described as a continent of superlatives, Antarctica is the world's southernmost continent. It is also the world's highest, driest, windiest, coldest, and iciest continent. Antarctica is about 5.5 million square miles (14.2 million square km) in size, and thick ice covers about 98 percent of the land. **Hence statements 1 and 2 are correct.**
- The continent is divided into East Antarctica (which is largely composed of a high ice-covered plateau) and West Antarctica (which is largely an ice sheet covering an archipelago of mountainous islands). Lying almost concentrically around the South Pole, Antarctica's name means "opposite to the Arctic." It would be essentially circular except for the out flaring Antarctic Peninsula, which reaches toward the southern tip of South America (some 600 miles [970 km] away), and for two principal embayments, the Ross Sea and the Weddell Sea. **Hence statement 3 is correct.**
- A bay, embayment, or sinus, is an extension of the sea into a recess or indentation of the coast. If the recess is formed by a long, gentle curve, the term bight may be applied. A small embayment is referred to as a cove.

Q 55.A

- A continent is one of Earth's seven main divisions of land. The continents are, from largest to smallest: Asia, Africa, North America, South America, Antarctica, Europe, and Australia. **Hence option (a) is the correct answer.**
- **Together, the continents add up to about 148 million square kilometers (57 million square miles) of land.** Continents make up most—but not all—of Earth's land surface. A very small portion of the total land area is made up of islands that are not considered physical parts of continents. The ocean covers almost three-fourths of Earth. The area of the ocean is more than double the area of all the continents combined. All continents border at least one ocean. Asia, the largest continent, has the longest series of coastlines.
- The sizes of the seven continents are as follows
  - Asia - 44,579,000 Sq. Km
  - Africa - 30,065,000 Sq. Km
  - North America - 24,256,000 Sq. Km
  - South America - 17,819,000 Sq. Km
  - Antarctica - 13,209,000 Sq. Km
  - Europe - 9,938,000 Sq. Km
  - Australia - 7,687,000 Sq. Km

Q 56.C

- **Zoji La pass is a high mountain pass on the Great Himalayas** that runs through Kashmir Valley to Ladakh at an altitude of 3528m above sea level.
- **Baralacha La pass is a high mountain pass in the Zanskar range** connecting Lahaul district in Himachal Pradesh to Leh district in Ladakh, situated along the **Leh–Manali Highway.**
- **Shipki La is a mountain pass that connects Kinnaur district to the Tibetan Autonomous Region in China.** It's a border post at 18,599 feet. **It is through this pass that the turbulent Sutlej enters India from China-occupied Tibet.**
- **Jelep La is a high-altitude mountain pass at 13,999 feet linking Lhasa to India.** It nestles between India and Tibet in the **eastern part of the Sikkim in India**. The word Jelep La is of Tibetan origin and it means "the lovely level pass".



- **Hence, option (c) is the correct answer.**

Q 57.C

- **Evolution of Earth's Atmosphere**
  - There were three stages in the evolution of the present atmosphere.
    - The **first stage** is marked by the loss of the primordial atmosphere.
    - In the **second stage**, the hot interior of the earth contributed to the evolution of the atmosphere.
    - Finally, in the **third stage**, the composition of the atmosphere was modified by the living world through the process of photosynthesis.
  - **The early atmosphere, with hydrogen and helium,** is supposed to have been stripped off as a result of the solar winds. **Hence, statement 1 is correct.**

- **During the cooling of the earth, gases and water vapor were released from the interior solid earth.** This started the evolution of the present atmosphere. The early atmosphere largely contained water vapor, nitrogen, carbon dioxide, methane, ammonia, and very little free oxygen. The process through which the gases were outpoured from the interior is called degassing. **Hence, statement 2 is correct.**
- **Atmosphere and Oceans began to have the contribution of oxygen through the process of photosynthesis.**

Q 58.A

- **Recent Context:** In collaboration with the UNICEF-Assam, the Anamika Ray Memorial Trust (ARMT) has produced three short videos using string puppetry for creating mass awareness on COVID appropriate behaviour.
- **Putul Nach (putal-doll, and nach-dance) is a traditional string puppet form of Assam, West Bengal and also extends to parts North-East India**.
  - **These puppets are carved from wood. Dolls are 1.5 meter tall and are made of hollow wood or bamboo.**
  - **The heads are made of terracotta.**
  - **These puppets have mostly three joints.** The heads, supported by the main rod, are joined at the neck and both hands attached to rods are joined at the shoulders.
  - The sculpted form of the puppets, their costumes and manipulation vary according to regional style.
  - A putul nach troupe is generally made up of fourteen persons (all men): ten puppeteers and four musicians who play a harmonium, a khol (flute), bells, a sarinda (stringed instrument), as well as sing.
  - The Ramayana, either in its entirety or by episodes, is performed, as well as scenes from the Mahabharata (thus themes are largely religious).
  - The Putala nach is also called putala bhaona due to its ancient link (16th century) with bhaona theatre.
  - The puppeteers add dialogues or chants taken from bhaona, the local traditional theatre. In this regard, some traditional performances include contemporary educational themes such as the fight against deforestation or family planning messages.
- **Hence option (a) is the correct answer.**

Q 59.C

- **Block disintegration due to frost:**
  - The disintegration of rocks into large size blocks due to freeze and thaw of water is of common occurrence in the temperate and cold climatic regions. In fact, this process is more active in those areas which are very often characterized by alternate processes of freezing and thawing of water mainly during night and day respectively. Frost's action weakens the rocks in two ways e.g.
    - due to freeze and thaw of water between the particles of the rocks and
    - due to freeze and thaw of water in the crevices and pore spaces.
  - The more **compact and highly consolidated rocks, like granites**, are **least affected** by freeze-thaw actions. **Hence, statement 1 is correct.**
  - Less compact and loosely consolidated rocks are more affected by frost actions, for example, **sedimentary rocks** being more porous are **highly susceptible** to the mechanism of weathering. **Hence, statement 2 is correct.**
  - Diurnal freeze and thaw cycle causes alternate expansion and contraction which introduce tension and stresses due to which rocks are disintegrated into smaller particles. This process, known as **granular disintegration** due to frost action, is an exceedingly slow process and rocks are least affected by this process.

