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60 DAYS PLAN

PRELIMS 2021

COMPILATIONS

GEOGRAPHY - PART 1

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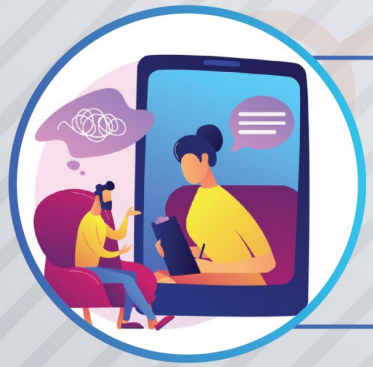

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Q.1) Consider the following statements:

1. The point within the earth where an earthquake rupture starts is called hypocenter.
2. Love waves are transverse in nature.
3. Rayleigh wave is the slowest of all the seismic waves.

Which of the above statements are correct?

a) 1 and 2 only
b) 2 and 3 only
c) 1 and 3 only
d) 1, 2 and 3

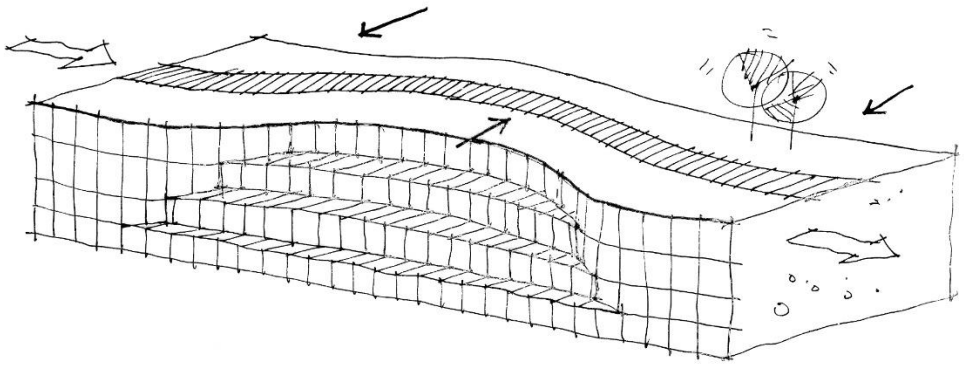
Q.1) Solution (d)

Basic Information:

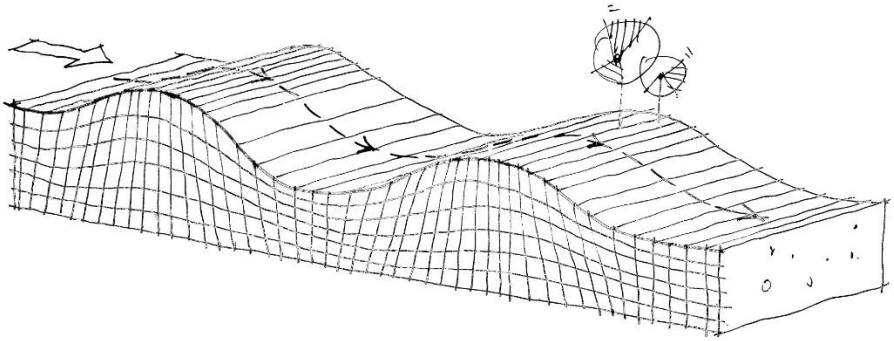
Surface waves: These waves travel through the surface of the earth. Due to their amplitude, they are most destructive waves causing extensive damage on the surface of the earth.

Types of Surface Waves:

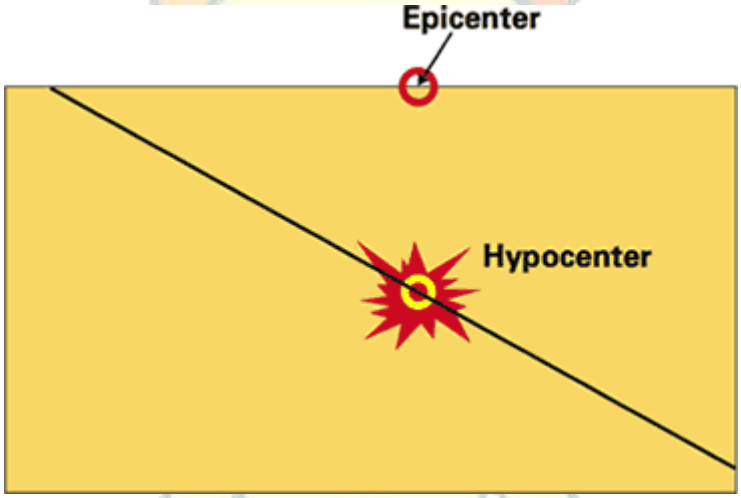
Love waves (L-waves) - its fastest surface waves and move on ground side to side. It is confined to surface of the crust love wave is wounded by Seismograph.



Rayleigh waves- Rayleigh waves rolls along the ground just like a wave roll across a lake or an ocean.



The hypocenter is the point within the earth where an earthquake rupture starts. The epicenter is the point directly above it at the surface of the Earth. Also commonly termed the focus. See also epicentre.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
The point within the earth where an earthquake rupture starts is called hypocenter. In seismology, it is a	Rayleigh wave and Love wave are transverse waves.	Rayleigh wave is the slowest of all the seismic waves. Rayleigh waves are slower than body waves and

synonym of the **focus**.		typically travel at a speed that is 10% slower than S-waves. Rayleigh waves propagate through the ground as ripples.

Q.2) Consider the following statements:

1. Acid rocks have high content of silica.
2. Basic rocks are poor in silica, hence the parent material of such rocks cools slowly and thus, flows and spreads far away.

Which of the above statements is/are NOT correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.2) Solution (d)

Note: Incorrect statements are asked in the question.

Basic Information:

Acid Rocks:

- These are characterized by high content of silica, up to 80 per cent, while the rest is divided among aluminum, alkalis, magnesium, iron oxide, lime etc.
- These rocks constitute the SiAl portion of the crust.
- Due to the excess of silicon, acidic magma cools fast and it does not flow and spread far away.
- High mountains are formed of this type of rock.
- These rocks have a lesser content of heavier minerals like iron and magnesium and normally contain quartz and feldspar.
- Add rocks are hard, compact, massive and resistant to weathering.

Basic Rocks:

- These rocks are poor in silica (about 40 per cent); magnesia content is up to 40 per cent and the remaining 40 per cent is spread over iron oxide, lime, aluminum, alkalis, potassium etc.
- Due to low silica content, the parent material of such rocks cools slowly and thus, flows and spreads far away.
- This flow and cooling gives rise to plateaus. Presence of heavy elements imparts to these rocks a dark colour.
- Basalt is a typical example, others being gabbro and dolerite. Not being very hard, these rocks are weathered relatively easily.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Acid rocks have high content of silica. These are characterized by **high content of silica, up to 80 per cent,** while the rest is divided among aluminum, alkalis, magnesium, iron oxide, lime etc.	Due to low silica content, the parent material of such rocks cools slowly and thus, flows and spreads far away. This flow and cooling gives rise to plateaus or **shield volcanoes**.

Q.3) With reference to Geomagnetism, consider the following statements:

1. The Earth has more than two magnetic poles.
2. Agonic line is an imaginary line connecting the points of same angle of declination.
3. Geomagnetic dipole does not coincide with the Earth's axis of rotation rather it is parallel to it.
4. Presently, South Magnetic pole is located in Northern Canada.

Which of the statements given above is/are correct?

a) 3 and 4 only
b) 1 only

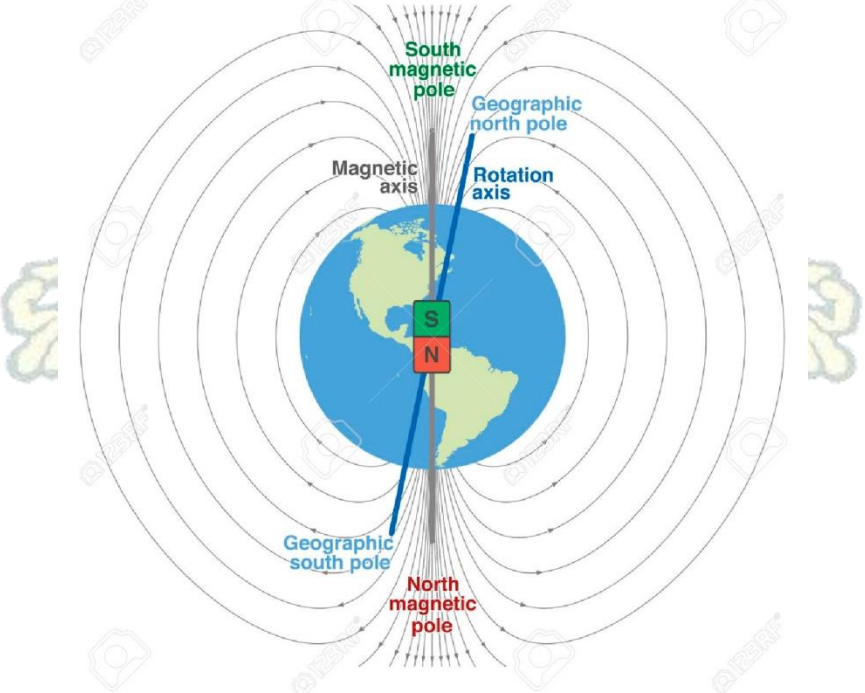
c) 1 and 4 only
d) 2, 3 and 4 only

Q.3) Solution (c)

Basic Information:

Geomagnetism (also known as **terrestrial magnetism**) is the scientific study of the earth from the point of view of its magnetic properties.

The Earth acts like a **large spherical magnet**. It is surrounded by a **magnetic field** that changes with time and location. The field is generated by a **dipole magnet** (i.e., a straight magnet with a North and South Pole) located at the centre of the Earth. The axis of the dipole is offset from the axis of the Earth's rotation by approximately **11 degrees**. This means that the north and south geographic poles and the north and south magnetic poles are not located in the same place. At any point and time, the Earth's magnetic field is characterized by a **direction** and **intensity** which can be measured.



Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Correct	**Incorrect**	**Incorrect**	**Correct**
The Earth has two dominant magnetic poles, and **several very weak 'quadrupolar' poles** of which there are, at least mathematically, about 8 in number. These poles are far weaker than the dipole field and measure only weak departures of the local geographic field strength from the basic dipolar North-South field.	**Isogonic line** is an imaginary line connecting the points of same angle of declination. **Agonic line** is an imaginary line tracing the zero angle of declination.	Geomagnetic dipole does not coincide with the Earth's axis of rotation rather it is tilted at an angle of about **11 degrees** to Earth's rotational axis.	Presently, South Magnetic pole is located North of Ellesmere Island in Northern Canada. **Note:** Don't get confused with South Magnetic Pole and Geomagnetic South Pole. The direction are opposite in nature.

Q.4) With reference to Karst landforms, which of the following are depositional features:

1. Travertine
2. Tufa
3. Polje
4. Stalagmite
5. Stalactite
6. Uvala

Select the correct answer using the code given below:

a) 1, 2, 3 and 5 only

b) 1, 2, 4 and 5 only
c) 2, 4, 5 and 6 only
d) 2, 3, 4 and 5 only

Q.4) Solution (b)

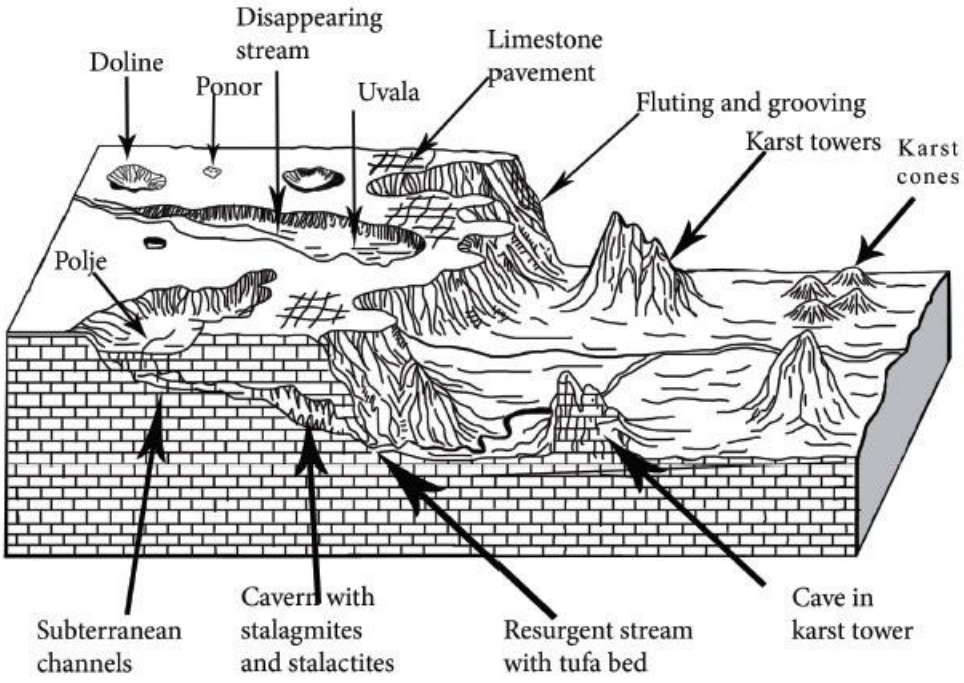
Basic Information:

Karst is a topography formed from the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by **underground drainage systems** with sinkholes and caves.

It is so named after a province of Yugoslavia on the Adriatic Sea coast where such formations are most noticeable.

Conditions for development of Karst topography:

1. Limestone must be massive, thickly bedded.
2. Limestones should not be porous wherein permeability is largely controlled by joints and not by mass of the limestone. If they are porous then water will pass through the rock mass and the whole rock will become weak and will collapse.
3. The carbonate rocks should be very close to the ground surface so that rainwater may easily and quickly infiltrate into the beds of limestone and may corrode the rocks to form solutional landforms.
4. The limestones should be highly folded, fractured or faulted.
5. There should be enough rainfall so that the required amount of water is available to dissolve carbonate rocks.



Erosional Landforms:

- Sink hole: it is a narrow well like depression formed on the surface due to erosion of limestone. This is a cavity created for the water to seep down.
- Doline: when 2-3 sinkhole combines they form a deeper depression called doline.
- Polje: when doline combine they form a still deeper depresseion called polje. Example: Livno Polje
- Uvala: an extremely large depression caused by collapse of cave.
- Lapies: highly corrugated and rough surface of limestone characterized by low ridges and pinnacles, narrow clefts and numerous solution holes.
- Caves: void of large dimension below the ground surface.

Depositional Landforms:

- Travertine: banded calcareous deposits
- Tufa: softer calcareous deposits at mouth of the cave.
- Helectite: the dripstone growing sideward from stalactite
- Heligmite: the dripstone growing sideward from stalagmite

- Flowstone: sheetlike deposits formed where water flows down the wall or along the floor of a cave.
- Pillar: when stalactite and stalagmite join they form pillar
- Curtain: needle shaped stalactites from the ceiling

Q.5) The gently sloping accumulation of coarse alluvium deposits by a braided stream is known as:

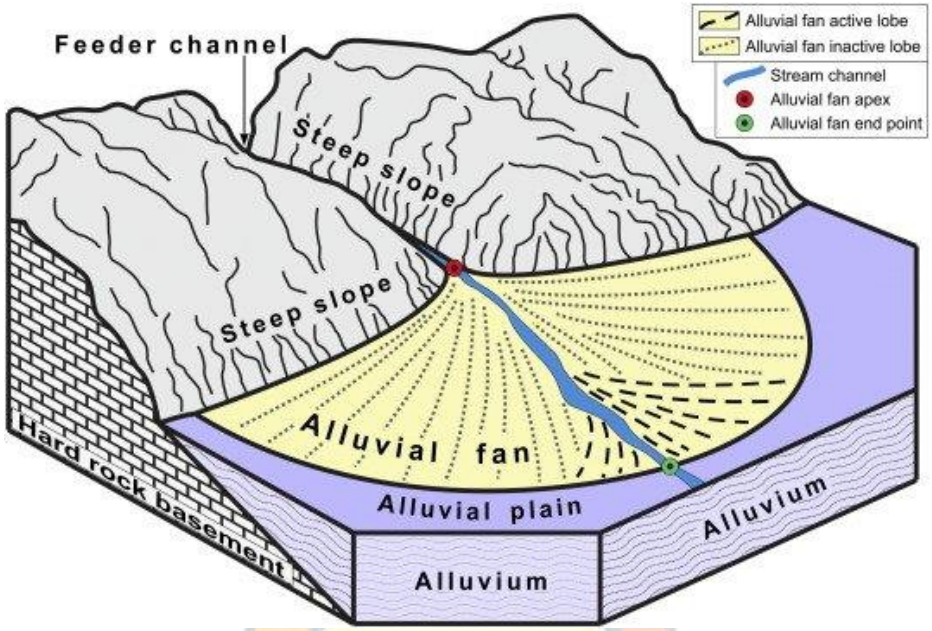
a) Alluvial fan
b) Sand bar
c) Bajada
d) Pediment

Q.5) Solution (a)

Explanation:

Alluvial Fan:

- An alluvial fan is a cone-shaped depositional landform built up by streams, heavy with sediment load.
- Alluvial fans are formed when streams flowing from mountains break into foot slope plains of low gradient.
- Normally **very coarse load** is carried by streams flowing over mountain slopes. This load gets dumped as it becomes too heavy to be carried over gentler gradients by the streams
- Furthermore, this load spreads as a broad low to a high cone-shaped deposit called an alluvial fan that appears as a series of continuous fans.
- Alluvial fans in humid areas show normally low cones with a gentle slope from head to toe and they appear as high cones with a steep slope in arid and semi-arid climates.



Sand Bar: Sandbar, also called Offshore Bar, submerged or partly exposed ridge of sand or coarse sediment that is built by waves offshore from a beach. The swirling turbulence of waves breaking off a beach excavates a trough in the sandy bottom. Some of this sand is carried forward onto the beach and the rest is deposited on the offshore flank of the trough.

Bajada: it is a landform with gentle and sloping surface, formed between pediment and playa.

Pediment: gently sloping erosional surface that cuts across bedrock and typically has a thin veneer of sediments on its surface.

Q.6) Consider the following discontinuities:

1. Repetti discontinuity
2. Conrad discontinuity
3. Lehmann discontinuity
4. Gutenberg discontinuity
5. Mohorovicic's discontinuity

What is the correct order from top to bottom?

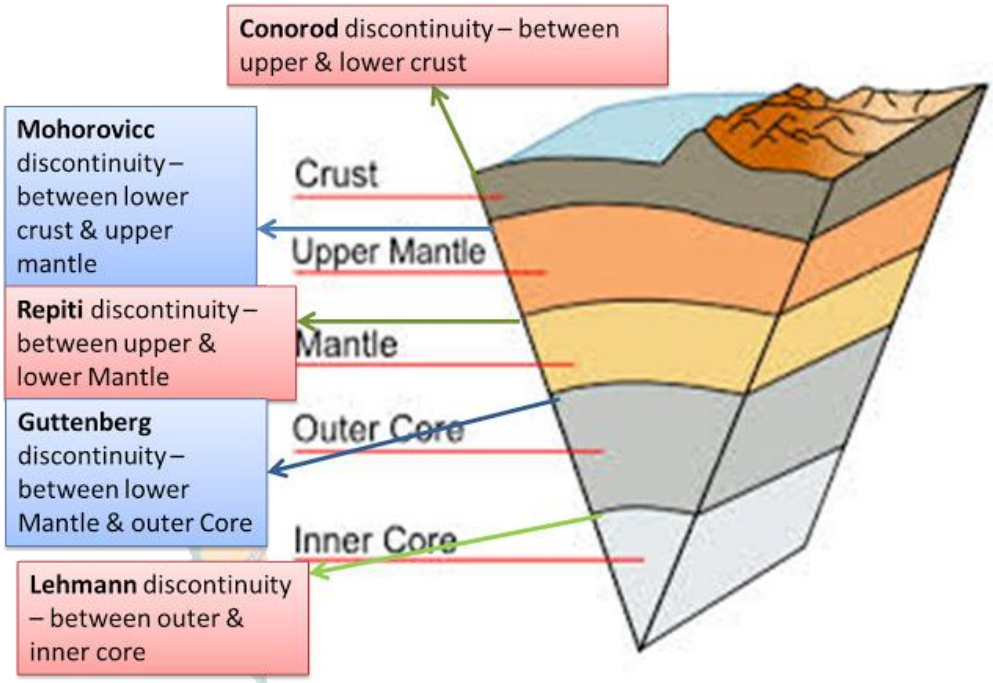
a) 1-2-3-4-5
b) 5-2-1-3-4
c) 1-4-2-3-5

d) 2-5-1-4-3

Q.6) Solution (d)

Basic Information:

- **Conrad discontinuity:** The Conrad discontinuity corresponds to the subhorizontal boundary in continental crust at which the seismic wave velocity increases in a discontinuous way. This boundary is observed in various continental regions at a depth of 15 to 20 km, between outer and inner crust however it is not found in oceanic regions.
- **Mohorovicic discontinuity:** The Mohorovicic Discontinuity, or "Moho," is the boundary between the crust and the mantle.
- **Repetti discontinuity:** This discontinuity is found between upper and lower Mantle. This is marked by general decrease in velocity of seismic waves between upper and lower mantle.
- **Gutenberg discontinuity:** The Gutenberg discontinuity occurs within Earth's interior at a depth of about 1,800 mi (2,900 km) below the surface, generally between mantle and core ,where there is an abrupt change in the seismic waves (generated by earthquakes or explosions) that travel through Earth.
- **Lehmann discontinuity:** The Lehmann discontinuity is an abrupt increase of P-wave and S-wave velocities at the depth of 220±30 km, discovered by seismologist Inge Lehmann. It appears beneath continents, but not usually beneath oceans, and does not readily appear in globally averaged studies. It is generally found between outer and inner core.



Q.7) Which of the following characteristics cannot be associated with metamorphic rocks?

1. Recrystallization due to melting and solidifying again
2. Foliation
3. Fossiliferous
4. Banding

Select the correct answer using the code given below:

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

Q.7) Solution (c)

Basic Information:

Metamorphic rocks:

- Metamorphic rocks form under the action of pressure, volume and temperature (PVT) change.

- Metamorphism occurs 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 or the underlying rocks are subjected to great amounts of pressure by overlying rocks. In Metamorphism consolidated rocks undergo recrystallization and reorganization of materials within original rocks. They don't undergo fusion.
- In the process of metamorphism in some rocks grains or minerals get arranged in layers or lines. Such an arrangement of minerals or grains in metamorphic rocks is called foliation or lineation.
- Sometimes minerals or materials of different groups are arranged into alternating thin to thick layers appearing in light and dark shades. Such a structure in metamorphic rocks is called banding and rocks displaying banding are called banded rocks.
- Metamorphic rocks have been put under great pressure, heated, squashed or stretched. So fossils do not usually survive these extreme conditions. Generally, it is only sedimentary rocks that contain fossils.

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Incorrect	**Correct**	**Incorrect**	**Correct**
In Metamorphism consolidated rocks undergo recrystallization and reorganization of materials within original rocks due to extreme pressure and temperature conditions. They don't undergo fusion.	In the process of metamorphism in some rocks grains or minerals get arranged in layers or lines. Such an arrangement of minerals or grains in metamorphic rocks is called foliation or lineation.	Metamorphic rocks have been put under great pressure, heated, squashed or stretched. So fossils do not usually survive these extreme conditions.	Sometimes minerals or materials of different groups are arranged into alternating thin to thick layers appearing in light and dark shades. Such a structure in metamorphic rocks is called banding.

Q.8) Consider the following statements regarding the geomorphic process:

1. The source of energy for the exogenetic process is atmosphere whereas, that for the

endogenic process is the Earth herself.
2. Exogenetic forces cause aggradation whereas, the endogenic forces, degradation.
3. Diastrophic forces are classified under exogenetic forces.

Which of the above statements is/are incorrect?

a) 1 only
b) 1 and 2 only
c) 3 only
d) 2 and 3 only

Q.8) Solution (d)

Basic Information:

- Endogenic processes include folding, faulting, warping, volcanism thus, they cause upliftment. The ultimate source of energy behind forces that drive endogenic movements is the Earth's internal heat due to radioactive decay and the gravitation.
- Exogenetic processes include weathering and erosion hence, degradation.
- Both endogenetic and exogenetic forces are needed to shape the landforms on the Earth.
- The exogenetic processes derive their energy from the atmosphere and ultimately from the Sun.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Incorrect**	**Incorrect**
Source of energy behind forces that drive endogenic movements is the Earth's internal heat due to radioactive decay and the gravitation. The subaerial erosion are are carried by exogenetic forces which are driven by atmospheric forces.	Exogenetic forces are degradational, and endogenetic forces are aggradational.	Diastrophic forces are classified under endogenetic forces.

Q.9) Consider the following statements about Paleomagnetism or fossil magnetism:

1. Statement 1: It acts as a decisive evidence for continental drift and global plate
2. Statement 2: It does not provide an understanding to the problems of thermal history of our planet.

Which of the statements given above is/are correct?

a) Statement 1 is correct only
b) Statement 2 is correct only
c) Both the statements are correct
d) Both the statements are incorrect

Q.9) Solution (a)

Basic Information:

- The record of the strength and direction of Earth's past magnetic field is called paleomagnetism or fossil magnetism.
- It is an important source of our knowledge about the Earth's evolution throughout the entire geological history. This record is preserved by many rocks from the time of their formation.
- The paleomagnetic data have played an instrumental role in deciphering the history of our planet including a decisive evidence for continental drift and global plate tectonics.
- The data have also been crucial for better understanding the problems of regional and local tectonics, geodynamics, and thermal history of our planet.

Statement Analysis:

Statement 1	Statement 2
Correct	**Incorrect**
Paleomagnetism is also called fossil magnetism. Study of past magnetic fields recorded in magnetic rocks help us in ascertaining about continental drift.	Fossil magnetism does help in understanding the thermal history of Earth.

Q.10) With reference to meanders, consider the following statements:

1. Riffles play an important role in the formation of meanders, but pools don't.
2. Meanders are formed only in the mature stage of a river.
3. Slip-off slope is formed on the concave side of a bend, whereas river cliff is formed in the convex side of a bend.

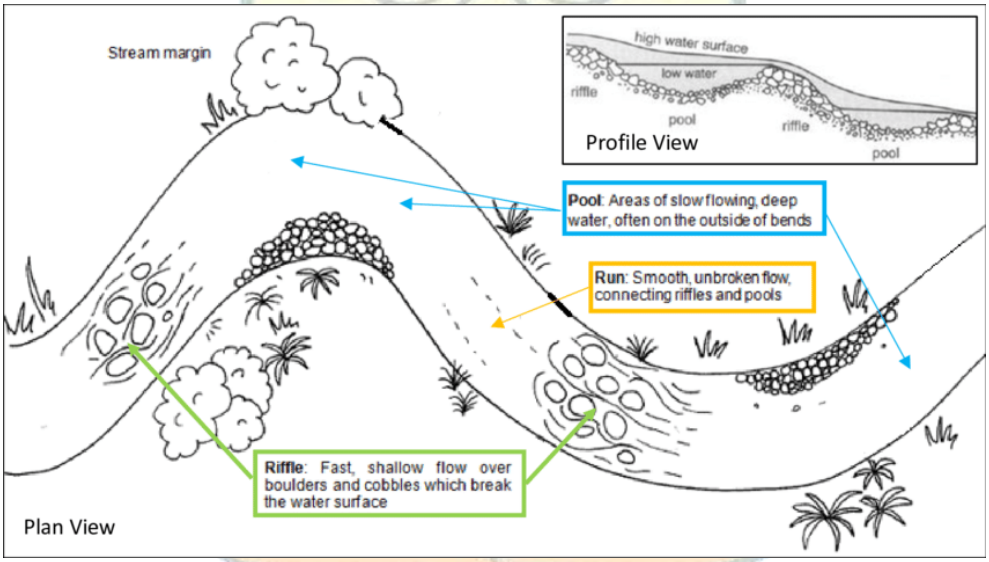
Which of the statements given above is/are correct?

a) 1 and 2 only
b) 2 and 3 only
c) 3 only
d) 1, 2 and 3

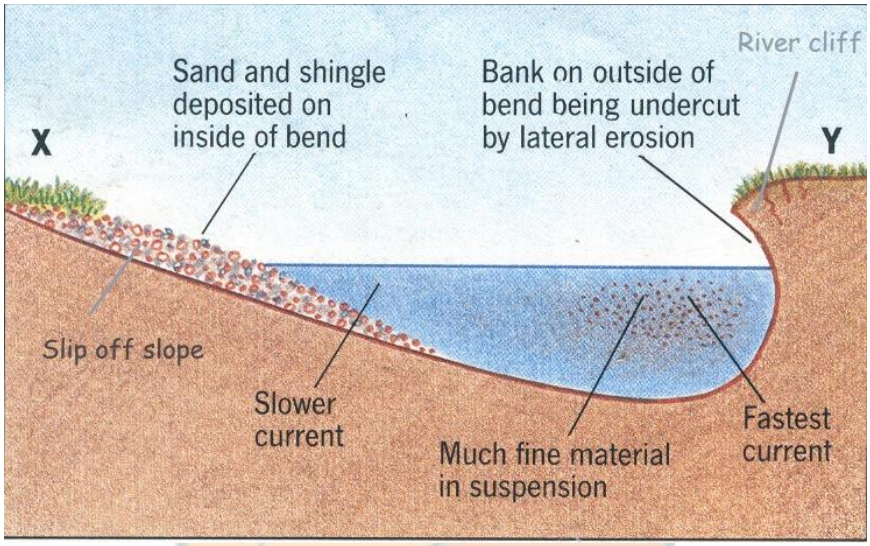
Q.10) Solution (c)

Basic Information:

- Riffles and pools both help in the formation of the meanders.



- Although, complete understanding of formation of meanders is still lacking, meanders are seen to be formed in all the stages of a river, albeit with very less probability in the youth stage.
- Jhelum river in the UT of Jammu & Kashmir is known to meander in the youth stage.
- Slip-off slope is formed on the concave side of a bend, whereas river cliff is formed on the convex side of a bend.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	**Incorrect**	**Correct**
Both riffles and pools help in the formation of meanders.	Jhelum meanders are formed in the youth stage.	Observe the figure.

Q.11) The term 'isostasy' is related to:

a) geodetic survey
b) gravity anomalies
c) energy equilibrium
d) weathering and erosion

Q.11) Solution (b)

Explanation:

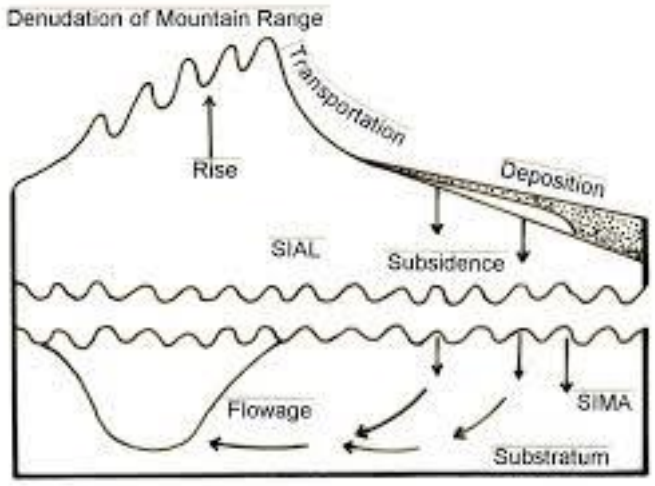
The term "Isostasy" is derived from "Isostasios", a word of Greek language meaning the state of being in balance.

Isostasy represents the **mechanical stability** between the upstanding parts and low lying basins

on a rotating earth.

Lateral variations in **gravity anomalies** are related to anomalous density distributions within the Earth. Locally measuring the gravity of Earth helps us to understand the planet's internal structure.

In large mountain areas, this is because of **isostasy**, the rock density of the mountain roots is lower, compared with the surrounding earth's mantle, causing a further gravity deficit.



Q.12) Consider the following statements regarding "Circum-Pacific belt":

1. It is characterized by convergent plate boundary only.
2. Fold Mountains are found along both the margins of Pacific Ocean.
3. It is prone to Tsunami.

Which of the above statements is/are correct?

a) 1 and 2 only
b) 2 and 3 only
c) 3 only
d) 1, 2 and 3

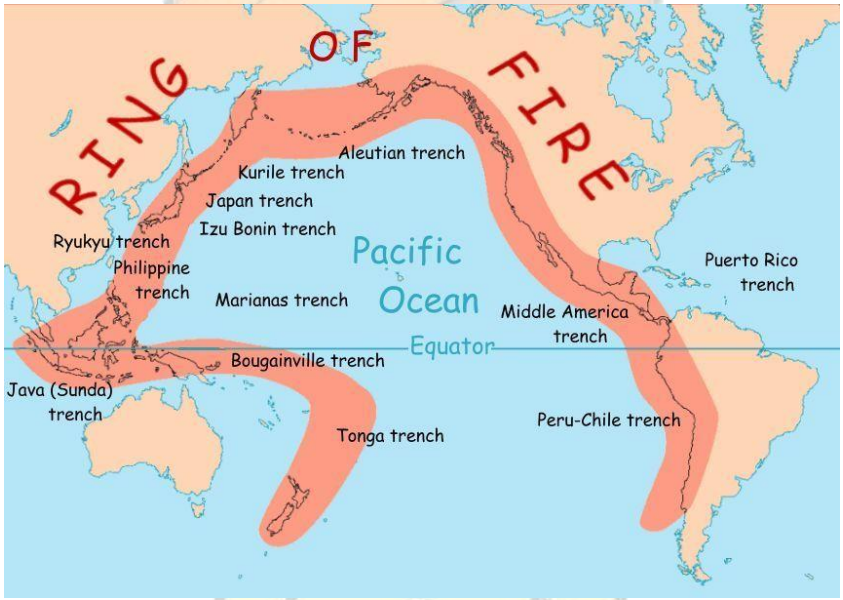
Q.12) Solution (c)

Basic Information:

The **Ring of Fire**, also referred to as the **Circum-Pacific Belt**, is a path along the Pacific Ocean characterized by active volcanoes and frequent earthquakes.

The Pacific Plate, an oceanic plate that forms the bed of the Pacific Ocean, is surrounded by a number of continental plates including the North American plate, South American plate, Philippine plate, the Australian-Indian plate and the Eurasian plate. The movement of these plates create zones of subduction (e.g. where the Pacific and Eurasian plates meet). This leads to the formation of volcanoes and the occurrence of earthquakes.

