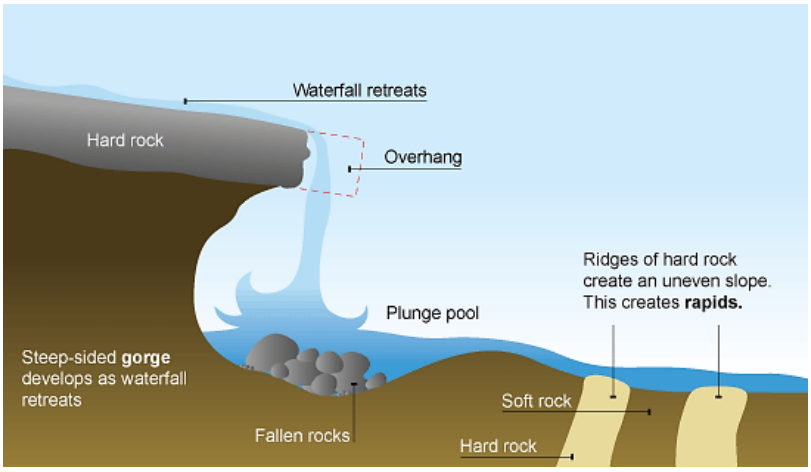
SFG – FRC for CSE 2024 | Geography #3 – Solutions | ForumIAS

Q.1)
Ans) a
Exp) Option a is correct
Statement 1 is correct. The process of **disintegration and decomposition** of rocks in situ through mechanical and chemical changes is called weathering. Weathering agents are divided into three types- Physical or mechanical weathering agents; Chemical weathering agents; Biological weathering agents. Erosion is a process which includes the **destruction and displacement** of existing rocks and the product from the site of destruction. Its agents are running water, winds, ice and waves.
Statement 2 is *incorrect*. Weathering is distinguished from erosion by the fact that erosion includes the transportation of the disintegrated rock and soil away from the site of the degradation. While **weathering does not involve any moving agent of transport.**
The chemical, physical and biological weathering agents are associated with disintegration of rocks. Hence, Statement 2 is incorrect because only erosion is associated with process of transportation.
Statement 3 is *incorrect*. As disintegrated material, the products or the results of weathering **do not involve any motion** except the falling down of material by the force of gravity. **Weathering is followed by erosion** which is a process of scraping, scratching and grinding of the surface rocks. Hence, Statement 3 is incorrect because the weathered material is transported by agents of erosion which signifies that both processes occur in different time frames not together.

Q.2)
Ans) c
Exp) Option c is the correct answer.
The youthful stage of a river is a **dynamic phase in its life cycle, characterized by active erosion and the formation of distinct landforms**. During this stage, the river shapes the landscape through the excavation of valleys, development of meanders, and creation of features that reflect its energetic and erosive nature.
Option 1 is correct: V-shaped valleys are narrow, steep-sided valleys with a distinct V-shaped cross-section. **They are formed through the downward erosion of the river and indicate active erosion and the incision of the landscape by the river**. The steep slopes are a result of the river's ability to carry away sediment and rock
Option 2 is correct: Waterfalls are **formed in areas where a river encounters a sudden change in elevation,** often due to the presence of resistant rock layers. This type of landform is found during the youthful stages of a river.
Option 3 is correct: Georges are formed in the upper course (youthful stage) of the river. They are characterized by steep rocky walls located between hills or mountains.
Option 4 is incorrect: An oxbow lake is a U-shaped Lake that forms when a river's meander is cut off from the main river flow. It is **formed during the later or old stages of the river** and not in its youth stage.
Option 5 is correct: Rapids are areas of turbulent, fast-flowing water characterized by irregular and rapid flow. In the youthful stage, rapids may form **where the river encounters resistant rock formations**, leading to localized turbulence and erosional sculpting of landscapes.



Q.3)
Ans) b
Exp) Option b is correct
Statement 1 is correct. When the soil is completely saturated with water, the individual particles are almost suspended in the water and move easily over one another and over the underlying rocks. The soil acts like a liquid and a soil flow or mud flow occurs. Soilifuction is also called as Soil flow.
Statement 2 is *incorrect*. Earth flow is promoted by excessive water received mostly through rainfall so that the materials are oversaturated Earth flow is more common on planar hillsides or valley sides having alluvium, rich in clay minerals. The statement is ***incorrect*** because the **condition mentioned is one of the favourable condition for Mud flow.**
Statement 3 is correct. Very slow and imperceptible downslope movement of materials (colluvium) is called creep. On the basis of materials involved in such movement creep is divided into -soil creep (fine weathered rock debris as well as soil) and rock creep (unweathered joint blocks). It may be pointed out that the rate of movement of materials under creep is so slow (a few millimeters per year) that it becomes practically difficult for the observers to notice it.
Statement 4 is *incorrect*. Mud flow is most common feature which occur **along valley sides of alluvial rivers and the debris (mud)** so produced is transported by the rivers. The necessary conditions which promote mud flow include (1) steep and vertical slope, (2) presence of unconsolidated materials on the upper surface so that these, when mixed with water, become viscous fluid and slippery, (3) intermittent supply of sufficient water as lubricant, and (4) absence of vegetation. The statement given stands ***incorrect*** because it is description of earth flow and Mud flow differs from earth flow as the 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.

Q.4)
Ans) b
Exp) Option b is correct.
Igneous rocks (from the Latin word for fire) form when hot, molten rock crystallizes and solidifies. The melt originates deep within the Earth near active plate boundaries or hot spots, then rises toward the surface.
Statement 1 is *incorrect*. Igneous rocks are formed when **magma cools and solidifies**. The process of cooling and solidification can happen in the earth's crust or on the surface of the earth. Igneous rocks are

classified based on texture. Texture depends upon size and arrangement of grains or other physical conditions of the materials. They are **not stratified (layered).**

Sedimentary rocks are formed by lithification and shows stratified (layered) formation.

Statement 2 is correct. Generally Igneous rocks do **not contain any fossils** because of extreme high temperature during its formation process. A**ny fossils in the original rock will have melted when the rock melts to form magma**.

Statement 3 is *incorrect*. Extrusive igneous rocks (Lava or Volcanic rocks) are formed by sudden cooling of magma just below the surface or lava above the surface. This results in **small and smooth grains** in rocks as **rapid cooling prevents crystallisation**, as a result, such rocks are **fine-grained**. E.g., Basalt

Statement 4 is correct. Intrusive igneous rocks (Plutonic rocks) are formed when magma cools slowly at great depths of earth crust. Slow cooling means the individual mineral grains have a very long time to grow, so they grow to a relatively large size. Intrusive rocks have a coarse-grained texture. E.g., Granite

Q.5)

Ans) b

Exp) Option b is correct

Statement 1 is correct. In deserts exposed to winds from two different directions but with comparable magnitude, dunes are found to be linear ridges, which are either perpendicular or parallel to the mean wind direction, depending on the angle between the two wind directions. The **sand dunes which are formed parallel to the wind direction are called longitudinal sand dunes or Seifs** while the sand dunes with **cresentic shape occurring transversely to the direction of winds are called Barchan**. Both sand dunes hold one specific similar characteristic that the windward side is gently sloping and the leeward side is steep. Great systems of both types of sand dunes are found in Thar desert of India (Great Indian Desert).

Statement 2 is *incorrect*. Seif sand dunes are stable and extend in time whereas **Barchans are unstable** as they evolve into wavy ridges and eventually break if the sand supply is too low. The isolated barchans migrate freely across the desert plains. They **are large enough to maintain themselves as they migrate and represent a remarkable balance between accumulation, transportation, and erosions.** The three cases of migration of active barchans observed are- (1) They advance regularly with constant rate when the sand supply is constant. (2) They advance with decelerating rate when the sand supply goes on increasing but the height continues to increase. (3) They advance with accelerated rate when the sand supply continues to decrease. Regular advancement or migration of barchans results in gradual spreading of deserts. Hence, this depicts the instability of Barchans making the given statement ***incorrect***.