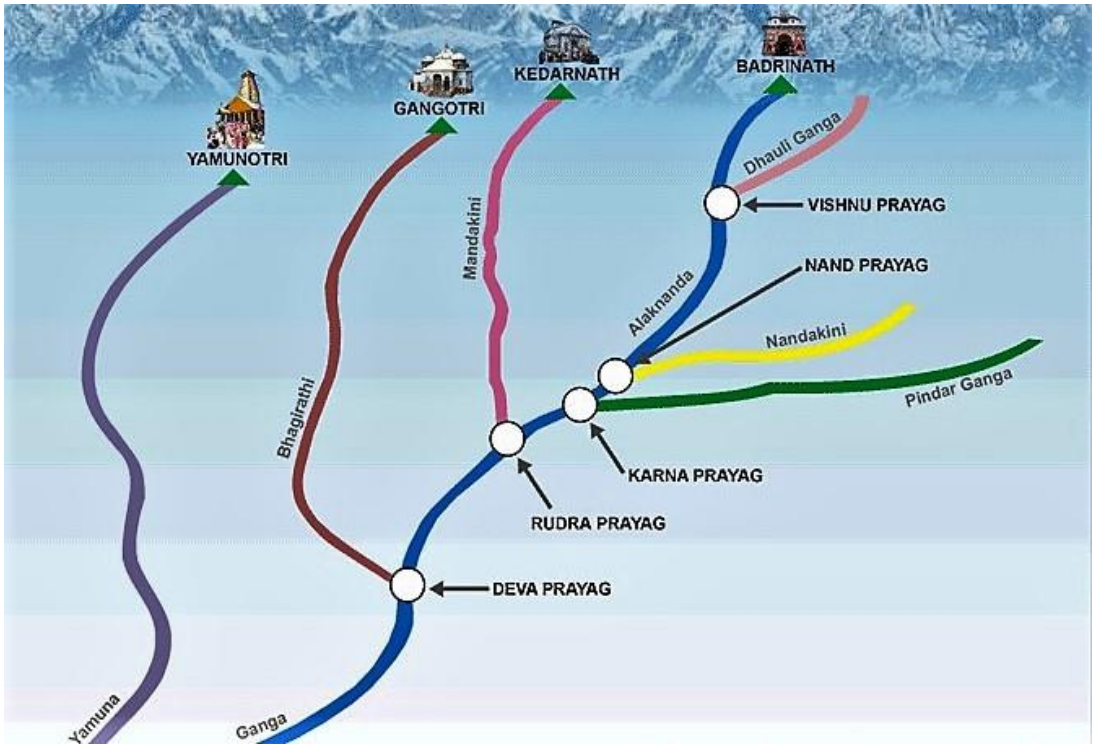
Q 60.A

- **Recent context: NASA's OSIRIS-REX, begins two-year long journey back to earth from asteroid Bennu. Hence statement 1 is correct and statement 2 is not correct.**
- **OSIRIS-REx is NASA's first mission to visit a near-Earth asteroid (Bennu), survey its surface and collect a sample from it and return to earth.**
- Touch-And-Go Sample Acquisition Mechanism (TAGSAM) – an articulated robotic arm with a sampler head is developed to collect a sample of Bennu's surface. OSIRIS-REx Sample Return Capsule (SRC) – a capsule with a heat shield and parachutes through which the spacecraft will return the asteroid sample to Earth.
- **Analyzing the sample will help scientists understand the early solar system, as well as the hazards and resources of near-Earth space.**

- **Why asteroid Bennu ?**
  - Bennu is an **ancient asteroid, believed to have been born in the Main Asteroid belt between Mars and Jupiter,** currently more than 200 million miles from Earth.
  - It is known that this asteroid is a **B-type asteroid, implying that it contains significant amounts of carbon and various other minerals.** Because of its **high carbon content, it reflects about 4% of the light** that hits it, which is very low when compared with a planet like Venus, which reflects about 65% of the light that hits it. Earth reflects about 30%.
  - Significantly, Bennu hasn't undergone drastic changes since its formation over billions of years ago and therefore **it contains chemicals and rocks dating back to the birth of the solar system. It is also relatively close to the Earth.**
  - There is a slight possibility that Bennu, which is classified as a Near Earth Object (NEO), might strike the Earth in the next century, between the years 2175 and 2199.

Q 61.C

- The Ganga is the most important river of India both from the point of view of its basin and cultural significance. It rises in the Gangotri glacier near Gaumukh (3,900 m) in the Uttarkashi district of 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. **Hence pair 1 is correctly matched**.
- The Alaknanda consists of the Dhauli and the Vishnu Ganga which meet at Joshimath or Vishnu Prayag. **Hence pair 2 is not correctly matched.**
- The other tributaries of Alaknanda such as the Pindar joins it at Karna Prayag while Mandakini or Kali Ganga meets it at Rudra Prayag. The Ganga enters the plains at Haridwar. **Hence pair 3 is correctly matched.**



Q 62.A

- **A tornado is a violently rotating column of air touching the ground, usually attached to the base of a thunderstorm. Tornadoes are nature's most violent storms.** Tornadoes, also called twisters, are fierce products of severe thunderstorms. As the air in a thunderstorm rises, the surrounding air races in to fill the gap, forming a funnel. A tornado lasts from a few seconds to several hours. The average wind speed is about 177 kph (110 mph), but some winds are much faster. A tornado travels over the ground at about 45 km per hour (28 miles per hour) and goes about 25 km (16 miles) before losing energy and disappearing. **Hence option (a) is the correct answer.**
- Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds. Thunderstorms are caused by intense convection on moist hot days. A thunderstorm is a well-grown cumulonimbus cloud producing thunder and lightning. When the clouds extend to heights where sub-zero temperature prevails, hails are formed, and they come down as hailstorms. If there is insufficient moisture, a thunderstorm can generate duststorms.

- Tornadoes that occur over water are called waterspouts. Tornadoes are usually spawned from powerful thunderstorms and can cause fatalities and devastate a neighborhood in seconds. Tornadoes have been reported on all continents except Antarctica. The United States has the most violent tornadoes. In the Indian sub-continent, Bangladesh is the most prone country to tornadoes.
- Thunderstorms are caused by intense convection on moist hot days. A thunderstorm is a well-grown cumulonimbus cloud producing thunder and lightning. A thunderstorm is characterized by an intense updraft of rising warm air, which causes the clouds to grow bigger and rise to a greater height. Later, downdraft brings down to earth the cool air and rain. The incoming thunderstorm is indicated by a violent gust of wind. This wind is due to the intense downdraft. The updraft and downdraft determine the path of the thunderstorm. Most of the time, the path is erratic. When the clouds extend to heights where sub-zero temperature prevails, hails are formed, and they come down as hailstorms. If there is insufficient moisture, a thunderstorm can generate dust storms.

Q 63.C

- **Acidic lavas:**
  - These lavas are **highly viscous** with a higher melting point. **Hence, statement 1 is correct.**
  - They are **light-colored, of low density**, and have a **high percentage of silica**. They flow slowly and seldom travel far before solidifying. The resultant cone is therefore steep-sided. **Hence, statement 2 is not correct.**
  - The rapid congealing of lava in the vent obstructs the flow of the out-pouring lava, resulting in **loud explosions,** throwing out many volcanic bombs or pyroclasts. **Hence, statement 3 is correct.**
  - Sometimes the lavas are so vicious that they **form spine or plug** at the crater-like that of **Mt. Pelee in Martinique.** Some spines are very resistant and while most of the material of very old volcanoes is removed by erosion the spine may remain.

Basic lava	Acidic lava
Contain small amount of silica	Contain large amount of silica
Highly fluid	Highly viscous/ sticky
Low melting point	High melting point
Fast flowing	Slow flowing
Travel long distances	Seldom travel far
Build gently sloping cones	Build steep sided cones
Quiet and without much explosive activity	Explosive volcanic activity

Q 64.A

- **Dry deciduous forest** covers vast areas of the country, where rainfall ranges between 70 -100 cm. Trees of these forests drop its leaves in winter (when the weather remains driest) and the forest appears like a vast grassland with naked trees all around and new leaves are generated after winter. During rainy season these types of forests completely decorate lush green leaves.
- These forests are found in rainier areas of the Peninsula and the plains of Uttar Pradesh and Bihar.
- On the wetter margins, it has a transition to the moist deciduous, while on the drier margins to thorn forests.
- Tropical moist deciduous forests are the most widespread forests in India. **Hence statement 1 is not correct.**
- Tendu, palas, amaltas, bel, Khair, axlewood, teak, rosewood, common bamboo, red sanders, laurel, etc. are the common trees of these forests. **Hence, statement 2 is correct.**

Q 65.A

- **Recent Context:** Red-eared slider, also called as the red-eared terrapin, **is an American breed of turtles widely spread across the USA and North Mexico.** They are famous as pet animals and have quickly become an invasive species in many parts of the world including India. **Hence, statement 2 is not correct.**
- Herpetologists have warned that the red-eared slider turtle, released in natural water bodies by people who keep them as pets (and it is traded legally), could negatively impact native species of turtles and tortoises (through interspecific competition).
- The red-eared slider has already affected States such as **Karnataka and Gujarat,** where it has been found in 33 natural water bodies. **Also preventing this invasive species from overtaking the Brahmaputra**

and other river ecosystems in the Northeast is crucial because the Northeast is home to more than 72% of the turtle and tortoise species in the country, all of them very rare. Hence statement 1 is correct.

- The females of this species are usually larger than the males. The life span of individuals of this species typically ranges between 20 and 30 years though it can go up to 40 years in some cases.