The Ring of Fire is the result of plate tectonics. Tectonic plates are huge slabs of the Earth's crust, which fit together like pieces of a puzzle. The plates are not fixed but are constantly moving atop a layer of solid and molten rock called the mantle.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	**Incorrect**	**Correct**
It is characterized by convergent boundary, divergent boundary as well as transform boundaries. ***Convergent:*** The Aleutian	Fold mountains are formed only along eastern margin of Pacific Ocean. Example: Andes and Rockies.	Since the region is seismically active it is prone to tsunami.

Islands in the U.S. state of Alaska, for example, run parallel to the Aleutian Trench. Both geographic features continue to form as the Pacific Plate subducts beneath the North American Plate. ***Divergent:*** The East Pacific Rise is a site of major seafloor spreading in the Ring of Fire. The East Pacific Rise is located on the divergent boundary of the Pacific Plate and the Cocos Plate (west of Central America), the Nazca Plate (west of South America), and the Antarctic Plate. ***Transform:*** The San Andreas Fault, stretching along the central west coast of North America, is one of the most active faults on the Ring of Fire.		

Q.13) "Continental Drift Theory" of Alfred Wegner was criticized and subsequently rejected. Which of the following were its criticism?

1. His theory starts from the carboniferous period and does not describe the conditions before this period.
2. His belief that both the tidal and pole fleeing forces are inadequate in moving continents.
3. His theory of Continents and Oceans of the same age.

Select the correct answer using the code given below:

a) 1 only

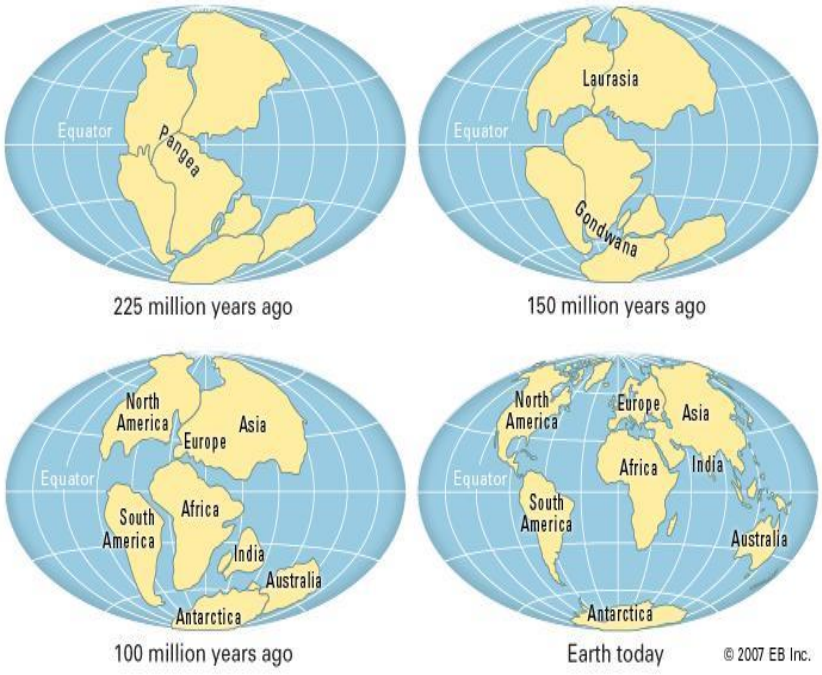
b) 2 and 3 only
c) 3 only
d) 1, 2 and 3

Q.13) Solution (d)

Basic Information:

The theory of continental drift was put forth by Alfred Wegener, a German meteorologist, polar explorer, astronomer and a geologist. He is in fact known as the father of continental drift.

In a lecture in 1912, Wegener proposed a startling theory of 'continental drift'.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
Wegner was essentially a **climatologist** who was essentially reconstructing earth's climatic history.	Both the tidal and pole fleeing forces he suggested are believed to be **inadequate** in moving	As per Drift Theory, Ocean and Continents must be of the same age but later it was found out that **Oceans are**

His theory starts from the carboniferous period and does not describe the conditions before this period.	continents. According to experts had the gravitational force of moon or sun was so strong to cause the landmass to break, then it would have stopped the rotations of the earth and made it stationary. Also, in order to cause a drift in landmass the rotations required should be at such a high speed that it would have thrown the atmosphere (the gases) and everything else in the outer space away from the earth's gravitational pull.	**much younger than the Continents**.

Q.14) Absence of surface drainage is a predominant characteristic of which of the following landform?

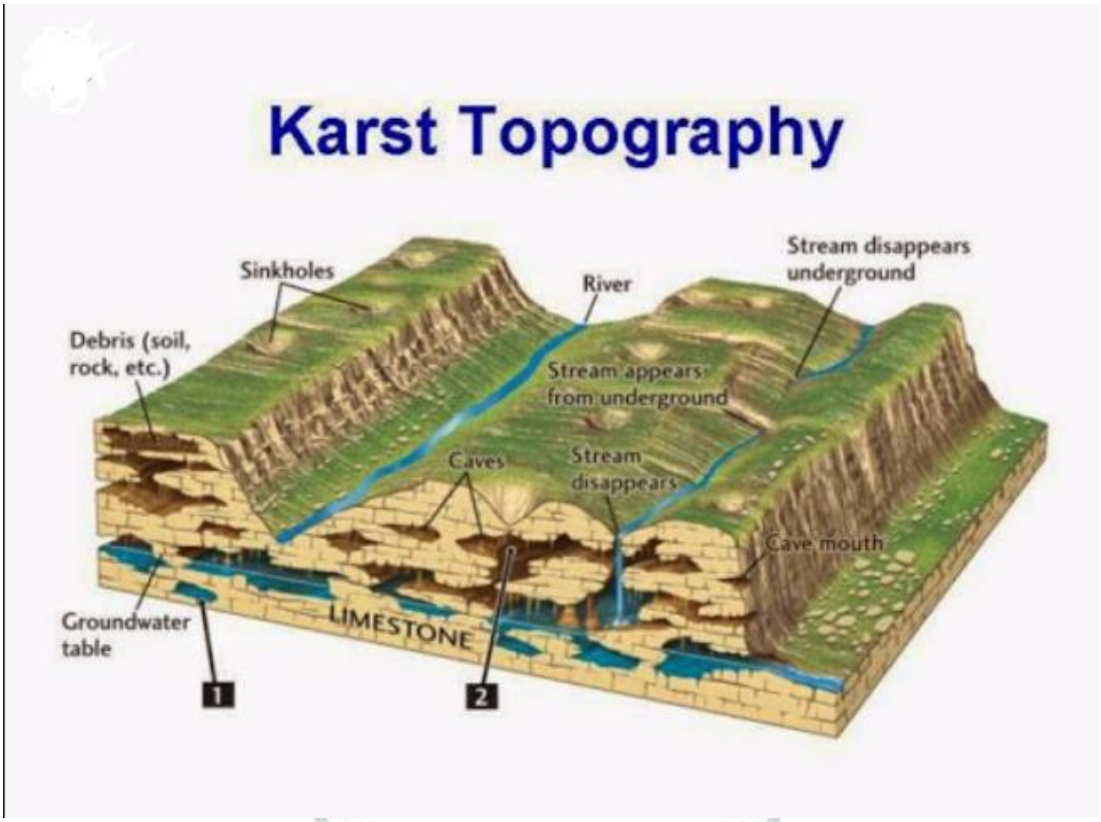
a) Fluvial Landforms
b) Glaciation landforms
c) Limestone and chalk landforms
d) Volcanic landforms

Q.14) Solution (c)

Basic Information:

The **Karst region** is an example of Limestone and Chalk Landform with a large stretch of limestone. These 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. In this region, streams rising on other rocks only flow over limestone for a short distance and then disappear underground.

The solubility of limestone in water and weak acid solutions leads to karst landscapes, in which water erodes the limestone over thousands to millions of years. Most cave systems are carved from limestone bedrock.



Q.15) With reference to "fault", consider the following statements:

1. A fault is a fracture in the earth's crust due to tension force.
2. In case of normal fault, new surface is generated in the form of scarp.

Which of the above statements is/are correct?

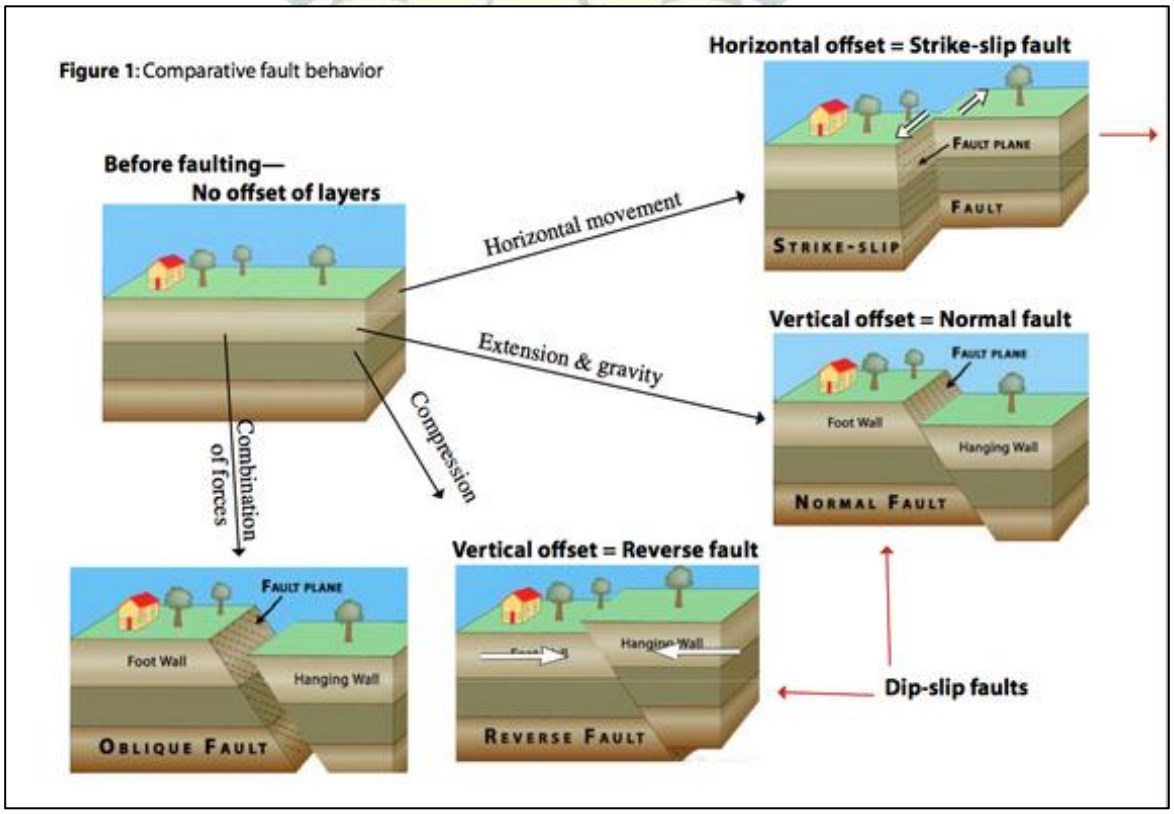
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.15) Solution (c)

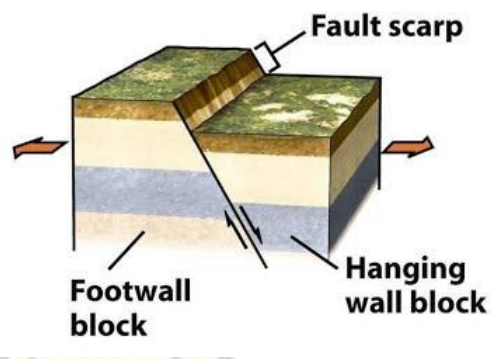
Basic Information:

A fault is a fracture or zone of fractures between two blocks of rock. It is a fracture in the earth's crust due to tension force. It can also occur due to compression in hard and brittle rocks.

- When there is **tension** the crust ruptures. One block is thrown upwards and the other downwards. The upthrown block is called **Horst** while the downthrown block is called **Graben**. The line along which the fault occurs is called strike. This fault is called normal fault and is most common. In case of a normal fault, new surface is generated in the form of scarp.
- When there is **compression**, in case of hard rocks instead of folding, the faulting occurs. The block with hanging wall is thrown upwards while the one with footwall is thrown downwards. This is called a **reverse fault**. In case of a reverse fault there is net destruction of the surface.
- When the forces are acting **parallel** to each other, along the line of fault the blocks move past each other without being upthrown or downthrown. This is called **lateral fault**.



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
A fault is a **fracture** in the earth's crust due to tension force. It can also occur due to compression in hard and brittle rocks. Due to heavy compression, the crust **bends** in a zigzag wavy fashion. This is called a **fold**.	In case of a normal fault, new surface is generated in the form of scarp. 

Q.16) What are the characteristics associated with fjord?

1. A fjord is a long, deep, narrow body of water.
2. Fjords commonly are deeper in their middle and upper reaches than at the seaward end.
3. Fjords are commonly V-shaped valleys.

Select the correct answer using the code below:

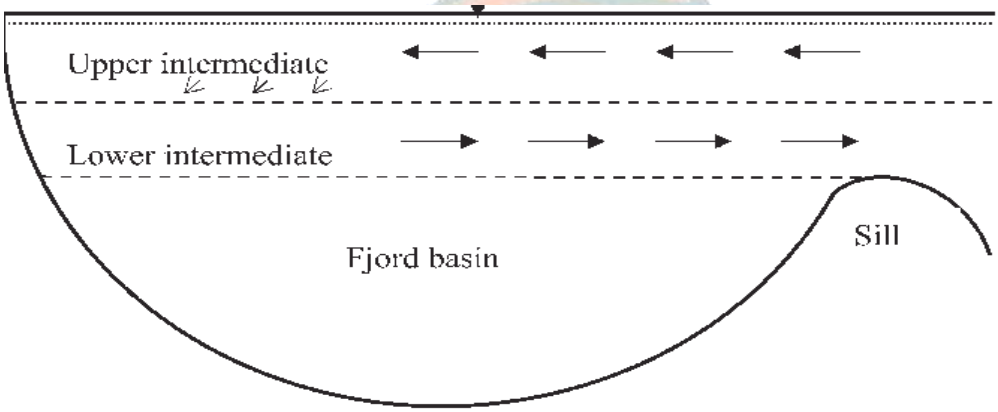
a) 1, 2 and 3
b) 2 and 3 only
c) 1 and 2 only
d) 1 and 3 only

Q.16) Solution (c)

Basic Information:

- Fjord, also spelled 'fiord', long narrow arm of the sea, commonly extending far inland, that results from marine inundation of a glaciated valley.

- Many fjords are astonishingly deep; Sogn Fjord in Norway is 1,308 m deep, and Canal Messier in Chile is 1,270 m. The great depth of these submerged valleys, extending thousands of feet below sea level, is compatible only with a glacial origin.
- It is assumed that the enormous, thick glaciers that formed in these valleys were so heavy that they could erode the bottom of the valley far below sea level before they floated in the ocean water.
- After the glaciers melted, the waters of the sea invaded the valleys.
- Glacial erosion produces **U-shaped valleys**, and fjords are characteristically so shaped.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Incorrect**
This is basic definition of fjord.	Fjord valleys are U-shaped, therefore, they are deeper in the middle.	Fjords are U-shaped valleys.

Q.17) Consider the following statements about weathering:

1. Physical weathering happens especially in places where there is little soil and few plants grow, such as in mountain regions and hot deserts.
2. Exfoliation occurs as cracks develop parallel to the land surface, a consequence of the reduction in pressure during uplift and erosion.

Which of the above statements is/are correct?

a) Statement 1 is correct only
b) Statement 2 is correct only
c) Both the statements are correct
d) Both the statements are incorrect

Q.17) Solution (c)

Basic Information:

- Physical weathering is caused by the effects of changing temperature on rocks, causing the rock to break apart. The process is sometimes assisted by water.
- Physical weathering happens especially in places where there is little soil and few plants grow, such as in mountain regions and hot deserts.
- Exfoliation occurs when the rock mass at depth under high pressure from underlying rocks is relieved off of its pressure due to unloading. The tension is thus at right angle to the land surface producing cracks parallel to the land surface.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Lack of rainfall and plants gives rise to more physical weathering.	Exfoliation is caused due release of super incumbent load.

Q.18) Consider the following statements about Aeolian processes:

1. Deflation is the intermittent, leaping movement of particles of sand or gravel, as from the force of wind.
2. Saltation is the lifting and removal of fine, dry particles of silt, soil, and sand by the blowing wind.
3. Abrasion is the mechanical scraping of a rock surface, by friction between rocks and moving particles, during their transport by wind.

Which of the above statements is/are correct?

a) 1 and 2 only

b) 2 only
c) 3 only
d) None of these

Q.18) Solution (c)

Basic Information:

- Saltation is the intermittent, **leaping movement** of particles of sand or gravel, as from the force of wind.
- Deflation is the **lifting and removal of fine**, dry particles of silt, soil, and sand by the blowing wind.
- Abrasion is the mechanical scraping of a rock surface, by friction between rocks and moving particles, during their transport by wind.

Statement Analysis:

Note: incorrect statements are asked.

Statement 1	Statement 2	Statement 3
Incorrect	**Incorrect**	**Correct**
Definition is wrong. Deflation is the **lifting and removal of fine**, dry particles of silt, soil, and sand by the blowing wind.	Definition is wrong. Saltation is the intermittent, **leaping movement** of particles of sand or gravel, as from the force of wind.	Definition is correct. Abrasion is the mechanical scraping of a rock surface, by friction between rocks and moving particles, during their transport by wind.

Q.19) Which among the below given pairs is/are correct?

1. Dykes : : horizontal intrusion of magma
2. Sills : : vertical intrusion of magma
3. Phacolith : : lens shaped mass of igneous rocks

Choose the correct answer using the codes given below:

a) 1 and 2 only
b) 3 only
c) 1, 2 and 3
d) None

Q.19) Solution (b)

- Dykes : : vertical intrusion of magma
- Sills : : horizontal intrusion of magma
- Laccolith : : dome-shaped mass of igneous rocks
- Lapolith : : saucer shaped igneous intrusion
- Phacolith : : lens shaped mass of igneous rocks

Q.20) Which of the following condition(s) will favour the phenomena of river capture?

1. Steep channel gradient of the captor river.
2. Higher sediment load in the captor river.
3. Low volume of water discharge in the captor river.
4. Soft rocks towards the head-ward direction.

Select the correct code:

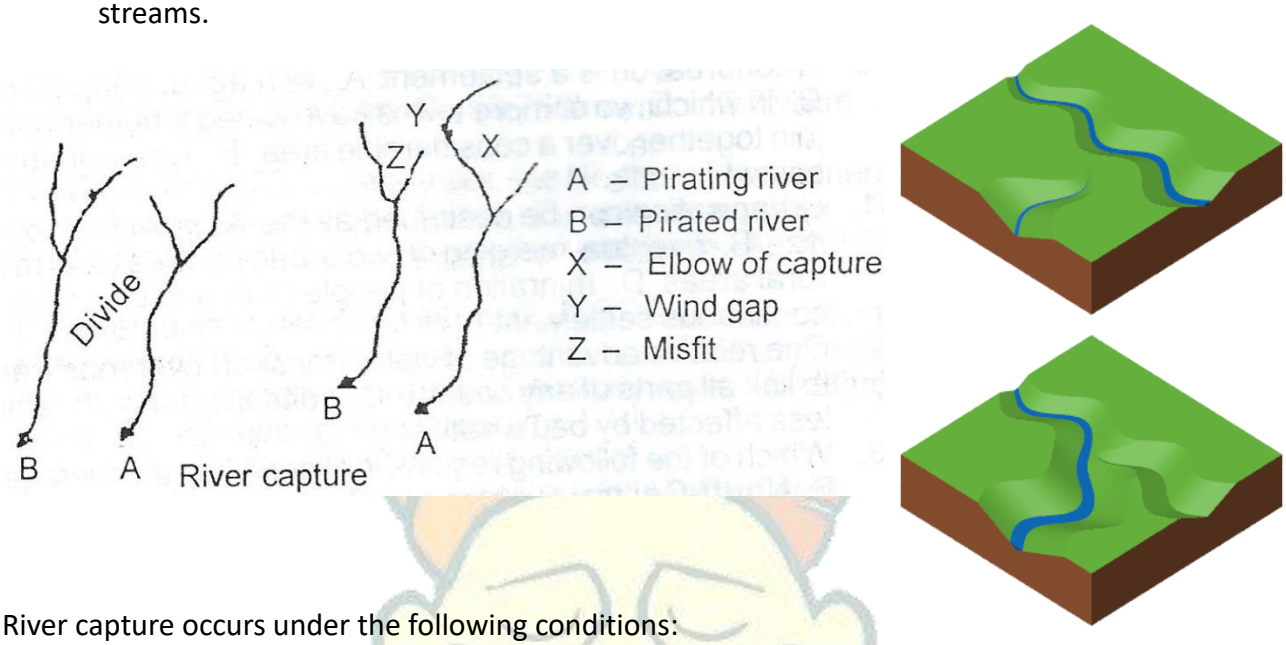
a) 1 and 4 only
b) 1, 2 and 4 only
c) 1, 3 and 4 only
d) 1, 2, 3, 4

Q.20) Solution (a)

Basic Information:

- River capture is a natural process which is more active in the youthful stage of the valley development because the streams are actively engaged in head-ward erosion and valley lengthening.
- River capture also occurs during mature and senile stages of the valley development through the process of **lateral erosion and meander intersection.**

- The stronger and more powerful streams (in terms of channel gradient, stream velocity and discharge and kinetic energy) capture the upper courses of weak and sluggish streams.



River capture occurs under the following conditions:

- Steep channel gradient,
- Relatively narrow valley so that water may not spread in the otherwise wide and flat valleys,
- Higher volume of water so that velocity and discharge may be sufficiently high,
- Soft rocks so that the river may resort to rapid rate of head-ward erosion,
- Deeper valley than the valleys of other neighboring rivers, and
- Low sediment load so that the river may resort to active erosion etc.

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Correct	**Incorrect**	**Incorrect**	**Correct**
Steep channel will help in more head-ward erosion.	Higher sediment load will cause the river to slowdown and reduce head-ward erosion.	High volume of water discharge will favour head-ward erosion.	Soft rocks will be easy to erode.

Q.21) Arrange the following in chronological order as per the 'Geological Time Scale'.

1. Archean
2. Proterozoic
3. Mesozoic
4. Palaeozoic

Choose the correct answer:

a) 1 –2 –3 –4
b) 2 –3 –4 –1
c) 1 –3 –2 –4
d) 1 –2 –4 –3

Q.21) Solution (d)

Analysis:

Option (a) Archean	**Option (b)** Proterozoic	**Option (c)** Mesozoic	**Option (d)** Paleozoic
1	2	3	4
Earlier Precambrian Eon. 4000 million years ago.	Later Precambrian Eon. 2500 million years ago.	Later Phanerozoic Eon	Earlier Phanerozoic Eon

Archean is the oldest with subdivisions of eo, paleo, meso aerchean etc.

Proterozoic follows archean with subdivisions of plaeo, meso, neo proterozoic etc.

Paleozoic is the first era of the Phanerozoic Eon and that is followed by Mesozoic era.

Do you know?

- Geologists have divided Earth's history into a series of time intervals. The time intervals are variable in length. Geologic time is divided using significant events in the history of the Earth.
- Geological Time Scale: This is a system of chronological dating that relates geological strata (stratigraphy) to time. It is used by geologists, palaeontologists, and other Earth

scientists to describe the timing and relationships of events that have occurred during Earth's history.

Additional Information:

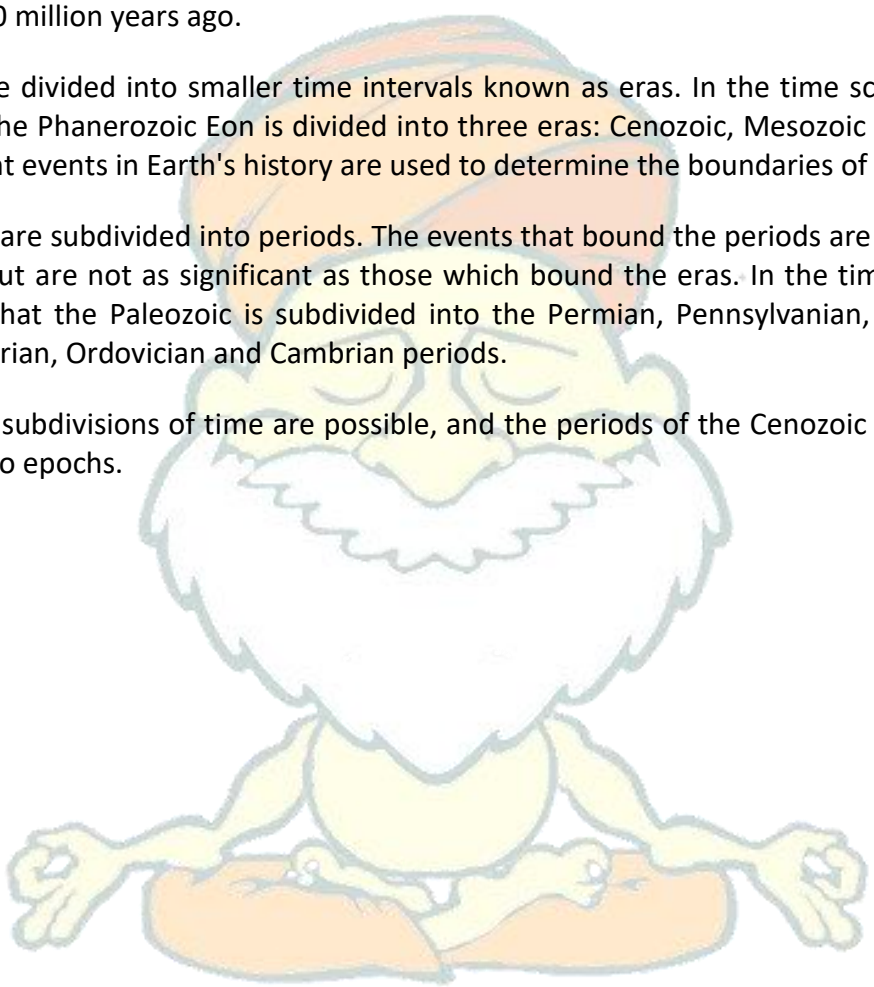
The Geological Time Scale is divided as follows-

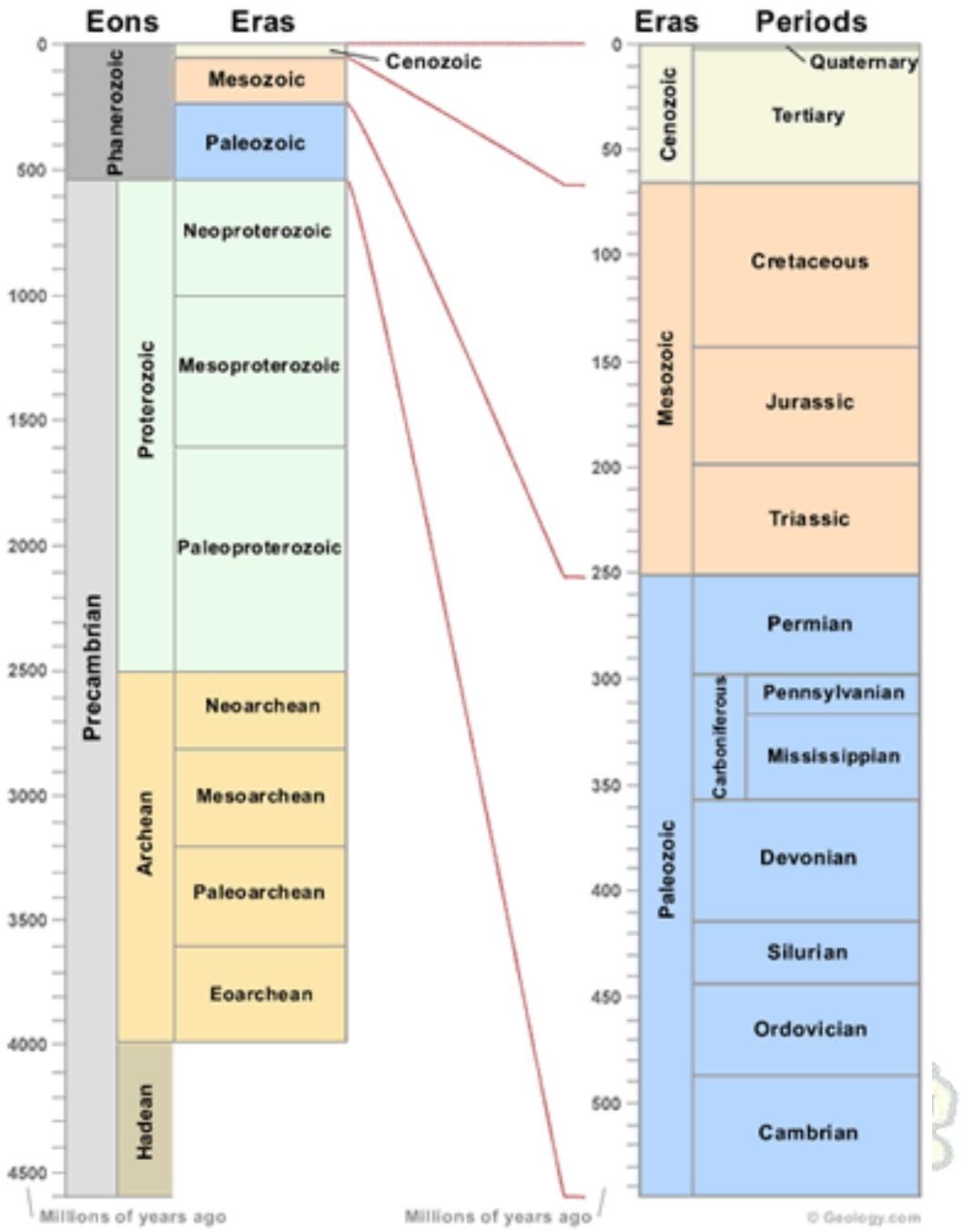
Eons –are the largest intervals of geologic time and are hundreds of millions of years in duration. Precambrian Eon is the oldest and Phanerozoic Eon is the most recent eon and began more than 500 million years ago.

Eras –Eons are divided into smaller time intervals known as eras. In the time scale below you can see that the Phanerozoic Eon is divided into three eras: Cenozoic, Mesozoic and Paleozoic. Very significant events in Earth's history are used to determine the boundaries of the eras.

Periods –Eras are subdivided into periods. The events that bound the periods are widespread in their extent but are not as significant as those which bound the eras. In the time scale below you can see that the Paleozoic is subdivided into the Permian, Pennsylvanian, Mississippian, Devonian, Silurian, Ordovician and Cambrian periods.

Epochs -Finer subdivisions of time are possible, and the periods of the Cenozoic are frequently subdivided into epochs.





Q.22) Indian plate along the Himalayan Mountain ranges can be classified as what type of plate boundary?

a) Ocean Continent Divergence
b) Continent Continent Convergence

c) Divergent Boundary
d) Transform Boundary

Q.22) Solution (b)

Elimination:

Indian plate collides with Eurasian plate and the continuous movement anti clockwise has lead to uplift of Himalayas. This is a Convergent boundary with continent continent collision.

Analysis:

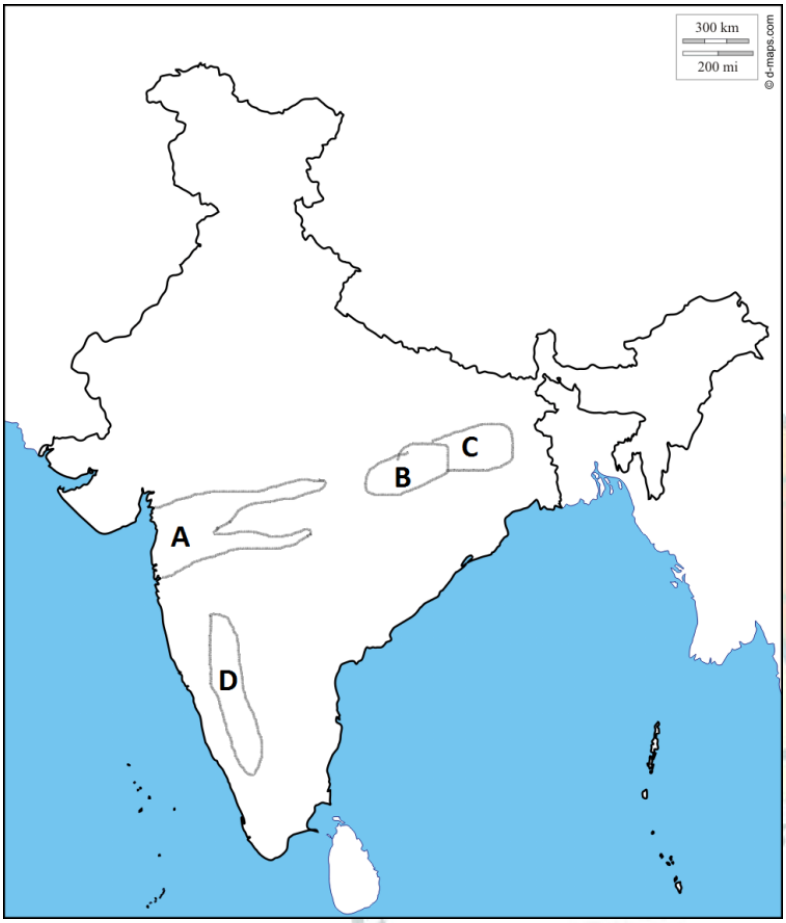
Option (a)	**Option (b)**	**Option (c)**	**Option (d)**
Incorrect	**Correct**	**Incorrect**	**Incorrect**
Ocean –Continent divergence	Continent Continent Convergence	Divergent Boundary	Transform Boundary

Do you know?

It is convergent plate boundary which is also termed as destructive plate boundary because of no basinal development but instead is the collision where mountain building takes part.

- Himalayas ranges are the resulting Eurasian and Indian plate collisions.
- With destruction of the crust it is a convergence.