Q.6)

Ans) b

Exp) Option b is correct

A delta is a tract of alluvium at the mouth of a river where it deposits more material than can be carried away. The load carried by the river is dumped and spread into the sea. Course materials settled out first and a finer fraction of material like silts and clay have flowed into the sea.

Following conditions favour the formation of deltas:

- **Active vertical and lateral erosion in the upper course of the river** to provide extensive sediments to be eventually deposited as deltas.
- The coast should be sheltered preferably tideless.
- The **sea adjoining the delta should be shallow** or else the load will disappear in the deep waters.
- There should be **no large lakes in the river course** to filter off the sediments.

- There should be **no strong current** running at right angle to the river mouth, washing away the sediments.

Q.7)
Ans) b
Exp) Option b is correct
An ox-bow lake is a **crescent-shaped lake** formed by a meandering river. During its journey through a plain, a river twists and turns to form meanders. Oxbow lakes **usually form in flat, low-lying plains** close to where the river empties into another body of water. On these plains, rivers often have wide meanders. **Lake Chicot (North America)** is an example of oxbow lake. **Kabartal Wetland (locally known as Kanwar lake)** is Asia's largest oxbow lake situated in the Begusarai district of Bihar.
Lac de Chaillexon in the Jura Mountains is the example of **Karst lakes** and **Lake Mead in USA** is an example of **man-made lakes.**

Q.8)
Ans) c
Exp) Option c is correct.
Statement 1 is correct.
Metamorphic Rocks are formed by the process by which **recrystallisation and reorganisation of minerals occur within an original rock**. This occurs due to pressure, volume and temperature changes. When rocks are forced down to lower levels by tectonic processes or when molten magma rising through the crust comes in contact with the crustal rocks, metamorphosis occurs.
Statement 2 is correct.
Causes of Metamorphism among rocks are:
1) **Orogenic (Mountain Building) Movements**: Such movements often take place with an interplay of folding, warping and high temperatures. These processes give existing rocks a new appearance.
2) **Lava Inflow:** The molten magmatic material inside the earth's crust brings the surrounding rocks under the influence of intense temperature pressure and causes changes in them.
3) **Geodynamic Forces:** The omnipresent geodynamic forces such as plate tectonics also play an important role in metamorphism.

Statement 3 is correct. The change of form or re-crystallisation of minerals of sedimentary and igneous rocks under the influence of high temperatures is known as **thermal metamorphism. As a result of thermal metamorphism, sandstone changes into quartzite and limestone into marble.**
The conversion of **granite into gneiss** is due to the process of **Dynamic metamorphism i.e., under high pressure.**

Q.9)
Ans) a
Exp) Option a is correct.
Statement 1 is correct. Fold mountains occur near **convergent or compressional plate boundaries**. Plate movement creates fold mountains as the plates move towards each other. This movement causes layers of sedimentary rock on the ocean floor to become wrinkled and folded. Fold mountains are formed due to convergence between two continental plates (Himalayas, Alps) or between an oceanic and a continental plate (the Rockies, Andes).
Statement 2 is *incorrect.* Fold Mountains are the **loftiest** mountains, and they are generally concentrated along continental margins. They extend for **great lengths** and runs into miles. Therefore, they are **called as Mountains of Elevation. Example: Himalayas**

Statement 3 is *incorrect*. Rockies Fold Mountains are formed by convergence of **North American plate** (continental plate) and the **Juan de Fuca plate** (minor oceanic plate) and the Pacific plate (major oceanic plate).
The Andes are formed due to convergence between Nazca plate (oceanic plate) and the South American plate (continental plate).

Q.10)
Ans) c
Exp) Option c is the correct answer.
A **rift valley** is a lowland region that forms where Earth's tectonic plates move apart, or rift. Narmada flows in a rift valley flowing west between the Satpura and Vindhya ranges.
Statement 1 is incorrect: The Brahmaputra has its origin in the **Chemayungdung glacier of the Kailash** range near the Manasarovar Lake. From here, it traverses eastward longitudinally for a distance of nearly 1,200 km in a dry and flat region of southern Tibet. It then enters India west of Sadiya town in Arunachal Pradesh. Flowing southwest, it **does not flow through rift valley**.
Statement 2 is correct: The Damodar occupies the eastern margins of the Chotanagpur Plateau where it **flows through a rift valley** and finally joins the Hugli. The Barakar is its main tributary. Once known as the 'sorrow of Bengal', the Damodar has been now tamed by the Damodar Valley corporation, a multipurpose project.
Statement 3 is correct: Narmada is one of the rivers in India that **flows in a rift valley**, bordered by the **Satpura and Vindhya ranges.** As a rift valley river, the Narmada does not form a delta; Rift valley rivers form estuaries.
Statement 4 is correct: The Tapti River is a river in the central region which **flows through a rift valle**y in India. The river rises from the Gawilgarh Hills of the central Deccan plateau in the south-central state of Madhya Pradesh.

Q.11)
Ans) b
Exp) option b is correct.
Pair 1 is correctly matched. Bhabhar tract lies to the south of shiwalik from west to east. It consists of **gravels and unassorted sediments** deposited by rivers of Himalayas and shiwaliks. Thus the **porosity is so high** that most of **small rivers(chos and raos) disappear** and only **the large rivers can be seen.**
Pair 2 is *incorrectly* matched. Tarai region lies south of Bhabhar and most of rivers re-emerge and thus creating swampy and marshy conditions and thus has a luxurious growth of natural vegetation. It is known for **good cultivation of sugarcane, rice, wheat, maize etc.**
Pair 3 is *incorrectly* matched. Khadar is the **newer alluvium deposits** which are enriched by fresh deposits of silt every year. It consists of **sand, silt clay and mud**. It does not contain concretions and nodules of calcium carbonate. Concretions and nodules of calcium carbonate are present in Bhangar region.
Pair 4 is correctly matched. Bhangar is the older alluvium tract**. Its soil is dark in colour , rich in humus content and is productive.**

Q.12)
Ans) c
Exp) Option c is correct
Statement 1 is correct. Antecedent flow is mainly a characteristic feature of Himalayan Rivers, which further leads to dendritic pattern formation in plains.

Statement 2 is correct. In Antecedent drainage, river slope and the surrounding area gets uplifted and the river sticks to its original slope, cutting through the uplifted portion like a saw (Vertical erosion or vertical down cutting), and forming deep gorges. Ex – Himalayan Rivers
Statement 3 is correct. The Kosi, Indus, Sutlej, Brahmaputra are some examples of antecedent rivers.
Knowledge Base: An antecedent river is a stream that maintains its original course and pattern despite the changes in underlying rock topography. When upliftment occurs, the stream erodes through the rising ridge to form a steep-walled gorge. The stream thus keeps its dendritic pattern even though it flows over a landscape that will normally produce a trellis drainage pattern.

Q.13)
Ans) a
Exp) Option a is correct
Statement 1 is correct. The dendritic pattern develops where the river channel follows the slope of the terrain. The stream with its tributaries resembles the branches of a tree, thus the name dendritic.
Statement 2 is incorrect. A river joined by its tributaries, at approximately right angles, develops a trellis pattern. A trellis drainage pattern develops where hard and soft rocks exist parallel to each other.
Statement 3 is incorrect. A rectangular drainage pattern develops on a strongly jointed rocky terrain. It differs from the trellis pattern in so far as it is more irregular and its tributary streams are neither as long, nor parallel as in trellis drainage. A typical example of this drainage pattern is found in the Vindhyan Mountains of India.
Knowledge Base:

- The streams within a drainage basin form certain patterns, depending on the slope of land, underlying rock structure as well as the climatic conditions of the area.
- These are dendritic, trellis, rectangular, and radial patterns.
- Further, the radial pattern develops when streams flow in different directions from a central peak or dome like structure.