Q 66.B

- **India has 15,106.7 Km of land border and a coastline of 7,516.6 Km including island territories.** The length of land border with neighbouring countries and states sharing international borders are as under:
- **India shares the longest land frontier with Bangladesh.**
- **Bangladesh – 4096.7km - West Bengal, Mizoram, Meghalaya, Tripura and Assam. Hence option (b) is the correct answer.**
- China – 3488km - Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh
- Pakistan – 3323km - Jammu & Kashmir, Punjab, Rajasthan, and Gujarat
- Nepal – 1751km - Bihar, Uttarakhand, Uttar Pradesh, Sikkim and West Bengal
- Myanmar - 1643km - Arunachal Pradesh, Nagaland, Manipur and Mizoram; Myanmar also shares a maritime boundary with India in the Bay of Bengal.
- Bhutan – 699km - West Bengal, Sikkim, Arunachal Pradesh and Assam
- Afghanistan – 106km – Jammu and Kashmir (POK)
- **Along with these, India have neighbouring links through sea with Sri Lanka and Maldives.**

Figure 1.1 : India : Administrative Divisions

Q 67.D

- **Potholes and Plunge Pools:**
  - Over the rocky beds of hill-streams **more or less circular depressions** called potholes to form because of stream erosion aided by the abrasion of rock fragments. The **kettle-like small depressions** in the rocky beds of the river valleys are called potholes which are usually cylindrical in shape. **Hence, statement 1 is correct.**
  - Potholes are generally formed **in coarse-grained rocks such as sandstones and granites. Hence, statement 2 is correct.**
  - The diameter of potholes ranges from a few centimeters to several meters. The depth of potholes is far more than their diameters. **Potholes of much bigger size** are called **plunge pools.** In fact, plunge pools are **formed at the base of waterfalls** due to the pounding of rocks by gushing water from the falls (waterfalls). **Hence, statement 3 is correct.**
  - The Once a small and waterfalls also, large potholes, quite deep and wide, form because of the sheer impact of water and rotation of boulders. Such large and deep holes at the base of waterfalls are called plunge pools.

Q 68.A

- **Recent Context: Union Minister for Panchayati Raj released a new framework for implementation of the SVAMITVA Scheme to mark the nationwide roll-out of the SVAMITVA Scheme.**
- **SVAMITVA Scheme is a Central Sector scheme launched on National Panchayat Day i.e 24th April 2020. The Ministry of Panchayati Raj (MoPR) is the Nodal Ministry for implementation of the scheme.** In the States, the Revenue Department / Land Records Department will be the Nodal Department and shall carry out the scheme with support of State Panchayati Raj Department. **Survey of India shall work as the technology partner for implementation. Hence, statement 2 is not correct.**
- **The Scheme aims to provide an integrated property validation solution and thus ensuring property rights to the residents of rural inhabited areas in India by using Drone survey and CORS Networks which provides mapping accuracy of 5 cms.** This would provide the 'record of rights' to village households. **Hence, statement 1 is correct.**
- The scheme seeks to achieve objectives such as:
  - Creation of accurate land records for rural planning;
  - Ensuring financial stability of the citizens in rural India by enabling them to use the property as a financial asset for taking loans and other financial benefits.
  - Determination of property tax;
  - Creation of survey infrastructure and GIS maps for departmental use.
  - To reduce property related disputes and legal cases.

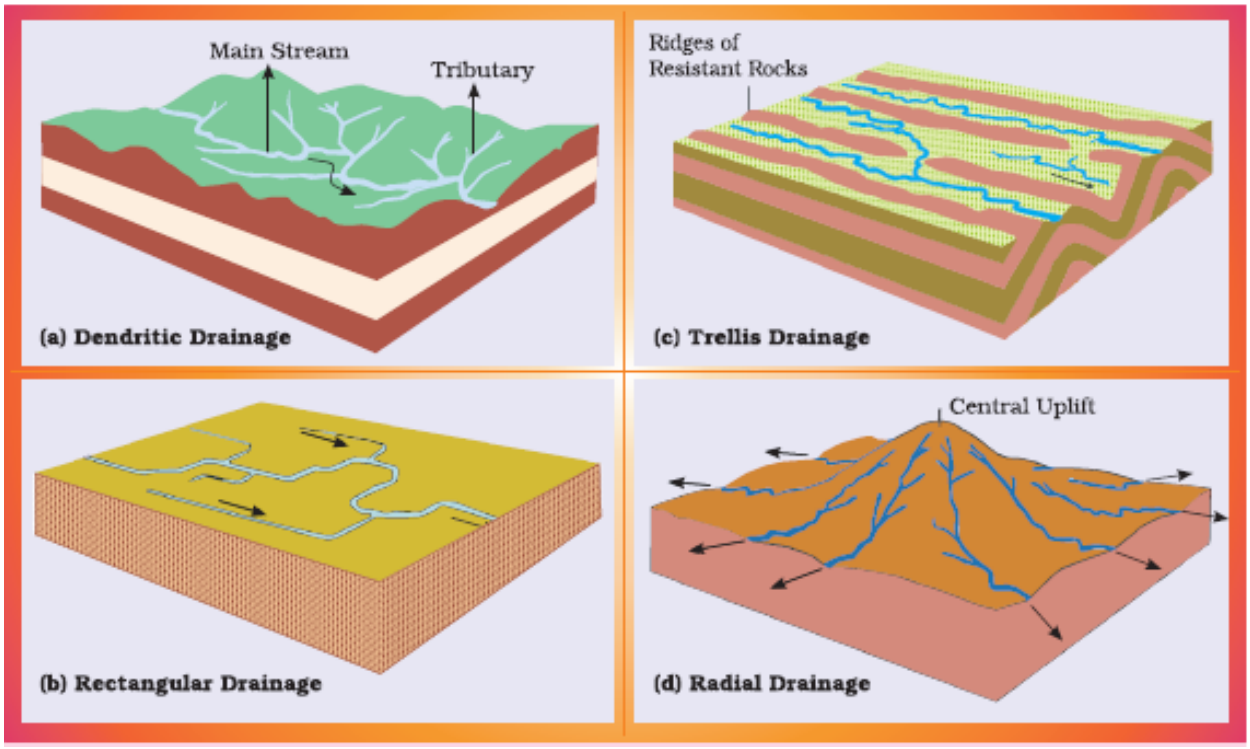
Q 69.B

- The Warm Temperate Eastern Margin Climate or China type of climate is found on the eastern margins of continents in warm temperate latitudes, just outside the tropics. It has comparatively more rainfall than the Mediterranean climate in the same latitudes
- It is, in fact, the climate of most parts of China –a modified form of monsoonal climate. It is thus also called the Temperate Monsoon or China Type of climate.
- The Warm Temperate Eastern Margin Climate is typified by a warm moist summer and a cool, dry winter. The mean monthly temperature varies between 5°C and 25°C and is strongly modified by maritime influence.
- Another important feature is the fairly uniform distribution of rainfall throughout the year.
- It can be sub-divided into three main types –
  - The China type: central and north China (including southern Japan (temperate monsoonal).
  - The Gulf type: south-eastern United States, (slight-monsoonal).
  - The Natal type: the entire warm temperate eastern margin (non-monsoonal areas) of the southern hemisphere including Natal, eastern Australia, and southern Brazil-Paraguay-Uruguay, and northern Argentina
- The eastern margins of warm temperate latitudes have a much heavier rainfall than either the western margins or the continental interiors and thus have luxuriant vegetation. The lowlands carry both evergreen broad-leaved forests and deciduous trees quite similar to those of the tropical monsoon forests.
- **These climatic regions also experience many local winds such as**
  - **Pampero - a dry cold wind in South America**
  - **Berg - a hot dry wind in Southern Africa**
  - **Southerly Buster - a cold wind on the southeast coast of Australia**

- **Harmattan is a cool dry wind that blows from the northeast or east in the Western Sahara which is not a China-type climatic region.**
- **Hence option (b) is the correct answer.**