Q.23) Consider the map given below:



The place marked A, B, C and D in the given map are:

a) Rift valley region, Chhattisgarh plain, Rain shadow region and Chhota Nagpur
b) Rift valley region, Chhattisgarh plain, Chhota Nagpur plateau and Rain shadow region
c) Rain shadow region, Chhattisgarh plain, Chhota Nagpur plateau and Rift valley region
d) Rift valley region, Chhota Nagpur plateau, Chhattisgarh plain and Rain shadow region

Q.23) Solution (b)

Explanation:

Region A	Region B	Region C	Region D
Rift Valley region	Chhattisgarh plain	Chhota Nagpur plateau	Rain shadow region

Elimination:

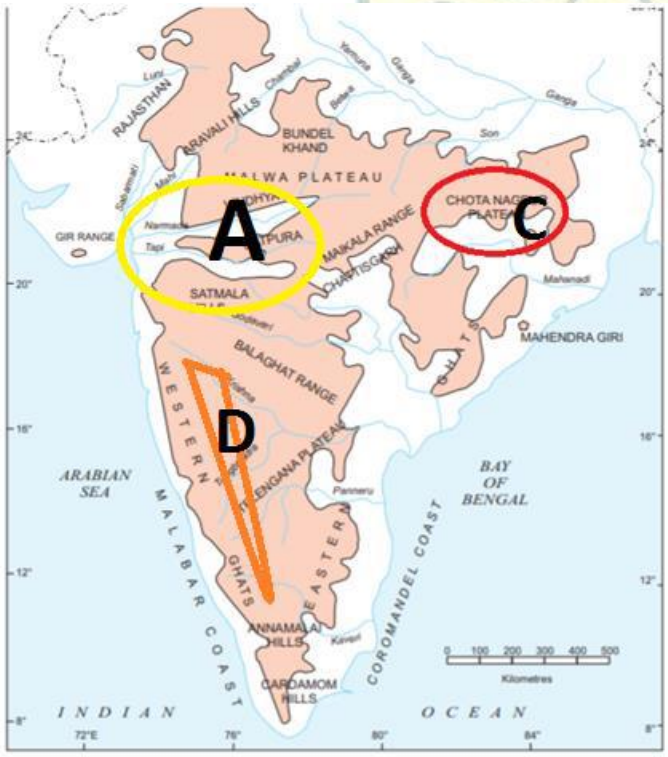
If you are aware of the rivers that flow thorough rift valley in India, which are Narmada river, Tapti, Mahi (all flowing west), Damodar river in Chota Nagpur plateau, then it is easy to identify that region marked "A" in map is part of Rift Valley (Narmada and Tapti)

Rain Shadow Region is an area having relatively little precipitation due to the effect of a topographic barrier, especially a mountain range, that causes the prevailing winds to lose their moisture on the windward side, causing the leeward side to be dry. Eastern Side of Sahyadri ranges or Western Ghats on Deccan comprises of Rain Shadow Region.

The Chhota Nagpur Plateau is a plateau in eastern India, which covers much of Jharkhand state as well as adjacent parts of Odisha, West Bengal, Bihar and Chhattisgarh.

Chhattisgarh Plain forms the upper Mahanadi River basin. it is bounded by the Chota Nagpur plateau to the north, the Raigarh hills to the northeast, the Raipur Upland to the southeast, the Bastar plateau to the south, and the Maikala Range to the west.

Observe figure given below:



Q.24) With reference to Himalayas, consider the following statements:

1. Lesser Himalayas were formed during the Eocene period.
2. Shiwaliks are separated from the plain by Himalayan Front Fault (HFF).

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.24) Solution (b)

Basic Information:

Trans Himalayas:

- The Himalayan ranges immediately north of the Great Himalayan range.
- Also called the Tibetan Himalaya because most of it lies in Tibet.
- The Zaskar, the Ladakh, the Kailas and the Karakoram are the main ranges.
- The Nanga Parbat (8126 m) is an important range which is in The Zaskar Range.

The Great Himalayas:

- Also known as Inner Himalaya, Central Himalaya or Himadri.
- Average elevation of 6,100 m above sea level and an average width of about 25 km.
- Terminates abruptly at the syntaxial bends. One in the Nanga Parbat in north-west and the other in the Namcha Barwa in the north-east.
- This mountain range boasts of the tallest peaks of the world, most of which remain under perpetual snow.

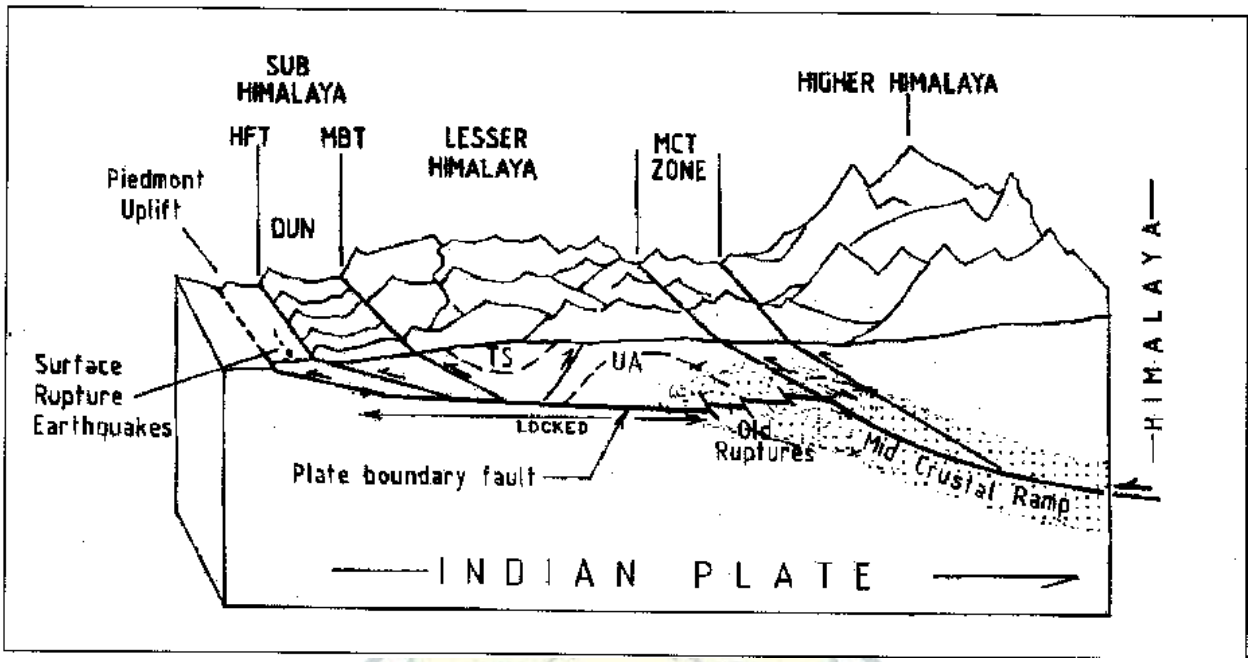
The Lesser Himalayas:

- In between the Shiwaliks in the south and the Greater Himalayas in the north.
- Runs almost parallel to both the ranges.
- It is also called the Himachal or Lower Himalaya.
- Lower Himalayas have steep, bare southern slopes (steep slopes prevent soil formation) and more gentle, forest covered northern slopes.

Shiwalik Range:

- Also known as Outer Himalayas.
- Located in between the Great Plains and Lesser Himalayas.
- The altitude varies from 600 to 1500 metres.

- Runs for a distance of 2,400 km from the Potwar Plateau to the Brahmaputra valley.



Statement Analysis:

Statement 1	Statement 2
Incorrect	**Correct**
Lesser Himalayas were formed during the second upheaval in Miocene period (45mya).	Shiwaliks are separated from the plain by Himalayan Front Fault (HFF).

Q.25) Arabian Sea records higher salinity than the Bay of Bengal because

a) Arabian Sea exhibits high rate of evaporation and low influx of freshwater.
b) Arabian Sea has shallow water.
c) Arabian Sea has more enclosed land.
d) Arabian Sea receives more rainfall.

Q.25) Solution (a)

Explanation:

- Salinity is measured as the ratio of weight of dissolved salts to total weight and is usually

expressed as parts per thousand (ppt).

- 75% of seawater has a salinity ranging between 34 35 ppt. The average salinity in the oceans is 34.7 ppt i.e., on an average there is 34.7 g of salt in every kg of seawater.
- Salinity near the surface in the northern Bay of Bengal can be as low as 31 ppt because the bay receives lots of freshwater in the form of rain and from runoff of surrounding rivers (Ganga, Brahmaputra, Irrawaddy, Godavari, and others).
- Salinity near the surface in the Arabian Sea is much higher than in the Bay of Bengal because evaporation over the Arabian Sea is much greater and it receives relatively less river runoff.

Q.26) With reference to Peninsular Plateau, consider the following statements:

1. It is the largest physiographic unit of India.
2. The general slope is from west to east.

Which of the above statements is/are NOT correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.26) Solution (d)

Note: *Incorrect statements are asked in the question.*

Basic Information:

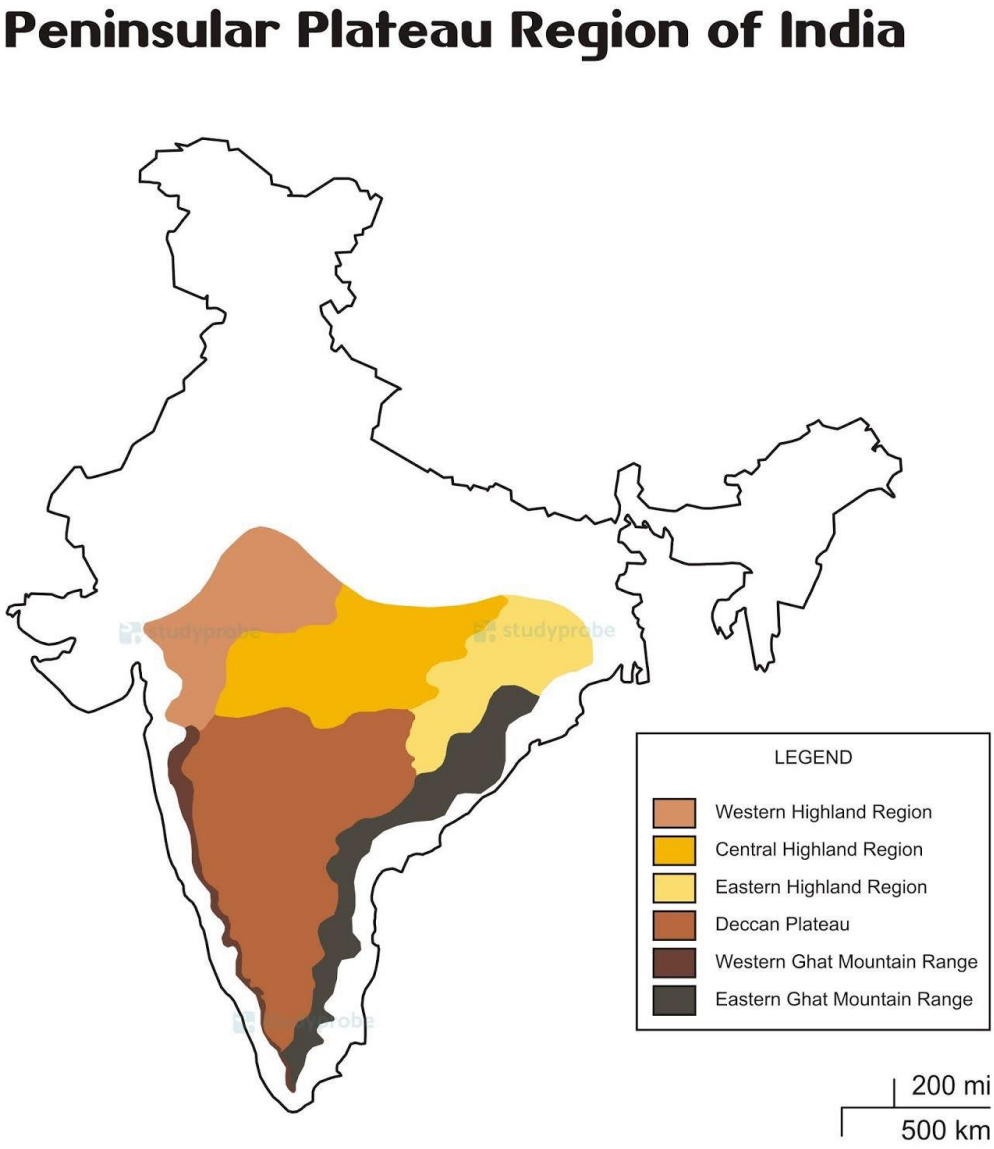
The Peninsular Plateau:

It covering an area of about 16 lakh sq. km forms the largest and oldest physiographic division of India. It is bounded by the Aravallis in the North West, Maikal range in the North, Hazaribagh and Rajmahal Hills in the North East, the Western Ghats in the West and the Eastern Ghats in the East.

The peninsular plateau is divided into:

- Central High lands which include Aravalli Range, Malwa Plateau, Vidhya Range, Bundelkhand Plateau, Baghelkhand Plateau.
- Eastern Plateau Chhota Nagpur plateau and Meghalaya Plateau
- The Deccan Plateau which include Mahadev Hills, Kaimur Hills, Maikal Range, Western Ghats, Nilgiri, Anaimalai Hills, Palani Hills and Cardamom Hills, Eastern Ghats (Shevaroy

Hills, Javadi Hills, Palkonda Range Nallamala Hills) Mahendragiri. Maharashtra Plateau, Mahanadi Basin, Garhjat Hills, Karnataka Plateau, Telangana Plateau and Tamil Nadu Upland.



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**

It covering an area of about 16 lakh sq. km forms the largest and oldest physiographic division of India.	The slope of Peninsular Plateau is from West to East and most of the rivers follow the same direction except Narmada and Tapi which flows from East to West.

Q.27) Consider the following statements:

1. Eastern and Western Coastal plains meet each other at Kanyakumari.
2. Mullayanagiri is the highest of Karnataka plateau.
3. Malabar Coast is an emerging coast.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) 1 and 2 only
d) 1, 2 and 3

Q.27) Solution (d)

Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
Fact based: Eastern and Western Coastal plains meet each other at Kanyakumari.	Mullayanagiri is the highest peak in Karnataka. Mullayyanagiri is located in the Chandra Dhrona Hill Ranges of the Western Ghats of Chikkamagaluru Taluk. With a height of 1,930 metres it is the highest peak in Karnataka.	Malabar coast is the southern part of West Coast which covers Kerala and part of Karnataka. It is an emergent coast and beaches are found in this region.

Q.28) Consider the following statements:

1. Sutlej and Subansiri are antecedent rivers.
2. River Barak, a tributary of Brahmaputra is the second largest river of northeast.

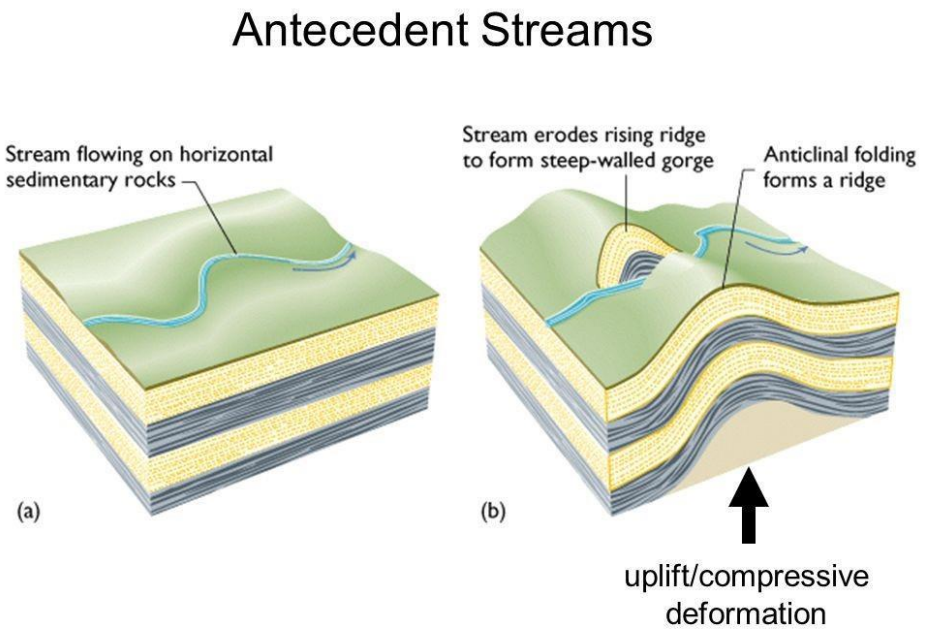
Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.28) Solution (a)

Basic Information:

An **antecedent stream** is a stream that maintains its original course and pattern despite the changes in underlying rock topography. Many **Himalayan rivers** are good examples of antecedent origin. These rivers originated well before the Himalayan region was uplifted. The rivers Indus, Brahmaputra, Sutlej, Kosi and Subansiri originated on the Tibetan side and now traverse the existing mountain ranges, cutting deep gorges.



Statement 1	Statement 2
Correct	**Incorrect**
Many Himalayan rivers are good examples of antecedent origin.	River Barak is not a tributary of Brahmaputra but it is the second largest river of northeast.

The rivers Indus, Brahmaputra, Sutlej, Kosi and Subansiri are examples of antecedent rivers.	The Barak sub basin drains areas in India, Bangladesh and Mayanmar. The Katakhal, Jiri, Chiri, Modhura, Longai, Sonai, Rukni and Singla are the main tributaries of the valley.

Q.29) What does the term 'Duar' refer to?

a) Coarse pebble belt along the foothills of the Shivaliks.
b) Rolling plains with low granitic hills in southern India.
c) Alluvial floodplains south of outer foothills of Himalayas and north of Brahmaputra basin.
d) Longitudinal region where mountains run parallel to the coast.

Q.29) Solution (c)

Explanation:

Duar:

- Alluvial floodplains south of outer foothills of Himalayas and north of Brahmaputra basin.
- The Daurs are floodplains in the region around the Himalayas, in the state of Assam in the north east and in the north of West Bengal.
- The altitude of duar typically varies from one area to the other but usually, the minimum is 90 m and the maximum is 1750 m.
- The daurs are floodplains, so the mechanism by which it is produced consists of the materials that are deposited on the edges of the rivers during a flood.
- It is also known as silt, when the rivers overflow, these floods occur and leave certain particles behind that are classified as daurs.

Coarse pebble belt along the foothills of the Shivaliks: Bhabar

Rolling plains with low granitic hills in southern India: Maidan

Longitudinal region where mountains run parallel to the coast: Dalmatian coast

Q.30) With reference to Indian soil, consider the following statements:

1. The sand content of alluvial soil decreases from west to east.
2. Peninsular soils are formed due to in situ decomposition of rocks.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.30) Solution (c)

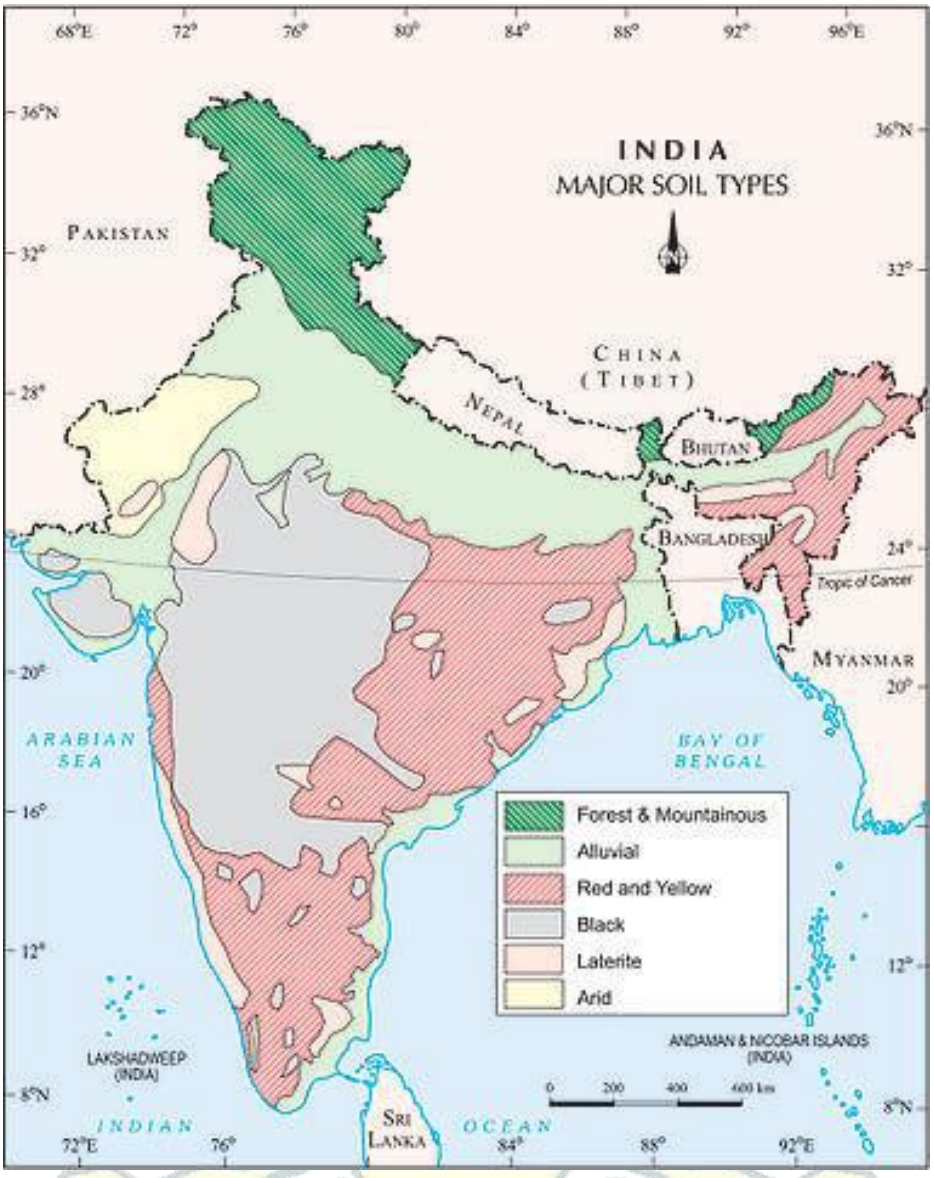
Basic Information:

Major classification of Indian soils:

- Alluvial soil (43%)
- Red soil (18.5%)
- Black / regur soil (15%)
- Arid / desert soil
- Laterite soil
- Saline soil
- Peaty / marshy soil
- Forest soil
- Sub mountain soil
- Snowfields

Alluvial soil:

- The alluvial soil occurs mainly in the Satluj Ganga Brahmaputra Plains.
- They are also found in the valleys of the Narmada, Tapi, and the Eastern and Western coastal plains.
- These soils are mainly derived from the debris brown from the Himalayas
- This soil has a phosphorous deficiency.
- The colour of soil varies from light grey to ash.
- This soil is suited for Rice, maize, wheat, sugarcane, oilseeds, etc.
- This soil is divided into
    - Khadar Soil (New)
    - Bhangar Soil (Old)



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
The sand content of alluvial soil decreases from west to east.	Peninsular soils are formed due to in situ decomposition of rocks whereas the extra peninsular soils are depositional work of rivers and winds.

Q.31) With reference to Naku La, consider the following statements:

1. It is located to the north of Kangchendzonga peak.
2. The Teesta River passes through the pass.

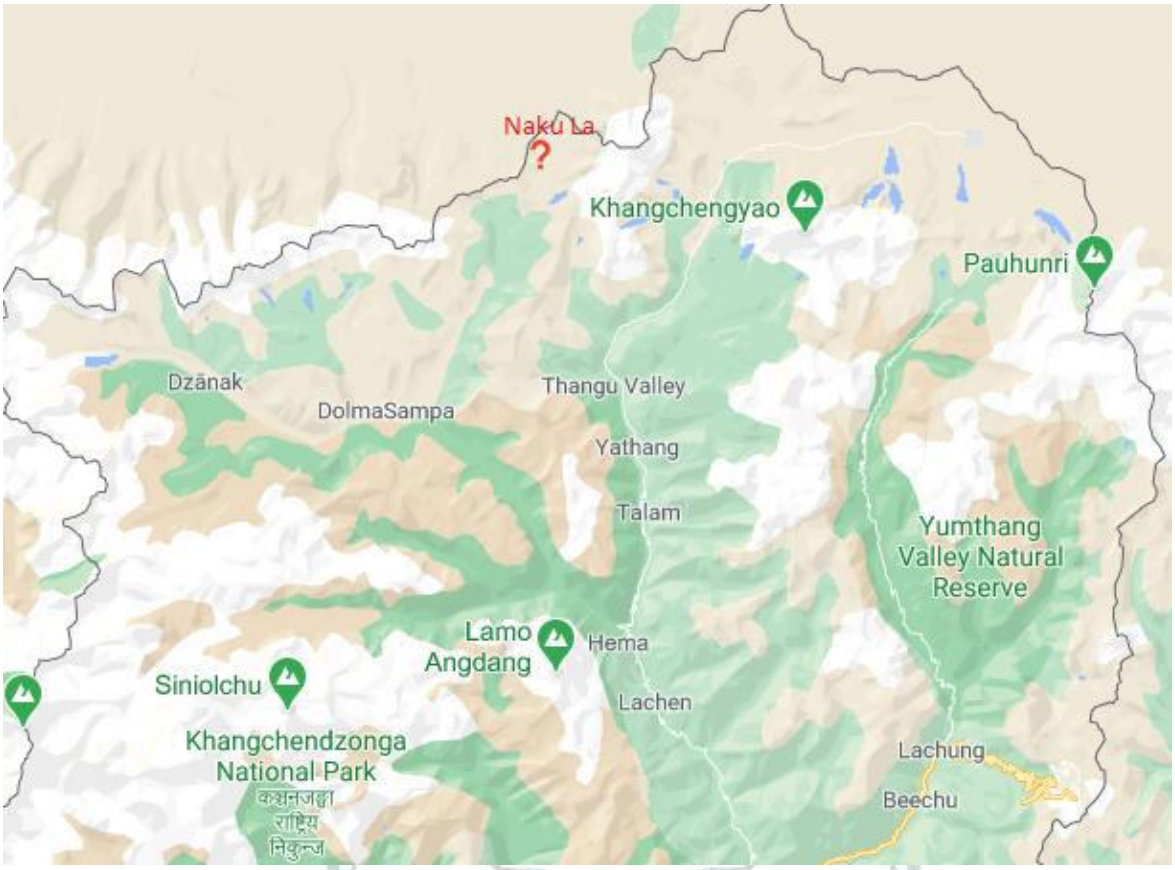
Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.31) Solution (a)

Basic Information:

- Naku La sector is a pass at a height of more than 5,000 metres above Mean Sea Level (MSL) in the state of Sikkim.
- It is located ahead of Muguthang or Cho Lhamu (source of River Teesta).
- At Muguthang, the road on the Chinese side is motorable, and on the Indian side, it is a remote area.
- The other passes located in the state of Sikkim are Nathu La Pass and Jelep La Pass.


Naku La
?
Khangchengyao
Pauhunri
Dzānak
DolmaSampa
Thangu Valley
Yathang
Talam
Yumthang
Valley Natural
Reserve
Lamo
Angdang
Hema
Siniolchu
Lachen
Khangchendzonga
National Park
Lachung
Beechu


Naku La
Yumthang
CHINA
Sikkim
Mangan
Yuksom
Gangtok
INDIA
International Boundary
West Bengal

Statement Analysis:

Statement 1	Statement 2
Correct	**Incorrect**
Naku La is to the north of Kangchendzonga.	Naku La lies ahead of Teesta's source.

Q.32) Consider the following statements with reference to Snowline:

1. It is the level below which snow will lie all year.
2. In eastern Himalayas the snowline is lower.
3. Snowline depends on precipitation, latitude and local topography.

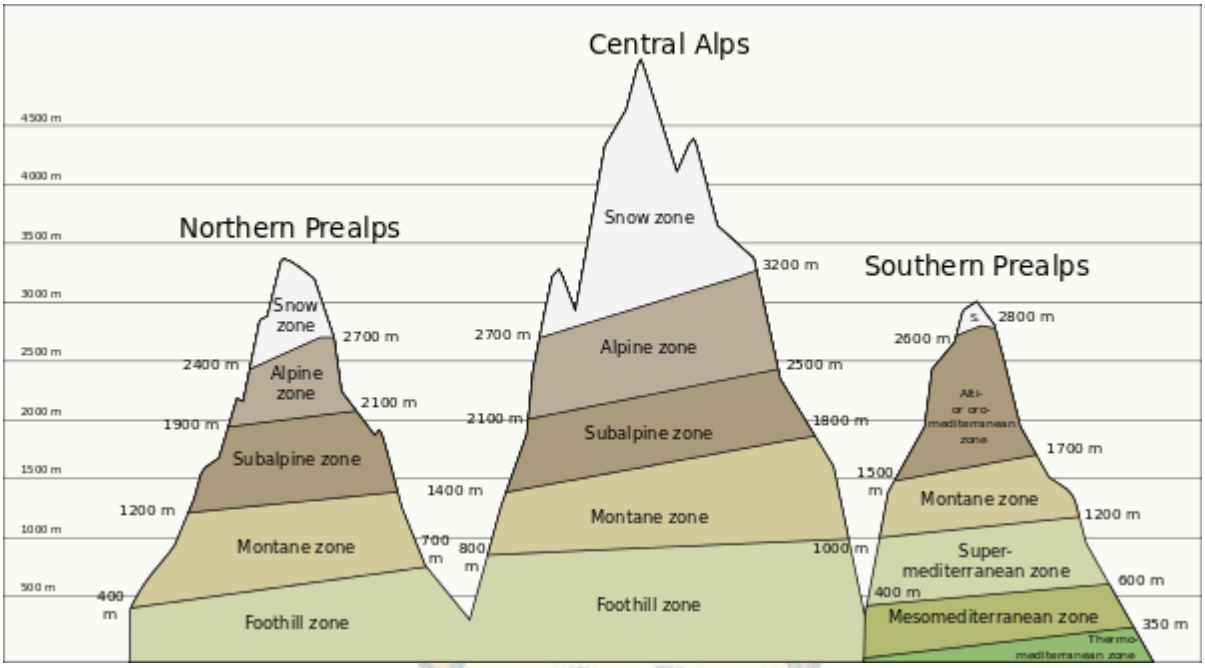
Which of the above statements is/are correct?

a) 1 and 3 only
b) 3 only
c) 2 and 3 only
d) 1, 2 and 3

Q.32) Solution (b)

Basic Information:

- The lower limit of perpetual snow is called the 'snowline'.
- The climatic snow line is the boundary between a snow covered and snow free surface.
- The actual snow line may adjust seasonally, and be either significantly higher in elevation, or lower.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	**Incorrect**	**Correct**
It is the level above which snow will lie all year. It is the boundary between a snow covered and snow-free surface.	In Eastern Himalayas and Kumaon Himalayas the snowline is around 3,500 m above sea level whereas in western Himalayas snowline is about 2,500 m above sea level. This difference in snowline is partly due to the increase in latitude from 28° N in Kanchenjunga to 36° N in the Karakoram. But the major factor is precipitation. Precipitation in western Himalayas is comparatively low and occurs mostly as snowfall where as in	Himalayas has different heights in different parts, depending on latitude, altitude, amount of precipitation, moisture, slope and local topography.

	eastern Himalayas the precipitation is greater and occurs mostly in the form of rain.	

Q.33) Consider the following statements regarding peninsular rivers:

1. They are generally not fit for navigation.
2. All the peninsular rivers are nonperennial in nature.
3. All the peninsular rivers are fed by rain only.
4. Both deltas and estuaries are formed by them.

Which of the statements given above is/are correct?

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

Q.33) Solution (c)

Basic Information:

Peninsular rivers:

- These rivers originate in the Peninsular Plateau and are named as Peninsular Rivers.
- 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 peninsular river system can be categorised into the following sections:

- **The East flowing rivers**: Mahanadi, Godavari, Krishna and Cauvery flow eastwards and drain into the Bay of Bengal. These rivers make **deltas** at their mouths.
- **The West flowing rivers:** Narmada and Tapi along with other small rivers originating from the Western Ghats and falling in the Arabian Sea form **estuaries in place of deltas**. This is due to the fact that these rivers, especially Narmada and Tapi, flow through hard rocks and are not able to form distributaries before they enter the sea.

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4

Correct	Incorrect	Correct	Correct
They are generally not fit for navigation because these are **not perennial** in nature and the **presence of sharp bends and waterfalls** hinder navigational activities.	A few Peninsular rivers are also perennial. The main reason for this is the **continuous rainfall**, first by South-West monsoon, and second by North-East monsoon in some regions of South India especially in Tamil Nadu. Examples of some **perennial peninsular** rivers are Cauvery (due to winter rainfall in the lower course), Periyar, etc. Further, some rivers such as Godavari, Narmada, etc. have a large number of tributaries making them perennial.	All the Peninsular rivers are fed by rain only.	**The East flowing rivers** make **deltas** at their mouths. The **West flowing rivers** form **estuaries** in place of deltas.

Q.34) Consider the following statements about the Vindhyas and the Satpuras:

1. Satpuras is the source of rivers Narmada and Tapti.
2. Kalumar Peak is the highest point of the Vindhyas.
3. The Satpuras meet the Vindhyas in the Maikal Hills.

Which of the following statement(s) is/are *incorrect*?

a) 1 and 2 only
b) 2 and 3 only
c) 1 only

d) None of these

Q.34) Solution (d)

Basic Information:

- The Satpura and Vindhaya Range lies in central India and both these ranges run parallel to each other.
- Out of these two, Satpura range is longer and is the source of rivers like Narmada and Tapti.
- Both Satpura and Vindhaya are mainly situated in Madhya Pradesh and Maharashtra with some extension to Gujarat, Chattisgarh and Uttar Pradesh.
- Kalumar Peak (752m) and Duphgarh Peak (1350m) are the highest point in Vindhaya and Satpura range.
- These ranges are famous for a large no of tourist spot like Panchmarhi Hill Station, Kanha National Park, Amarkantak and Omkareshwar temple.
- A southern chain of Vindhyas runs between the upper reaches of the Son and Narmada rivers to meet the Satpura Range in the Maikal Hills near Amarkantak.

Statement Analysis:

Note: Incorrect statements are asked.

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
Narmada originates from Amarkantak and Tapti originates from Multai, both lie in the Satpuras.	Kalumar Peak (752m) and Duphgarh Peak (1350m) are the highest point in Vindhaya and Satpura range.	A southern chain of Vindhyas runs between the upper reaches of the Son and Narmada rivers to meet the Satpura Range in the Maikal Hills near Amarkantak.

Q.35) Which of the statements given below is/are not true in regard to western coastal plain?

a) It is a narrow belt.
b) Eastern coastal plain receives comparatively low rainfall but the Western coastal plain receives heavy rainfall.
c) West Coast Plain is infertile and agriculturally not prosperous except in the Malabar Coast.
d) It is an example of emergent coastal plain.