Q.14)
Ans) a
Exp) Option a is correct
Statement 1 is incorrect. The river has a length of 2,525 km. It is shared by Uttarakhand (110 km) Uttar Pradesh (1,450 km), Bihar (445 km) (not Chhattisgarh and Jharkhand), and West Bengal (520 km). The Ganga basin covers about 8.6 lakh sq. km area in India alone.
Statement 2 is correct. The Ganga river basin is the largest in India and covers 26% of countries geographical area.
Statement 3 is incorrect. Son is Ganga's major right bank tributaries. The important left bank tributaries are the Ramganga, the Gomati, the Ghaghara, the Gandak, the Kosi and the Mahananda (not right bank).
Knowledge Base: 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. It cuts through the Central and the Lesser Himalayas in narrow gorges. At Devprayag, the Bhagirathi meets the Alaknanda; hereafter, it is known as the Ganga.

Q.15)
Ans) d
Exp) Option d is correct
Statement 1 is incorrect. Coastal lagoon is a shallow body (not deep) of water which forms along gentle sloping coast.

Statement 2 is incorrect. Chilika Lake (1165 sq km) is the largest lagoon or largest brackish water lake with estuarine character that spreads along the east coast of India. The Sambhar Salt Lake (230 sq. km), is India's largest inland Salt Lake, located southwest of the Jaipur.
Knowledge Base:

- Vembanad Lake (2033 sq km) is the largest lake in India in terms of area however it is mixed type I.e., having Brackish and Freshwater both.
- Wular lake (31 to 259 sq km) in Jammu and Kashmir is the largest freshwater lake in India.
- There is an overlap between bodies of water classified as coastal lagoons and bodies of water classified as estuaries. Some geographers include fresh water bodies in the definition of "lagoon", while others explicitly restrict "lagoon" to bodies of water with some degree of salinity

Q.16)
Ans) b
Exp) Option b is correct.
Statement a is incorrect. Epeirogenic processes are continent-building processes. They are also classified as endogenic processes. Weathering is an example of denudational process. As such, weathering is also an exogenic geomorphic process.
Statement b is correct. When rocks undergo weathering, some materials are removed through chemical or physical leaching by groundwater and thereby the concentration of valuable materials increases. Without such a weathering taking place, the concentration of the same valuable material may not be sufficient and
economically viable to exploit, process and refine. Thus, weathering aids the process of enrichment of valuable minerals in their natural environment.
Statement c is incorrect. Mass movements are mainly the work of gravity. Gravity exerts its force on all matter, both bedrock and the products of weathering. So, weathering is not a pre-requisite for mass movement though it aids mass movements. Mass movements are very active over weathered slopes rather than over unweathered materials.
Knowledge Base: Weathering is defined as mechanical disintegration and chemical decomposition of rocks through the actions of various elements of weather and climate.
The three major groups of weathering processes are chemical, physical or
Mechanical and biological weathering processes.

Q.17)
Ans) c
Exp) Option c is correct.
Statement 1 is incorrect. Exfoliation is the flaking off of more or less curved sheets of shells from over rocks. The erosion of rocks leads to the removal of overlying rock load and vertical pressure release. The release of pressure allows the upper layers of the rock to expand resulting in the disintegration of rocks. Thus, rock masses develop fractures parallel to the ground surface. Where the ground surface is curved, these fractures look like arched and tend to produce massive sheets or exfoliation slabs of rock. Thus, exfoliation sheets result from expansion due to unloading and consequent pressure release – an outcome of physical weathering process.
Statement 2 is correct. In areas with alternating wetting and drying conditions salt crystal growth is common. Many salts like calcium, sodium, magnesium, potassium and barium have a tendency to expand. Salt crystals in near-surface pores cause splitting of individual grains within rocks, which eventually leads to granular disintegration or granular foliation. Thus, salt crystallisation is a type of weathering.

Statement 3 is correct. The surface layers of the rocks tend to expand more than the rock at depth and this leads to stresses within the rock. Due to differential heating and resulting expansion and contraction of
surface layers and their subsequent exfoliation from the surface results in smooth rounded surfaces in rocks. Tors are smooth surfaced and rounded boulders that form due to such exfoliation in rocks like Granite.
Statement 4 is correct. Karst topography results from the action of groundwater in the limestone or dolomitic region. It is an example of chemical weathering.
Knowledge Base: Weathering is an in-situ or on-site exogenic process. Weathering processes differ from climate to climate and the depth of the weathering mantle.

Q.18)
Ans) c
Exp) Option is correct.
Option 1 is correct. Delhi is located within a distance of 200-400 km from different locations of the main boundary thrust fault. The main boundary thrust fault of the Himalayas, which runs from Kashmir to Arunachal Pradesh, is highly active.
Option 2 is correct. Earthquakes in Delhi-NCR were due to the "release of stress" accumulated from the movement of the Indian tectonic plate and its collision with the Eurasian tectonic plate.
Option 3 is *incorrect*. The "large sediment thickness (loose soil) in the Ganga Alluvial Plains" to the north of Delhi **tends to amplify the impact of earthquakes. It is not directly responsible for the generation of earthquakes.**
Option 4 is correct. There are so many weak zones and faults in the Delhi-NCR: - Delhi-Haridwar ridge, Mahendragarh-Dehradun subsurface fault, Moradabad fault, Sohna fault, Great boundary fault, Delhi-Sargodha ridge, Yamuna River lineament, Ganga River lineament etc.

Q.19)
Ans) b
Exp) Option (b) is the correct answer.
Hanging valleys are shallow canyons formed over a larger canyon, and are tributary valleys to the larger valleys. The hanging valleys are so named due to their positioning of being above main valleys. Hanging valleys form a characteristic U-shape above their respective main valleys, and have a steep wall at the point where the two valleys meet. These valleys are found in regions of high altitude, particularly in mountainous regions. The valleys are natural crevices through which rivers flow, and at the cliff meeting point where the two valleys meet the rivers dramatically drop to form waterfalls. In most cases, the hanging valleys are smaller than the main valleys. However, some hanging valleys are also found underwater in fjord systems where hanging fjords are shallower than the main fjords.
Hanging valleys are formed as a result of the erosion effects of glaciation. The valleys are thought to have been formed by two different glacier flows that interact with each other. A glacier with the relatively small amount of material flows into the main glacier with the more glacial material. The main glacier with huge volumes of glacier material ultimately erodes away either through abrasion or plucking, with vertical erosion forming extremely steep valleys with vertical slopes, while lateral erosion is widening the valley walls. The hanging valleys formed in this way have U-shaped walls.
Statement 1 is correct. The main valley is eroded much more rapidly than tributary valley because it contains a much larger glacier than tributary valley.
Statement 2 is incorrect. The main valley contains larger glaciers than tributary valleys.
Statement 3 is correct. Hanging valleys forms a natural site for hydro power generation due to the presence of waterfalls.

Q.20)

Ans) a

Exp) Option (a) is the correct answer.

Geomorphological features of Indo – Gangetic – Brahmaputra Plain

The Bhabar

Statement 3 is incorrect. It is a narrow, porous, northernmost stretch of Indo-Gangetic plain.

- It is about 8-16 km wide running in an east-west direction along the foothills (alluvial fans) of the Shiwaliks.
- They show a remarkable continuity from the Indus to the Tista.
- Rivers descending from the Himalayas deposit their load along the foothills in the form of alluvial fans.
- These alluvial fans have merged together to build up the bhabar belt.
- The porosity of bhabar is the most unique feature.
- The porosity is due to deposition of huge number of pebbles and rock debris across the alluvial fans.
- The streams disappear once they reach the bhabar region because of this porosity.
- Therefore, the area is marked by dry river courses except in the rainy season.
- The Bhabar belt is comparatively narrow in the east and extensive in the western and north-western hilly region.
- The area is not suitable for agriculture and only big trees with large roots thrive in this belt.
- The Terai

Statement 4 is incorrect. Terai is an ill-drained, damp (marshy) and thickly forested narrow tract to the south of Bhabar running parallel to it.