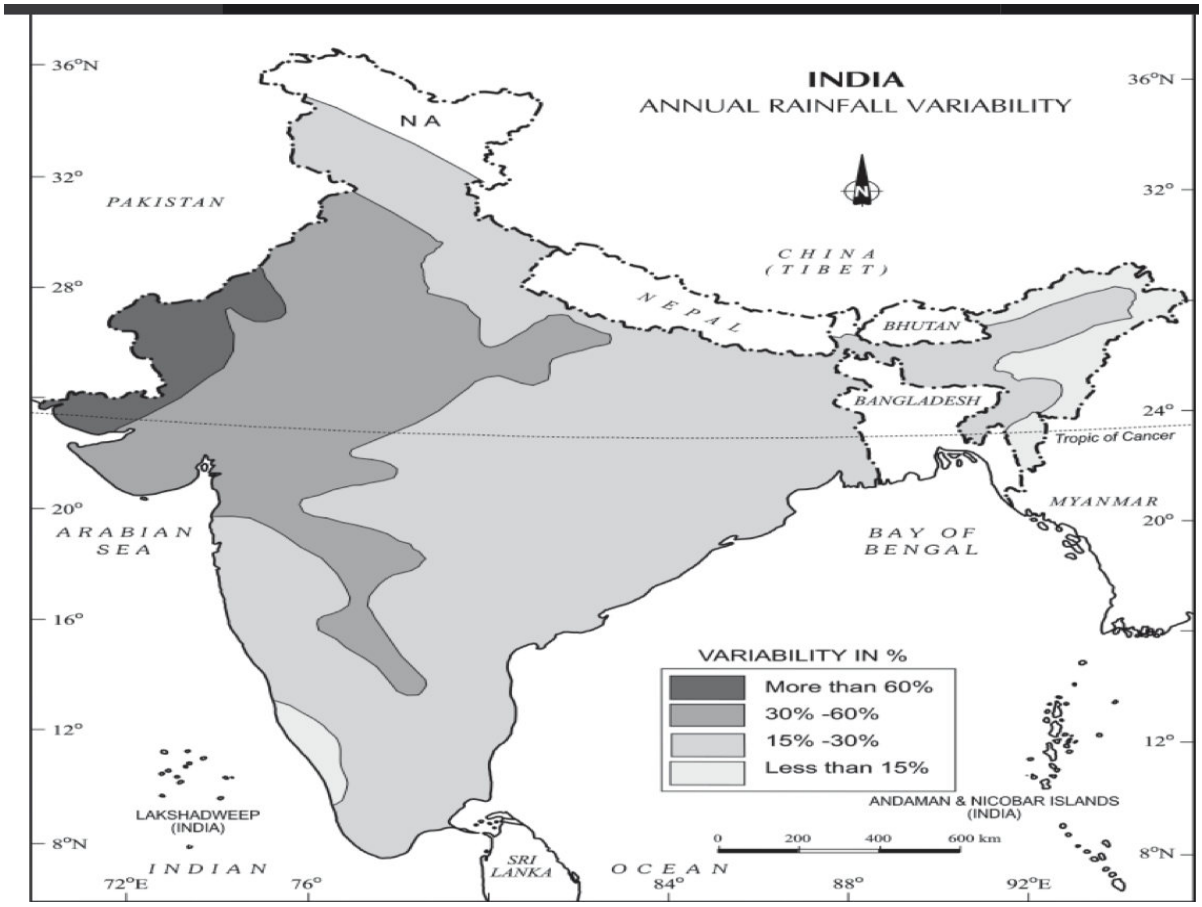
Q 70.A

- **Trellised drainage patterns**: They are formed by the network of tributaries and master consequent streams that follow the regional slope and are well adjusted to the geological structures. Such patterns are developed **in the area of simple folds characterized by parallel anticlinal ridges alternated by parallel synclinal valleys**. Several streams develop on both the flanks of the ridges and **join the longitudinal synclinal streams at a right angle**. These tributary streams are **called lateral consequent streams**. Thus the resultant networks of numerous longitudinal streams and transverse or lateral consequents are called the trellised patterns. This pattern also resembles the rectangular pattern. **Hence option (a) is the correct answer.**
- In fact, the trellised and rectangular patterns are differentiated on the basis of spacing between the streams. If the streams are closely spaced the resultant pattern becomes trellised while the rectangular pattern is formed when the streams are widely spaced.



Q 71.C

- A characteristic feature of rainfall in India is its variability. The **variability of rainfall** is computed with the help of the following formula: **Coefficient of Variation = (Standard Deviation / Mean) × 100**
- The values of the coefficient of variation show the change from the mean values of rainfall. The actual rainfall in some places deviates from 20-50 percent. The values of coefficient of variation show variability of rainfall in India. A **variability of less than 25 percent e**xists on the **western coasts (Malabar coast)**, Western Ghats, northeastern Peninsula, eastern plains of the Ganga, northeastern India, Uttaranchal, and Himachal Pradesh, and south-western part of Jammu and Kashmir. These areas have an annual rainfall of over 100 cm.
- A **variability of over 50 percent** exists in the western part of Rajasthan, the **northern part of Jammu and Kashmir,** and the interior parts of the Deccan plateau. These areas have an annual rainfall of less than 50 cm.
- **Rest of India (including the Chota Nagpur plateau)** have a variability of **25-50 percent** and these areas receive an annual rainfall between 50 -100 cm.



- **Hence the correct order is 1-3-2.**

Q 72.B

- The Savannah or Sudan Climate is a transitional type of climate found between the equatorial forest and the trade wind hot deserts. It is confined within the tropics and is best developed in Sudan.
- **There are two distinct seasons consisting of a wet and a dry season. The wet season comes during the summer period while the dry season comes during the winter. Hence statement 2 correct.**
- The mean high temperature throughout the year is between 24°C and 27° C. The annual range of temperature is between 3°C and 8°C, but the range increases as one moves further away from the equator. **The extreme diurnal range of temperature (the difference between day and night time temperatures) is characteristic of the Savanna type of climate. Hence statement 1 is not correct.**
- Diurnal range is the difference between day and night temperatures. The average annual rainfall ranges between 100 cm and 150 cm. The prevailing winds of the region are the trade winds that bring rain to the coastal areas of these regions.
- The savannah landscape is typified by tall grass and short trees. The terms 'parkland' or 'bushveld perhaps describe the landscape better.
- Trees grow best towards the border of equatorial humid latitudes or along river banks but decrease in height and density away from the equator. **The trees are deciduous, shedding their leaves in the cool, dry season to prevent excessive loss of water through transpiration. Hence, statement 3 is not correct.**
- The savannah, particularly in Africa, is the home of wild animals. It is known as the 'big game country.
- Many tribes live within the Savanna lands. Some tribes live as pastoralists like the Masai and others as settled cultivators like the Hausa of northern Nigeria. However, agriculture is not much developed.