Q.35) Solution (d)

Explanation:

Western Coastal Plains	Eastern Coastal Plains
It lies between the lies in between the Western Ghats and the Arabian Sea	It lies between the Eastern Ghats and the Bay of Bengal.
It is divided into three stretches – Konkan (Mumbai-Goa), Kannad (central stretch) and Malabar (southern stretch).	It is divided into two stretches Northern Circar (northern part) and Coromandel Coast (southern part)
The short rivers do not make any deltas on the West Coast.	The large rivers make wide deltas on the Eastern Coastal Plains.
The West Coast Plain is formed by coarse grained soil. It is infertile and agriculturally not prosperous except in the Malabar Coast.	The East Coast Plain is formed by fine alluvial soil and is fertile especially in the deltaic regions.
The Western Coastal Plain is narrow with a width of 50 to 65 km. In some places it is so narrow that the Western Ghats touch the Sea water.	Eastern Coastal Plain is broader than the West Coast plain. The width varies from 80 to 100 km.
The Western Coast 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 Konkon Coast. But the southern part especially the Malabar Coast has the beautiful scene of back water country with a series of lagoons.	The Eastern Coast 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.
Western Coastal plain receives heavy rainfall.	This Coastal plain receives comparatively low rainfall.

It is fault coast and shows marks of subsidence except in Malabar coast in south where evidence of emergence is found. In other words, Western coastal plain is an example of submerged coastal plain (not emergent). It provides natural conditions for development of ports.	This coast is emergent type which is characterised by offshore bars, sea beaches and lagoons.
It is narrow plain drained by many swift but small rivers.	It is aggradational plain (It is the 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.

Q.36) Which among the following is called 'Ruhr of India'?

a) Chotanagpur plateau
b) Malwa plateau
c) Bundelkhand plateau
d) Deccan plateau

Q.36) Solution (a)

Explanation:

Chotanagpur Plateau is spread over in the states of Chhattisgarh, Jharkhand, West Bengal and Odisha.

The region is composed of granite, gneiss and dharwar rocks, which are rich in mineral wealth. Chotanagpur plateau is prosperous in minerals as well as industries. Therefore, it is called 'Mineral bowl of India' and 'Ruhr of India'.

This region has become a hub of heavy industries such as iron and steel, tin planting, railway coaches and locomotives, etc. Hence it has earned the name of 'Ruhr valley of India'. The other important industries of this region are agriculture equipment, paper, electrical wires, chemical industry, cement, glass and ceramic.

Q.37) Consider the following statements about Lakshadweep Islands:

1. Lakshadweep is India's smallest union territory.
2. The Amindivi is the northernmost group of islands, and Minicoy Island is the southernmost island.
3. Their topography is flat and relief features such as hills, streams, valleys, etc. are absent.

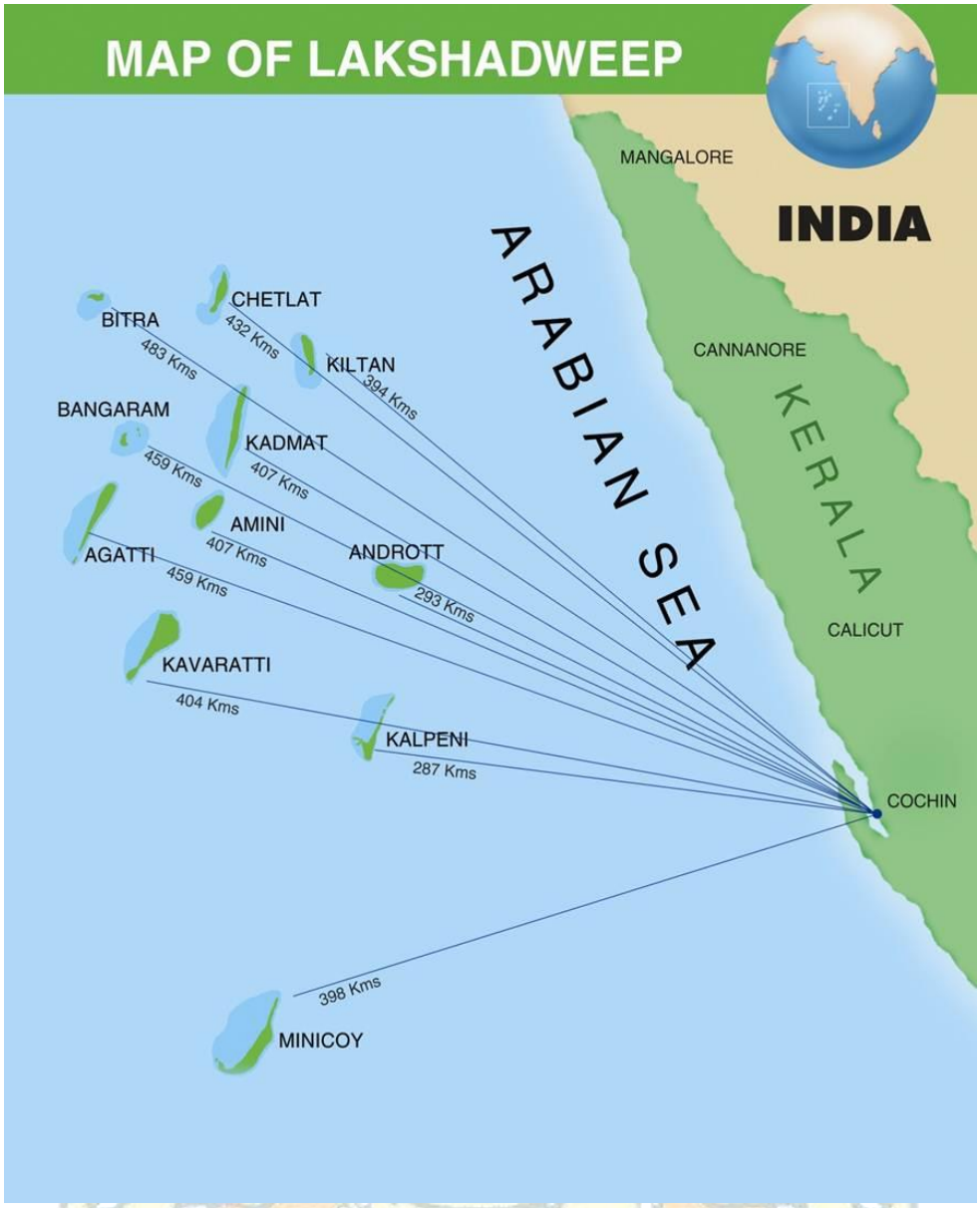
Select the correct statements:

a) 1 only
b) 2 only
c) 3 only
d) All of the above

Q.37) Solution (d)

Basic Information:

- Lakshadweep, formerly Laccadive, Minicoy, and Amindivi Islands, is the smallest union territory of India.
- It is a group of some three dozen islands scattered over some 30,000 square miles (78,000 square km) of the Arabian Sea off the south-western coast of India. Extending between 8°N and 12°N latitude.
- The principal islands in the territory are Minicoy and those in the Amindivi group. The easternmost island lies about 185 miles (300 km) from the coast of the state of Kerala.
- Ten of the islands are inhabited.
- The administrative centre is Kavaratti.
- The name Lakshadweep means "Hundred Thousand Islands" in the Malayalam language and also in Sanskrit. Area 12 square miles (32 square km).
- The islands of Lakshadweep are small, none exceeding 1 mile (1.6 km) in breadth;
- The higher eastern sides of the islands are the most suited for human habitation, while the low-lying lagoons on the western sides protect the inhabitants from the southwest monsoon. The soils of Lakshadweep are generally sandy, derived from the coral.
- Throughout the year, temperatures in Lakshadweep generally range from about 70 °F (about 20 °C) to nearly 90 °F (about 32 °C). Cyclones moving across the Arabia Sea rarely strike the islands. However, the winds and waves associated with them can alter the land features considerably.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
It's a fact. Lakshadweep, formerly Laccadive, Minicoy, and Amindivi Islands, is the smallest union territory of India.	Amindivi is a group of islands, while Minicoy is a single island. The dividing line is the 9 degree channel.	These are coral islands, flat and featureless.

Q.38) With reference to the Thar Desert, consider the following statements:

1. One of the reasons of formation of the Thar Desert is change in drainage pattern of the area.
2. The subtropical high pressure belt and limited monsoon contributes to the dryness of the Thar Desert.

Which of the following statement(s) is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.38) Solution (c)

Basic Information:

- The Thar Desert, also known as the Great Indian Desert, encompasses 77,000 square miles of rolling sand dunes in eastern Pakistan and the north-western Indian state of Rajasthan.
- Small portions of the desert also extend into the Indian states of Haryana, Punjab, and Gujarat, but these states do not exercise extensive control over the region.
- The Thar Desert's name derives from the word **t'hul**, the general term for the region's sand ridges. It is defined by a series of natural borders, including the Aravalli Mountain Range to the southeast and the Punjab plain in the north and northeast. To the west, lies the Indus plain, and to the south, the Rann of Kutch.
- The geographic isolation of the Thar Desert by mountain ranges and plains contributes significantly to the weather patterns that shape its distinctive, hot, dry environment. The environment around the Thar effectively absorbs all the rain that is carried in the monsoon clouds before the clouds can reach the desert. The resulting monsoon winds in the desert are hot and dry, and the desert does not share in the wet season experienced in surrounding terrains.
- The origin of the Thar Desert is a controversial subject. Some experts consider it to be 4,000 to 10,000 years old, while others maintain that aridity started in this region much earlier.
- It has been observed through remote sensing techniques that Late Quaternary climatic changes and neotectonics have played a significant role in modifying the drainage courses, and a large number of palaeochannels exist.

- Most of the studies share the opinion that the palaeochannels of the Sarasvati coincide with the bed of present day Ghaggar and believe that the Sutlej along with the Yamuna once flowed into the present Ghaggar riverbed. It has been postulated that the Sutlej was the main tributary of the Ghaggar and that subsequently the tectonic movements might have forced the Sutlej westward and the Yamuna eastward, causing the Ghaggar to dry up.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
The modification of drainage patterns due tectonic activity caused the rivers to dry up. This factor aided in the formation of the Thar Desert.	The Thar Desert lies in the subtropical high pressure belt like many other subtropical deserts. This belt has subdued rainfall. The monsoon winds reaching the Thar are already exhausted and a lot of it runs parallel to the Aravalis without affecting the region.

Q.39) Consider the following statements about the Western and Eastern Himalayas of India:

1. The Western Himalayas are higher with sudden steep slope whereas Eastern Himalayas are lower with gradual slope.
2. The Western Himalayas are located on higher latitude whereas the Eastern Himalayas are located on lower latitude.

Which of the above statement(s) is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.39) Solution (b)

Western Himalayas	Eastern Himalayas
Lower and gradual slope. Hence, the higher peaks in this part are farther from the plains and a number of ranges lie between the plains and high peak.	Higher and steep sudden slope. That is why two of the highest peaks of Himalayas, Mt. Everest (in Nepal) and Kanchenjunga are not very far from the plains.
Located on higher latitude, therefore colder. As a result, the snowline in the Western Himalayas is at a lower altitude than in the Eastern Himalayas.	Located on lower latitude, therefore warmer. Therefore, snowline is at a higher altitude.
From Indus to Kali river	From Kali river to Brahmaputra river
Peaks: Nanga Parbat, Nanda Devi, Badrinath	Peaks: Everest, Makalu, Annapurna, Dhaulagiri

Q.40) In which of the following areas, 'ravines' are present in India?

1. Along the banks of Narmada
2. Along the foothills of Shivalik
3. Chambal
4. Chota Nagpur region

Select the correct code:

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

Q.40) Solution (d)

Explanation:

A ravine is generally a fluvial slope landform of relatively steep (cross sectional) sides, on the order of twenty to seventy percent in gradient.

Ravines may or may not have active streams flowing along the downslope channel which originally formed them; moreover, often they are characterized by intermittent streams, since their geographic scale may not be sufficiently large to support a perennial watercourse. A ravine is a deep valley which is formed due to linear/dendritic fluvial erosion of loose unconsolidated

and bare soils byes.

In all the given areas along the banks of Narmada and foothills of Shivalik, Chambal and Chota Nagpur region Ravines are found.

Q.41) Consider the following statements:

1. The weather varies tremendously whereas, the climate is always constant in a region.
2. Generally the climate of temperate latitudes is far more variable than that of tropics.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.41) Solution (b)

Basic Information:

WEATHER:

The vast and invisible atmospheric envelope is energized by solar radiation, stimulated by earthly motions, and affected by contact with Earth's surface. The atmosphere reacts by producing an infinite variety of conditions and phenomena known collectively as weather—**the study of weather is known as meteorology.**

- **The term weather refers to short-run atmospheric conditions that exist for a given time in a specific area.**
- It is the sum of temperature, humidity, cloudiness, precipitation, pressure, winds, storms, and other atmospheric variables for a short period of time.
- Thus, we speak of the weather of the moment, the week, the season, or perhaps even of the year or the decade.

CLIMATE:

Weather is in an almost constant state of change, sometimes in seemingly erratic fashion, yet in the long view, it is possible to generalize the variations into a composite pattern that is termed

climate.

- **Climate is the aggregate of day-to-day weather conditions over a long period of time.**
- It encompasses not only the average characteristics, but also the variations and extremes of weather.
- To describe the climate of an area requires weather information over an extended period, normally at least three decades.

Statement Analysis:

Statement 1	Statement 2
Incorrect	**Correct**
The weather or climate can or cannot change in a region. It is not always constant, it is liable to change. Relate to Climate Change too!!	Generally, the climate of **temperate latitudes** is far **more variable** than that of the **tropics**. For instance, the climate of the British Isles is so changeable that many people have said that '**Britain has no climate, only weather**'. Conversely, the climate of Egypt is so static that it makes a good deal of sense when people say that '**Egypt has no weather, only climate**'.

Q.42) Consider the following statements about the Atmosphere:

1. In climatic processes, 99.9% of the atmosphere plays no role.
2. Water vapour is a variable gas whose amount decreases from equator towards pole.
3. Carbon dioxide is transparent to short wave but absorbs long wave radiations.

Which of the above statements are correct?

a) 1 and 2 only
b) 2 and 3 only

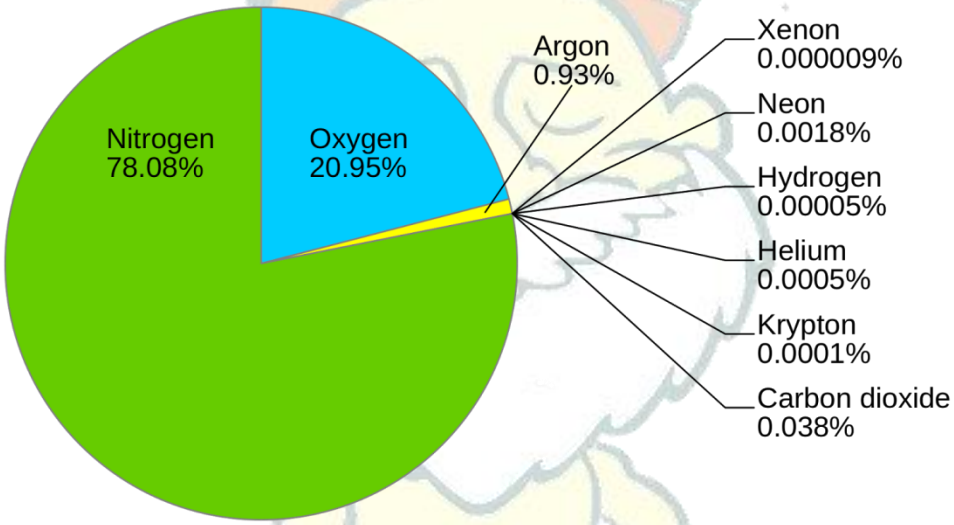
c) 1 and 3 only
d) 1, 2 and 3

Q.42) Solution (d)

Basic Information:

Atmosphere is a mixture or mechanical aggregate of gases and dust. As a whole atmosphere is very well mixed acting as a single gas and following gas laws.

Atmosphere contains living gases like oxygen for man and animal, and carbon dioxide for plants (important for survival). It protects the earth from the harmful radiation from the sun. It acts as Green house by **allowing short-wave radiation (from Sun) and trapping long-wave terrestrial radiation (from Earth's surface).**



The proportion of the main gases in the atmosphere is shown in the figure above. A unit of **dry air** consists of 78.084% Nitrogen, 20.946% Oxygen, 0.934% Argon, 0.036% Carbon dioxide and the remaining other trace gases.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
In climatic processes 99.9%	Water vapour is highly	Carbon dioxide is a

of the atmosphere plays no role since only greenhouse gases play important role as it absorbs heat.	variable and 99.99% is found within 6km. Temperature is the primary factor that controls presence of water vapour. The concentration decreases from equator to pole.	greenhouse gas thus it is transparent to short wave but absorbs long wave radiations.

Q.43) The line above which atmospheric gases are not well-mixed is?

a) Tropopause
b) Van Allen belt
c) Turbopause
d) Exospehre

Q.43) Solution (c)

Explanation:

Karman Line:

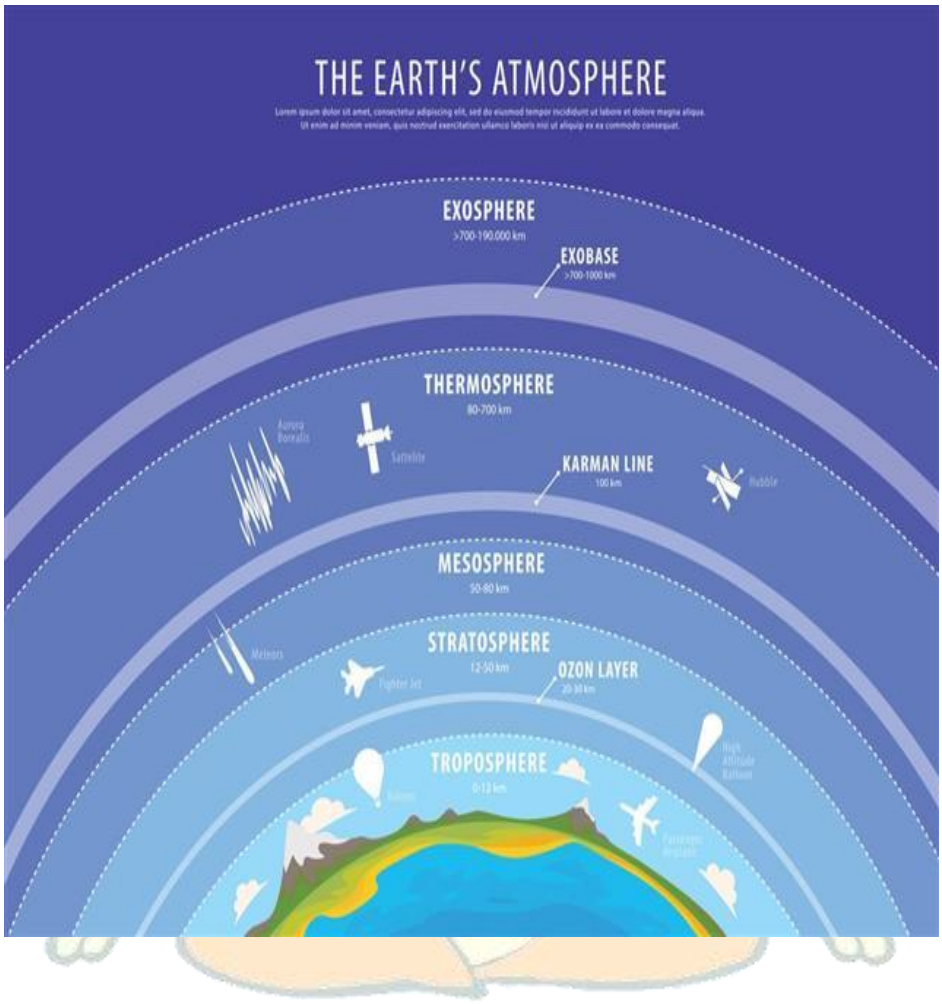
- The Karman line is an attempt to define a boundary between Earth's atmosphere and outer space.
- The line is named after Theodore von Kármán (1881–1963), a Hungarian American engineer and physicist, who was active primarily in aeronautics and astronautics.
- He was the first person to calculate the altitude at which the atmosphere becomes too thin to support aeronautical flight and arrived at 83.6 km (51.9 miles) himself.

Locating the line:

- The Fédération Aéronautique Internationale (FAI) defines Karman Line as the altitude of 100 kilometres above Earth's mean sea level.
- However, other organizations do not use this definition. There is no international law defining the edge of space, and therefore the limit of national airspace.

- For instance, the US Air Force and NASA define the limit to be 50 miles (80 km) above sea level.
- The line is approximately at the **turbopause**, above which atmospheric gases are not well-mixed.

Note: The turbopause or Karman Line marks the boundary between Homosphere and Heterosphere.



Q.44) With reference to Coriolis force, consider the following statements:

1. The Coriolis force acts perpendicular to the pressure gradient force.
2. It has a role in the direction of wind and also affects wind speed.
3. It is maximum at poles.

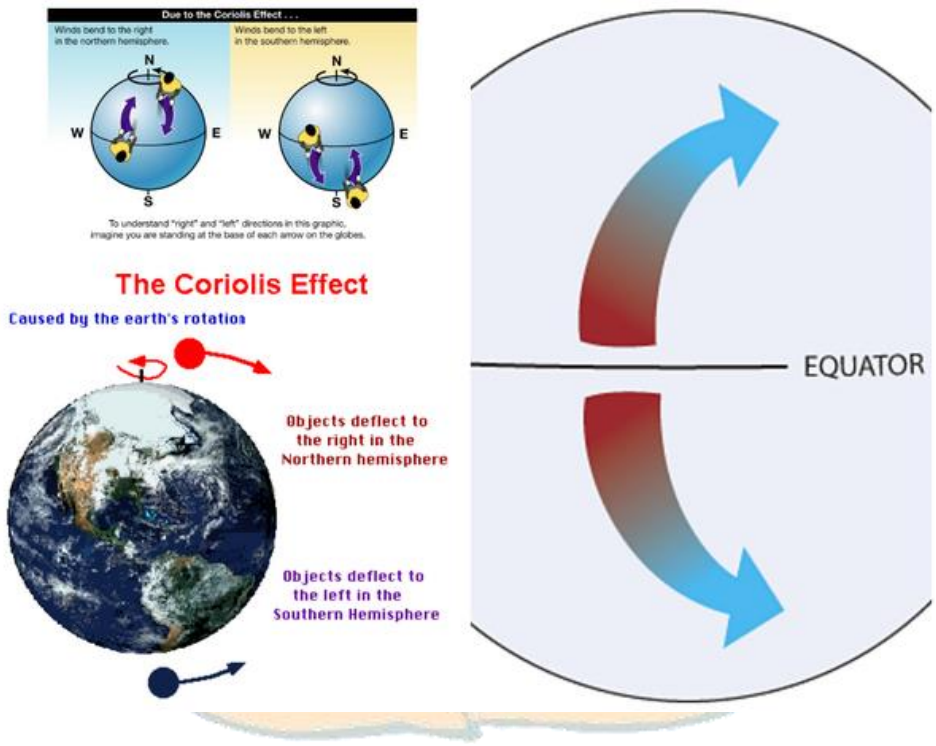
Which of the above statements is/are correct?

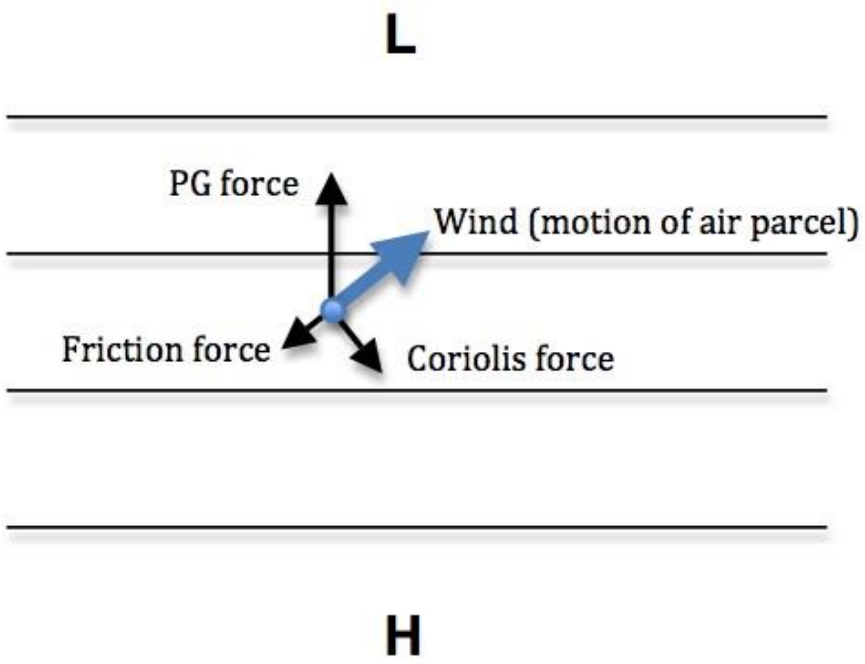
a) 1 and 2 only
b) 2 and 3 only
c) 3 only
d) 1, 2 and 3

Q.44) Solution (c)

Basic Information:

It is a **pseudo deflecting force** experienced due to rotation of earth. Because of coriolis the air appears to turn towards its right in the northern hemisphere and towards its left in the southern hemisphere. The coriolis always acts in the perpendicular direction of the motion of air. It is zero at the equator and increases towards the poles.





$$F_c = 2 * m(v \; x \; \omega)$$

v= velocity
m= mass
ω = angluar velocity

Fig: Formula of Coriolis force

Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	**Incorrect**	**Correct**
The Coriolis force acts **perpendicular** to the **direction of motion of wind** and not pressure gradient	It has a role only in the direction of wind and does not affect wind speed. More Coriolis force does not	It is **maximum** at the **poles** and is zero at the equator because it is directly proportional to the **angle of**

force.	mean more wind speed.	**latitude**.

Q.45) Doldrums are

1. Equatorial calms
2. Calm and light winds
3. Roaring forties
4. Variable both in position and in extent

Select the correct answer using the code given below:

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

Q.45) Solution (a)

Explanation:

Known to sailors around the world as the **doldrums**, the **Inter-Tropical Convergence Zone**, (ITCZ pronounced and sometimes referred to as the "itch"), is a belt around the Earth extending approximately **five degrees north and south of the equator**. Here, the prevailing trade winds of the northern hemisphere blow to the southwest and collide with the southern hemisphere's driving northeast trade winds.

Because the air circulates in an **upward direction**, there is often little surface wind in the ITCZ. That is why sailors well know that the area can be calm sailing ships for weeks. And that's why they call it the doldrums.

The doldrums are **variable both in position and extent** usually moving northward and southward with the sun.

Roaring forties are strong **Westerly Winds** found in Southern hemisphere generally latitudes of 40 ° and 50 °.

Q.46) Select the incorrect statement about Laurentian type of climate:

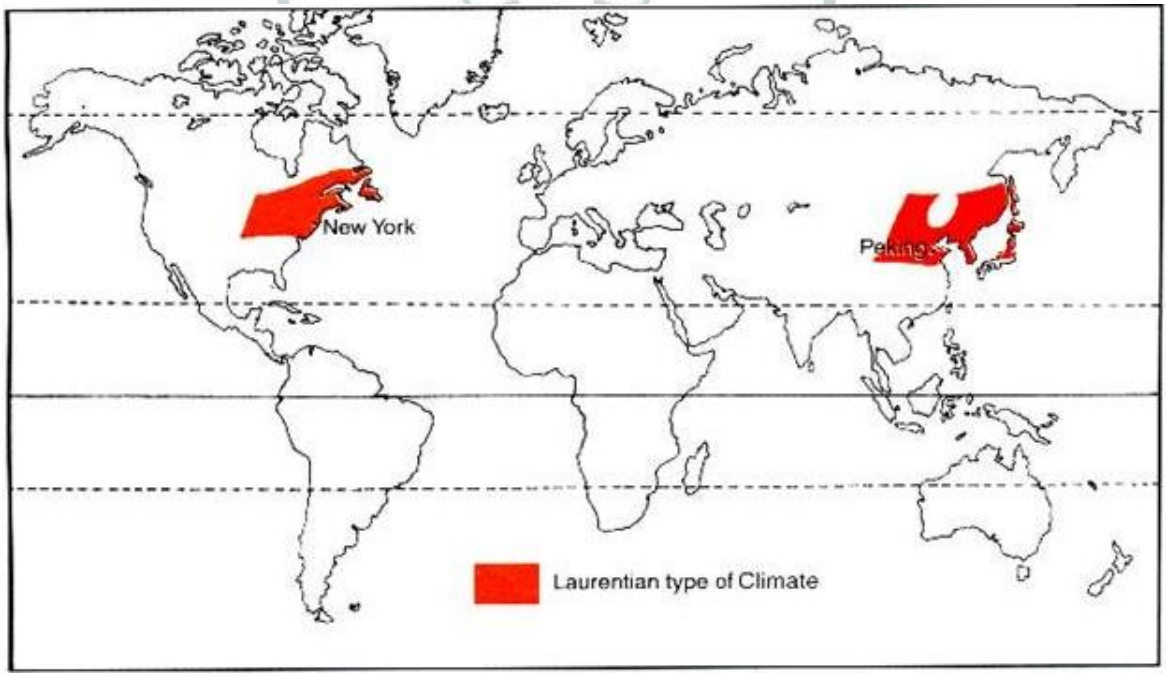
a) The Laurentian type of climate has cold, dry winters and warm, wet summers.

b) Eastern coast of North America and of China fall in this type of climate.
c) Laurentian climate of the North American region has uniformity in precipitation throughout the year.
d) Laurentian climate of eastern China region has uniformity in precipitation throughout the year.

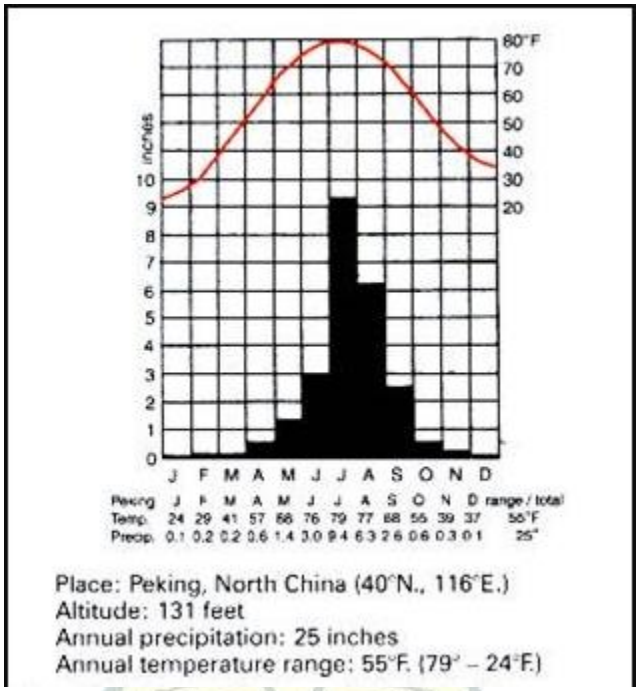
Q.46) Solution (d)

Basic Information:

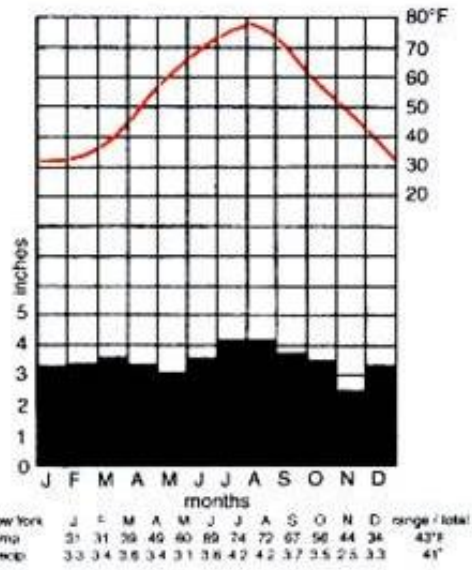
- The Cool Temperate Eastern Margin (Laurentian) Climate is an intermediate type of climate between the British and the Siberian type of climate. It has features of both the maritime and the continental climates.
- The Laurentian type of climate has cold, dry winters and warm, wet summers. The Laurentian type of climate is found only in two regions.
- One is north-eastern North America, including eastern Canada, north-east U.S.A., (i.e. Maritime Provinces and the New England states), and Newfoundland.
- The other region is the eastern coastlands of Asia, including eastern Siberia, North China, Manchuria, Korea and northern Japan.
- In the southern hemisphere, this climatic type is absent because only a small section of the southern continents extends south of the latitude of 40°S.



- The annual precipitation graph of Asiatic region.



- The most remarkable characteristic of the Laurentian climate of the North American region is its uniformity in precipitation (about 3 to 4 inches monthly) with a late summer maximum.
- No month is really dry, and the driest month, November, has 2.5 inches of rain. This uniformity of precipitation is largely due to the Atlantic influence and that of the Great Lakes. The warm Gulf Stream increases the moisture content of easterly winds from the open Atlantic.
- In contrast to the North American region, the **distribution of precipitation is less uniform in the Asiatic region.**
- Winters are very cold and dry while summers are warm and exceptionally wet.
- The rainfall regime resembles the tropical monsoon type in India where the rainfall is concentrated in the three summer months.



Place: New York, U.S.A (41°N., 74°W.)
Altitude: 314 feet
Annual precipitation: 41 inches
Annual temperature range: 43°F. (74° – 31°F.)

Q.47) With reference to British type of climate, consider the following statements:

1. This climate is experienced in Southern Chile, Southern Australia, Tasmania and most parts of New Zealand.
2. Rainfall occurs throughout the year with winter maxima.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

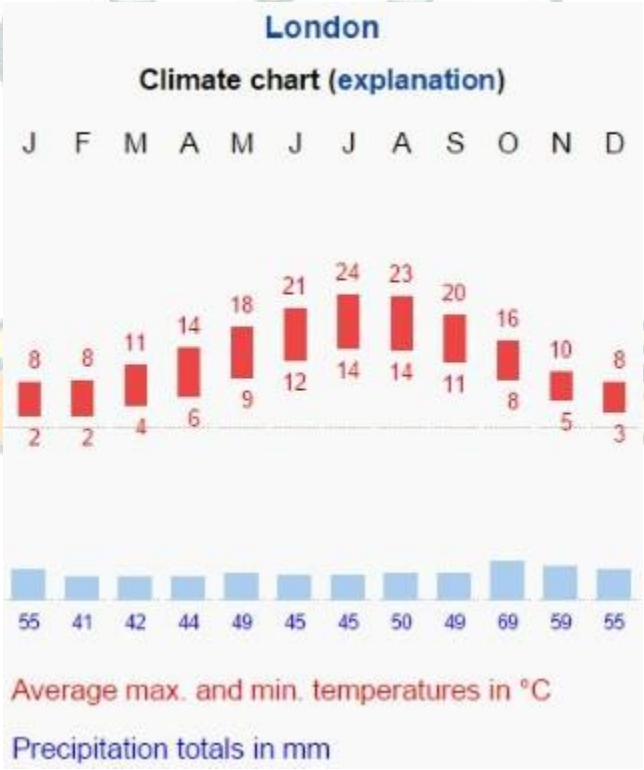
Q.47) Solution (c)

Basic Information:

- British Type Climate or Cool Temperate Western Margin Climate or North-West European Maritime Climate.