- The Terai is about 15-30 km wide.
- The underground streams of the Bhabar belt re-emerge in this belt.
- This thickly forested region provides shelter to a variety of wildlife. [Jim Corbett National Park in Uttarakhand and Kaziranga National Park in Assam lie in terai region]
- The Terai is more marked in the eastern part than in the west because the eastern parts receive comparatively higher amount of rainfall.
- Most of the Terai land, especially in Punjab, Uttar Pradesh and Uttarakhand, has been turned into agricultural land which gives good crops of sugarcane, rice and wheat.

The Bhangar

Statement 2 is correct. The Bhangar is the older alluvium along the river beds forming terraces higher than the floodplain. It is in south of Tarai.

- The terraces are often impregnated with calcareous concretions known as 'KANKAR'.
- 'The Barind plains' in the deltaic region of Bengal and the 'bhur formations' in the middle Ganga and Yamuna doab are regional variations of Bhangar.
  [Bhur denotes an elevated piece of land situated along the banks of the Ganga river, especially in the upper Ganga-Yamuna Doab. This has been formed due to accumulation of wind-blown sands during the hot dry months of the year]
- Bhangar contains fossils of animals like rhinoceros, hippopotamus, elephants, etc. The Khadar

Statement 1 is incorrect. The Khadar is composed of newer alluvium and forms the flood plains along the river banks. It is in south of bhangar.

- A new layer of alluvium is deposited by river floods almost every year.
- This makes them the most fertile soils of Ganges.

Q.21)

Ans) c

Exp) Option (c) is the correct answer.

Antecedent Drainage or Inconsequent Drainage:
A part of a river slope and the surrounding area gets uplifted and the river sticks to its original slope, cutting through the uplifted portion like a saw (Vertical erosion or Vertical down cutting), and forming deep gorges: this type of drainage is called Antecedent drainage.
Examples: Indus, Sutlej, Brahmaputra, Ganga, kali, Arun (a tributaries of Kosi), Teesta and other Himalayan rivers that are older than the Himalayas themselves. They are usually called as Antecedent rivers. Yamuna is not an antecedent river

Q.22)
Ans) c
Exp) Option (c) is the correct answer.
All rivers have some properties or action which defines its age or are defined by its age.
The features of young river are River capture or River piracy or River beheading.
River piracy- When the stream of a river is diverted from its own bed and flow starts to flow down the bed of a neighbouring stream, the phenomenon is called River piracy and it occurs in Young Rivers.
Meanders- Meanders are formed when water flowing under gravity seldom flows straight for any long distance, a winding course develops. The Irregularities of the ground forces the river to swing in loops which are known as Meanders. These are usually snake like structure.
Ox-Bow lakes- Also known as cut-offs or bayous. Ox-bow lakes are formed in the lower course of the river. When a meander becomes more pronounced the outside bend is rapidly eroded forming a complete circle.
Gradually with time river cuts through the narrow neck of the ox-bow lake and starts flowing straight leaving the ox-bow lake as a swamp.
Pair 1 is correctly matched. River piracy is the feature of young river.
Pair 2 is also correctly matched. Meanders are the feature of Mature river.
3 is also correctly matched. Ox-Bow lake is the feature of old age rivers.

Q.23)
Ans) b
Exp) Option (b) is the correct answer.
Weathering and erosion are processes by which rocks are broken down and moved form their original location. They differ based on whether a rock's location is changed: weathering degrades a rock without moving it, while erosion carries rocks and soil away from their original locations. Weathering often leads to erosion by causing rocks to break down into smaller pieces, which erosive forces can then move away.
Statement 1 is incorrect. Frost is an agent of weathering and not erosion because frost does not move away or cut through the underlying surface and do not move rocks or matter from one location to another.
Statement 2 is correct. Wind is an agent of both weathering and erosion. Both air and water contain some amount of chemical which when exposed to surface of rocks starts chemical weathering.
While wind blows it also carries the lighter weathered materials with it. A strong wind can also erode the surface and transport it somewhere else.
KB) Denudation is the general lowering and levelling of the earth's surface.
The denudation process occurs in four phases namely weathering, erosion, transportation and deposition. rain, frost and wind are the agents of weathering. Rivers, ice, wind and waves are agents of erosion.

Q.24)
Ans) a
Exp) Option (a) is the correct answer.

The earth's crust constantly undergoes changes and that plays a very important role in rejuvenation of a river.
Statement 3 is incorrect. When there is an uplift of land or a fall in sea level occurs then a negative movement occurs in the river system which steepen the slope and active down-cutting of the river is renewed.
Statement 1 is correct. A fall in sea level results in the increase in the altitude of flood plain above the sea level. The river with its new energy starts to cut the former floodplain leaving behind terraces on both sides of the river.
The point where the old and rejuvenated profile meet is known as Knick point or Rejuvenated head.
Statement 2 is incorrect. A positive movement occurs when there is a depression of land or rise in sea level. This submerges the land along the coast drown, the valleys and weaken the erosive power of the river.

Q.25)
Ans) d
Exp) Option (d) is the correct answer.
Statement 1 is incorrect. Poljes are large flat closed depressions that can be found in most karst areas around the world. They are prone to regular flooding, which occurs after abundant rainfall or snowmelt events. The floods can form several meters deep intermittent lakes that can persist for months.
A typical form of a Polje is easy to explain, after the way they were formed is understood. The whole karst area is drained underground by caves. If the caves are rather close to the surface and rather big too, sometimes the roof collapses and forms a doline. The stream that flows through the cave now flows through the Doline and the doline looks like a valley with steep walls and a river arising from a cave and disappearing into another cave.
As erosion continues, several parts of the cave may collapse and it looks like dolines or poljes connected by short caves and natural bridges. After some time, the remaining natural bridges collapse too and the dolines get connected, to form bigger poljes.
Statement 2 is incorrect. Oxbow lakes are formed by river deposition. A river may shorten its course during flood by cutting across its meandering loops, leaving behind a horseshoe-shaped channel as an Oxbow Lakes, e.g. those that occur on the floodplain of lower Mississippi, USA and Rio Grande, Mexico.

Q.26)
Ans) d
Exp) Option (d) is the correct answer.
Coastal Features of Deposition
Beaches: Sands & gravel loosened from the land are moved by waves to be deposited along the shore as beaches. The eroded material is transported along the shore in several distinct ways. Long shore drifts which comes obliquely to the coast carries material along the shore in the direction of the dominant wind. At the same time, backwash removes part of the material seawards, along the bed of the sea, and deposits it on the off-shore terrace and even beyond. The constant action of the waves automatically sorts out the shoreline deposits in a graded manner. The coarser materials are dropped by the waves at the top of the beaches & the finer materials, carried down the beach by the backwash, are dropped closer to the sea.
Spits & Bars: The debris eroded by waves is continually moved by long shore drift & where there is an indentation in the coast, such as at the mouth of the river or a bay, material may continue to be deposited across the inlet. As more materials are added, they will pile up into a ridge or embankment of shingle forming a spit, with one end attached to the land and other projecting into the sea. When a ridge of shingle is formed across the mouth of a river or the entrance to a bay, it is called a bar. Such a connecting bar that joins two land masses is known as Tombolo.

Marine Dunes & Dune Belts: With the force of on-shore winds, a large amount of coastal sand is driven landwards forming extensive marine dunes that stretches into dune belts. Their advance inland may engulf farms, roads & even the entire villages. Hence to arrest the migration of dunes, sand binding species of grass & shrubs, such as marram grass & pines are planted.

Q.27)
Ans) c
Exp) Option (c) is the correct answer.
Wind erosion is carried out in the following three ways
i) Deflation
ii) Abrasion
iii) Attrition
Deflation- Deflation involves the lifting and blowing away of loose materials from the ground. Such unconsolidated sand and pebbles may be carried in the air or rolled along the ground depending on the grain size.
Abrasion- The sand-blasting of rock surfaces by winds when they hur; sand particles against them is called abrasion.
Attrition- When wind-borne particles roll against one another in collision they wear each other away so that their sizes are greatly reduced and grains are grounded into millet seed sand.
Statement 1 is correct. Deflation is the lifting and blowing away of loose materials from the ground.
Statement 2 is correct. Abrasion is the sand- blasting of rock surfaces by winds when they hurl sand particles against them.