Q 73.D

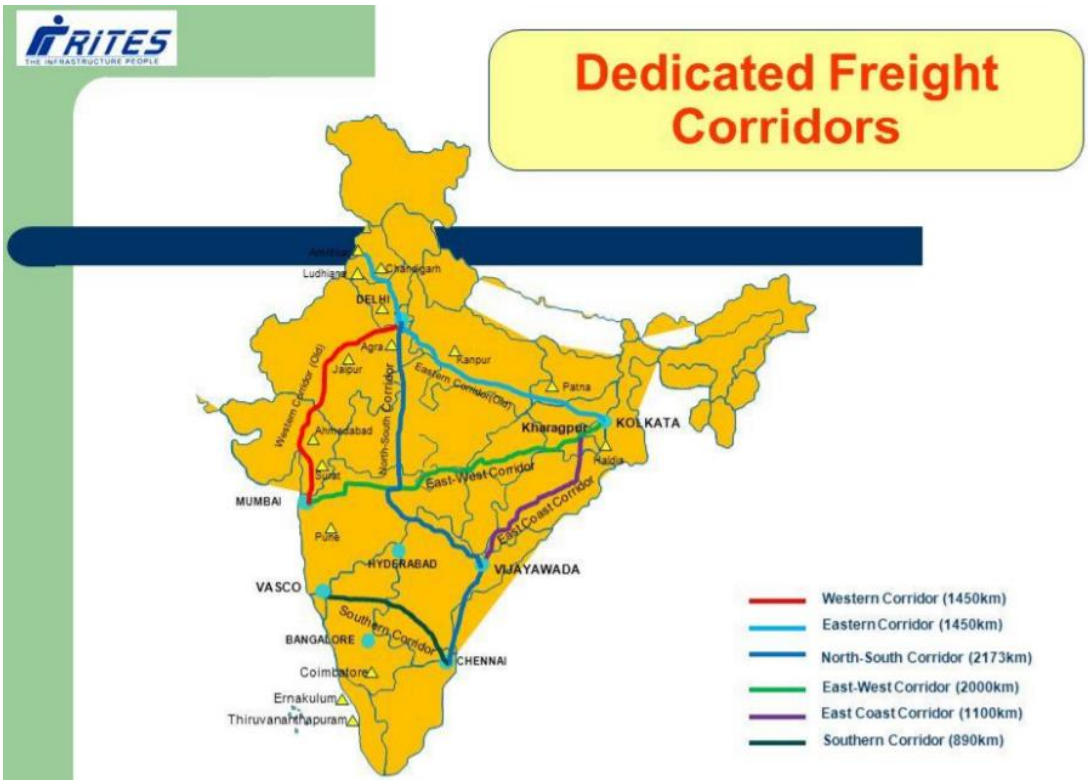
- **Old Stage of the cycle of erosion:**
  - The old stage is characterized by a further **decrease in channel gradient, almost total absence of valley deepening, decrease in the number of tributary streams, and flattening of valleys.** Tributary streams also attain the base level of erosion and are graded. Lateral erosion and consequent backwashing eliminate most inter stream areas.
  - Valleys become broad and flat characterized by **concave slopes of valley sides**. **Downcutting of the valleys is totally absent**. Weathering processes are most active. Thus, **lateral erosion, downcutting,**

and weathering continuously degrade the land resulting in a gradual lowering of absolute altitude and water divides. **Transporting capacity of the rivers becomes minimum** because of the very low channel gradient and thus the rivers become overloaded. Consequently, sedimentation becomes most active during this stage. The rivers adopt highly meandering courses. **Hence option (d) is the correct answer.**

- The entire landscape is converted into the **extensive flat plain of undulating surface** except for a few residual convexo-concave hills which project above the generally flat surface and thus break the monotony of reliefless flat plain, called peneplain.

Q 74.A

- Recently the Prime Minister of India has dedicated to the nation a section of the Western Dedicated Freight Corridor (WDFC). It will connect the cities of Haryana and Rajasthan which will be beneficial for industries surrounding this corridor. It is known as the Rewari-New Madar section of WDFC. Dedicated Freight Corridor (DFC) is a railway corridor that is exclusively meant for the transportation of freight at high speed which will save lots of time and increases the freight capacity. It involves the seamless integration of better infrastructure & state of the art technology and allows for efficient and fast freight movement (very important for the horticulture sector).
- Six freight corridors will be set up under the project all over the country
  - **Western Dedicated Freight Corridor -** Dadri to JNPT, Nava Sheva
  - **Eastern Dedicated Freight Corridor -** Ludhiana to Dankuni
  - **East-West Dedicated Freight Corridor -** Kharagpur to Bhusawal
  - **North-South Dedicated Freight Sub-Corridor -** Vijayawada to Itarsi
  - **East Coast Dedicated Freight Corridor -** Kharagpur to Vijayawada
  - **Southern Dedicated Freight Corridor** - Madgaon to Chennai
- **Hence option (a) is the correct answer.**



Q 75.B

- The troposphere is the lowermost layer of the Earth's atmosphere. Most of the weather phenomena occur in this layer, although some may extend into the lower portion of the stratosphere.
- The troposphere contains almost all the atmospheric water vapour, in fact, it contains about 70 to 80 percent of the total mass of the Earth's atmosphere.
- **The troposphere's average height is 13 km and extends roughly to a height of 8 km near the poles and about 18 km at the equator. The thickness of the troposphere is greatest at the equator because here the air is relatively warmer due to high insolation compared to other latitudes and the warm air is transported to great heights by strong convectional currents and thus the higher thickness at the equator. The difference in thickness is not due to gravity. Hence, statement 1 is not correct**

- The tropopause is the upper limit of the troposphere and therefore forms the boundary between the troposphere and Stratosphere.
- On average, the troposphere air temperature decreases with height at an overall positive lapse rate of about 6.5°C/km, until the tropopause.
- **Since the tropopause at poles is located at a lower elevation than the tropopause at the equator, the temperature of tropopause at poles is greater than the equator. The air temperature at the tropopause is about minus 80 degrees centigrade over the equator and about minus 45 degrees centigrade over the poles. Hence, statement 2 is correct.**

Q 76.A

- The earth is made up of three different layers: the crust, the mantle, and the core. Each layer has a unique chemical composition, physical state, and can impact life on Earth's surface.
- **The Crust:**
  - **This is the outside layer of the earth and is made of solid rock, mostly basalt, and granite.** There are two types of a crust; oceanic and continental. **Hence, statement 1 is correct.**
  - The thickness of the crust varies under the oceanic and continental areas. **Oceanic crust is thinner as compared to continental crust.** The mean thickness of the oceanic crust is 5 km whereas that of the continental is around 30 km. The continental crust is thicker in the areas of major mountain systems. It is as much as 70 km thick in the Himalayan region. **Hence, statement 2 is correct.**
  - Both oceanic crust and continental crust are less dense than the mantle, **but the oceanic crust is denser than continental crust. Hence, statement 3 is not correct.**

Q 77.C

- **Tsunami:**
  - Earthquakes and volcanic eruptions that cause the sea-floor to move abruptly resulting in sudden displacement of ocean water in the form of high vertical waves are **called tsunamis (harbour waves) or seismic sea waves.**
  - Normally, the seismic waves cause only one instantaneous vertical wave, but, after the initial disturbance, a series of afterwaves are created in the water that oscillate between high crest and low trough in order to restore the water level.
  - **The speed of wave in the ocean depends upon the depth of water. It is more in the shallow water than in the ocean deep.**
  - **The impact of tsunami is less over the ocean and more near the coast** where they cause large-scale devastations. Therefore, a ship at sea is not much affected by tsunami and it is difficult to detect a tsunami in the deeper parts of sea**. Hence statement 1 is not correct.**
    - It is so because over deep water the tsunami has very long wave-length and limited wave-height. Thus, a tsunami wave raises the ship only a metre or two and each rise and fall takes several minutes. As opposed to this, when a tsunami enters shallow water, its wave-length gets reduced and the period remains unchanged, which increases the wave- height and causes large-scale destructions along the shores. Thus, these are also called **Shallow Water Waves.**
- **Floods:**
  - Floods are relatively slow in occurrences and often, occur in well-identified regions and within expected time in a year.
  - Floods occur commonly when water in the form of surface run-off exceeds the carrying capacity of the river channels and streams and flows into the neighbouring low-lying flood plains. At times, this even goes beyond the capacity of lakes and other inland water bodies in which they flow.
  - **Floods can also be caused due to a storm surge** (in the coastal areas), high intensity rainfall for a considerably longer time period, melting of ice and snow, reduction in the infiltration rate and presence of eroded material in the water due to higher rate of soil erosion.
  - Storm Surge is an abnormal rise of sea level as the cyclone crosses the coast.Sea water inundates the coastal strip causing loss of life, large scale destruction to property & crop. Increased salinity in the soil over the affected area makes the land unfit for agricultural use for two or three seasons. Storm surge depends on the intensity of the cyclone. **Hence statement 2 is not correct.**

Q 78.D

- India's climate is controlled by a number of factors.
- **Factors related to Location and Relief:**
  - **Latitude:** The tropical zone being **nearer to the equator,** experiences high temperatures throughout the year with **small daily and annual ranges**. Area north of the Tropic of Cancer being **away from**

the equator experiences an **extreme climate** with a high daily and annual range of temperature. **Hence statement 2 is correct.**

- **The Himalayan Mountains**: The lofty Himalayas in the north along with its extensions act as an effective climatic divide. The towering mountain chain provides an invincible shield to **protect the subcontinent from the cold northern winds.** These cold and chilly winds originate near the Arctic circle and blow across central and eastern Asia. The Himalayas also trap the monsoon winds, forcing them to shed their moisture within the subcontinent. **Hence statement 1 is correct.**
- **Distribution of Land and Water:** As compared to the landmass, water heats up or cools down slowly. This differential heating of land and sea creates different air pressure zones in different seasons in and around the Indian subcontinent.
- **Distance from the Sea:** Areas in the **interior of India** are far away from the moderating influence of the sea. Such areas have **extremes of climate.** That is why the people of Mumbai and the Konkan coast have hardly any idea of extremes of temperature and the seasonal rhythm of weather. On the other hand, the seasonal contrasts in weather at places in the interior of the country such as Delhi, Kanpur and Amritsar affect the entire sphere of life. **Hence statement 3 is correct.**
- **Altitude:** Temperature decreases with height. Due to thin air, places in the mountains are cooler than places on the plains.