- The cool temperate western margins are under the influence of the Westerlies all-round the year.
- They are the regions of frontal cyclonic activity (Temperate Cyclones).
- This type of climate is typical to Britain, hence the name 'British Type'.
- However this type of climate is also found in southern Chile, Southern Australia, Tasmania and most parts of New Zealand.
- It is called as North-West European Maritime Climate due to greater oceanic influence.

- Rainfall occurs throughout the year with winter maxima.



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Though, Britain has most developed 'British' type of climate, it is also found in Southern Chile, Southern Australia, Tasmania and most parts of New Zealand	The increase in precipitation starts from October and stays till whole of winters.

Q.48) Consider the following statements about rainfall:

1. Convectional rainfall is possible above both land and sea.
2. All high mountain ranges cause orographic rainfall.
3. Frontal rainfall is absent in southern hemisphere due to very less land area present beyond 40°S latitude.

Which of the above statements is/are NOT correct?

a) 1 only
b) 2 and 3 only
c) 1 and 2 only
d) 2 only

Q.48) Solution (b)

Basic Information:

There are three main types of rainfall that occur frequently and depend on a variety of factors.

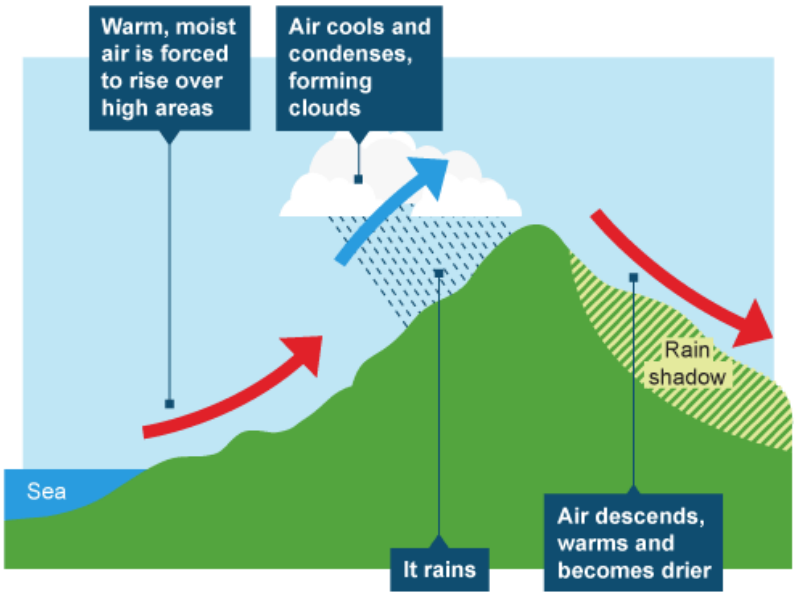
Relief Rainfall

This type of rainfall is common in places with mountains and sea. Relief rainfall frequently occurs near mountains beside the sea. The moisture-laden wind blows in from the sea because the wind meets a high mountain and hence it is forced to rise upwards. At the height, it is cooled and then the cloud is formed.

This saturated cloud with water vapor begins to precipitate on the side of the mountain facing the sea. This front side of the mountain is called the windward side.

The cloud mostly precipitates on the windward side of the mountain. Meanwhile, the cloud meets the other side, which is called the leeward side. Since the cloud has already lost most of its moisture so it rains very little there.

This makes leeward side of a mountain receive very little rains. There is a much moister climate on the windward sides of slopes. On the other hand, there is a drier, sheltered climate on the leeward side.

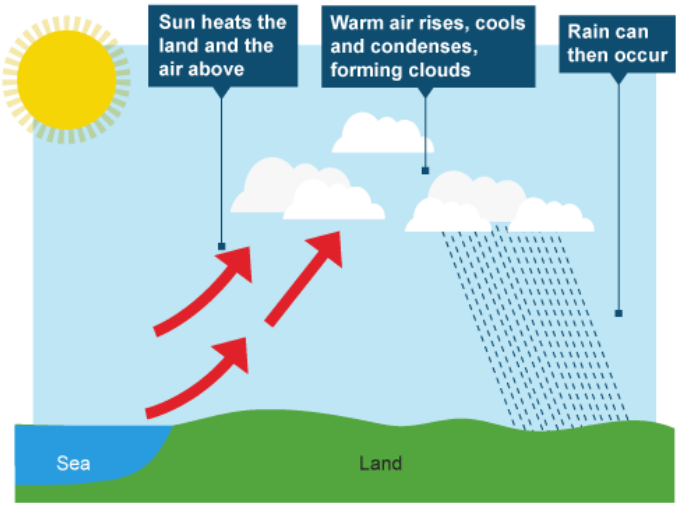


Convectional Rainfall

Suppose we are enjoying the rays of sunshine and suddenly, the sky gets darker with the grey cloud. Without any warning the heavens open and it begins to rain, with a thundery feel. This is the convectional rain. It occurs frequently on hot days usually giving cumulus cloud and thundery showers.

The sun heats the ground which causes the air to warm and become very hot. Then the air rises upwards and becomes cool. Then it condenses to form cumulus cloud.

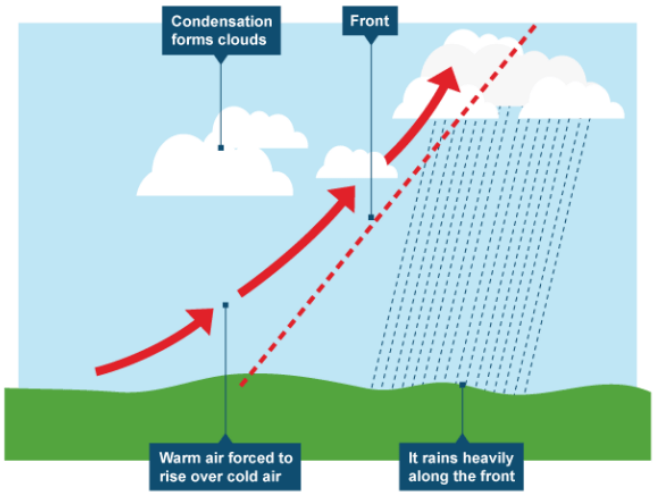
When this cloud is saturated, it begins to precipitate giving heavy and thundery showers. Due to this, we get thundershowers on a hot day, as the Sun warms the air and it rises, cools and begins to rain.



Frontal Rainfall

This rainfall occurs when a warm, tropical air mass comes in contact with a cold, polar air mass. It is very common in Britain and Ireland. Because the air is in the warm front, then it rises over the cold front. The air is cooled and so condenses to form a stratus cloud. Thus when the stratus cloud becomes saturated, it begins to precipitate.

Though frontal rainfall is common and more developed in the northern hemisphere, it does occur in the southern hemisphere as well; regions experiencing British type of climate also experience frontal rainfall. **These regions are southern Chile, Southern Australia, Tasmania and most parts of New Zealand.**



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Incorrect**	**Incorrect**
As long as there is moisture in the air, convectional rainfall may happen above both land and sea.	All high mountain ranges may not cause orographic rainfall, as it is necessary for the mountain range to lie perpendicular to the direction of movement of wind.	Although, southern area has less developed frontal rain it does happen in then regions experiencing British type of climate.

Q.49) Select the *incorrect* statement about Harmattan Winds:

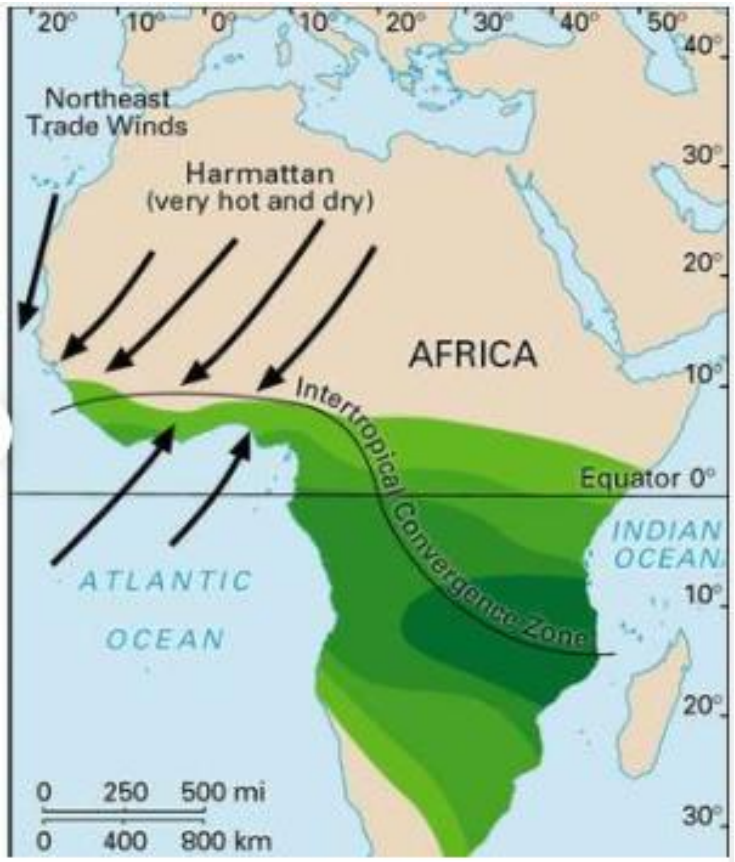
a) It is dry and dusty north-easterly trade wind.
b) It blows from the West Africa towards the Sahara desert.
c) It is seasonal wind blowing between the end of November and the middle of March
d) It is also known as the "doctor wind", because of its invigorating dryness compared with humid tropical air.

Q.49) Solution (b)

Basic information:

- The Harmattan is a seasonal wind in West Africa, which occurs between the end of November and the middle of March.
- It is characterized by the dry and dusty north-easterly trade wind, of the same name, which blows **from the Sahara Desert over West Africa into the Gulf of Guinea**.
- The name is related to the word 'haramata' in the Twi language. The temperature is cold in most places, but can also be hot in certain places, depending on local circumstances.
- The Harmattan blows during the dry season, which occurs during the months with the lowest sun.
- In this season the subtropical ridge of high pressure stays over the central Sahara Desert and the low-pressure Intertropical Convergence Zone (ITCZ) stays over the Gulf of Guinea. On its passage over the Sahara, the harmattan picks up fine dust and sand particles (between 0.5 and 10 microns).

- It is also known as the **"doctor wind"**, because of its invigorating dryness compared with humid tropical air.



Q.50) Which of the statements about sub-tropical high pressure belt is/are correct?

1. It lies in the area where the ascending equatorial air currents descend.
2. Both trade winds and westerlies originate from the sub-tropical high pressure belt.

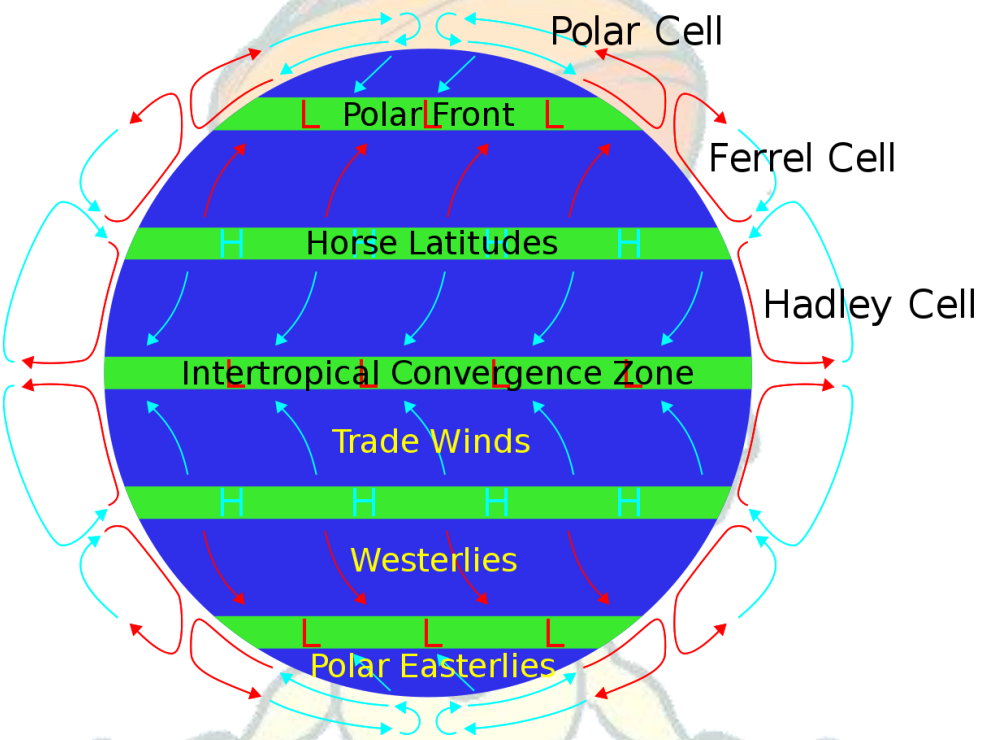
Select the correct code:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.50) Solution (c)

Basic Information:

- At about 30°North and South of Equator lies the area where the ascending equatorial air currents descend.
- This area is thus an area of high pressure. It is also called as the **Horse latitude**.
- Winds always blow from high pressure to low pressure. So the winds from subtropical region blow towards the Equator as Trade winds and another wind blow towards Sub-Polar Low-Pressure as Westerlies.



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Descending air causes high pressure in this zone.	As shown in the diagram.

Q.51) With reference to Somali Jet Stream, consider the following statements:

1. It is a temporary jet stream originating near Madagascar.
2. It flows at low height and obstructs the southwest monsoon wind reaching Indian subcontinent.

Which of the above statements is/are NOT correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.51) Solution (b)

Note: Incorrect statements are asked in the question.

Basic Information:

Jet Streams:

Jet streams are high speed winds that occur in narrow bands of upper air westerlies. The width of this air band can be 160 – 480 km wide and 900 – 2150 m thick, with core speed exceeding 300 km/hr. such is their strength that aircraft routes which run counter to jet movements are generally avoided. Jets are coincident with major breaks in the tropopause.

Types of Jet Streams:

1. **Permanent:**
   - **Polar Jet Stream:** This is a thermally induced jet stream and it flows parallel to surface fronts. They flow west to east in a sinusoidal fashion. It is strongest at 200-300mb level and swings between 40^{o}-60^{o} latitude. It is found in both the hemispheres. Its band is non-continuous but flows all-round the year. It can reach up to 160-200 km/hr.
   - **Subtropical jet stream:** They also flow all-round the year. They flow to conserve the angular momentum in upper atmosphere. They are found at the poleward limit of Hadley cell around 30^{o}N and S latitude. It follows a more fixed pattern than polar jet stream. It is strongest on Indian sub-continent. The maximum speed can reach upto 300km/hr. the subtropical westerly jet does not seem to affect surface weather as much as the polar front's jets do.

2. Temporary:

- **Polar Night Jet Stream:** The polar-night jet stream forms mainly during the winter months when the nights are much longer, hence polar nights, in their respective hemispheres at around 60° latitude.
- **Tropical Easterly Jet Stream:** They are seasonal jet streams flowing east to west. These are only found in northern hemisphere and generates only in summer season. These are also thermally induced.
- **Somali/Findlater Jet Stream:** The Somali jet occurs during the summer over northern Madagascar and off the coast of Somalia. The jet is most intense from June to August with average monthly maximum speeds of 18 m/s even though daily speeds can reach the order of 50 m/s. The jet remains relatively steady from June to September before moving southward to the southern Indian Ocean during the winter.

Statement Analysis:

Statement 1	Statement 2
Correct	**Incorrect**
The Somali jet occurs during the summer over northern Madagascar and off the coast of Somalia.	It flows at **low height around 1.6-2km** and **helps in aiding** the southwest monsoon wind reaching Indian subcontinent.

It is temporary and most intense from June to August.	

Q.52) Consider the following statements regarding "nacreous clouds":

1. They may contain both liquid and ice crystals.
2. These clouds enhance the breakdown of the Earth's ozone layer.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.52) Solution (c)

Basic Information:

Ice polar stratospheric clouds or nacreous clouds:

- It occurs mainly at high latitudes during the winter when temperatures in the stratosphere fall below the frost point.
- They are most common in Antarctica, but have also been observed in the Arctic, Scotland, Scandinavia, Alaska, Canada and the northern Russian Federation. On rare occasions, they have been reported in other parts of northern Europe.
- Ice polar stratospheric clouds (nacreous clouds) form at temperatures below the ice frost point, typically near −85 °C, which is colder than the average lower stratosphere temperature.
- The characteristic bright iridescent colours, resulting from diffraction and interference of light waves, suggest that the clouds are composed of similarly sized spherical crystals of about 10 µm in diameter.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Nacreous clouds will also only form when the temperature in the stratosphere is below a chilly -78°C, which turns any **moisture in the air** into **super-cooled liquid or ice crystals**.	Nacreous clouds have a darker side too. These clouds enhance the breakdown of the Earth's ozone layer, a vital part of our atmosphere that provides protection from the sun's harmful ultraviolet rays. The ice crystals in the clouds encourage a chemical reaction between the ozone layer, which is made up of a specific type of molecular oxygen (O3), and gases such as chlorine and bromine.

Q.53) Consider the following statements:

1. Photochemical smog is formed in cool humid climate.

2. Planting trees increases the albedo.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.53) Solution (d)

Basic Information:

Photochemical smog:

- Photochemical smog is a type of smog produced when **ultraviolet light** from the sun reacts with **nitrogen oxides** in the atmosphere. It is visible as a **brown haze**, and is **most prominent** during the **morning** and **afternoon**, especially in densely populated, **warm cities**.
- It is oxidising smog.
- Photochemical smog forms from a complex process, however the source of it is quite apparent. The largest contributor is **automobiles**, while **coal-fired power plants** and some other power plants also produce the necessary pollutants to facilitate its production. Due to its abundance in areas of warmer temperatures, **photochemical smog is most common in the summer**.

Albedo:

- Albedo is a non-dimensional, unitless quantity that indicates how well a surface reflects solar energy.
- Albedo varies between 0 and 1.
- Albedo commonly refers to the "whiteness" of a surface, with 0 meaning black and 1 meaning white. A value of 0 means the surface is a "perfect absorber" that absorbs all incoming energy.
- Absorbed solar energy can be used to heat the surface or, when sea ice is present, melt the surface. A value of 1 means the surface is a "perfect reflector" that reflects all incoming energy.

Surface	Range of Albedo
Fresh Snow	0.80 to 0.90
Old/Melting Snow	0.40 to 0.80
Desert Sand	0.40
Grassland	0.25
Deciduous Trees	0.15 to 0.18
Coniferous Forest	0.08 to 0.15
Tundra	0.2
Ocean	0.07 to 0.10

Statement Analysis:

Statement 1	Statement 2
Incorrect	**Incorrect**
Photochemical smog is formed in warm, dry and sunny climate. **Classical smog** is formed in cool humid climate.	Planting trees **decreases** the albedo. The dark leaves of trees can raise temperatures by absorbing sunlight.

Q.54) This type of inversion takes place in lower planetary boundary layer where earth is cooled due to long wave radiation at night. Identify the correct answer –

a) Frontal inversion
b) Advection inversion
c) Tropopause inversion
d) Radiation inversion

Q.54) Solution (d)

Basic Information:

Temperature Inversion:

Usually as we move up in troposphere from the surface, the temperature decreases with increase in altitude. But sometimes due to local conditions, the temperature, instead of decreasing, increases with height. This phenomenon is called temperature inversion. This is also known as **negative lapse rate**.

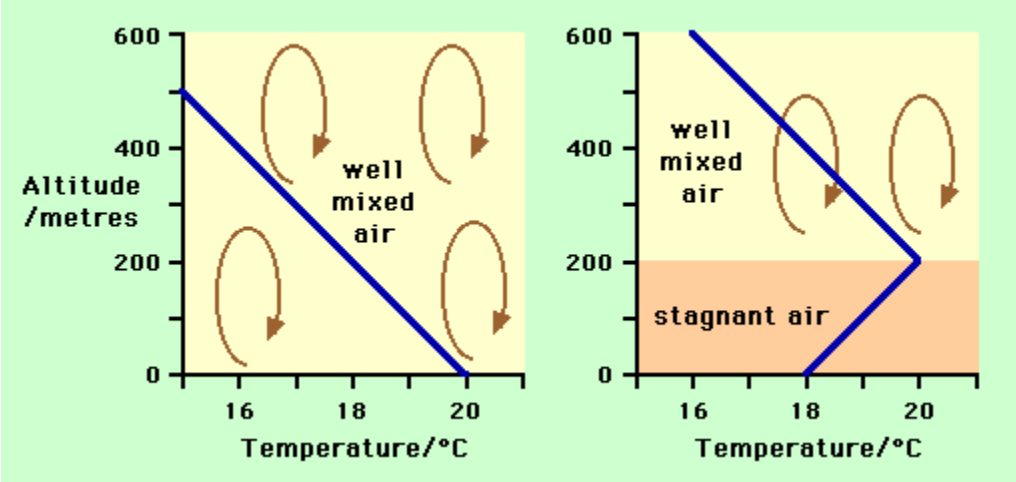
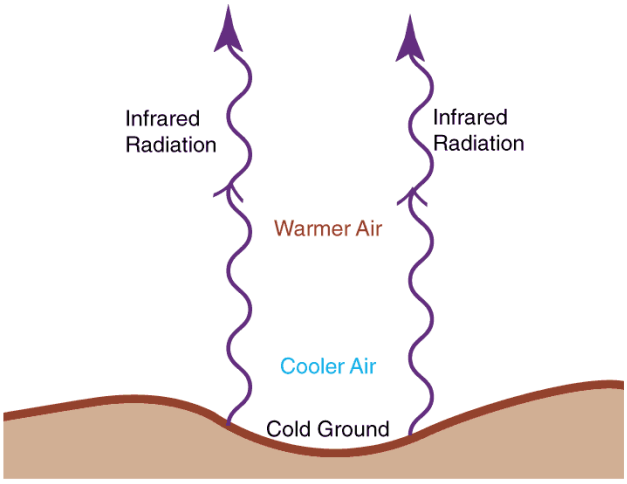


Fig: graphs comparing normal condition and condition of temperature inversion.

The different types of inversions may be classified as:

Radiation Inversion: This is the condition where temperature near the ground increases, rather than decreasing with elevation. This type of inversion occurs generally in tropical and sub-tropical regions during the period of long winter nights. This inversion however, disappears with sunrise. The duration and height of surface inversion increases pole wards. Following conditions are required for ground surface inversion:

- Long winter nights
- Cloudless calm skies
- Dry air and low relative humidity
- Calm atmosphere or slow movement of air
- Snow covered surface



Upper air inversion: It occurs when the warm air is transported upwards into the cold air due to eddies. It may be caused due to compression of the descending air as it happens in the case of subtropical high-pressure belts.

Frontal inversion: It is caused by horizontal and vertical movement of air. The temperate cyclones are formed by convergence of warm westerlies and cold polar air, and thus the warm air overlies the cold air. The presence of warm air above and cold air below reverses the normal lapse rate and inversion of temperature occurs.

Advection Inversion: Here the warm air rises and then advects in the middle of troposphere away from the source region and forms a lid in region of lower elevation.

Tropopause inversion: it is a condition of extreme stability which restricts further rise of air globally. Since temperature rises with height in stratosphere there is a condition of inversion.

Q.55) Consider the following statements:

1. Blocking highs tend to force areas of low pressure to travel around them.
2. Horse latitude is found in the northern hemisphere only.
3. All Rossby waves are geostrophic wind.

Which of the above statements is/are correct?

a) 1 only
b) 2 only

c) 2 and 3 only
d) 1 and 3

Q.55) Solution (d)

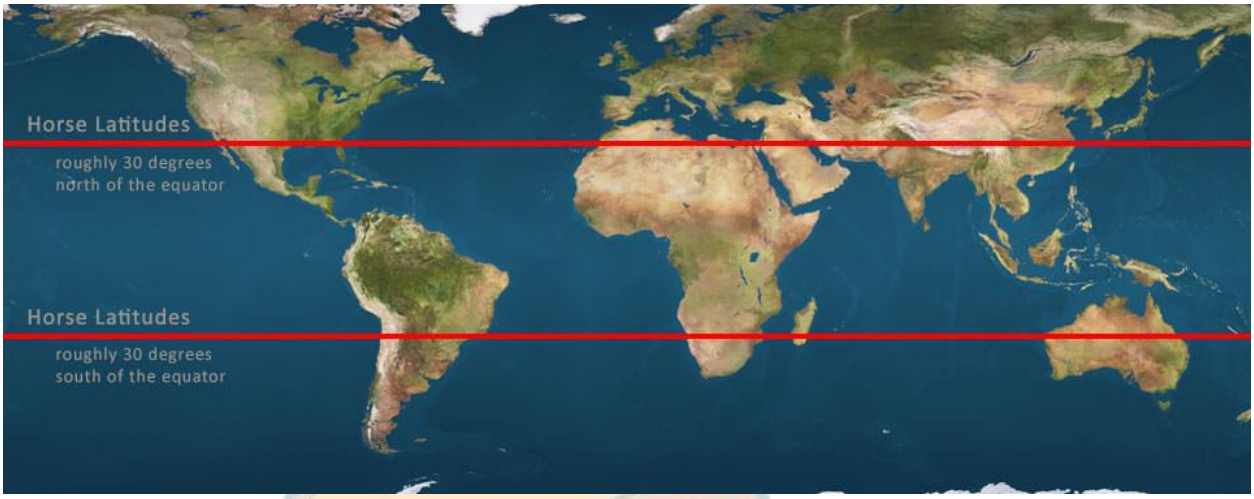
Basic Information:

Blocking highs:

- Blocks in meteorology are large-scale patterns in the atmospheric pressure field that are nearly stationary, effectively "**blocking**" or **redirecting migratory cyclones**. They are also known as **blocking highs** or **blocking anticyclones**.
- **Areas of high pressure** can sometimes be very slow moving, almost stationary. Such a region of slow moving air can prevent other, faster moving pressure systems from moving into a region. For this reason they are known as blocking highs or blocking anticyclones.

Horse latitude:

- The horse latitudes are located at about **30 degrees north and south** of the equator.
- It is common in this region of the **subtropics** for winds to diverge and either flow toward the poles (known as the prevailing westerlies) or toward the equator (known as the trade winds).
- These diverging winds are the result of an **area of high pressure**, which is characterized by **calm winds, sunny skies, and little or no precipitation**.
- According to legend, the term comes from ships sailing to the New World that would often become stalled for days or even weeks when they encountered areas of high pressure and calm winds. Many of these ships carried horses to the Americas as part of their cargo. Unable to sail and resupply due to lack of wind, crews often ran out of drinking water. To conserve scarce water, sailors on these ships would sometimes throw the horses they were transporting overboard. Thus, the phrase 'horse latitudes' was born.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Incorrect**	**Correct**
Anticyclones produce a **stable atmosphere**. Anticyclones, or highs, are also referred to as **blocking highs because they tend to force areas of low pressure to travel around them.** For example, a hurricane (tropical cyclone) that encounters an area of high pressure will be deflected around the cyclone. Blocking highs have spared the East Coast of the United States from many hurricane strikes, pushing them out over the Atlantic Ocean.	The horse latitudes are located at about **30 degrees north and south** of the equator.	Rossby waves form outer edge of geostrophic wind generally in polar areas. Thus, all Rossby waves are geostrophic wind but all geostrophic winds are not Rossby waves.

Q.56) Select the incorrect statement about tropical cyclones:

a) A tropical cyclone is a non-frontal synoptic scale low-pressure system.
b) Heaviest rain is found at the eye-wall of the storm.
c) Sea-surface temperature must be 26°C spanning through at least 100m depth.
d) A weaker vertical shear makes the storm grow faster vertically into the air.

Q.56) Solution (c)

Basic Information:

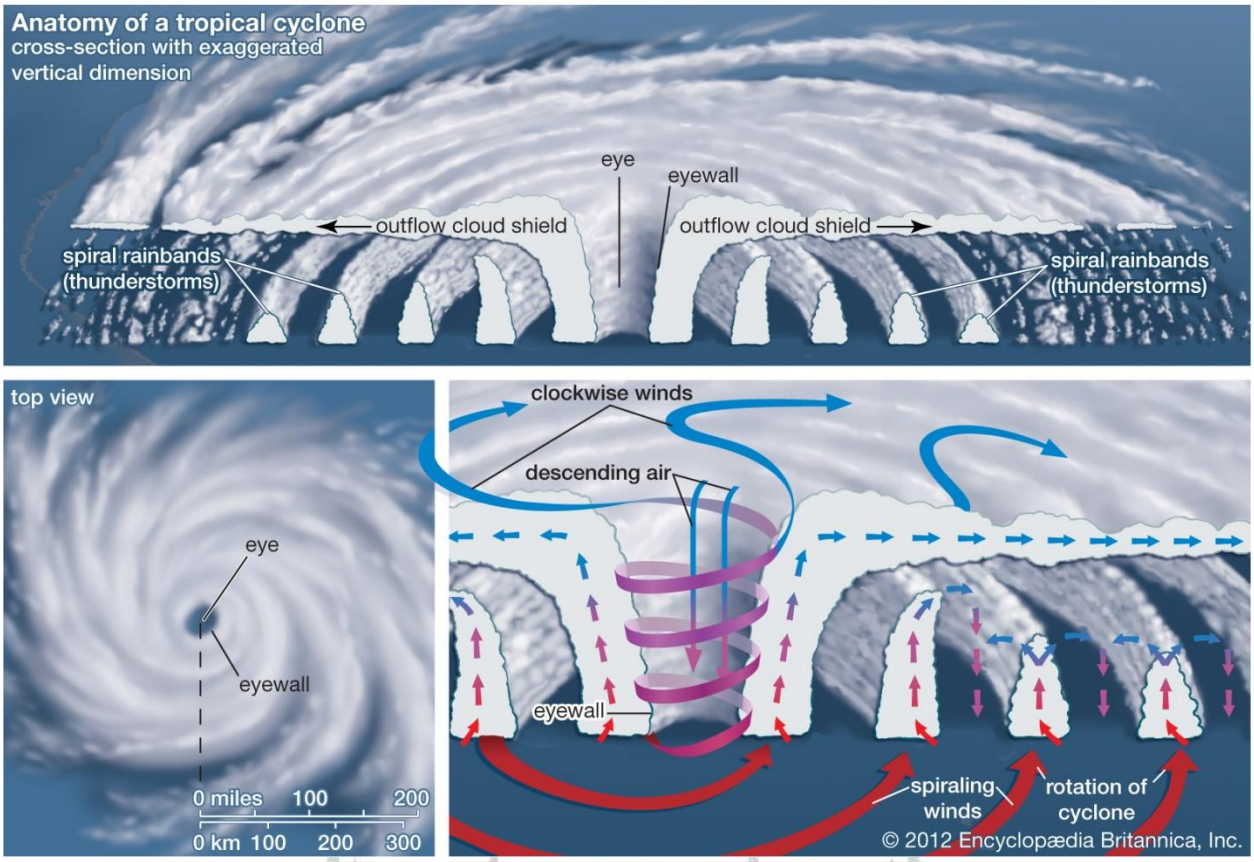
A tropical cyclone is the generic term for a non-frontal synoptic scale low-pressure system over tropical or sub-tropical waters with organized convection (i.e. thunderstorm activity) and definite cyclonic surface wind circulation

A cluster of thunderstorms can develop over warm tropical oceans. If that cluster persists in an area of low pressure, it can start rotating. If the conditions are just right, the cluster of thunderstorms can grow in size and sustain itself and then develop into a tropical cyclone.

Preconditions for formation of tropical cyclone:

a) The temperature of the surface layer of ocean water must be 26.5 °C (80 °F) or warmer, and this warm layer must be at least 50 metres (150 feet) deep.
b) A pre-existing atmospheric circulation must be located near the surface warm layer.
c) The atmosphere must cool quickly enough with height to support the formation of deep convective clouds.
d) The middle atmosphere must be relatively humid at a height of about 5,000 metres (16,000 feet) above the surface.
e) The developing system must be at least 500 km (300 miles) away from the Equator.
f) The wind speed must change slowly with height through the troposphere—no more than 10 metres (33 feet) per second between the surface and an altitude of about 10,000 metres (33,000 feet).

Structure of the cyclone



The eye is a region of mostly calm weather at the center of tropical cyclones. The eye of a storm is a roughly circular area, typically 30–65 kilometers (19–40 miles) in diameter. It is surrounded by the eyewall, a ring of towering thunderstorms where the most severe weather and highest winds occur.

Q.57) Consider the following statements:

1. Increase in temperature and pressure will increase the rate of evaporation in the atmosphere.
2. All the moisture present in the atmosphere is due to evaporation.

Which of the statements given above is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2

d) Neither 1 nor 2

Q.57) Solution (d)

Basic Information:

- Evaporation happens when a liquid substance becomes a gas. When water is heated, it evaporates. The molecules move and vibrate so quickly that they escape into the atmosphere as molecules of water vapour.
- Evaporation is a very important part of the water cycle. Heat from the sun, or solar energy, powers the evaporation process. It soaks up moisture from soil in a garden, as well as the biggest oceans and lakes. The water level will decrease as it is exposed to the heat of the sun.
- Many factors affect how evaporation happens. If the air is already clogged, or saturated, with other substances, there won't be enough room in the air for liquid to evaporate quickly. When the humidity is 100 percent, the air is saturated with water. No more water can evaporate.
- Air pressure also affects evaporation. If air pressure is high on the surface of a body of water, then the water will not evaporate easily. The pressure pushing down on the water makes it difficult for water to escape into the atmosphere as vapour. Storms are often high-pressure systems that prevent evaporation.
- Temperature, of course, affects how quickly evaporation happens. Boiling-hot water will evaporate quickly as steam.
- Evaporation is the opposite of condensation, the process of water vapour turning into liquid water.
- Evaporation is the process by which water changes from a liquid to a gas or vapour. Evaporation is the primary pathway that water moves from the liquid state back into the water cycle as atmospheric water vapour. Studies have shown that the oceans, seas, lakes, and rivers provide nearly 90 percent of the moisture in the atmosphere via evaporation, with the remaining 10 percent being contributed by plant transpiration.
- A very small amount of water vapour enters the atmosphere through sublimation, the process by which water changes from a solid (ice or snow) to a gas, bypassing the liquid phase. This often happens in the Rocky Mountains as dry and warm Chinook winds blow in from the Pacific in late winter and early spring.