Q.28)
Ans) d
Exp) Option (d) is the correct answer.
Peneplains are irregular structure which is reduced to low lying structure by the action of agents of erosion like rain, rivers, ice, winds etc.

Q.29)
Ans) d
Exp) Option (d) is the correct answer.
The Peninsular plateau of India is flanked by narrow coastal plains of varied width from north to south, known as Western coastal plains and the East coastal plains. These coastal plains differ from each other. They were formed by the depositional action of the rivers and the depositional and erosional action of the sea waves. According to geologists their origin maybe attributed to the faulting and subsidence of Arabian Sea and the Bay of Bengal.
Statement 1 is incorrect. The western coastal plains show evidence of emergence in the south on the Malabar coast (Kerala). From the coast of Gujarat till Malabar the western coastal plains are submergent in nature. The eastern coastal plains are emergent on the other hand.
Statement 2 is incorrect. The eastern coastal plains are formed by the alluvial fillings of the littoral zone comprising some of the largest deltas in the world. Thus, the eastern coastal plains and not the western coastal plains consist
mostly of recent and tertiary alluvial deposits. The Western coastal plains are dominated by shallow backwaters and lagoons known as Kayals and Teris.
KB) Eastern Coast of India

- It extends from the Ganga delta to Kanyakumari.
- This coast is emergent type which is characterised by offshore bars, sea beaches and lagoons.

- It is aggradational plain (It is a term used in geology for the increase in land elevation, typically in a river system, due to the deposition of sediment) formed by the rivers sediments.
- Get maximum cyclonic storms and fit for predominantly rice and jute cultivation.
- It is sandy with alluvium and slopes gently towards the sea. Sand dunes and marshy lands are also found. In some Coastal strips lagoons (Chilka, Pulicat) are formed.
- It has straight shorelines and consists mainly of recent and tertiary alluvium deposits.
- It is washed by the Bay of Bengal.
- It receives comparatively low rainfall.
- It receives rain from North East Monsoons.
- Regional names of Eastern Coast: Odisha= Utkal Coast; Tamil Nadu= Coromandel Coast or Payan Ghat.

Western Coast of India

- The west coast extends from the Gulf of Cambay in the north to Cape Comorin.
- It is fault coast and shows marks of subsidence except in Malabar coast in south where evidence of emergence is found.
- It is narrow plain drained by many swift but small rivers.
- Estuaries are predominantly instead of deltas as in Eastern coast.
- It is relatively rocky with sand and sand dunes. It slopes abruptly down to the sea. There is no lagoon on the northern part. It has many estuaries on the Konkan Coast. But the southern part especially the Malabar Coast has the beautiful scene of back-water country with a series of lagoons. Backwaters locally called Kayals are found in Malabar Coast, e.g. Vembanad Lake.
- Western continental margin is much broader than the Eastern counterpart.
- It is washed by the Arabian Sea.
- It receives heavy rainfall.
- It receives rain from South West Monsoons.
- Regional names of the western coast: Konkan coast = Maharashtra coast and Goa coast; Malabar Coast = Kerala and Karnataka coast.

Q.30)

Ans) c

Exp) Option (c) is the correct answer.

Statement 1 is correct. Load carrying capacity of peninsular rivers is low as their flow is low as compared to extra peninsular (or Himalayan) rivers. Thus, due to the combination of low flow and load carrying capacity, there is hardly any vertical erosion in Peninsular rivers. Also, the Peninsular rocks are hard and stable, thus eroding them is comparatively more difficult.

Statement 2 is correct. Extra peninsular rivers or Himalayan rivers consists of mainly three river systems: (i) The Indus system (ii) The Ganga system (iii) The Brahmaputra system. All of these rivers form deltas.

The Indus River Delta forms where the Indus River flows into the Arabian Sea, mostly in the southern Sindh province of Pakistan with a small portion in the Kutch Region of the western tip of India. The delta covers an area of about 41,440 km2 (16,000 square miles), and is approximately 210 km (130 mi) across where it meets the sea.

The Ganges Delta (also known as the Sundarbans Delta or the Bengal Delta) is a river delta in the Bengal region of the Indian subcontinent, consisting of Bangladesh and the Indian state of West Bengal. It is the world's largest delta and empties into the Bay of Bengal the combined waters of several river systems, mainly those of the Brahmaputra river and the Ganges river.

Statement 3 is correct. Due to the lower incline, lesser flow and hard rocks beneath, the peninsular rivers' erosional power is relatively less than that of Himalayan rivers, so much so that they perform mainly depositional function. Himalayan rivers on the other hand have steeper incline, newly formed soft rocks

beneath and larger flow, which leads to higher erosional power. Due to the increase in erosional power there is more vertical erosion which leads to easier navigation.

Q.31)
Ans) d
Exp) Option (d) is the correct answer.
Marine agents of erosion operate in the following ways to transform the coastal landscape:
Corrasion : Corrasion is a process of mechanical erosion. Waves armed with rock debris break on cliff faces and slowly erode it. On-coming currents and tides complete the work by sweeping the eroded material into the sea.
Attrition : Attrition occurs when waves cause loose pieces of rock debris such as boulders, pebbles, shingle and fine sand, to collide with each other. Under attrition, these materials are broken down into finer, smaller and rounder particles which are largely responsible for the fine sand that forms the beaches.
Hydraulic action : In their forward surge, waves splashing against the coast may enter joints and crevices in the rocks. The air trapped inside is immediately compressed. When the waves retreat, the compressed air expands with explosive violence. Such repeated action causes enlargements of the cracks and rock fragments are prised apart.
Solvent action : This refers to chemical erosion of rocks. This process is limited to limestone coasts. On limestone coasts, the solvent action of seawater on calcium carbonate sets up chemical changes in the rocks and disintegration takes place.
The rate of marine erosion depends on the nature of rock, the amount of rock exposed to the sea, the effects of tides and currents, and human interference in coastal protection. Others effects such as vulcanicity, glaciation, earth movement and organic accumulations have also to be considered.

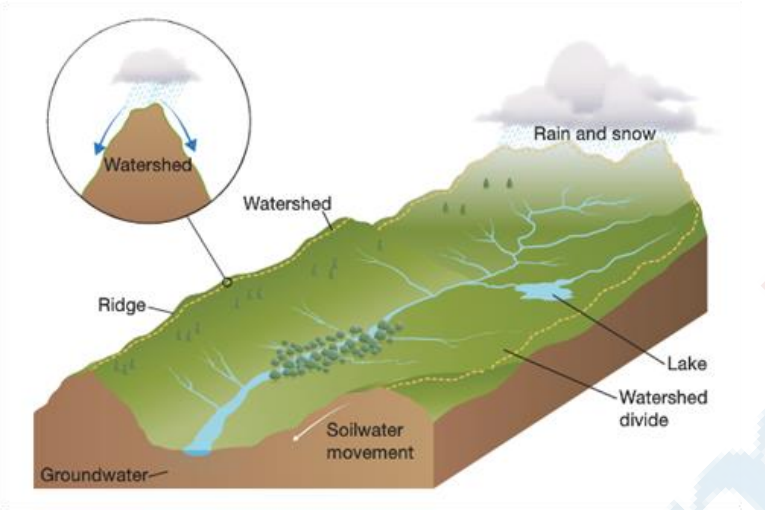
Q.32)
Ans) c
Exp) Option (c) is the correct answer.
Under classification of streams:
Statement 1 is correct. Obsequent streams flow in a direction opposite to that of the original consequent slope. A consequent river is one whose course is determined by the original course of the land.
Statement 2 is correct. Resequent rivers are those that flow in the same direction as the consequent stream but at a lower level.