- **Factors related to Air Pressure:**
  - Upper air circulation caused by factors controlling global weather and the inflow of different air masses and jet streams.
  - The inflow of western cyclones generally known as disturbances during the winter season and tropical depressions during the south-west monsoon period into India, creating weather conditions favorable to rainfall.

Q 79.A

- **Recent Context:** An anti-COVID-19 therapeutic application of t**he drug 2-deoxy-D-glucose (2-DG) has been developed by Institute of Nuclear Medicine and Allied Sciences (INMAS), a lab of Defence Research and Development Organisation (DRDO),** in collaboration with Dr Reddy's Laboratories (DRL), Hyderabad. The drug was originally developed by INMAS-DRDO to treat cancer. **Hence, statement 2 is not correct.**
- The drug comes in powder form in sachet, which is **taken orally by dissolving it in water. It accumulates in the virus infected cells and prevents virus growth by stopping viral synthesis and energy production. Its selective accumulation in virally infected cells makes this drug unique. Hence, statement 1 is correct.**
- The **basic mechanism of the drug involves inhibiting glycolysis,** or one of the way in which cells break down glucose from energy. (It can work in inhibiting virus cells too, that were almost entirely dependent on glycosides for replication).
- Clinical trial results have shown that this molecule helps in faster recovery of hospitalised patients and reduces supplemental oxygen dependence. Higher proportion of patients treated with 2-DG showed RT-PCR negative conversion in COVID patients.

Q 80.C

- The earth moves in space in two ways: it rotates on (or about) its axis and revolves around the earth.
- Earth rotates along its axis from west to east. It takes approximately 24 hrs to complete on rotation. **Days and nights occur due to the rotation of the earth. (does not contribute to seasonal changes)**
- Earth rotates on a tilted axis. Earth's rotational axis makes an angle of 23.5° with the normal i.e. it makes an angle of 66.5° with the orbital plane. The orbital plane is the plane of earth's orbit around the Sun.
- Throughout the year, different parts of Earth receive the Sun's most direct rays. So, when the North Pole tilts toward the Sun, it's summer in the Northern Hemisphere. And when the South Pole tilts toward the Sun, it is winter in the Northern Hemisphere.
- The second motion of the earth around the sun in its orbit is called revolution. It takes 365¼ days (one year) to revolve around the sun. Six hours saved every year are added to make one day (24 hours) over a span of four years. Changes in the seasons occur because of the revolution of the earth.
- **The Revolution of the earth on a tilted axis is the cause of variation of seasons.**
- **Hence, option (c) is the correct answer.**

Q 81.A

- **Recent Context:** Union Finance Minister handed over possession of homes to homebuyers virtually as Government of India's **Special Window for Affordable & Mid-Income Housing (SWAMIH)** completes its first residential project (Rivali Park, located in suburban Mumbai).

- SWAMIH fund is a government backed fund that was set up as a Category-II AIF (Alternate Investment Fund) debt fund registered with SEBI, launched in 2019 to complete construction of stalled, RERA-registered affordable and mid-income category housing projects which are stuck due to paucity of funds. **Hence, statement 1 is correct**
- **SBICAP Ventures is the Investment Manager to the first AIF set-up under this special window. Hence, statement 1 is correct.**
  - SBICAP Ventures Ltd, an asset management company that is a wholly-owned subsidiary of SBI Capital Markets Ltd, which in turn is a wholly-owned subsidiary of SBI.
- **The Department of Economic Affairs under the Ministry of Finance administers this scheme. Hence, statement 2 is not correct.**

Q 82.C

- An ephemeral river is a river that only flows when there is rain or snow has melted. The rest of the year there is just a dry river bed with no water.
- Luni is the largest river system of Rajasthan, west of Aravali. It originates near Pushkar in two branches, i.e. the Saraswati and the Sabarmati, which join with each other at Govindgarh. From here, the river comes out of Aravali and is known as Luni.
- **It flows towards the Rann of Kuchchh and dissipates in the marshy area. The entire river system is ephemeral. Hence option (c) is the correct answer.**
- A perennial stream or perennial river is a stream or river (channel) which has a constant stream throughout the year through parts of its stream bed during years of normal rainfall.

Q 83.A

- **The islands of the Arabian sea include Lakshadweep and Minicoy.** These are scattered between 8°N-12°N and 71°E -74°E longitude. These islands are located at a distance of 280 km-480 km off the Kerala coast. **The entire island group is built of coral deposits. Hence statement 1 is correct.**
- There are approximately 36 islands of which 11 are inhabited. Minicoy is the largest island with an area of 453 sq. km. **The entire group of islands is broadly divided by the Ten-degree channel, north of which is the Amini Island and to the south of the Canannore Island**.
- The Islands of this archipelago have **storm beaches** consisting of unconsolidated pebbles, shingles, cobbles, and boulders on the **eastern seaboard.**
- **Most of the islands in the Lakshadweep are marked by storm beaches on the eastern seaward shores and sandy beaches on the western lagoon shores. Hence statement 2 is correct.**
- **Saddle Peak is the highest peak in the Andaman and Nicobar Islands which are the islands of the Bay of Bengal. Hence statement 3 is not correct.**

Q 84.C

- **Recent Context:** In a recent judgement, along with the Maratha Reservation case, the Supreme Court ruled by a 3:2 majority that after the passage of the 102nd Constitution Amendment Act in 2018, the States do not have any power to identify 'socially and educationally backward' (SEBC) classes.
- **The 102nd Constitutional Amendment Act, 2018 established a National Commission for Backward Classes by adding Article 338B to the Constitution.** The commission is a five-member body and is tasked with monitoring safeguards provided for socially and educationally backward classes, giving advice on their socio-economic development, inquiring into complaints and making recommendations, among other functions. It also provides that the Centre and the States shall consult the Commission on all policy matters concerning the SEBCs.
- The **Amendment also added Article 342A**, under which the **President shall notify a list of SEBCs in relation to each State and Union Territory, in consultation with Governors** of the respective States. Once this 'Central List' is notified, **only Parliament could make inclusions or exclusions in the list by law.**
- Through the 102nd Constitutional Amendment Act, 2018 a definition of 'SEBCs' was added to the Constitution — 'SEBC' means "such backward classes as are so deemed under Article 342A for the purposes of this Constitution".
- **Hence option (c) is the correct answer.**

Q 85.C

- **A body of air covering a relatively wide area, exhibiting approximately uniform properties such as temperature, moisture, etc is called airmass. In an air mass, there is very little horizontal variation in temperature and moisture. Hence, statement 1 is correct. Hence statement 2 is not correct.**