Statement Analysis:

Statement 1	Statement 2

Incorrect	Incorrect
Evaporation increases with increase in temperature. Evaporation decreases with increase in pressure.	Moisture enters the atmosphere through evaporation, transpiration and also sublimation.

Q.58) Consider the following statements about lapse rate:

1. If the environmental lapse rate is greater than the adiabatic lapse rate, the atmosphere is then said to be stable.
2. If the environmental lapse rate is less than the adiabatic lapse rate, the atmosphere is said to be unstable.
3. Dry adiabatic lapse rate is always higher than saturated adiabatic lapse rate.

Which of the statements given above is/are correct?

a) 1 only
b) 2 only
c) 1, 2 and 3
d) 3 only

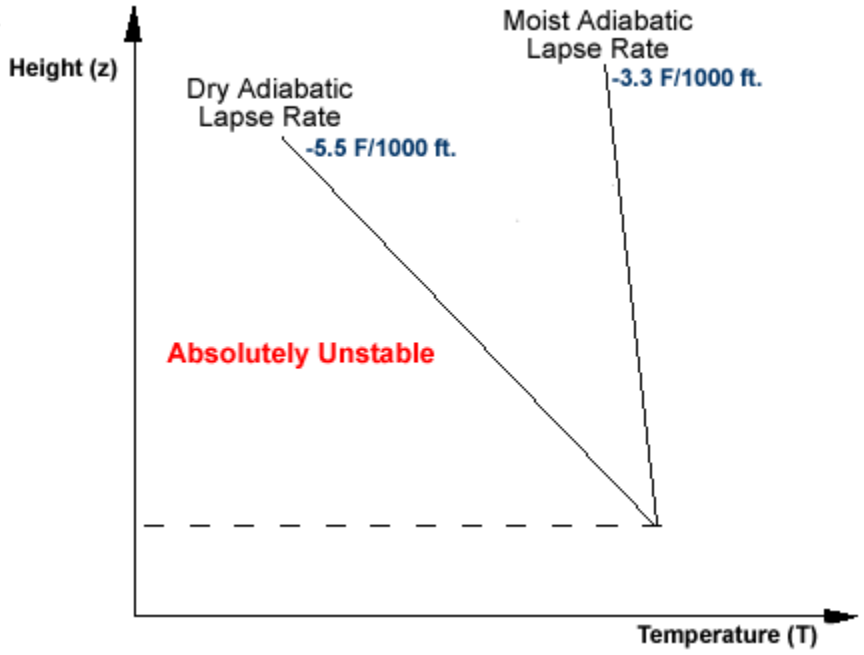
Q.58) Solution (d)

Basic Information:

- When air is forced to rise up in the atmosphere, the pressure reduces with height. For a given volume of gas, the pressure divided by the temperature remains constant (Boyle's Law). Therefore, as the air pressure reduces, so does the temperature.
- If no heat is exchanged with the surrounding air during this process, which is called "adiabatic cooling", the rate at which the air cools, the Adiabatic Lapse Rate (ALR) is a constant.
- For unsaturated air, the lapse rate is 3°C per 1000 feet; this is called the Dry Adiabatic Lapse Rate (DALR). However, when the parcel of air reaches the Dew Point and becomes saturated, water vapour condenses, latent heat is released during the condensation process, which warms the air, and the lapse rate reduces. The Saturated Adiabatic Lapse Rate (SALR) is therefore the rate at which saturated air cools with height and is, at low levels and latitudes, 1.5°C per thousand feet. At higher altitudes and latitudes, where

there is generally less water content in the air, and therefore less latent heat to release, the SALR is closer to 3°C per thousand feet.

- The ELR (Environmental Lapse Rate) is the actual rate at which the ambient temperature changes with height.
- Considering the parcel of air as before and utilizing the DALR and SALR for that parcel of air in contrast to the surrounding air:
- If the ELR is greater than the ALR, rising air will be warmer than the surrounding air and therefore keep rising; the atmosphere is then said to be unstable. If ELR is greater than SALR, the air is said to be absolutely unstable, since the air, whether saturated or unsaturated, will always have a higher temperature than it surroundings.
- When the ELR is less than the SALR and greater than the DALR, then the air is considered conditionally unstable: the condition being whether the air is saturated or not.
- If the ELR is less than the ALR, then the rising air will be cooler than the surrounding air and will sink - the atmosphere is said to be stable. If the ELR is less than the DALR, the air is said to be absolutely stable, since the air, whether saturated or unsaturated, will always be cooler than the surrounding air.
- The distinctions between stability and instability as noted above are the foundation of weather analysis, in particular for afternoon airmass thunderstorm development or stable conditions. The most complex situation is when the troposphere is considered conditionally unstable, since a trigger may be needed to enhance either the stability or instability factor.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	**Incorrect**	**Correct**
If the ELR is greater than the ALR, rising air will be warmer than the surrounding air and therefore keep rising; the atmosphere is then said to be **unstable**.	When the ELR is less than the ALR, the air packet is cooler than the surrounding air and will not rise; a **stable** condition.	Less moisture means less latent heat released due to condensation, therefore, the air packet will cool faster.

Q.59) Consider the following statements about the characteristics prevalent during El Nino:

1. In an El Nino year, air pressure drops over large areas of the central Pacific and along the coast of South America.
2. Peruvian coast gets relatively cooler during El Nino than normal times.
3. El Nino brings drought to the western Pacific and rains to the equatorial coast of South America.

Which of the above statements is/are correct?

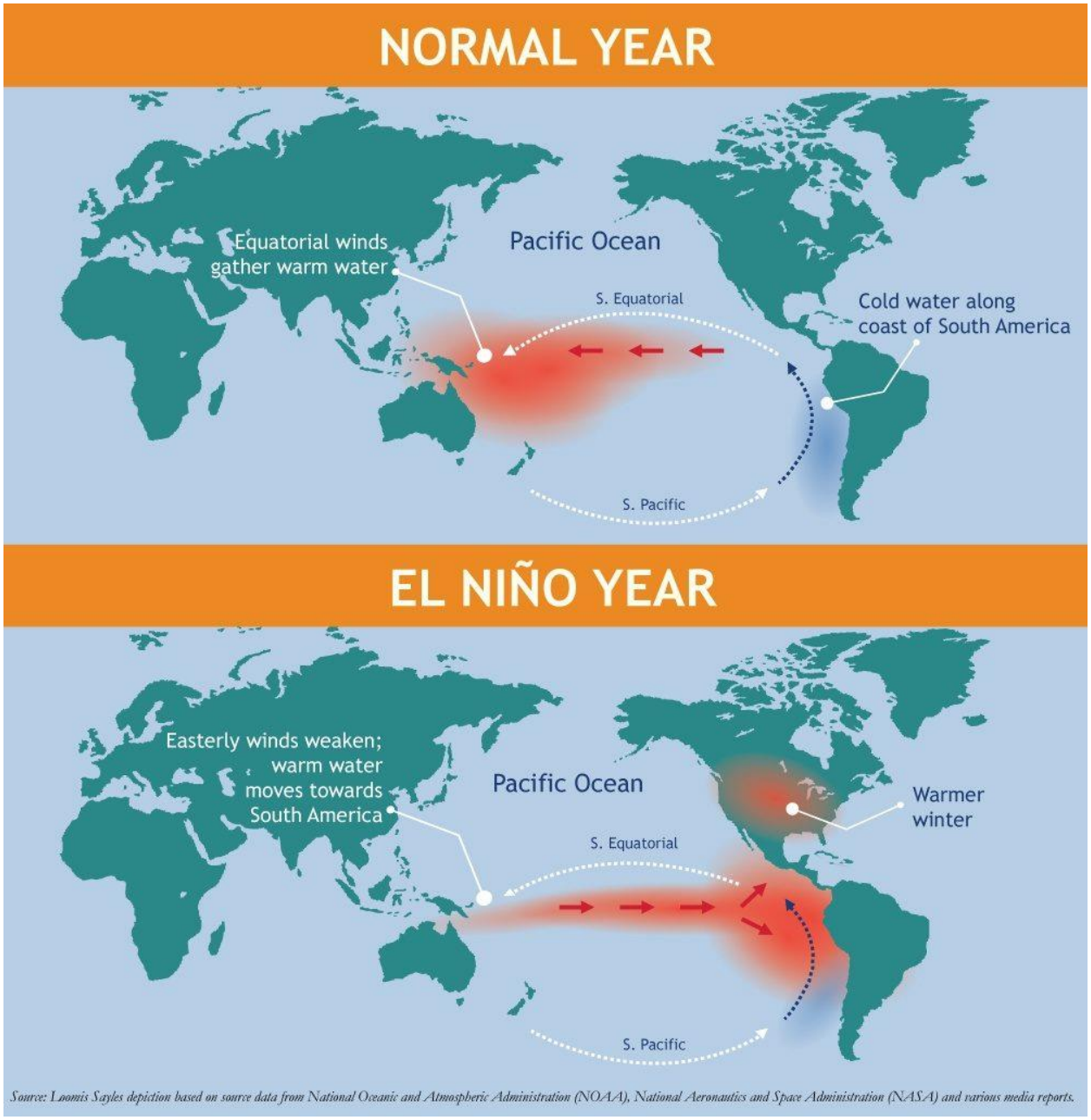
a) 2 and 3 only
b) 1 and 3 only
c) 2 only
d) 1, 2 and 3

Q.59) Solution (b)

Basic Information:

- El Nino is the name given to the occasional development of warm ocean surface waters along the coast of Ecuador and Peru.
- When this warming occurs the usual upwelling of cold, nutrient rich deep ocean water is significantly reduced.
- El Nino normally occurs around Christmas and usually lasts for a few weeks to a few months.
- In an El Nino year, air pressure drops over large areas of the central Pacific and along the coast of South America.

- The normal low pressure system is replaced by a weak high in the western Pacific (the southern oscillation). This change in the pressure pattern causes the trade winds to be reduced, thereby weakening the Walker Cell. Sometimes Walker Cell might even get reversed.
- Climatically, the development of an El Niño brings drought to the western Pacific, rains to the equatorial coast of South America, and convective storms and hurricanes to the central Pacific.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Incorrect**	**Correct**
It is a fact. In an El Nino year, air pressure drops over large areas of the central Pacific and along the coast of South America.	The pressure drop and accumulation of warm water along the Peruvian coast keeps it relatively warm (observe the figure above).	El Nino brings drought to the western Pacific, rains to the equatorial coast of South America, and convective storms and hurricanes to the central Pacific.

Q.60) Select the incorrect statements with respect to Steppes type of climate:

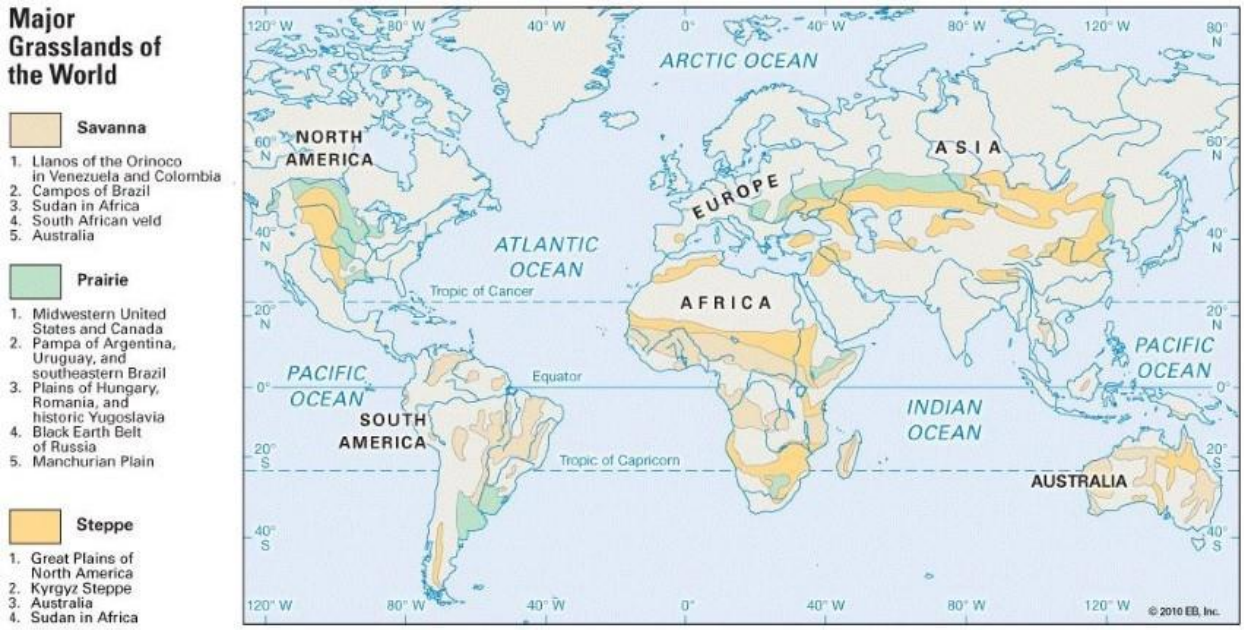
a) Climate is continental with extremes of temperature.
b) Steppes type of climate in the southern hemisphere is more severe.
c) The heaviest rain comes in summer in.
d) Southern hemisphere experiences more rainfall.

Q.60) Solution (b)

Basic information:

- Climate is continental with extremes of temperature.
- Temperatures vary greatly between summer and winter.
- The summers are hot and the winters are cold.
- Summers are very warm, over 18 – 20° C.
- The steppe type of climate in the southern hemisphere is never severe.
- The average rainfall may be taken as about 45 cm, but this varies according to location from 25 cm to 75 cm.
- The heaviest rain comes in June and July (late spring and early summer).
- Most of the winter months have about 2.5 cm of precipitation, brought by the occasional depressions of the Westerlies and coming in the form of snow.
- The maritime influence in the southern hemisphere causes more rainfall.

- The major grasslands of the world correspond to the Steppes type of climate.



Q.61) Consider the following statements about "Peninsular Rivers":

1. The Peninsular Rivers have shorter and deeper courses as compared to their Himalayan counterparts.
2. They are characterized by absence of meanders.

Which of the above statements is/are *NOT* correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.61) Solution (a)

Note: Incorrect statements are asked in the question.

Basic Information:

- Peninsula Rivers are much older than the Himalayan Rivers.

- They are non-perennial/seasonal rivers with a maximum discharge in the rainy season.
- The main water divide in peninsular rivers is formed by the Western Ghats.
- The peninsular rivers have reached mature stage and have almost reached their base level.
- The rivers are characterized by broad and shallow valleys.
- The river banks have gentle slopes except for a limited tract where faulting forms steep sides.
- The east flowing rivers like the Mahanadi, the Godavari, the Krishna and the Cauvery draining into the Bay of Bengal make deltas at their mouths.
- But the west flowing rivers like Narmada and Tapi as well as those originating from the Western Ghats and falling in the Arabian Sea form estuaries in place of deltas.

Statement Analysis:

Statement 1	Statement 2
Incorrect	**Correct**
The Peninsular Rivers have **shorter** and **shallower** courses as compared to their Himalayan counterparts.	Reasons for absence of meandering of rivers are twofold, primarily the river flows over **hard rock** and secondly most of the rivers are in **youth stage**.

Q.62) With reference to Monsoon, consider the following statements:

1. Spatial distribution of rainfall is largely governed by relief or topography.
2. Amount of rainfall in different parts is related to the continentality effect.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.62) Solution (c)

Basic Information:

Generally, across the world, the monsoons are experienced in the tropical area roughly between 20° N and 20° S.

The climate of India is described as the '**monsoon'** type. In Asia, this type of climate is found mainly in the south and the southeast.

Out of a total of 4 seasonal divisions of India, monsoon occupy 2 divisions:

- **The southwest monsoon season:** Rainfall received from the southwest monsoons is seasonal in character, which occurs between June and September.
- **The retreating monsoon season:** The months of October and November are known for retreating monsoons.

Statement Analysis:

Statement 1	**Statement 2**
Correct	**Correct**
Spatial distribution of rainfall is largely governed by **relief or topography**. For instance, the windward side of the Western Ghats registers a rainfall of over 250 cm while the leeward side receives much less rainfall. Again, the heavy rainfall in the north-eastern states can be attributed to their hill ranges and the Eastern Himalayas. Rainfall ranges from 20 cm in western Rajasthan to more than 400 cm in certain parts of Western Ghats and North-East India. Less rainfall in the Rajasthan is because the South-West monsoon winds coming from the Arabian Sea are parallel to the Aravali range there.	The monsoon rainfall has a **declining** trend with **increasing distance from the sea**. **Continentality:** It refers to a climatic effect that emerges because of the different range of temperature that exists at places lying in the interior of the continent away from the moderating influence of the sea and the places that are located near the continent.

Q.63) Consider the following statements:

1. Pranhita is the largest tributary of Godavari.
2. Unlike Deccan Rivers it flows in south direction.

3. Kaleshwaram Lift Irrigation Project of Andhra Pradesh starts at the confluence point of Pranhita River and Godavari River.

Which of the above statements is/are correct?

a) 1 and 2 only
b) 3 only
c) 2 and 3 only
d) 1, 2 and 3

Q.63) Solution (a)

Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Incorrect**
Pranahita river is the **largest** tributary of the Godavari river covering about **34%** of its drainage basin.	Unlike Deccan Rivers it flows in south direction.	Kaleshwaram Lift Irrigation Project of **Telangana** starts at the confluence point of Pranhita River and Godavari River.

Q.64) Consider the following statements:

1. Kerala has bimodal pattern of rainfall.
2. Diurnal range of temperature is low during Retreating monsoon season.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.64) Solution (a)

Basic Information:

Diurnal range of temperature:

- The difference between the **daily maximum** and **minimum temperature** is called Diurnal range of temperature.
- Changes in this kind of temperature have multiple possible causes (cloud cover, urban heat, land-use change, aerosols, water vapour and greenhouse gases).
- In the Thar Desert, the day temperature may rise to 50ºC and drop down to near 15°C the same night, whereas, there is hardly any difference in day and night temperatures in other places like Karnataka and Maharashtra.

Retreating Monsoon

- During the months of October-November, the south-west monsoon winds become weaker and start to retreat from the skies of North India. This phase of the monsoon is known as the retreating monsoon.
- With the onset of retreating monsoon, skies become clearer and clouds disappear. The disappearance of clouds makes the climate of various places hotter gradually. Severe tropical cyclones emerge from the Bay of Bengal. The month of October-November is prone to severe cyclones.

Statement Analysis:

Statement 1	**Statement 2**
Correct	**Incorrect**
Kerala has bimodal pattern of rainfall i.e. it receives rainfall from both south-west monsoon and retreating monsoon.	Diurnal range of temperature is **high** during Retreating monsoon season. **October Heat**: The retreating southwest monsoon season is marked by clear skies and a rise in temperature. Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive. This is commonly known as the 'October heat'. The day is hot but the nights are cool hence, the **diurnal range of temperature is high**.

Q.65) Which of the following pairs is/are correctly matched?

1. Inconsequent River: Godavari
2. Subsequent River: Son
3. Consequent River: Kali

Select the correct pair(s) using the codes given below:

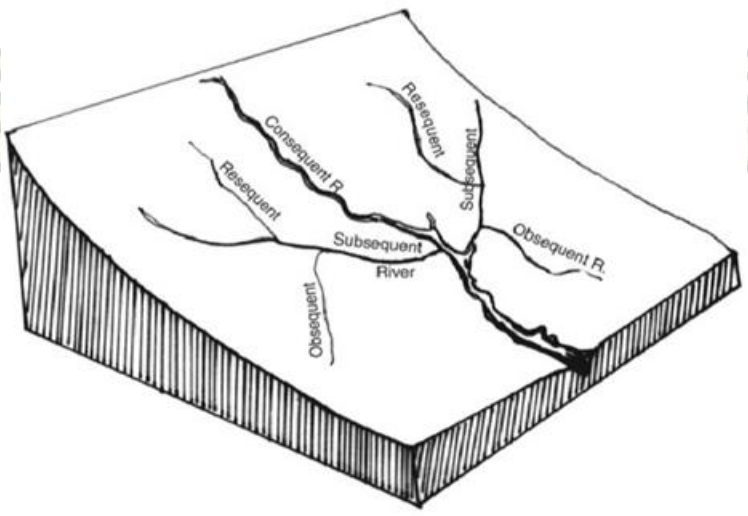
a) 1 only
b) 2 only
c) 3 only
d) 1 and 2 only

Q.65) Solution (b)

Basic Information:

Concordant/Accordant Drainage: The pattern of drainage which arises from and closely follows the trends of the underlying strata is called concordant drainage.

- **Consequent Streams:** Those streams whose courses are the direct consequence of the initial topography are called consequent streams.
- **Subsequent Streams:** These are developed after the master consequent.
- **Obsequent streams:** These flow in opposite direction to the master consequent.
- **Resequent Streams:** A resequent stream flows in the same direction as that of the initial consequent stream, but which develops in response to a new base level formed due to inversion of relief.



Inconsequent or Antecedent River: The river that existed before upheaval of Himalayas. E.g. Sutlej, **Kali**, Arun, Tista, Kosi, Brahmaputra etc.

Consequent Rivers: Peninsular rivers- **Godavar**i, Krishna, Kaveri etc.

Subsequent Rivers: Chmbal, Ken, Betwa, Tons, **Son**.

Q.66) Which among the following climate types is/are not found in India?

1. Cold steppe
2. Polar frost
3. Cold desert
4. Tropical savannah

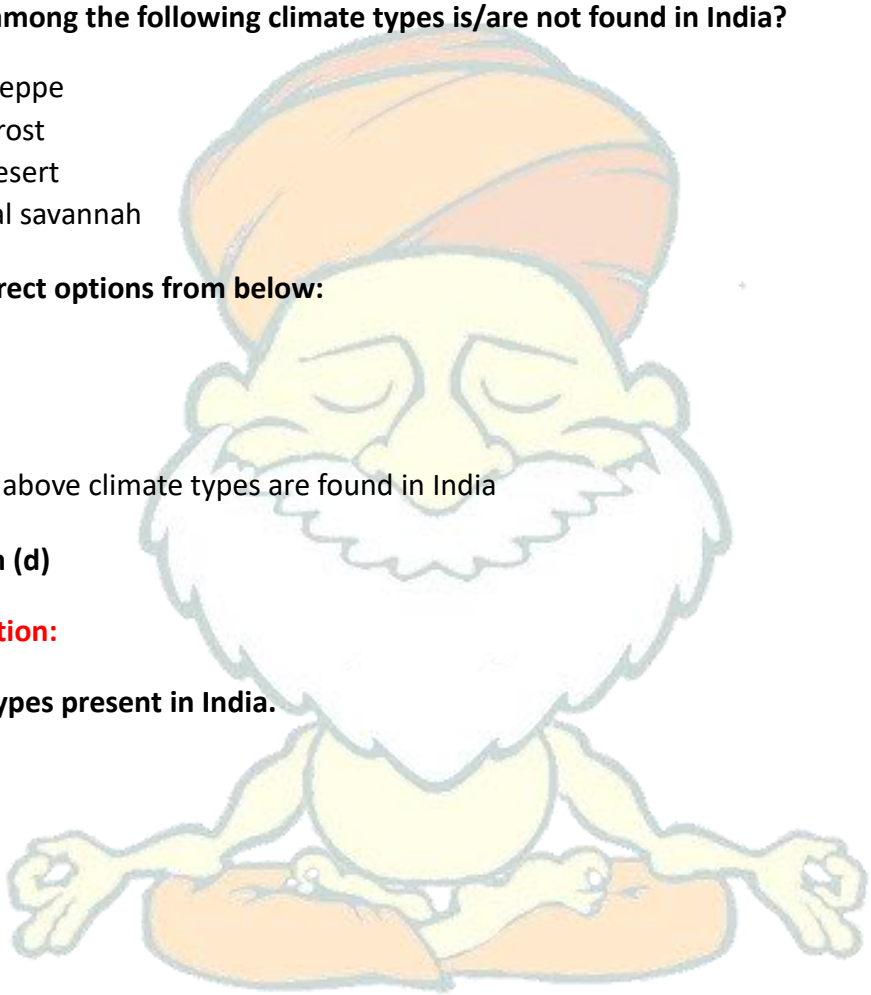
Select the correct options from below:

a) 1 only
b) 2 only
c) 4 only
d) All the above climate types are found in India

Q.66) Solution (d)

Basic Information:

The climatic types present in India.



The montane type of climate includes the following:

Q.67) Consider the following statements about India's climate:

1. Climate in South India is generally hotter and extremely humid than that of North India.
2. Generally, the southern half of the nation doesn't experience temperatures below 10 °C in winter.

Which of the following statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.67) Solution (c)

Basic Information:

- The climate of India comprises of a wide range of weather conditions across a vast geographic scale and varied topography, making generalizations difficult.
- Climate in South India is generally hotter and extremely humid than that of North India.
- South India is more humid due to nearby coasts. Southern half of the nation don't experience temperatures below 10 °C (50 °F) in winter, and the temperature usually tends to exceed 40 °C (104 °F) during summer.

Statement Analysis:

Statement 1	Statement 2
Correct	Correct

Sothern India closer to the equator, therefore is hotter.	Since southern India is closer to the equator, less extremities in the climate is observed.

Q.68) Arrange the following events of India's climatic history in a chronological order:

1. Mild climate favourable for hosting high-biomass ecosystems, underscored by India's vast coal reserves.
2. Creation of the Thar Desert.
3. Latest major ice age experienced by the Indian landmass.

Select the correct option from below:

a) 1-2-3
b) 2-1-3
c) 1-3-2
d) 2-3-1

Q.68) Solution (c)

Basic Information:

- India merged into the southern super continent Gondwana, a process beginning some 550–500 Ma. During the Late Paleozoic, Gondwana extended from a point at or near the South Pole to near the equator, where the Indian craton (stable continental crust) was positioned, resulting in a mild climate favorable to hosting high-biomass ecosystems.
- This is underscored by India's vast coal reserves—much of it from the late Paleozoic sedimentary sequence—the fourth-largest reserves in the world.
- The Quaternary Glaciation / Quaternary Ice Age started about 2.58 million years ago at the beginning of the Quaternary Period when the spread of ice sheets in the Northern Hemisphere began.
- More recently, in the Holocene epoch (4,800–6,300 years ago), parts of what is now the Thar Desert were wet enough to support perennial lakes; researchers have proposed that this was due to much higher winter precipitation, which coincided with stronger monsoons, later the Thar became dry and got converted into a desert.

Q.69) Which of the following statements about cloudbursts is *incorrect*?

a) A cloudburst is an extreme amount of precipitation in a short period of time, sometimes accompanied by hail and thunder.
b) Rainfall rate equal to or greater than 100 millimetres per hour over an area of approximately 20-30km^2.
c) They are caused due to both orographic upliftment and/or rapid convective upliftment.
d) Cloudbursts are common in the Gangetic plains during monsoon season.

Q.69) Solution (d)

Basic information:

- Cloudbursts in and around the southern rim of the Indian Himalayas are elusive in terms of their position and time of occurrences.
- Most of the reported cloudbursts are in the interior of the Himalayas and hence their observation itself is limited.
- The principal understanding of the cloudburst is associated with sudden heavy deluge of precipitation in very less time interval over a very small area.
- Except this understanding and India Meteorology Department (IMD) definition of N100 mm/h precipitation over a geographical region of approximately 20–30 km2 , nothing much else is known about these events
- Most of the cloudburst events are seen occurring in the elevation range of 1000 m to 2500 m within the valley folds of the southern rim of the Indian Himalayas. Apart from some of the large scale flow shown by few of the studies, it is found that cloudburst events are convectively triggered followed by orographically locked systems. These intertwined mechanisms lead cloudburst events to form. Amiss of any one of these mechanisms will not lead the cloudburst mechanism to form.
- However, cloudbursts are infrequent as they occur only via orographic lift or occasionally when a warm air parcel mixes with cooler air, resulting in sudden condensation.

Q.70) Consider the following statements about the summer season India:

1. The summer season in India begins from the month of March and continues till the month of May
2. During this season, thunder storms known as 'kalbaisakhi' hit the states of West Bengal and Assam.

3. An elongated high-pressure area develops from Thar Desert to the Chotanagpur plateau towards the end of May.
4. There is common occurrence of dust storm during mid to late summer season.

Which of the following statements is/are *incorrect*?

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

Q.70) Solution (b)

Basic Information:

- During the summer season, there is overall increase in temperature e.g. the temperature of Northern plains is between 42 to 45°C and in the Deccan plateau between 35 to 38°C.
- An elongated **low-pressure** area develops from Thar Desert (in North-West) to Patna and Chotanagpur plateau (in East and South-East) towards the end of May. From this low-pressure belt, the circulation of air begins.
- In the Northern and North-Westem plain, there is occurrence of a local wind; 'Loo'- a gusty, hot and dry wind.
- In the Northern India, there is common occurrence of dust storm in May.
- During this season, thunder storms known as 'kalbaisakhi' hit the states of West Bengal and Assam. These thunder storms are accompanied by heavy rainfall. It also rains in coastal Kerala and Karnataka. These showers are known as 'Mango showers' as they help in the early ripening of mangoes.

Statement Analysis:

Note: *incorrect statements are asked.*

Statement 1	Statement 2	Statement 3	Statement 4
Correct	**Correct**	**Incorrect**	**Correct**
Duration of summer season is from March till May.	Kalbaisakhis are intense thunderstorms, they help in bringing the temperature down and provide relief during	Intense heating during summer causes build-up of a low pressure.	Dust storms are common during summers.

	summers.		

Q.71) With reference to Indian Ocean Dipole (IOD), consider the following statements:

1. Positive IOD can bring good rains to India despite El Nino year.
2. During positive IOD eastern equatorial Indian Ocean off Sumatra becomes colder than normal.

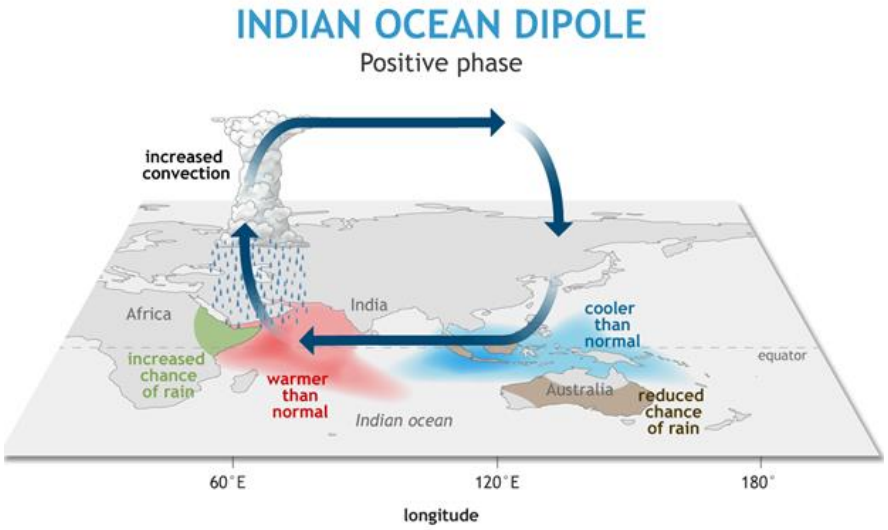
Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.71) Solution (c)

Basic Information:

- The **Indian Ocean Dipole** - often called the "**Indian Niño**" because of its similarity to its Pacific equivalent - refers to the difference in sea-surface temperatures in opposite parts of the Indian Ocean.
- This temperature difference results into **pressure difference** which results in flowing of winds between eastern and western parts of Indian Ocean.
- Temperatures in the eastern part of the ocean oscillate between warm and cold compared with the western part, cycling through phases referred to as "**positive**", "**neutral**" and "**negative**".
- A '**positive IOD'** or **simply 'IOD'** is associated with cooler than normal sea-surface temperatures in the eastern equatorial Indian Ocean and warmer than normal sea-surface temperatures in the western tropical Indian Ocean.
- The opposite phenomenon is called a '**negative IOD'**, and is characterised by warmer than normal SSTs in the eastern equatorial Indian Ocean and cooler than normal SSTs in the western tropical Indian Ocean.



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
It was demonstrated that a positive IOD index often negated the effect of ENSO, resulting in increased Monsoon rains in several ENSO years like the 1983, 1994 and 1997.	A 'positive IOD' is associated with cooler than normal sea-surface temperatures in the eastern equatorial Indian Ocean and warmer than normal sea-surface temperatures in the western tropical Indian Ocean.

Q.72) Which of the following best describes the term 'isohyet'?

a) A line on a map connecting points that have the same average percentage of cloudiness.
b) A line on a diagram or map connecting points relating to the same time or equal times.
c) A line on a map connecting points having the same amount of rainfall in a given period.
d) A line on a map or chart connecting points of equal wind speed.

Q.72) Solution (c)

Explanation:

Isoneph: A line on a map connecting points that have the same average percentage of cloudiness.

Isochrone: A line on a diagram or map connecting points relating to the same time or equal times.

Isohyet: A line on a map connecting points having the same amount of rainfall in a given period.

Isotach: A line on a map or chart connecting points of equal wind speed.

Q.73) Which of the following are correctly matched?

	Rivers	Confluence Location
1.	Dhauliganga and Alaknanda	Vishnuprayag
2.	Alaknanda and Bhagirathi	Devprayag
3.	Alaknanda and Mandakini	Kedarnath
4.	Alaknanda and Ganga	Rudraprayag

Select the correct option using the codes given below:

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

Q.73) Solution (a)

Explanation:

	Rivers	Confluence Location
1.	Dhauliganga and Alaknanda	Vishnuprayag
2.	Alaknanda and Bhagirathi	Devprayag
3.	Alaknanda and Mandakini	Rudraprayag

4. Alaknanda and Ganga Kedarnath

Q.74) With reference to "rivers of Goa", consider the following statements:

1. Mandovi is the longestriver of Goa.
2. Zuari is also known as the lifeline of Goa.
3. Terekhol forms boundary between Maharashtra and Goa.

Which of the above statements is/are correct?

a) 1 and 2 only
b) 2 only
c) 2 and 3 only
d) 3 only

Q.74) Solution (d)

Explanation:

Zuari:

- Longest river of Goa
- Originates at Hemad-Barshem in the Western Ghats
- Zuari and Madovi rivers form the backbone of Goa's agriculture
- Cumbahyem Canal links the two rivers
- Vaco da Gama city is located at its mouth

Mandovi:

- Also known as Mahadeyi or Mahadei
- Lifeline of Goa
- It originates at Bhimgad in the Belgaum district of Karnataka
- Falls: Dudhsagar Falls, Varapoha Falls
- Cities: Panaji, Old Goa

Terekhol:

- In its upper reaches it is known as the Banda River and in the lower reaches as the Tiracol.
- It forms the boundary between Sindhudurg district of Maharashtra state and North Goa district of Goa state for some distance.