Q.33)
Ans) a
Exp) Option (a) is the correct answer.
Statement 1 is correct. The mass movements transfer the mass of rock debris down the slopes under the direct influence of gravity. So, weathering is not a pre-requisite for mass movements though it aids mass movements. Mass movements are very active over weathered slopes rather than over unweathered materials.
Statement 2 is incorrect. Mass movements are aided by gravity and no geomorphic agents like running water, glaciers, wind, waves and currents participate in the process of mass-movements.

Q.34)
Ans) b
Exp) Option b is the correct answer.

A drainage basin is the area of land that it drained by a river and its tributaries. When a droplet of water falls onto the land (as precipitation), gravity will make sure that the water is 'pulled' downhill to return to the sea.

Statement 1 is correct: The **boundary line separating one drainage basin from the other** is known as the **watershed.** It is often confused with river basins. However, watersheds are small in area while the basins cover larger areas. The catchments of large rivers are called river basins while those of small rivulets and rills are often referred to as watersheds.



Statement 2 is incorrect: A **catchment area** is the area in which a river drains the water collected from a specific area.

Watershed divide is an imaginary line that **connects** the **highest points in the landscape** like mountain peaks and ridgelines that divide one valley or drainage from another.

Statement 3 is correct: Confluence is the point in drainage basins at which two rivers or streams join.

Q.35)

Ans) a

Exp) Option a is the correct answer.

Statement 1 is correct. Exfoliation is a technical term given for onion peeling weathering process as the surface layers of rounded boulders gradually split off and the various layers look like the layers of an onion. As very little or no motion of materials takes place in weathering, it is an in-situ or on-site process.

Statement 2 is incorrect. Exfoliation is a result of mechanical or physical weathering due to repeated temperature change. It happens due to expansion and contraction of the outer layers as it gets cooled and intensely heated than the interior of the rocks.

Q.36)

Ans) d

Exp) Option d is the correct answer.

Statement 1 is incorrect. The tropical countries, where the heavy rainfall and warm climate both promote rapid chemical reactions, weathering often proceeds very rapidly. Warm, wet climates promote rapid chemical weathering, while a dry climate inhibits chemical weathering. Thus, the tropical regions experience more rapid weathering proceeds than other regions.

Statement 2 is incorrect. Oxidation means combination of minerals with oxygen to form oxides or hydroxides. Red colour of iron upon oxidation turns to brown or yellow and upon reduction turns to greenish or bluish grey.

Q.37)

Ans) a

Exp) Option a is the correct answer.

Pair 1 is correct. Slump is a process of mass movements in which slipping of 1 or several units of rock debris with a backward rotation of mass occurs.

Pair 2 is incorrect. Creep is a process of mass movements in which movement of materials is extremely slow and imperceptible except through extended observation.

Pair 3 is incorrect. Rockslide is sliding of individual rock masses down bedding, joint or fault surfaces.

Q.38)

Ans) c

Exp) Option c is the correct answer.

All of the statements are correct.

Debris avalanches and landslides occur very frequently in the Himalayas. There are many reasons for this. One, the Himalayas are tectonically active. They are mostly made up of sedimentary rocks and unconsolidated and semi-consolidated deposits. The slopes are very steep.

Q.39)

Ans) b

Exp) Option b is the correct answer.

The sand-blasting of rock surfaces by winds when they hurl sand particles against them is called abrasion. The impact of such blasting results in rock surfaces being scratched, polished and worn away. Abrasion is most effective at or near the base of rocks, where the amount of material the wind is able to carry is greatest. Therefore, tele-graph poles in the deserts are protected by a covering of metal for a foot or two above the ground. The correct answer is (b).

Deflation: This process involves the lifting and blowing away of loose materials such as sands, pebbles from the ground. The finer dust and sands may be removed miles away from their place of origin, and be deposited even outside the desert margins. This process results in lowering of the land surface to form large depressions called deflated hollows.

Attrition: When wind-borne particles roll against one another in collision they wear each other away so that their sizes are greatly reduced and grains are rounded into millet seed sand.

Q.40)

Ans) c

Exp) Option c is the correct answer.

Flood plain, Ox-bow lakes and delta are the lower or plain course features of a river. River capture or river piracy or river beheading is a feature of the upper or mountain course of a river.

River capture: River capture or stream piracy is a geomorphological phenomenon occurring when a stream or river drainage system or watershed is diverted from its own bed, and flows instead down the bed of a neighboring stream.

Floodplain: A floodplain is an area of land which is covered in water when the river bursts its banks.

Ox-Box lakes: An oxbow lake is a U-shaped lake that forms when a wide meander from the main stem of a river is cut off, creating a free-standing body of water.

Delta: it forms when river reaches the sea. So, it is a part of coastal plains.

Q.41)

Ans) b

Exp) Option b is the correct answer.

The **Mississippi** has a **bird's foot delta**, with several main branches like the foot of a bird extending into the Gulf of Mexico.
The **Nile, Ganges and Mekong** have the **fan-shaped arcuate deltas** with numerous distributaries.
Rivers such as the **Amazon, Ob and Vistula** have their deltas partly submerged in coastal waters to form **estuarine deltas.**
A few rivers like the **Ebro of Spain** have tooth like projections at their mouths. These are known as **cuspate deltas.**

Q.42)
Ans) c
Exp) Option c is the correct answer.
The rapid mass movements are mostly prevalent in humid climatic regions and occur over gentle to steep slopes. The rapid mass movements include:
Earthflow: Movement of water saturated clayey or silty earth materials down low-angle terraces or hillsides is known as earthflow.
Mudflow: In the absence of vegetation cover and with heavy rainfall, thick layers of weathered materials get saturated with water and either slowly or rapidly flows down along definite channels. It looks like stream of mud within a valley.
Debris Avalanche: It is more characteristic of humid regions with or without vegetation cover and occurs on narrow tracks on steep slopes. It is similar to snow avalanche.
Solifluction: Slow downslope flowing soil mass or fine grained rock debris saturated or lubricated with water.
In terms of speed of mass movements, Debris Avalanche > Mudflow > Earthflow > Solifluction

Q.43)
Ans) c
Exp) Option c is the correct answer.
Decomposition and disintegration of rocks due to chemical reactions is called chemical weathering wherein the minerals of the rocks weather away.
Statement 1 is correct. On Earth's surface, regolith is largely a product of weathering either chemical or mechanical weathering. In chemical weathering process, a rock may be exposed to water or other chemical compounds that percolate through the soil, or it may occur as an outcrop (that is, a deposit of rock exposed at Earth's surface). These chemicals can alter the rock's mineral content over time, breaking down some material into smaller components and separating it from the bedrock layer.
Regolith is the mineral remains of decomposed rocks. Regolith is a blanket of unconsolidated, loose, heterogeneous superficial deposits covering solid rock.
Statement 2 is correct. When a **soil cover exists**, the **chemical weathering** of the underlying rocks is **enhanced**. This is because the **soil absorbs rain-water** and keeps the underlying rocks in contact with this moisture. The rain-water absorbs organic acids from the soil and thus becomes a stronger weathering agent than pure rain-water acting on bare rocks.
Statement 3 is correct. In some cases, **micro-organisms** and **plants** like **mosses or lichens** can live on bare rock, so long as the surface is damp. These **absorb chemical elements** from the rocks as food and also produce organic acids. They are thus **agents** of both **chemical and mechanical weathering.**

Q.44)
Ans) a
Exp) Option a is the correct answer.

Drainage systems, also known as river systems, are the patterns formed by the streams, rivers, and lakes in a particular drainage basin.

Statement 1 is incorrect. The **initial stream** that exists as a **consequence of the slope** is called the consequent stream. As the consequent stream wears down the surface by deepening its channel downwards, it is joined by several tributaries either obliquely or at right angles depending on the alignment and the degree of resistance of the rocks,

Rivers of Peninsular India such as the Godavari, Krishna, and Cauvery are consequent rivers descending from the western ghats and flowing into the Bay of Bengal.

Statement 2 is correct. A drainage pattern is described as **insequent or discordant if it does not correlate to the topology (surface relief features)** and **geology** of the area. In simple words, in a insequent drainage pattern, the river follows its initial path irrespective of the changes in topography.