- It is to be remembered that airmasses **do not exhibit uniform properties in the vertical direction**.
- The homogenous surfaces, over which air masses form are called the source regions. There are five major source regions.
  - Warm tropical and subtropical oceans
  - Subtropical hot deserts
  - Relatively cold high latitude oceans
  - The very cold snow-covered continents in high latitudes
  - Permanently ice-covered continents in the Arctic and Antarctica
- Accordingly, the following types of air masses are recognized:
  - Maritime tropical (mT)
  - Continental tropical (cT)
  - Maritime polar (mP)
  - Continental polar (cP)
  - Continental arctic (cA)
- **When two different air masses meet, the boundary zone between them is called a front. The process of formation of the fronts is known as frontogenesis**. There are four types of fronts:
  - Cold
  - Warm
  - Stationary
  - Occluded
- The fronts occur in middle latitudes and are characterized by the steep gradient in temperature and pressure. They bring abrupt changes in weather conditions such as temperature, pressure and cause the air to rise to form clouds and cause precipitation. The changes in weather brought by fronts are generally always sudden in nature **due to the turbulence in the frontal region and their movement. Hence statement 3 is correct.**

Q 86.A

- Bays, gulfs, and straits are types of water bodies that are contained within a larger body of water near land.
- **Bays:**
  - A bay is a small body of water or a broad inlet that is set off from a larger body of water generally where the land curves inward. In simple words, the **bay is a water body surrounded on three sides by land** with the fourth side (mouth) wide open towards oceans. (In Gulfs, the mouth is narrow). **Hence option (a) is the correct answer.**
  - A bay is usually smaller and less enclosed than a gulf.
  - Example: The Bay of Pigs (Cuba), Hudson Bay (Canada), Bay of Bengal etc.
  - An example of a bay at a river's mouth is New York Bay, at the mouth of the Hudson River (Hudson Estuary).
- **Gulfs**:
  - A gulf is a **large body of water, sometimes with a narrow mouth, that is almost completely surrounded by land.** The world's largest gulf is the Gulf of Mexico.
  - Examples of other gulfs include the Gulf of California, Gulf of Aden (between the Red Sea and the Arabian Sea), and the Persian Gulf (between Saudi Arabia and Iran).
- **Straits:**
  - A strait is a narrow passageway of water, usually **between continents or islands**, or **between two larger bodies of water.**
  - The Strait of Gibraltar is probably the world's most famous strait. It connects the Atlantic Ocean on its west with the Mediterranean Sea on its east.
  - Other well-known straits are the Strait of Bosporus and the Strait of Hormuz.
  - The Strait of Bosporus connects the Black Sea (from the north) and the Sea of Marmara (from the south), and splits northwestern Turkey.
  - The Strait of Hormuz is located at the southeastern end of the Persian Gulf. It is a narrow waterway that can be (and has been) controlled to prevent ships from sailing through the gulf.
    - The Strait is surrounded by the United Arab Emirates and Oman (on one side) and Iran (on the other side).
- **Choke Point:**
  - When a body of water such as a strait is capable of being blocked or even closed in order to control transportation routes, the body is called a "choke point."
  - Historically, the Strait of Gibraltar has been one of the world's most important choke points.

Middle East tensions.

- **Isthmus:**
    - Isthmus is the land-equivalent of a strait. i.e., a narrow strip of land connecting two larger land masses.
    - Example: Isthmus of Panama linking the continents of North and South America, and separates the Pacific and Atlantic Oceans, and Isthmus of Suez connects Africa and Asia.

87.A

- **Volcanic eruptions** of high magnitude can impact global climate , **reducing the amount of solar radiation reaching the Earth 's surface ,** lowering temperatures in the troposphere , and changing atmospheric circulation patterns . Volcanic eruptions **throw up a lot of aerosols** into the atmosphere . These aerosols remain in the atmosphere for a considerable period of time. **Hence statement 1 is correct.**
- Major eruptions alter the Earth 's radiative balance also because volcanic aerosol clouds absorb terrestrial radiation , and scatter a significant amount of the incoming solar radiation , an effect known as **"radiative forcing" that can last from two to three years following a volcanic eruption**.
- **Sunspots turned out to be areas of cooler zones on the surface of the sun .** These spots are about one - third cooler than the rest of the surface and **are protected by magnetic fields that stop the heat from being transmitted into the zone** . The magnetic field is formed from underneath the sun's surface but is able to project itself outside through the surface and all the way to the corona of the sun.
- With sunspots come an increase in ultraviolet rays that emit from the outer ring of the sunspots toward Earth. This increase in UV rays affects the chemistry of the outer atmosphere and the energy balance of Earth . When **the number of Sunspots increase , cooler and wetter weather and greater storminess occur . Hence statement 2 is not correct.**

88.B

- The Northeastern Plateau is the extension of the main Peninsular Plateau . During the north -eastward movement of the Indian plate at the time of the Himalayan origin , a force was exerted which created a huge fault . **The northeastern parts are therefore separated by the Malda fault in West Bengal from the Chotanagpur plateau. Hence statement 1 is not correct.**
- Bhima fault lies in the state of Maharashtra formed in the basin of the Bhima river.
- The **Karbi Anglong and the Meghalaya Plateau in the northeast** and **Rajasthan in the west** are the extensions of the Peninsular block. **Hence statement 2 is correct.**
- Today, the Meghalaya and Karbi Anglong plateau stand detached from the main Peninsular Block.
- The Meghalaya plateau is further sub-divided into three: **(i) The Garo Hills; (ii) The Khasi Hills; (iii) The Jaintia Hills,** named after the tribal groups inhabiting this region.
- Similar to the Chotanagpur plateau, the Meghalaya plateau is also rich in mineral resources like **coal, iron ore, sillimanite, limestone and uranium.**
- **This area receives maximum rainfall from the southwest monsoon.** As a result, the Meghalaya plateau has a highly eroded surface . **Cherrapunji** displays a bare rocky surface devoid of any permanent vegetation cover .

89.D

- Our solar system is made up of a star, eight planets, and countless smaller bodies such as dwarf planets , asteroids, and comets. Our solar system orbits the center of the Milky Way Galaxy.
- The planets of our solar system—and even some asteroids—hold more than 150 moons in their orbits. **Mercury and Venus are the two planets that do not have any satellites.**
- **Every planet in our solar system except for Venus and Uranus rotates counter -clockwise as seen from above the North Pole ; that is to say , from west to east .** This is the same direction in which all the remaining planets orbit the sun.
- The asteroid belt is a torus -shaped region in the Solar System , **located roughly between the orbits of the planets Jupiter and Mars** , that is occupied by a great many solid , irregularly shaped bodies , of many sizes but much smaller than planets, called asteroids or minor planets.
- **Hence option (d) is the correct answer**

Q 90.B

- A western disturbance is an **extratropical storm** originating in the Mediterranean region that brings sudden **winter rain** to the **northern parts of the Indian subcontinent .** The moisture in Western Disturbances usually originates over the Mediterranean Sea, the Caspian Sea, and the Black Sea. **Hence statement 1 is not correct and statement 3 is correct**

An **increase** in the prevailing **night temperature** generally indicates an advance in the **arrival of** the western cyclonic **disturbances. Hence statement 4 is not correct.**

The upper air circulation in the Northern Indian region is dominated by a westerly flow . An important component of this flow is the jet stream. These jet streams are located approximately over **27°-30° north latitude**, therefore, they are known as subtropical westerly jet streams. Over India, these jet streams blow south of the Himalayas , all through the year except in summer . The **western cyclonic disturbances** experienced in the north and north -western parts of the country are **brought in by this westerly flow** . **Hence statement 2 is correct.**

Western Disturbances are important to the **development of the Rabi crop** in the northern subcontinent, which includes the locally important staple wheat.

.D

Chemical activity is increased in higher temperatures , reduced in cooler temperatures (with an exception of carbonation), and stops in freezing conditions . That is why **tropical soils with higher temperatures show deeper profiles** and in the frozen tundra regions soils contain largely mechanically broken materials.

The intensity of bacterial activity shows up differences between soils of cold and warm climates . **Humus accumulates in cold climates as bacterial growth is slow.** With undecomposed organic matter because of low bacterial activity , layers of peat develop in sub-arctic and tundra climates . In humid tropical and equatorial climates, bacterial growth and action are intense and dead vegetation is rapidly oxidized leaving very low humus content in the soil. **Hence statements 1 and 2 are not correct.**

Over gentle slopes where erosion is slow and percolation of water is good, soil formation is very favorable . Soils over flat areas may develop a **thick layer** of clay with a good accumulation of organic matter giving the soil dark color.