Q.75) Consider the following statements:

1. Catchment area is the smallest unit of a drainage basin.
2. Catchment area of Krishna is larger than that of Brahmaputra in India.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.75) Solution (b)

Basic Information:

The Class XI NCERT textbook on Indian Physical Geography uses **drainage basin** for the **whole**

river system, along with all the **tributaries of that particular river.** Drainage basin is larger in size.

Watershed, according to it, is much **smalle**r. It is the area **drained by smaller rivulets** through gullies and rills and several such watersheds combine to form the larger drainage basin of a single river.

Command area is more of an economic term. It is the area 'served' (in terms of irrigation, mostly) by a particular reservoir/ dam or irrigation project.

Name of river	Catchment areas (Sq kms)
Ganga	861452
Indus (In India)	321289
Brahmaputra	194413
Mahanadi	141589
Godavari	312812
Cauvery	81155
Krishna	258948
Narmada	98795
Tapi	65145

Statement Analysis:

Statement 1	Statement 2
Incorrect	**Correct**
Watershed is the smallest unit of a drainage basin.	Kindly refer to the table.

Q.76) Which of the following factors affect the Indian climate?

1. Sea-surface temperatures across the central and east-central Equatorial Pacific.
2. North-easterly jet stream
3. Presence of Himalayas in the north.

Select the correct option from below:

a) 2 and 3 only
b) 1, 2 and 3
c) 1 and 3 only
d) None of the above

Q.76) Solution (b)

Basic information:

The Climate in India is affected by following factors:

I. Latitude
II. Himalaya Mountains
III. Altitude
IV. Distance from the sea
V. Geographical limits like western disturbances, conditions in the regions surrounding India, Conditions over the ocean.
VI. Jet Streams.

El Niño is a complex weather pattern resulting from variations in ocean temperatures in the Equatorial Pacific region along South America. The term El Niño refers to the large-scale ocean-atmosphere climate interaction linked to a **periodic warming in sea surface temperatures across the central and east-central Equatorial Pacific**.

The system involves oceanic and atmospheric phenomena with the appearance of warm currents off the coast of Peru in the eastern pacific and affects weather in many places including India.

Statement Analysis:

Statement 1	Statement 2	Statement 3

Correct	Correct	Correct
This phenomenon is nothing but El Nino.	North-easterly jet stream helps bringing monsoon winds to the Indian landmass.	Presence of Himalayas makes climate of north India fairly warm. It also helps in monsoon rains.

Q.77) With respect to western disturbances, consider the following statements:

1. It brings sudden winter rain to the north-western parts of the Indian subcontinent.
2. It is a non-monsoonal precipitation pattern driven by the easterlies.
3. Western disturbances are usually associated with cloudy sky and higher night temperatures
4. When they move across northwest India before the onset of monsoon, a temporary advancement of monsoon current appears over the region.

Which of the following statements is/are correct?

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

Q.77) Solution (a)

Basic information:

- A western disturbance is an extra-tropical storm originating in the Mediterranean region that brings sudden winter rain to the north-western parts of the Indian subcontinent. It is a non-monsoonal precipitation pattern driven by the westerlies. The moisture in these storms usually originates over the Mediterranean Sea, the Caspian Sea and the Black Sea.
- The disturbance moves towards the Indian subcontinent until the Himalayas inhibits its development, upon which the depression rapidly weakens. The western disturbances are embedded in the mid-latitude subtropical westerly jet stream.
- Western disturbances, specifically the ones in winter, bring moderate to heavy rain in low-lying areas and heavy snow to mountainous areas of the Indian Subcontinent. They are the cause of most winter and post-monsoon season rainfall across northwest India. Precipitation during the winter season has great importance in agriculture, particularly

for the rabi crops. Wheat among them is one of the most important crops, which helps to meet India's food security. **An average of four to five western disturbances form during the winter season**. The rainfall distribution and amount varies with every western disturbance.

- When western disturbances move across northwest India before the onset of monsoon, a temporary advancement of monsoon current appears over the region.

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Correct	**Incorrect**	**Correct**	**Correct**
A western disturbance is an extra-tropical storm originating in the Mediterranean region that brings sudden winter rain to the north-western parts of the Indian subcontinent	Western disturbances are driven by the westerlies.	Presence of clouds prevent radiational loss of heat.	Presence of low pressure area pulls the monsoon winds towards the Indian landmass.

Q.78) Consider the following statements about climate of "seven sister" states of India:

1. Nowhere in the region, there is heavy snow except in the higher parts of Arunachal Pradesh.
2. June is the rainiest month in these states.

Select the correct statement(s):

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.78) Solution (c)

Basic Information:

- Lying very close to the Tropics, North-East India displays, to a large extent, the character of tropical climate, especially in the valleys.
- The region has a monsoon climate with heavy to very heavy rains, confined within four summer months from June to September. The southwest monsoon is the main source of rain, and **June is the rainiest month.**
- There are three seasons in the area, winter, summer and rainy season, though rainy season, as in the rest of India, coincides with summer months.
- There is a climatic contrast between the valleys and the mountainous region. While the mean January temperature in the valley region of Assam is around 16 °C, the temperatures in the mountainous region of Arunachal Pradesh and Nagaland hover around a maximum of 14 °C and a sub-zero minimum temperature.
- The summer temperatures in the plains vary between 30 and 33 °C, while the hills have a mean summer temperature of around 20 °C with a mean minimum of 15 °C.
- Nowhere in the region, there is heavy snow except in the higher parts of Arunachal Pradesh, like west Kameng and Tawang areas.
- No part of North-East India receives rainfall below 1,000 mm.
- Guwahati, being in the rain shadow of the Meghalaya plateau, receives only 1,717 mm of rain. About 90 % of the rain is received during the southwest summer monsoon, and June is by far the rainiest month.
- The hilly areas of the region receive 2,000–3,000 mm of rain, though places like Kohima in Nagaland and Imphal in Manipur, because of their being in the shadow of the mountains, receive less than 2,000 mm of rains.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Heavy snow is present only in the higher reaches of Himalayas. Note: Sikkim is not included in the seven sister states.	June is by far the rainiest month.

Q.79) Consider the following statements about the Teesta river:

1. The Teesta originates from Pahunri mountain.
2. River Mahananda is a tributary to the Teesta river.

Select the *incorrect* statements:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.79) Solution (b)

Teesta River, is a 315 km long river that rises in the eastern Himalayas.

- It flows through the Indian states of Sikkim and West Bengal through Bangladesh and enters the Bay of Bengal.
- In India, it flows through Darjeeling district and the cities of Rangpo, Jalpaiguri and Mekhliganj. It joins the Jamuna River at Fulchhari in Bangladesh.
- The Teesta River originates from the Pahunri (or Teesta Kangse) glacier above 7,068 metres (23,189 ft), and flows southward through gorges and rapids in the Sikkim Himalaya.
- The Mahananda originates in the Himalayas: Paglajhora Falls on Mahaldiram Hill near Chimli, east of Kurseong in Darjeeling district at an elevation of 2,100 metres.
- It joins the Ganges at Godagiri in Nawabganj district in Bangladesh.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Pauhunri is a mountain in the Eastern Himalayas. It is located on the border of Sikkim, India and Tibet and is situated about 75 km northeast of Kangchenjunga. It marks the origin of Teesta river	The Mahananda is a tributary of the Ganga river.

Q.80) Which of the following coasts of India is most vulnerable to tropical cyclones?

a) Coromandel coast
b) Malabar coast
c) Northern Circars
d) Utkal Coast

Q.80) Solution (d)

Basin Information:

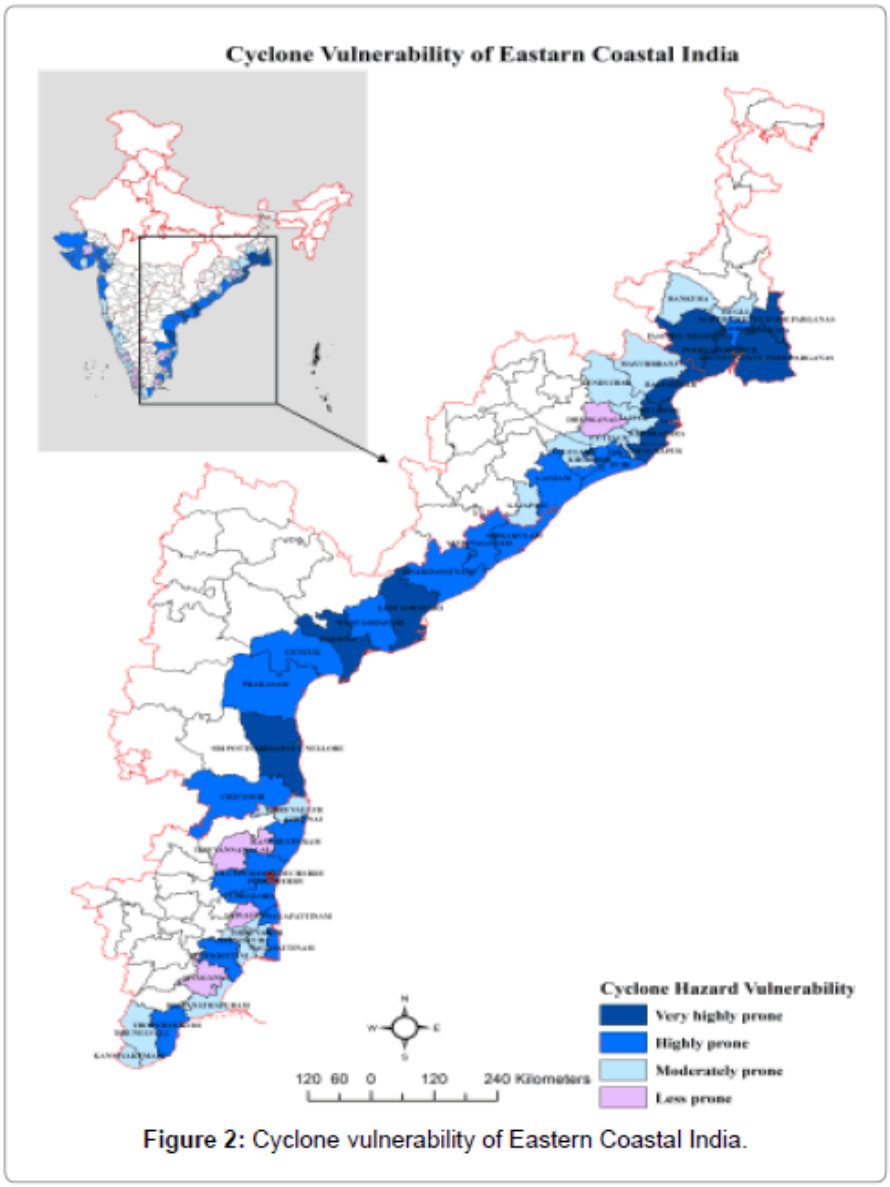
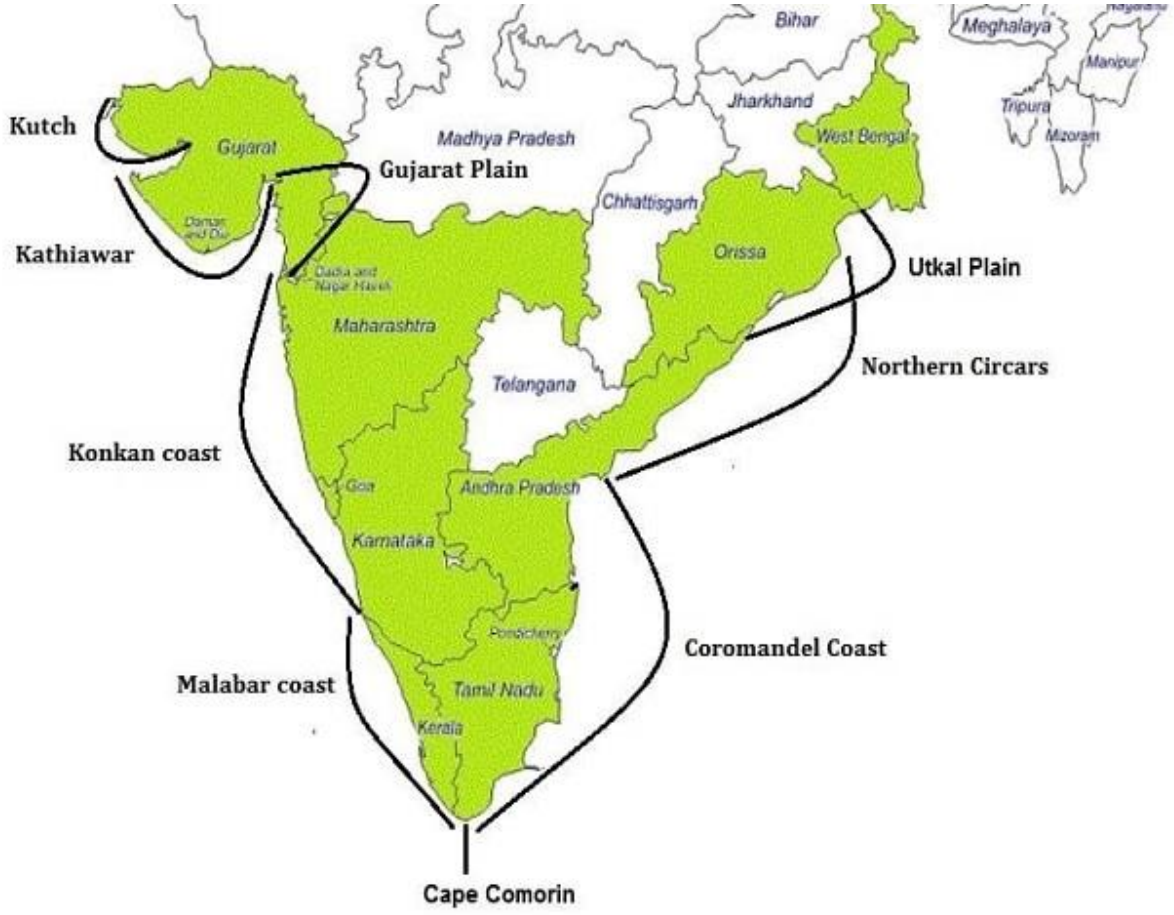


Figure 2: Cyclone vulnerability of Eastern Coastal India.

Nomenclature of coasts of India:



Q.81) Consider the following statements:

1. Groundwater hosts more water than lakes and rivers combined.
2. Deep-sea trenches are formed at the continent margin.
3. Eastern coast of North America has wider continental shelf than coast of Chile.

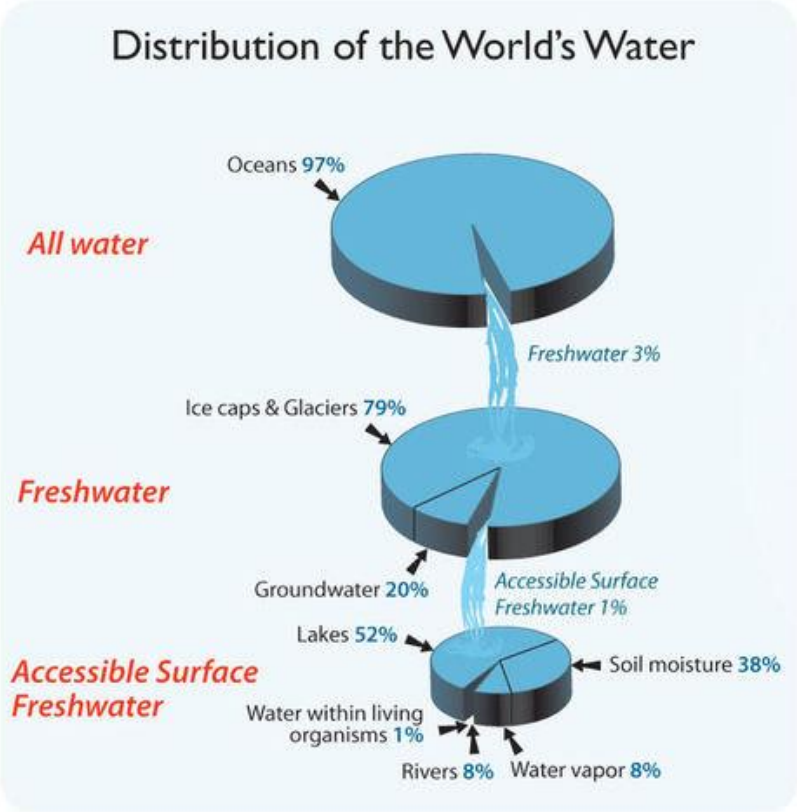
Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) 3 only
d) 1, 2 and 3

Q.81) Solution (d)

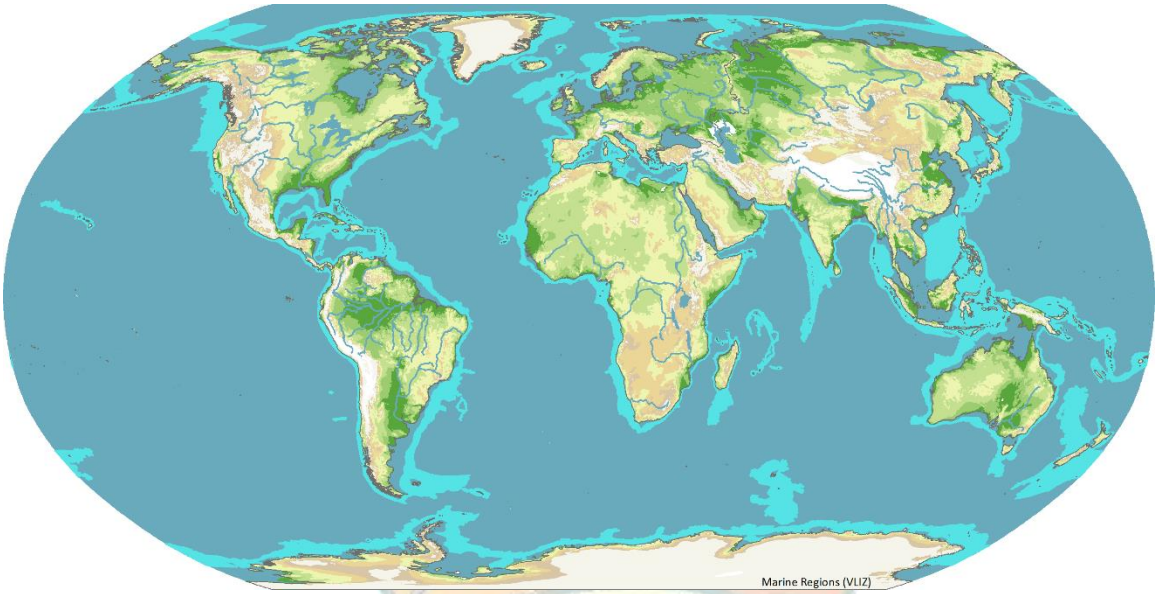
Basic Information:

Earth's water distribution:



Continental shelf:

- The continental shelf is the extended margin of each continent occupied by relatively shallow seas and gulfs. It is the shallowest part of the ocean showing an average gradient of 1° or even less.
- The shelf typically ends at a very steep slope, called the **shelf break**.
- The width of the continental shelves varies from one ocean to another. The average width of continental shelves is about 80 km.
- The shelves are **almost absent or very narrow** along some of the margins like the **coasts of Chile,** the **west coast of Sumatra**, etc. On the contrary, the Siberian shelf in the Arctic Ocean, the largest in the world, stretches to 1,500 km in width.



Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
Surface water (lakes, rivers etc.) constitutes not more than 1% of the total freshwater. Whereas groundwater constitutes more than 20%.	When the oceanic crust is subducted under continental crust along with the continental-oceanic crusts convergent boundary (the continent margin abyssal plain boundary), deep-sea trenches are formed.	The shelves are **almost absent or very narrow** along some of the margins like the **coasts of Chile,** the **west coast of Sumatra etc.**

Q.82) The phenomenon of "Ekman Transport" is related with?

a) Ocean Deposits
b) Waves
c) Tides
d) Ocean Currents

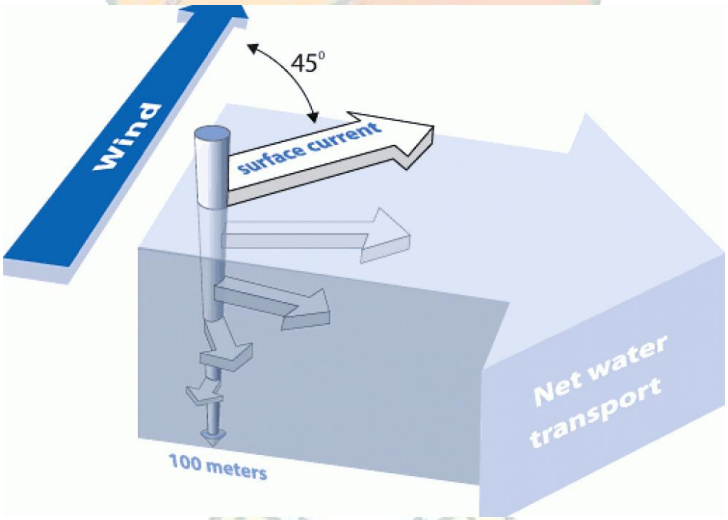
Q.82) Solution (d)

Explanation:

Ekman Spiral/Ekman Transport is the result of **Coriolis force** on the movement of surface water. The wind-stress moves the uppermost layer of water. This layer, in turn, drags the layer below it. Each deeper layer moves more slowly than the layer above it until the movement ceases at a depth of about 100 meters.

All layers of water are deflected by Coriolis force to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. As a result, each successive layer moves 45 degrees to the direction of drag force being applied. This creates a **twisting effect** creating the **spiral**. The spiral is known as Ekman Spiral and each subsequent layer is called the Ekman Layer.

The average movement of all the layers comes out to be 90 degrees to the direction of the surface wind.



Ekman Spiral gives rise to '**Gyres**'. These are **ocean-circling currents** that occur north and south of the equator.

Q.83) With reference to "Submarine Canyons", consider the following statements:

1. Submarine canyons are formed via erosion and mass wasting events.
2. A submarine canyon can extend up to the mouth of the rivers.
3. Due to turbidity current they are devoid of primary productivity.

Which of the above statements is/are correct?

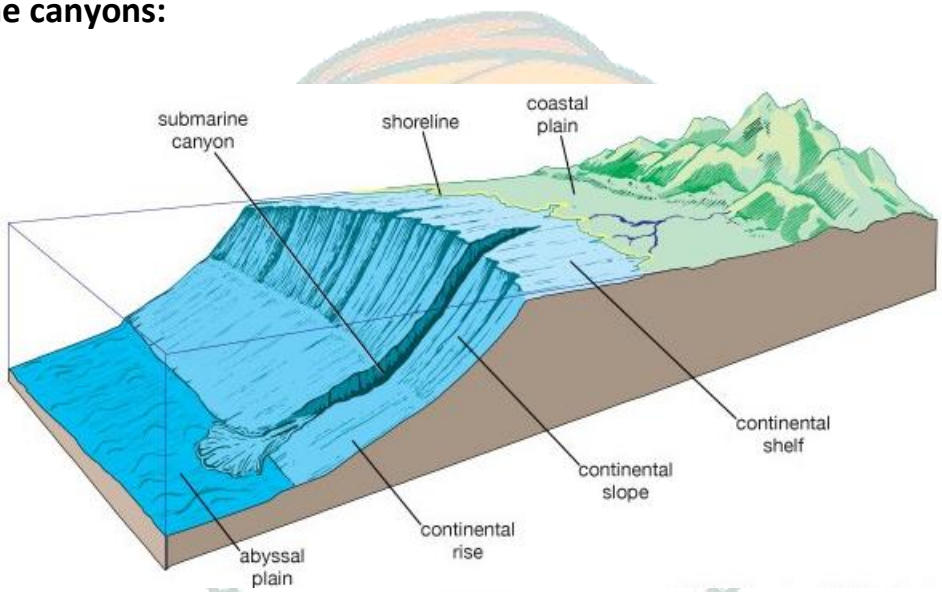
a) 1 and 2 only

b) 2 and 3 only
c) 1 and 3 only
d) 1, 2 and 3

Q.83) Solution (a)

Basic Information:

Submarine canyons:



- Submarine canyons are formed via **erosion** and mass **wasting events**, particularly on steep continental slopes but also on the flanks of volcanic islands.
- Canyons serve as conduits for terrigenous (land-derived) sediment derived from the continents to the deep ocean basins.
- Many of the world's largest submarine canyons commence on the **continental shelf**, and sometimes at the **mouths of large rivers or glaciers**, and are incised into the continental slope.
- Oceanographically, canyons may affect local upwelling patterns and **enhanced primary productivity** which extends up the food chain to include birds and mammals.
- Consequently, commercially important pelagic and demersal fisheries as well as cetacean feeding grounds are commonly located at the heads of submarine canyons.

Statement Analysis:

Statement 1	Statement 2	Statement 3

Correct	Correct	Incorrect
Submarine canyons are formed via **erosion** and mass **wasting events**, particularly on steep continental slopes but also on the flanks of volcanic islands.	A submarine canyon is a steep-sided valley of the oceans. They cut into the seabed of the continental slope, sometimes extending well onto the continental shelf, **up to the mouth of the rivers**.	The driving force behind the **enhanced productivity** is the **upwelling** and **mixing of cold, nutrient-rich waters** affected by canyon geomorphology interacting with ocean currents and internal waves.

Q.84) With respect to the ocean deposits consider the following statements:

1. Red clay is the most abundant of deep water deposits.
2. Calcareous biological ooze is found above carbon compensation depth.

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.84) Solution (c)

Basic Information:

Biogenous deposits – They include the organic deposits received from the dead animals and fishes. It also includes the shells and waste released by marine plants. In order to be categorized as organic particles, they should retain atleast 30% of their organic content.

The oozes- The biological deposits of oceans are called Oozes.

- Made of - shelly and skeletal remains of marine organism
- They have very fine, flour like texture and occur as accumulated deposits or float about in suspension.

They can be of two types –

- **Calcareous Oozes –** They have **high quantity of calcium**. Calcareous oozes may be divided based on the type of organism present in the sedimentary deposition. They are called Globigerina and pteropod.
- **Siliceous Oozes –** They have high quantity of silicon and found beyond 2500 m. Siliceous oozes comprise two forms, including diatom ooze and radiolarian ooze.

Red clay

They are one of the finest deposits found on the ocean floor.

- Occur as red clay in deep oceanic basin. (abundant in Pacific Ocean)
- These are believed as volcanic dust blown out from volcanoes during volcanic eruptions.

Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Red clay are most abundant of deep water deposits almost 30-40%. Red clay comprises the most widely distributed specific pelagic deposit and covers more than half of the total ocean floor in the Pacific Ocean.	Calcareous biological ooze is found above carbon compensation depth since deeper water contains more carbon dioxide leading to calcium carbonate dissolution.

Q.85) With reference to "Marine Heat Wave", consider the following statements:

1. Marine heat waves occur only in summer.
2. Marine heat wave is unique to Pacific Ocean.
3. The most common drivers of marine heat waves include ocean and air-sea heat flux.
4. It always negatively affects ecosystem structure.

Which of the following statements is/are correct?

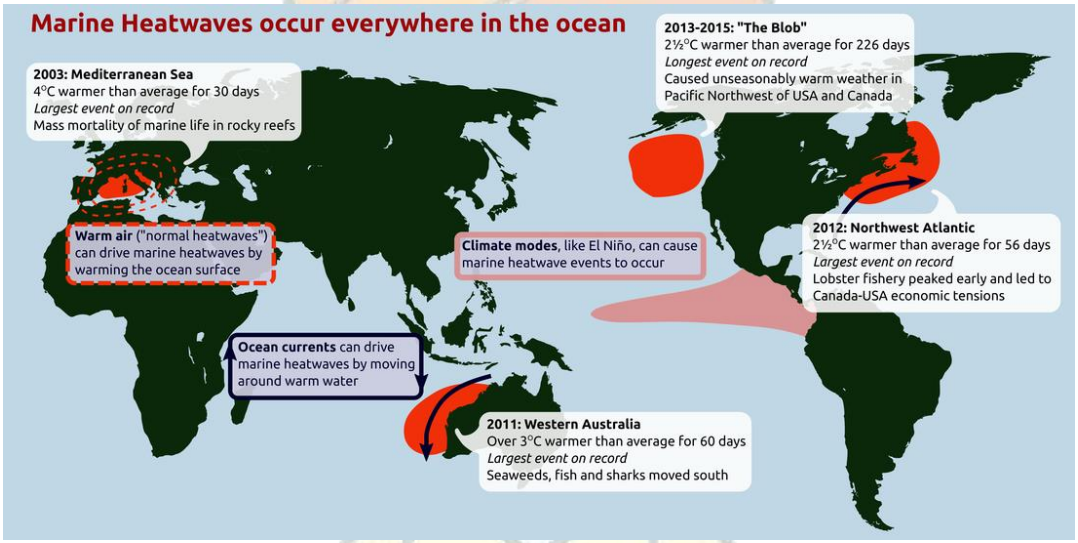
a) 1, 3 and 4 only
b) 3 only
c) 2 and 4 only

d) 3 and 4

Q.85) Solution (b)

Basic Information:

- We know that heatwaves occur in the atmosphere. We are all familiar with these extended periods of excessively hot weather. However, heatwaves can also occur in the ocean and these are known as **marine heatwaves,** or **MHWs**.
- These marine heatwaves, when ocean temperatures are extremely warm for an extended period of time can have significant impacts on marine ecosystems and industries. **Marine heatwaves can occur in summer or winter** - they are defined based on differences with expected temperatures for the location and time of year.



Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Incorrect	Incorrect	Correct	Incorrect
Heatwaves can happen in summer and also in winter, where they are known as "**winter warm-spells**".	They occur everywhere in the ocean. Refer the figure given above.	Marine heatwaves can be caused by a whole range of factors, and not all factors are important for each event. The most common drivers of marine heatwaves include ocean	Marine heatwaves affect ecosystem structure, by **supporting certain species** and **suppressing others.** Marine heatwaves can change the

		currents which can build up areas of warm water and air-sea heat flux, or warming through the ocean surface from the atmosphere.	habitat ranges of certain species, such as the spiny sea urchin off southeastern Australia which has been expanding southward into Tasmania at the expense of kelp forests which it feeds upon.

Q.86) Consider the following statements about abyssal plains:

1. Abyssal plains are flat featureless plains.
2. Fine to coarse grain sediments are deposited on the abyssal plains.

Which of the following statements is/are correct?

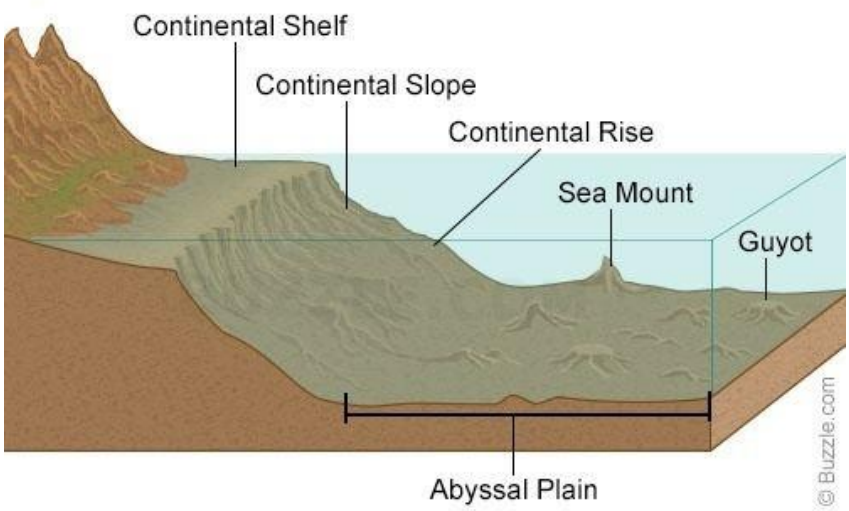
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.86) Solution (b)

Basic Information:

- At depths of over 10,000 feet and covering 70% of the ocean floor, abyssal plains are the largest habitat on earth.
- The plains are thought to be the upper surfaces of land-derived sediment that accumulates in abyssal depressions, thus smoothing out a preexisting hilly or otherwise irregular topography.

Cross section of the Ocean floor



- Sediment from the continental margins accretes at steep continental slopes, and occasional submarine slumping of this coarse material creates dense, sediment-laden slurries, called turbidity currents, that flow down the slopes in obedience to gravity. Part of the turbidity-current sediment settles out at the bases of the continental slopes, creating continental rises of lesser gradient, but some of the coarse sediment reaches the abyssal depressions. Horizontal silty, sandy, and even gravelly beds that are fractions of a centimetre to several metres thick comprise 2 to 90 percent of abyssal-plain sediment. Many such layers demonstrably are of shallow-water organisms.
- The coarse layers are interbedded with homogeneous deposits of fine-grained clay and the microscopic remains of organisms that inhabit the waters overlying the abyssal plains.

Statement Analysis:

Statement 1	Statement 2
Incorrect	**Correct**
Abyssal plains have undulating topography with occasional seamounts, guyots, sea knolls, etc.	Abyssal plains have sediments overlain over them.

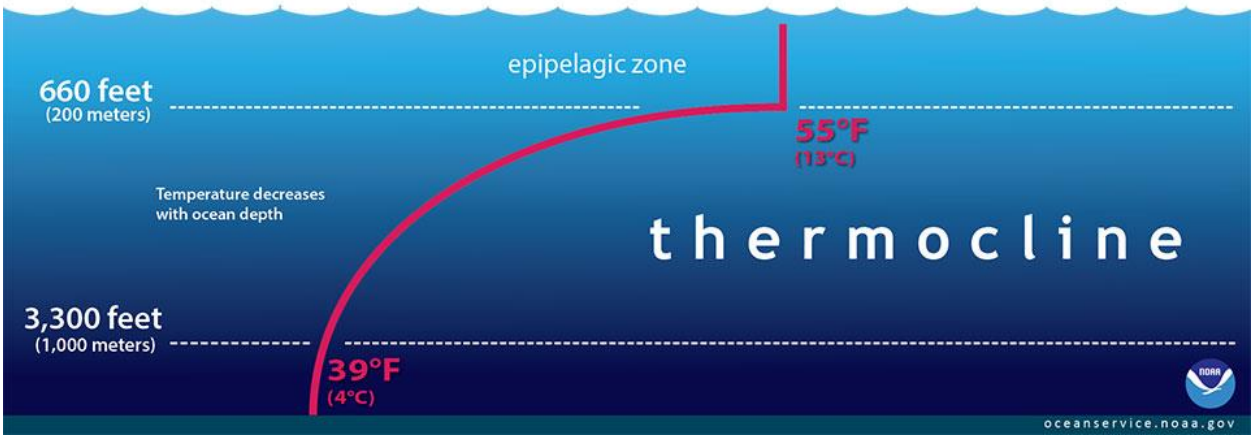
Q.87) Select the incorrect statement with respect to thermoclines:

a) It is a boundary region between the surface waters of the ocean and the deeper layers.
b) The boundary usually begins around 100 – 400 m below the sea surface and extends few meters downward.
c) It is a zone of steep temperature gradient.
d) Thermoclines are least developed in the upwelling zones.