Statement 3 is incorrect. A subsequent **stream generally developed after the original stream** (Consequent River). It is a **tributary stream** that is eroded **along an underlying belt of non-resistant rock after** the **main drainage pattern** has been **established.** If the rocks are made up of alternate layers of hard and soft rocks, the tributaries tend to follow the pattern of the rock structure. If the outcrops of the rocks occur at right angles to the main valley, the tributaries will join it **at right angles** as subsequent streams.

Q.45)

Ans) b

Exp) Option b is the correct answer.

Only Pairs 2 and 3 are correctly matched.

Fluvial Erosional Landforms are landforms created by the erosional activity of rivers. In rivers. erosion and transportation go on simultaneously, comprising the following inter-acting processes.

Pair 1 is incorrectly matched. Corrasion or abrasion is the **mechanical grinding of the river's traction load against the banks and bed of the river.** The rock fragments are hurled against the sides of the river and also roll along the bottom of the river. Corrasion takes place.in two distinct ways. (3) Lateral corrasion. This is the sideways erosion which widens the V–shaped valley. (b) Vertical corrasion. This is the downward action which deepens the river channel.

Pair 2 is correctly matched. Corrosion or solution is the **chemical or solvent action of water on soluble or partly-soluble rocks** with which the river comes into contact. For example, calcium carbonate in limestones is easily dissolved and removed in solution.

Pair 3 is correctly matched. Attrition is the wear and tear of the transported materials themselves when they roll and collide into one another. The coarser boulders are broken down into smaller stones; the angular edges are smoothed and rounded to form pebbles. The finer materials are carried further down-stream to be deposited.

Pair 4 is incorrectly matched. Hydraulic action is the **mechanical loosening and sweeping away of materials by the river water itself.** Some of the water splashes against the river banks and surges into cracks and crevices. This helps to disintegrate the rocks. The water also undermines the softer rocks with which it comes into contact. It picks up the loose fragments from its banks and bed and transports them away.

Q.46)

Ans) b

Exp) Option b is the correct answer.

Statement 1 is incorrect: In the upper or mountain course the predominant action of river is vertical erosion. The valley developed is deep, narrow and V-shaped. Down cutting takes place so rapidly that lateral erosion cannot keep pace.
Statement 2 is incorrect: In the middle or valley course lateral erosion tends to replace vertical erosion. Active erosion of banks widens the V-shaped valley. The work of the river is predominantly transportation with some deposition.
Statement 3 is correct: The work of the river is predominantly transportation with some deposition in the middle or valley course. **In the lower or plain course, the work of river is mainly deposition.**

Q.47)
Ans) b
Exp) Option b is the correct answer.
The Himalayan drainage system mainly includes the Ganga, the Indus and the Brahmaputra River basins. These rivers pass through the giant gorges carved out by the erosional activity carried on simultaneously with the uplift of the Himalayas.
Statement 1 is incorrect: While the Himalayan rivers form V-shaped valleys, rapids and waterfalls in their mountainous course, they form **depositional features like flat valleys, ox-bow lakes (depositional feature in the plains not the erosional feature)**, flood plains, braided channels, and deltas near the river mouth in the **plain region.** They have **strong meandering tendency** due to the erosional load carried by them.
Statement 2 is correct: The **Himalayan rivers** display a **strong meandering tendency** and **shift their courses frequently**. Many Himalayan rivers like Kosi have been notorious for frequently changing its course. The Kosi brings huge quantity of sediments from its upper reaches and deposits it in the plains. The course gets blocked, and consequently, the river changes its course.
Statement 3 is correct: The Himalayan drainage system has evolved through a long geological history. During the mid-Pleistocene period, the **down thrusting of the Malda gap,** an area between the Rajmahal hills and the Meghalaya plateau, took place. This **diverted the Ganga and the Brahmaputra systems** to flow towards the **Bay of Bengal.**

Q.48)
Ans) d
Exp) Option d is the correct answer.
The longitudinal valleys (elongated valley found between two almost-parallel mountain chains) which lie **between lesser Himalayas and the Shivalik** are termed Duns. **Doon or Dun refers to a local word that is used for valley**, particularly an open valley in the Shivaliks or between the Shivaliks and higher Himalayan foothills.
Statement 1 is incorrect: Duns are **longitudinal valleys** formed as a result of **folding when Eurasian plate and Indian plate collided**. They are not formed as a result of faulting of Australian plate and Indian plate. Basically, it refers to **a flat surface** where a large settlement resides.
Statement 2 is incorrect: The **southernmost part of Kashmir or Northwestern Himalayas** region consists of longitudinal valley known as 'Duns'. **Jammu Dun** and **Pathankot Dun** are important examples. Duns are also present in **Uttaranchal and Himanchal Himalayas**. Some important duns of this region are **Chandigarh – Kalka dun**, Nalagarh. **Dehra dun is the largest of all the duns.**

Q.49)
Ans) c
Exp) Option c is the correct answer.

The **Peninsular drainage system** is older than the Himalayan one. This is evident from the broad, largely-graded shallow valleys, and the maturity of the rivers. The Western Ghats running close to the western coast act as the water divide between the major Peninsular rivers, discharging their water in the Bay of Bengal and as small rivulets joining the Arabian Sea.

Statement 1, 3 and 4 are correct.

Three major geological events in the distant past have **shaped the present drainage systems of Peninsular India**:

- **Subsidence of the western flank of the Peninsula** leading to its submergence below the sea during the early tertiary period. Generally, it has disturbed the symmetrical plan of the river on either side of the original watershed.
- **Upheaval of the Himalayas** when the northern flank of the Peninsular block was subjected to subsidence and the consequent trough faulting. The Narmada and The Tapi flow in trough faults and fill the original cracks with their detritus materials. Hence, there is a lack of alluvial and deltaic deposits in these rivers.
- **Slight tilting of the Peninsular block** from northwest to the south-eastern direction gave orientation to the entire drainage system towards the Bay of Bengal during the same period.

Statement 2 is incorrect:

- **Formation of Deccan traps is not directly related the evolution of Peninsular Drainage System in India.**

Q.50)

Ans) c

Exp) Option c is the correct answer.

Himalayan rivers originate from the Himalayan mountain covered with glaciers. Peninsular rivers originate in Peninsular plateau and central highland.

Statement 1 is correct: Himalayan rivers have **V shaped valleys** because they are youthful and have very large basins. They are engaged in headward erosion to deepen the valleys to reach the base level of erosion.

Peninsular rivers are old rivers with graded profile (fixed course with well-adjusted valleys). They have relatively smaller basin. They have almost reached their base levels. Thus, they **have U shaped valleys.**

Statement 2 is correct: dendritic pattern is common with the **Himalayan** rivers in plains as they are mostly of antecedent and consequent in nature. Further, meandering and shifting of course nature promotes the dendritic drainage pattern.

Trellis, radial and rectangular patterns are common with the **Peninsular** rivers as they are superimposed and rejuvenated rivers in nature.

Knowledge Base:

The drainage pattern resembling the **branches of a tree** is known as "**dendritic**".

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 range present a good example of it.

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**'.

When the **rivers discharge their waters from all directions in a lake or depression**, the pattern is known as '**centripetal**'.

Q.51)

Ans) d

Exp) Option d is the correct answer

Option d is correct: It is the best answer because it captures the central message of the passage, which emphasizes the need for both local and global approaches to address climate change and energy security concerns, while also acknowledging that the green transition is a global challenge that requires a globalized approach.

Option a is incorrect: It is not the best answer because it focuses too much on the reshaping of fossil fuel trade flows and trade integration of mineral-endowed countries and does not fully capture the need for a combination of local and global solutions to address the green transition.

Option b is incorrect: It is a close option but not the best answer because it focuses too much on the impact of renewables on fossil fuel trade flows and trade integration, while not fully capturing the importance of a globalized approach to support the green transition.