.D

The Deccan Plateau is bordered by the Western Ghats in the west, the Eastern Ghats in the east.

The Western Ghats are comparatively higher in elevation and more continuous than the Eastern Ghats. Hence statement 1 is correct.

The Eastern Ghats are discontinuous and lower in elevation are highly eroded by the rivers such as the Mahanadi, the Godavari, the Krishna, the Kaveri, etc. Hence statement 2 is not correct.

The Western Ghats are higher in elevation and continuous which is almost perpendicular to the southwest monsoon coming from the Arabian sea and thus causes heavy rainfall in the Western Coastal Plains. However, Eastern Ghats are almost parallel to the monsoon coming from the Bay of Bengal and thus do not cause much rainfall.

Anaimudi (2,695 m), the highest peak of the Peninsular plateau is located on the Anaimalai Hills of the Western Ghats.

Some of the important ranges of Eastern Ghats include the Javadi hills, the Palconda range, the Nallamala hills, the Mahendragiri hills, etc.

Both Western Ghats and the Eastern Ghats meet each other at the Nilgiri Hills. Hence statement 3 is correct.

.A

Out of the eight planets, Mercury, Venus, Earth, and Mars are called the inner planets as they lie between ın and the belt of asteroids the other four planets **(Jupiter, Saturn, Uranus, and Neptune)** are called the planets.

Most of them are much larger than the terrestrial planets and have a thick atmosphere, mostly of helium ydrogen. All the planets were formed in the same period sometime about 4.6 billion years ago.

The difference between terrestrial and jovian planets can be attributed to the following conditions:

- The terrestrial planets were formed in the close vicinity of the parent star where it was too warm for gases to condense to solid particles. Jovian planets were formed at quite a distant location. **Hence, terrestrial planets are warmer than Jovian planets**
- The solar wind was most intense nearer the sun; so, it blew off lots of gas and dust from the terrestrial planets. The solar winds were not all that intense to cause similar removal of gases from the Jovian planets. **Therefore, Jovian planets have lots of gas and dust.**

The terrestrial planets are smaller than the Jovian planets. **Therefore, they have low gravity (as gravity is directly proportional to mass)** and their lower gravity could not hold the escaping gases.

Hence, option (a) is the correct answer

.B

Galathea National Park is a part of the Great Nicobar Biosphere Reserve. It is separated from **Campbell Bay National Park** by a 12-km wide forest buffer zone. it is the southernmost National Park of India. Its Vegetation includes tropical moist broadleaf forests, evergreen & semi-evergreen deciduous tree species. The major fauna found here includes giant robber crab, megapode, and Nicobar pigeon. **Hence option (b) is the correct answer.**

Mahatma Gandhi Marine (Wandoor) National Park is located in the South Andaman district. It provides protection to nesting sea turtles and corals and Most of the coral reefs found in this park are fringing reefs.

Mount Harriet National Park is the third-highest peak in the Andaman and Nicobar archipelago. It is named after Harriet C. Tytler, wife of a British army officer. Major Fauna includes Andaman wild pigs, saltwater crocodiles, turtles, and robber crabs and it is also a butterfly hotspot.

95.C

- The Big Bang Theory is the most popular argument regarding the origin of the universe. It is also called expanding universe hypothesis. Edwin Hubble, in 1920, **provided evidence that the universe is expanding**. As time passes, galaxies move further and further apart. Scientists believe that although the space between the galaxies is increasing, **observations do not support the expansion of galaxies. Hence, statement 2 is correct.**
- It is the cosmological model for the observable universe from the earliest known periods through its subsequent large-scale evolution. The model describes how the universe expanded from a very high-density and high-temperature state.
- **The Big Bang hypothesis states that all of the current and past matter in the Universe came into existence at the same time, roughly 13.8 billion years ago.** At this time, all matter was compacted into a very small ball with infinite density and intense heat called a Singularity. Suddenly, the Singularity began expanding, and the universe as we know it began. **Hence statement 1 is correct.**
- After the initial expansion, the theory maintains that Universe cooled sufficiently to allow the formation of subatomic particles and later simple atoms. Giant clouds of these primordial elements later coalesced through gravity to form stars and galaxies. The temperature of the cosmic background radiation drops smoothly as the Universe expands. The Universe of a few billion years ago was a few degrees warmer than it is now.

Q 96.C

- The drainage pattern resembling the branches of a tree is known as "dendritic" the examples of which are the rivers of northern plain – Ganga, Brahmaputra belong to this category. **Hence statement 2 is not correct.**
- When the rivers originate from a hill and flow in all directions, the drainage pattern is known as 'radial'. The rivers originating from the Amarkantak – Son and Narmada - present a good example of it. **Hence statement 1 is correct.**
- When the primary tributaries of rivers flow parallel to each other and secondary tributaries join them at right angles, the pattern is known as 'trellis'. The river systems of Subarnarekha, Baitarani, and Brahmani in the Singhbhum plateau are examples of such patterns.
- When the rivers discharge their waters from all directions in a lake or depression, the pattern is known as 'centripetal'. Loktak Lake is fed by the Manipur river and several tributaries and is an example of such a pattern. **Hence statement 3 is correct.**

Q 97.B

- A western disturbance is an **extratropical storm** originating in the Mediterranean region that brings sudden **winter rain** to the **northern parts of the Indian subcontinent.** The moisture in Western Disturbances usually originates over the Mediterranean Sea, the Caspian Sea, and the Black Sea. **Hence statement 1 is not correct and statement 3 is correct.**
- An **increase** in the prevailing **night temperature** generally indicates an advance in the **arrival of** the western cyclonic **disturbances. Hence statement 4 is not correct.**
- The upper air circulation in the Northern Indian region is dominated by a westerly flow. An important component of this flow is the jet stream. These jet streams are located approximately over **27°-30° north latitude**, therefore, they are known as subtropical westerly jet streams. Over India, these jet streams blow south of the Himalayas, all through the year except in summer. The **western cyclonic disturbances** experienced in the north and north-western parts of the country are **brought in by this westerly flow**. **Hence statement 2 is correct.**
- Western Disturbances are important to the **development of the Rabi crop** in the northern subcontinent, which includes the locally important staple wheat.

3. C

The arrangement of three layers called horizons is known as the **Soil profile**.

- **Horizon A** is the **topmost zone**, where organic materials have got incorporated with the mineral matter, nutrients , and water, which are necessary for the growth of plants. **Hence statement 1 is not correct.**
- **Horizon B** is a **transition zone** between the 'horizon A' and 'horizon C', and contains matter derived from below as well as from above. It has some **organic matter** in it, although the **mineral matter** is noticeably weathered. **Hence statement 3 is correct.**
- **Horizon C is** composed of loose parent material. This layer is the **first stage** in the soil formation process and eventually forms the above two layers. **Hence statement 2 is not correct.**

9.B

- **United Nations Global Road Safety week is a biennial Global Road Safety campaign (launched on May 17, l) and is hosted by the World Health Organisation (WHO).** This initiative was started in 2007.
- It aims to bring together all stakeholders that is governments, individuals, NGOs, corporations, etc. from around the world **to raise the awareness about road safety and to incorporate changes that will reduce the number of deaths due to road accidents.**
- The Week will be the occasion to garner policy commitments at national and local levels:
  - to deliver 30 km/h speed limits in urban areas;
  - generate local support for such low speed measures in order to create safe, healthy, green and liveable cities; and
  - officially launch the **Decade of Action for Road Safety 2021-2030 and its Global Plan.**
- The Week will also highlight the links between 30 km/h speed limits and attainment of a number of Sustainable Development Goals, including those on health, education, infrastructure, sustainable cities, climate action and partnerships.
- **Hence, option (b) is the correct answer.**

00.C

The Inter-Tropical Convergence Zone (ITCZ) is a **low-pressure zone** located at the equator where trade winds verge, and so, it is a zone where air tends to ascend. This convergence zone lies more or less parallel to the equator moves north or south **with the apparent movement of the sun. Hence statement 1 is correct.**