Option c is incorrect: It is not the best answer because it focuses too much on the challenges facing globalization, rather than the need for both local and global approaches to address shared challenges such as climate change and the green transition.

Q.52)

Ans) d

Exp) Option d is the correct answer

Option a is incorrect: This statement does not fully capture the central idea of the passage, as it only focuses on the history and characteristics of Samkhya philosophy and does not address how it can help individuals and society lead a better life.

Option b is incorrect: It focuses on the social problems that exist in society and suggests that Samkhya philosophy can address them. While this statement is partially true, as the passage mentions that Samkhya philosophy can help develop values, it does not fully capture the central idea of the passage, as it only addresses one aspect of how Samkhya philosophy can help individuals and society.

Option c is incorrect: It also focuses on the goal of education and how Samkhya philosophy can play a vital role in developing values and practical knowledge. While this statement is true and aligns with the central idea of the passage, it does not capture the full scope of how Samkhya philosophy can help individuals and society lead a better life.

Option d is correct: It, however, provides a more comprehensive and accurate statement of the central idea of the passage. It states that Samkhya philosophy is a comprehensive system of knowledge that can help individuals and society lead a beautiful and orderly life. This statement encompasses the key points mentioned in the passage, including the historical and philosophical background of Samkhya, its emphasis on developing values and practical knowledge, and its potential to help individuals and society live better lives.

Q.53)

Ans) b

Exp) Option b is correct answer

Statement 1 is correct: The passage suggests that while current quantum computers are not yet advanced enough to outperform classical computers in all calculations, progress is being made towards this goal. The passage notes that "great progress is under way" and that "small systems" are coming online, which suggests that quantum computers are improving and becoming more powerful over time. Therefore, it is reasonable to assume that in future quantum computers will eventually surpass classical computers in certain types of calculations.

Statement 2 is incorrect: The passage does not explicitly state that any of the existing quantum computers are error-corrected. However, it does note that "a few large companies and small start-ups now have functioning non-error-corrected quantum computers composed of several tens of qubits." This

suggests that error-corrected quantum computers may not yet be widely available, but that functioning quantum computers with tens of qubits do exist.

Statement 3 is correct: The passage states that a field focused on near-term applications of quantum computers is starting to grow. This implies that there are people and organizations who are interested in and working on applications for quantum computers that could be realized in the near future. Therefore, it is reasonable to assume that there is a growing field focused on near-term applications of quantum computers.

Statement 4 is incorrect: The passage does not provide any evidence to support the assumption that large-scale, error-corrected quantum computers will never be developed. While it notes that current quantum computers are not yet advanced enough to outperform classical computers in all calculations, it also suggests that progress is being made towards this goal. Therefore, it is premature to assume that large-scale, error-corrected quantum computers will never be developed based on the information provided in the passage.

Q.54)

Ans) c

Exp) Option c is the correct answer

Statement 1 is incorrect: The passage mentions the "emancipation of Land and industrial Capital from individual and class ownership, and the vesting of them in the community for the general benefit." This suggests that the Fabian Society believes that certain resources, particularly land and industrial capital, should be held in common by the community rather than being owned by individuals or classes. However, it does not necessarily imply the abolition of all private property.

Statement 2 is correct: This assumption is true. The passage states that the aim of the Fabian Society is to ensure that "the natural and acquired advantages of the country be equitably shared by the whole people." This implies that society seeks to promote a more equitable distribution of resources.

Statement 3 is correct: This assumption is likely true. The passage suggests that the Fabian Society's vision involves the "vesting" of land and industrial capital in the community, which implies a collective or public ownership of these resources. This is a core tenet of socialism.

Statement 4 is incorrect: This assumption is not supported by the passage. While the passage implies that the Fabian Society is opposed to the concentration of resources in the hands of individual or class owners, it does not suggest that those who hold such views are necessarily their opponents.

Statement 5 is correct: This assumption is likely true. The passage suggests that the society seeks to promote a more equitable distribution of resources for the "general benefit" and to ensure that "the natural and acquired advantages of the country be equitably shared by the whole people." This implies that society seeks to promote the interests of all members of society, particularly those who are vulnerable or disadvantaged.

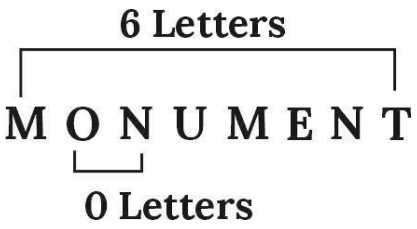
Q.55)

Ans) a

Exp) Option a is the correct answer.

Here, we are asked to solve problem according to English alphabet**. In such problems it is a general rule to count both ways i.e. from left to right and from right to left. But this has been mentioned in the question to avoid any confusion.**

Let us see the following representation:



The above presentation makes it clear that required pairs of letters are 2:
1) MT (In English alphabet there are 6 alphabets in between them and also in this word)
2) ON (In English alphabet there are 0 alphabets in between them and also in this word)

Q.56)
Ans) c
Exp) Option c is the correct answer
Marked price of article = Rs 600, which is 120% of cost price
Cost price of the article = 600/1.2= Rs 500
Customer receives a discount of Rs 60, then is asked to pay Rs X
Thus X= Rs (600 - 60) = Rs 540
He gets a further 5% discount of X, which is 0.05 * 540 = Rs 27
Thus the new selling price = Rs(540-27) = Rs 513
Therefore, Profit % = {(SP-CP)/CP} * 100
= {(513 -500)/500} * 100
= 2.6%

Q.57)
Ans) b
Exp) Option b is the correct answer
If the speed of the horse is x km/hr; that of the train is 3x Km/hr; and that of the ship is 3x / 1.5 = 1.5x km/hr
Total time taken is 16 hours 24 minutes = 16.4 hours
Thus as per the question,

$$\frac{180}{2x} + \frac{600}{3x} + \frac{120}{x} = 16.4$$

$$\frac{540 + 1200 + 720}{6x} = 16.4$$

$$X = \frac{2460}{6 * 16.4}$$

$$X = 25$$

Thus, Speed of the train = 3x = 75km/hr

Q.58)
Ans) d
Exp) Option d is the correct answer

In the first hour, Karan mows $\frac{1}{9}$ of the field.

In the first hour, Arjun mows $\frac{1}{12}$ of the field.

In first 2 hours, $\{ \frac{1}{9} + \frac{1}{12} = \frac{7}{36} \}$ of the field is mown.

In 10 hours, $\frac{7}{36} * 5 = \frac{35}{36}$

Now, $1 - \frac{35}{36} = \frac{1}{36}$ of the field need to be mown

In 1 hour i.e 60 min, Karan mows $\frac{1}{9}$ of the field.

Thus Karan will mow $\frac{1}{36}$ of the field in $\frac{9}{36} * 60$ min = 15min

Therefore, Total time required = 10 hours and 15 min

Thus the work will be finished in 6am + 10 hours and 15min = 4:15 pm

Q.59)

Ans) b

Exp) Option b is the correct answer.

Let assume, Length be L and breadth be B,

Area of rectangle = Length * Breadth = L * B

New length after 60% increase = L + 60% of L = L + 0.6 L = 1.6L

New breadth after 10% decrease = B - 10% of B = B - 0.10 B = 0.9 B

New area = 1.6L * 0.9B = 1.44 LB

Therefore, Change in area = (Final area - Initial area)/ Initial area = (1.44LB - LB)/LB = 0.44 * 100% = 44% increase.

Hence, there will be 44% increase in area.

Q.60)

Ans) c

Exp) Option c is the correct answer.

Given, two women are W1 and W2 and 3 Men are M1, M2, and M3,

So, the chairs are C1, C2, C3, C4, C5, C6, C7, and C8

2 Women can sit in any chair out of C1 to C4 chair.

i.e. ${}^{4}P_{2}$= 12 ways.

Therefore, 3 men can sit in any three remaining of 6 chairs

i.e. ${}^{6}P_{3}$= 6 * 5 * 4 = 120 ways.

Thus, total number of ways = 12 * 120 = 1440.