Q.87) Solution (b)

Basic Information:

- A thermocline is the transition layer between warmer mixed water at the ocean's surface and cooler deep water below.
- A thermocline is the transition layer between the warmer mixed water at the surface and the cooler deep water below. It is relatively easy to tell when you have reached the thermocline in a body of water because there is a sudden change in temperature
- The boundary usually begins around 100 – 400 m below the sea surface and extends **several hundred of meters** downward.
- Thermoclines also play a role in meteorological forecasting. For example, hurricane forecasters must consider not just the temperature of the ocean's skin (the sea surface temperature), but also the depth of warm water above the thermocline. Water vapor evaporated from the ocean is a hurricane's primary fuel. The depth of the thermocline is the measure of the size of the "fuel tank" and helps to predict the risk of hurricane formation.



Q.88) Consider the following statements about waves:

1. Surface waves, are formed due to the friction between surface water and wind.
2. Waves can be created by the gravitational pull of the sun and moon.
3. The breaking of water of surface waves can happen anywhere on the surface of the seawater.
4. Seiche waves are a type of standing waves.

Which of the following statements is/are correct?

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

Q.88) Solution (d)

Basic Information:

- The most common cause of ocean waves is wind. Wind-driven waves, also known as surface waves, are formed due to the friction between surface water and wind.
- The breaking waves are formed when the wave collapses on top of itself. The breaking of water surface waves happens anywhere on the surface of the seawater.
- Tidal waves are caused due to astronomical forces like the gravitational pull of the sun and the moon on the ocean water. You can think of the high and low tides as the traversing of a wave with a time period of 12 hours.
- Seiche waves or simple a seiche (pronounced 'saysh') are standing waves that form in a confined or partially confined body of water. Standing waves, in general, can form in any type of semi-enclosed or enclosed body of water.

Statement Analysis:

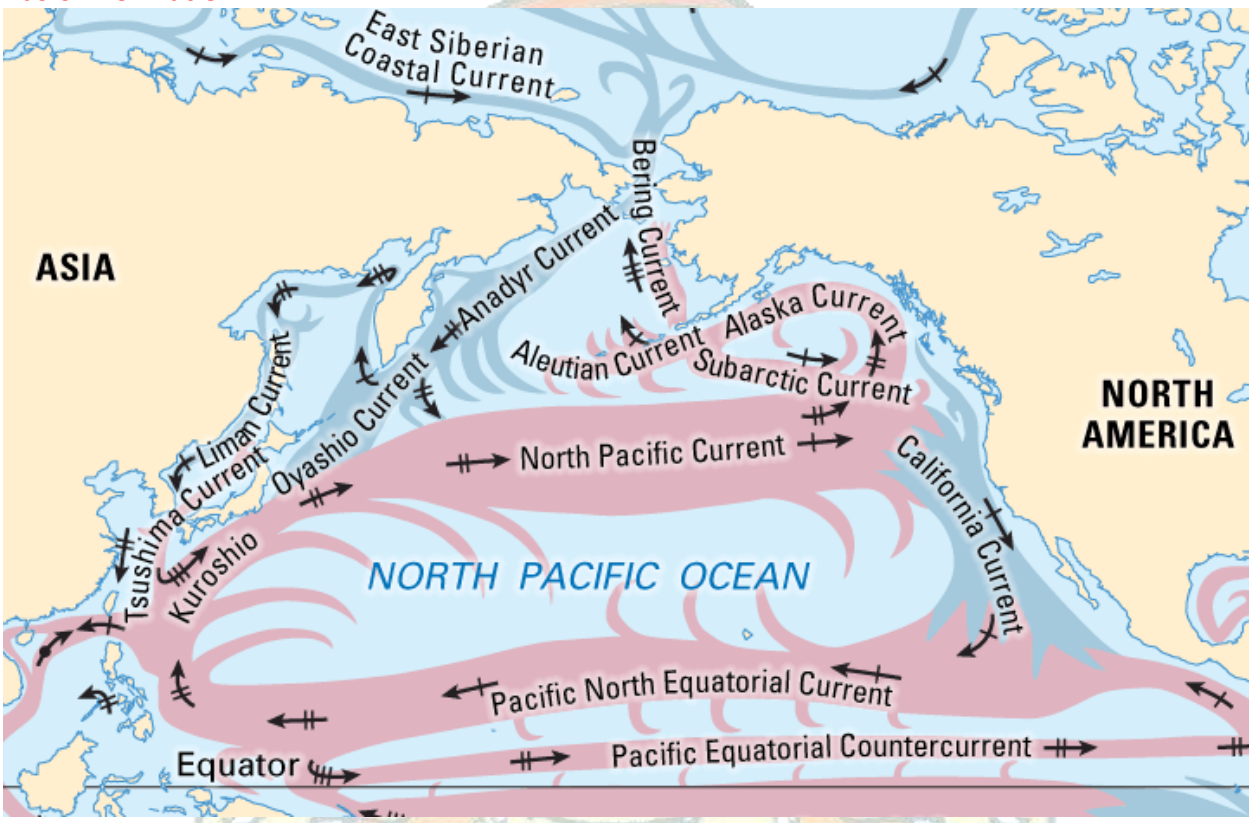
Statement 1	Statement 2	Statement 3	Statement 4
Correct	Correct	Correct	Correct
Friction causes water to move.	These are tidal waves.	Waves can collapse anywhere.	In standing waves each points oscillates in its respective amplitude in a periodic manner.

Q.89) Select the incorrect statement from below given options:

a) Oyashio current is a warm ocean current.
b) Anadyr current is a cold ocean current.
c) Alaska current is a warm ocean current.
d) California current is cold water current.

Q.89) Solution (a)

Basic Information:



Q.90) Consider the following statements about coral reefs:

1. Coral reefs help in shoreline protection.
2. Coral reefs are also found in the upwelling zones.
3. Coral reefs are largely absent on the eastern coast of India.

Which of the following statement is/are *incorrect*?

a) 2 only
b) 1 and 2 only
c) 1 and 3 only
d) 2 and 3 only

Q.90) Solution (a)

- A coral reef is an underwater ecosystem characterized by reef-building corals. Reefs are formed of colonies of coral polyps held together by calcium carbonate. Most coral reefs are built from stony corals, whose polyps cluster in groups.
- Sometimes called rainforests of the sea, shallow coral reefs form some of Earth's most diverse ecosystems. They occupy less than 0.1% of the world's ocean area, about half the area of France, yet they provide a home for at least 25% of all marine species.
- Coral reefs are estimated to cover 284,300 km^2, just under 0.1% of the oceans' surface area. The Indo-Pacific region (including the Red Sea, Indian Ocean, Southeast Asia and the Pacific) account for 91.9% of this total. Southeast Asia accounts for 32.3% of that figure, while the Pacific including Australia accounts for 40.8%. Atlantic and Caribbean coral reefs account for 7.6%.
- Deep-water coral inhabits greater depths and colder temperatures at much higher latitudes, as far north as Norway. Although deep water corals can form reefs, little is known about them.
- Coral reefs are rare along the west coasts of the Americas and Africa, due primarily to upwelling and strong cold coastal currents that reduce water temperatures in these areas (the Peru, Benguela and Canary Currents respectively).
- Corals are seldom found along the coastline of South Asia—from the eastern tip of India (Chennai) to the Bangladesh and Myanmar borders—as well as along the coasts of northeastern South America and Bangladesh, due to the freshwater release from the Amazon and Ganges Rivers respectively.

Statement Analysis:

Note: incorrect statements are asked.

Statement 1	Statement 2	Statement 3
Correct	**Incorrect**	**Correct**
Corals help in breaking the wave, thus protecting the shoreline.	Corals are not found in the upwelling zones.	Excessive mixing of freshwater.

Q.91) Which of the following lakes given below is/are manmade?

1. Bhojtal
2. Gobind Sagar
3. Bhimtal Lake

Select the correct option:

a) 1 only
b) 2 only
c) 3 only
d) 1, 2 and 3

Q.91) Solution (d)

Basic Information:

- Bhojtal Lake is a huge and magnificent body of water located in Madhya Pradesh and is a spectacular sight. Lying on the western side of Bhopal. It is a man made lake.
- About half an hour ride from Naina Devi, this amazing lake is a part of Bhakra Dam in Bilaspur and is astoundingly large in size. This is the ideal lake to visit if you are interested in rowing or boat riding. Naina Devi and the Bhakra Dam are two places nearby that are also popular destinations of Himachal.
- Bhimtal Lake is a lake in the town of Bhimtal, in the Indian state of Uttarakhand, with a masonry dam built in 1883 creating the storage facility. It is the largest lake in Kumaon region, known as the "lake district of India". The lake provides drinking water supply and supports aquaculture with variety of fish species.

Q.92) Consider the following statements about artesian basins:

1. An artesian basin is a low-lying region where groundwater is cramped under pressure.
2. The Great Artesian Basin is the largest and deepest artesian basin in the world which is located within Brazil.

Which of the following statement(s) is/are *incorrect*?

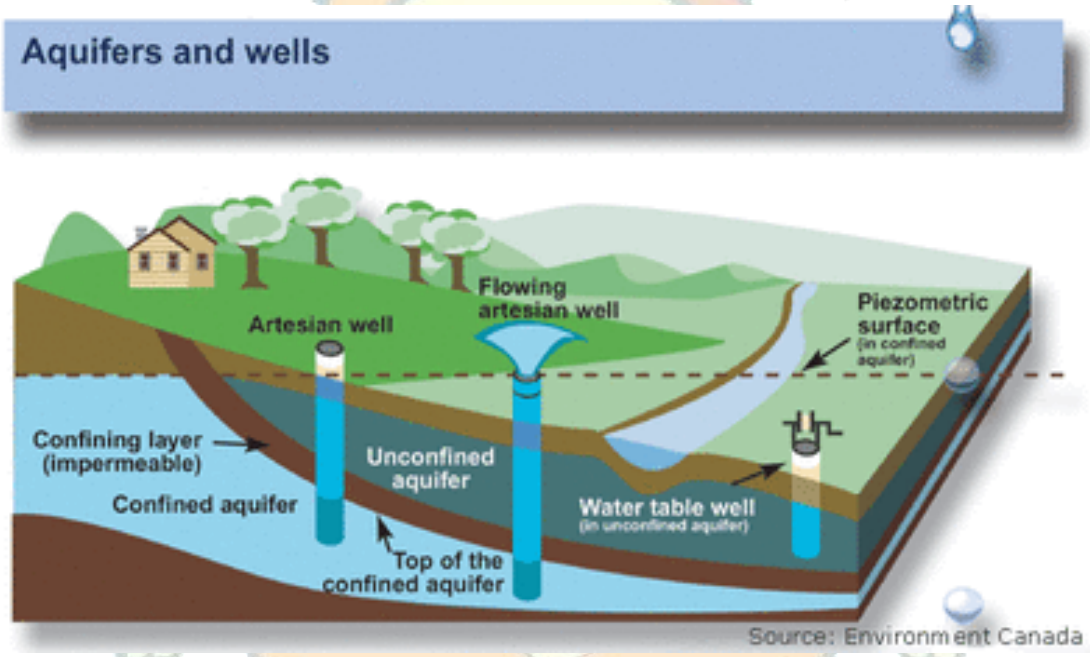
a) 1 only
b) 2 only

c) Both 1 and 2
d) Neither 1 nor 2

Q.92) Solution (b)

Basic Information:

- An artesian basin is a low-lying region where groundwater is cramped under pressure from surrounding layers of rock. These basins are usually found where an aquifer is present in a syncline, by impenetrable layers above as well as below. Whenever a fissure breaks open the surface, the underground water blows up. This results in the rising of the water level to a point where hydrostatic equilibrium has been achieved.
- A well drilled into this aquifer is known as an artesian well. If the water reaches the ground surface pressurized naturally by the aquifer, the well is known as a flowing artesian well. For an aquifer to be artesian, the water table must reach the surface.



- The Great Artesian Basin is the largest and deepest artesian basin in the world. It is located within Australia, stretching over 1,700,000 square kilometres, and is huge enough to fill Sydney Harbour 130,000 times.

Statement Analysis:

Note: incorrect statements are asked.

Statement 1	Statement 2
Correct	Incorrect

This is how artesian basins are formed.	Great Artesian Basin is located in Australia.

Q.93) Consider the following statements about glaciers:

1. Siachen is the second longest glacier outside of the Polar Regions and largest in the Himalayas-Karakoram region.
2. Glacial retreat may form glacial lakes.
3. Global warming induced by the climate change is increasing the number of the glaciers.

Which of the following statements is/are correct?

a) 1 and 2 only
b) 1 and 3 only
c) 2 and 3 only
d) 1, 2 and 3

Q.93) Solution (d)

Basic Information:
Glaciers are a bulk of ice moving under its weight. It forms in areas where the amassing of snow goes beyond its ablation over many years.

- They are generally seen in the snow-fields.
- This largest freshwater basin covers around 10 percent of the land surface of the Earth.
- According to the topography and the location of the glacier, it can be categorized as Mountain Glacier (Alpine Glaciers) or Continental Glacier (Ice Sheets).
- The Continental Glacier moves outward in all directions whereas the Mountain Glacier moves from a higher to a lower altitude.
- Siachen is the second longest glacier outside of the Polar Regions and largest in the Himalayas-Karakoram region. It is located in the UT of Ladakh.

According to NDMA, glacial retreat due to climate change has given rise to the formation of numerous new glacial lakes.

Due to the same reason the glaciers are getting fragmented and thus their number is increasing. However, their size is decreasing.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	**Correct**	**Correct**
It is a fact.	Glacial retreat due to climate change has given rise to the formation of new glacial lakes.	Fragmentation leads to increase in the number of glaciers.

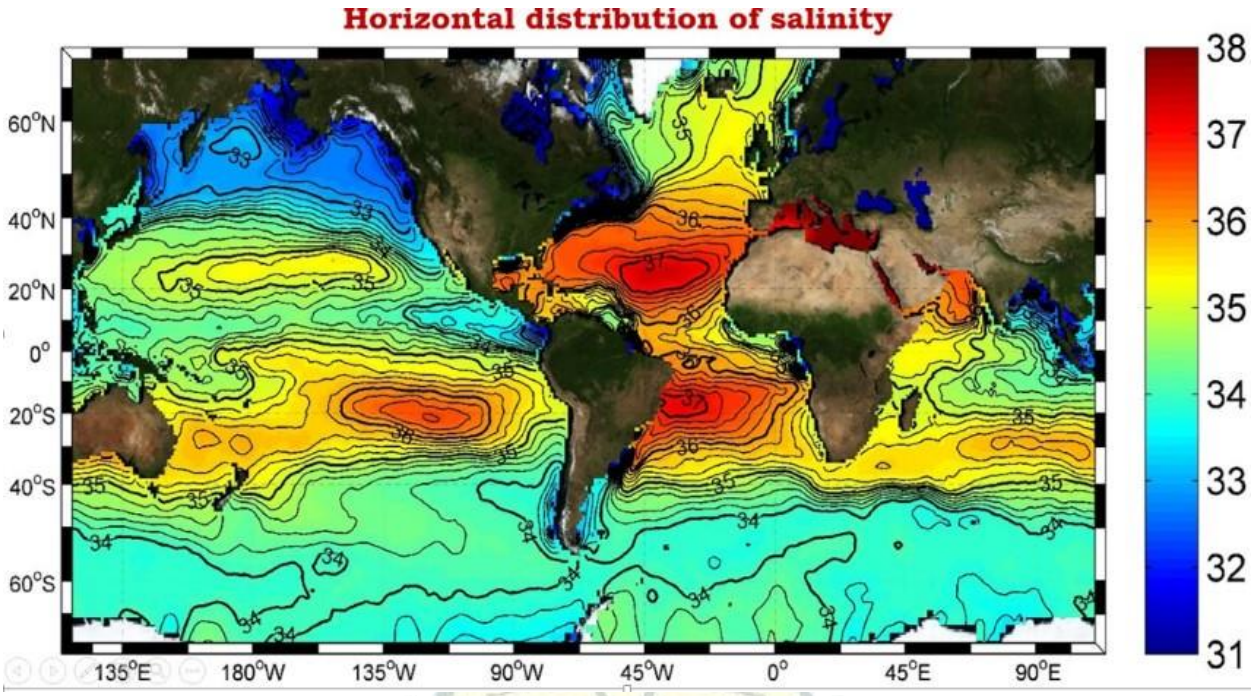
Q.94) Which of the following statements about ocean salinity is *incorrect*?

a) The North Sea, in spite of its location in higher latitudes, records higher salinity than other oceanic waters at same latitude.
b) The Mediterranean Sea records higher salinity due to high evaporation.
c) Arabian Sea shows lower salinity than Bay of Bengal.
d) Equatorial waters have less salinity than tropical waters.

Q.94) Solution (c)

Basic Information:

- The salinity of water in the surface layer of oceans depends mainly on evaporation and precipitation.
- Surface salinity is greatly influenced in coastal regions by the fresh water flow from rivers, and in Polar Regions by the processes of freezing and thawing of ice.
- Wind also influences salinity of an area by transferring water to other areas.
- The ocean currents contribute to the salinity variations.
- The equatorial region of the Atlantic Ocean has a salinity of about 35.
- Near the equator, there is heavy rainfall, high relative humidity, cloudiness and calm air of the doldrums.
- The polar areas experience very little evaporation and receive large amounts of fresh water from the melting of ice. This leads to low levels of salinity, ranging between 20 and 32.
- Maximum salinity (37) is observed between 20° N and 30° N
- Arabian Sea shows higher salinity due to high evaporation and low influx of fresh water.
- The Mediterranean Sea records higher salinity due to high evaporation.
- The North Sea, in spite of its location in higher latitudes, records higher salinity due to more saline water brought by the North Atlantic Drift.



Q.95) Consider the following statements:

1. Lake Titicaca is the highest navigable lake in the world.
2. Gaet'ale Pond located in Ethiopia is the saltiest water body on Earth.

Which of the following statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.95) Solution (c)

Basic Information:

- The most saline water body in the world is the Gaet'ale Pond, located in the Danakil Depression in Afar, Ethiopia. The water of Gaet'ale Pond has a salinity of 43%, making it the saltiest water body on Earth; (i.e. 12 times as salty as ocean water).

- Lake Titicaca is a large, deep, freshwater lake in the Andes on the border of Bolivia and Peru, often called the "highest navigable lake" in the world. By volume of water and by surface area, it is the largest lake in South America.

Q.96) With reference to "tides" consider the following statements:

1. Zenith tide is formed where the tidal force of moon is maximum.
2. Solar bulges are 46% the size of lunar bulges.

Which of the above statements is/are correct?

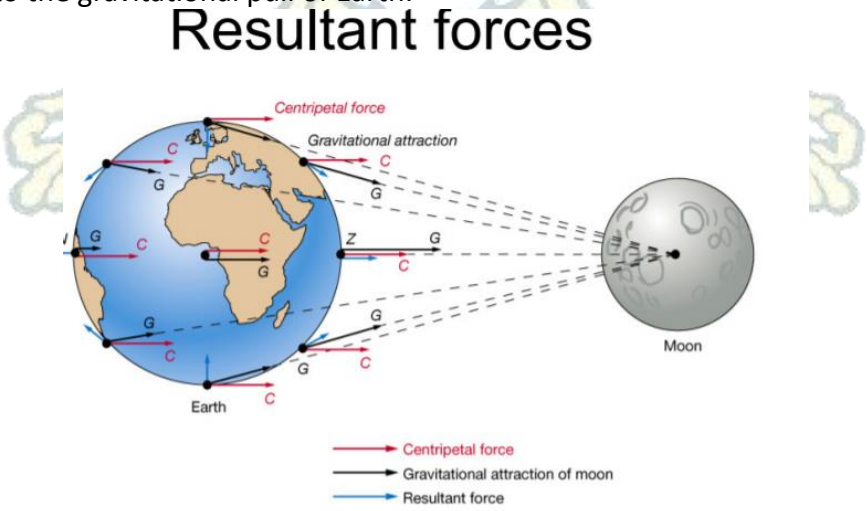
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.96) Solution (c)

Basic Information:

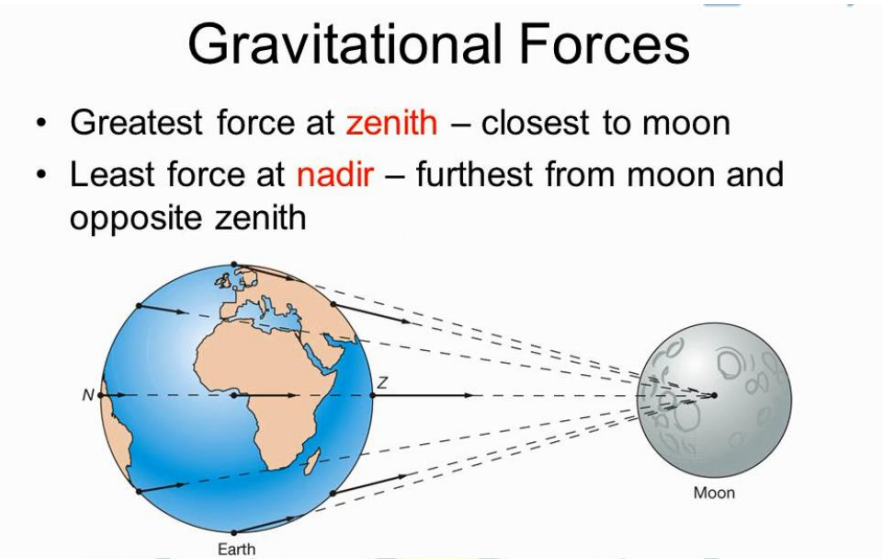
The periodical rise and fall of the sea level, once or twice a day, mainly due to the attraction of the sun and the moon, is called a tide.

The Moon's **gravitational pull** to a great extent and to a lesser extent the Sun's gravitational pull, are the major causes for the occurrence of tides. Another factor is **centrifugal force** which acts opposite to the gravitational pull of Earth.



Zenith:

- The term zenith is derived from an **Arabic expression** meaning **direction of the head** or **path above the head**.
- Zenith is sometimes also used to refer to the highest point that a celestial body reaches during its orbit at a given point of observation. The opposite of zenith, that is the direction of the gravitational pull, is called the **Nadir**, at 180 degrees.



Statement Analysis:

Statement 1	Statement 2
Correct	**Correct**
Refer to the above figure. '**Z**' denotes zenith and '**N**' represents nadir. Tidal force keeps on decreasing with the distance.	Since tidal force of moon is twice that of sun the bulge is also twice in size. Sun has 46% the tide generating force of the moon.

Q.97) Consider the following statements about "water mass":

1. It makes up to 90% ocean waters.
2. It is more distinct below pycnocline.
3. Water mass is more developed in zones of upwelling.
4. They are not confined to one ocean.

Which of the above statements is/are correct?

a) 1, 2 and 3 only

b) 2 and 3 only
c) 1, 2 and 4 only
d) 1, 2, 3 and 4

Q.97) Solution (c)

Basic Information:

A **very large body** of water which has almost **comparable density** with some variations in salinity and temperature is called water mass.
On the basis of depth there are 3 types of water masses:

- Central (100-1000m)
- Intermediate (1000-3000m)
- Deep (>3000m)

Source of water mass: areas where they develop are zones of downwelling.
Common **water masses** in the world ocean are:

- Antarctic Bottom Water (AABW)
- North Atlantic Deep Water (NADW)
- Circumpolar Deep Water (CDW)
- Antarctic Intermediate Water (AAIW)
- Subantarctic Mode Water (SAMW)
- Arctic Intermediate Water (AIW)
- North Pacific Intermediate Water (NPIW)

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Correct	**Correct**	**Incorrect**	**Correct**
Water masses makes up to 90-95% ocean waters.	Water mass is more distinct below pycnocline where the changes in density is not steep.	Water mass is more developed in zones of downwelling and is observed in high latitude seas or oceans where it is prominent due to brine rejection.	It is not confined to one ocean. Example a water mass can be partly in Indian Ocean and Pacific Ocean.

Q.98) Consider the following statements:

1. Ansupa is the largest fresh water lake in Odisha.
2. Vellayani Lake is a freshwater lake located in Tamil Nadu.

Select the correct statement(s):

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.98) Solution (a)

Basic Information:

Ansupa Lake:

- Ansupa is located 50km from Cuttack and situated in the middle of the state highway connecting Athagarh and Banki block of Cuttack district.
- Spread across 382 km, Ansupa is the largest fresh water lake in Odisha.
- The lake derives its name from its shape which is like a horse shoe (Ansupa).
- The ruins of an ancient fort on top of the **Saranda hill** adjacent to the lake adds to the charm of the place and provides a panoramic view of the lake.

Vellayani Lake:

- Vellayani Lake, or **Vellayani Kayal** as known in local language, is the **largest fresh water lake** in Thiruvananthapuram district, of **Kerala**.
- It is a sacred lake worshipped by local people.
- It is the venue for the boating competitions that take place in the region during the festival of Onam.

Statement Analysis:

Statement 1	Statement 2
Correct	**Incorrect**
Ansupa is the largest fresh water lake in Odisha.	Vellayani Lake is a freshwater lake located in Kerela.

Q.99) Which of the following is/are correctly matched?

	Ocean	Gyre
1.	North Pacific Subtropical Gyre	Turtle Gyre
2.	Indian Ocean Gyre	Majid Gyre
3.	South Atlantic Gyre	Heyerdahl Gyre

Select the correct option using the codes given below:

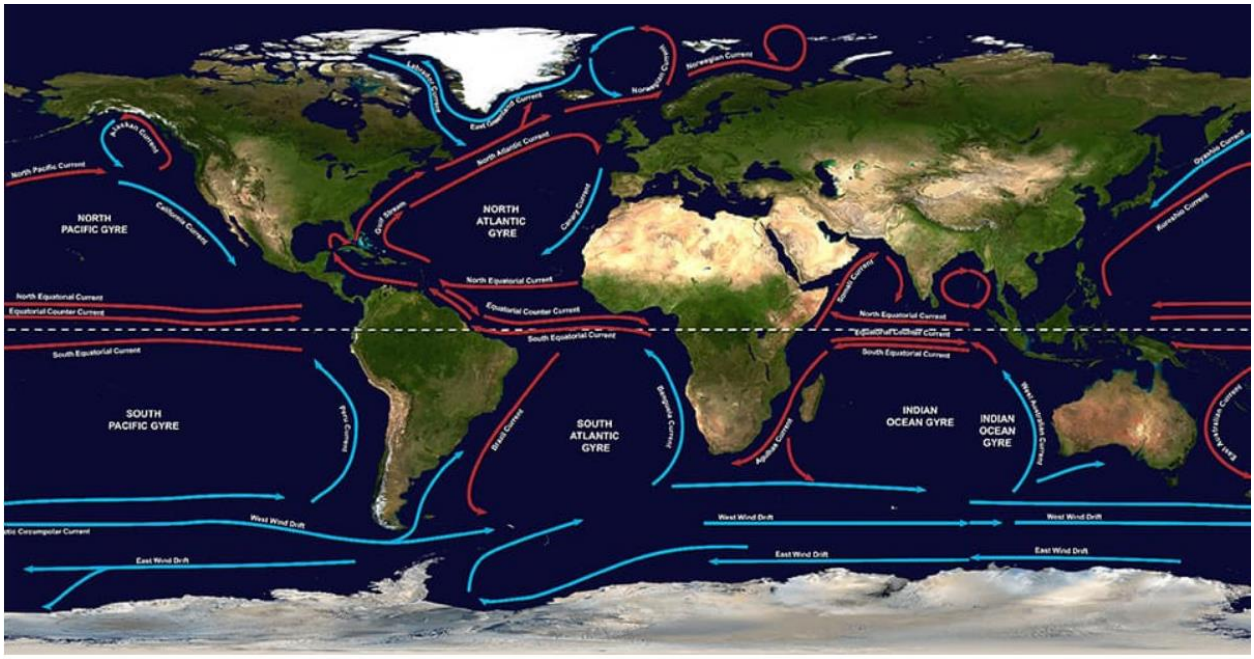
a) 1 and 2 only
b) 2 only
c) 2 and 3 only
d) 1,2 and 3

Q.99) Solution (a)

Basic Information:

Gyre:

- A gyre is a large system of rotating ocean currents.
- Wind, tides, and differences in temperature and salinity drive ocean currents. The ocean churns up different types of currents, such as eddies, whirlpools, or deep ocean currents. Larger, sustained currents—the Gulf Stream, for example go by proper names. Taken together, these larger and more permanent currents make up the systems of currents known as gyres.
- **There are five major gyres:** the North and South Pacific Subtropical Gyres, the North and South Atlantic Subtropical Gyres, and the Indian Ocean Subtropical Gyre.
- In some instances, the term "gyre" is used to refer to the collections of plastic waste and other debris found in higher concentrations in certain parts of the ocean. While this use of "gyre" is increasingly common, the term traditionally refers simply to large, rotating ocean currents.



Explanation:

Ocean	Name
1. Indian Ocean	Majid Gyre
2. North Atlantic Ocean	Columbus Gyre
3. South Atlantic Ocean	Prince Henry Gyre
4. North Pacific Ocean	Turtle Gyre
5. South Pacific Ocean	Heyerdahl Gyre

Q.100) With reference to "United Nations Convention on Law of the Sea (UNCLOS)" consider the following statements:

1. The contiguous zone extends seaward up to 24 nautical miles from the boundary of territorial waters.
2. Australia has the largest Exclusive Economic Zone in the world.

Which of the above statements is/are correct?

a) 1 only
b) 2 only

c) Both 1 and 2
d) Neither 1 and 2

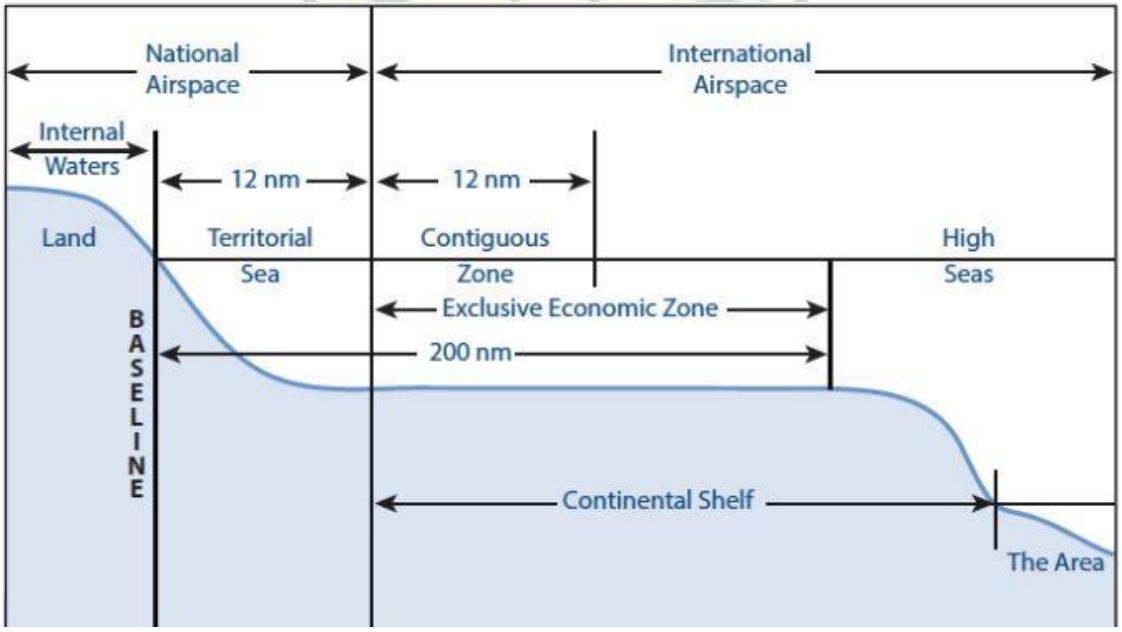
Q.100) Solution (d)

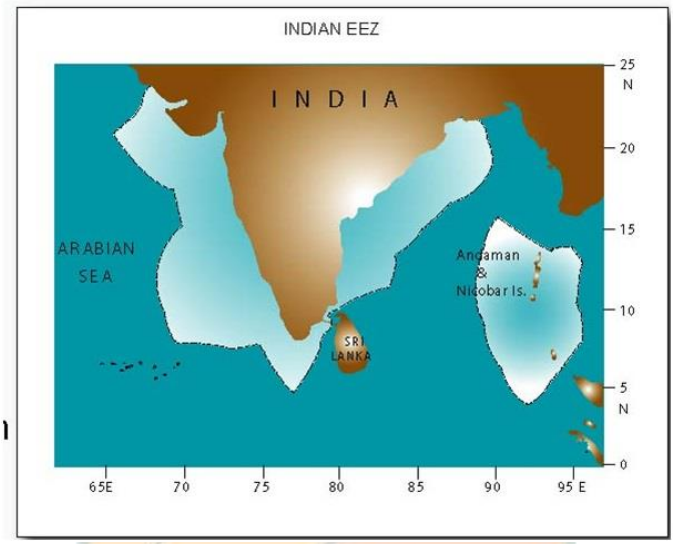
Basic Information:

United Nations Convention on the Law of the Sea (UNCLOS) 1982, also known as Law of the Sea divides marine areas into **five main zones** namely:

- Internal Waters
- Territorial Sea
- Contiguous Zone
- Exclusive Economic Zone (EEZ)
- High Seas.

UNCLOS is the **only international convention** which stipulates a framework for state jurisdiction in maritime spaces. It provides a different legal status to different maritime zones.





Statement Analysis:

Statement 1	Statement 2
Incorrect	**Incorrect**
The contiguous zone extends seaward up to 24 nautical miles from its **baseline**. *Note:* All the measurements are taken from the baseline. **Baseline**: It is the low-water line along the coast as officially recognized by the coastal state.	Due to its numerous overseas departments and territories scattered all over the oceans, **France** has the largest exclusive economic zone in the world.

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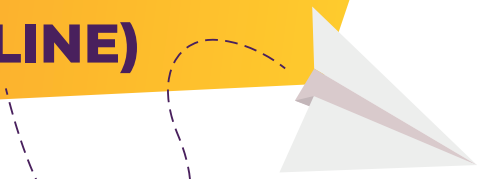

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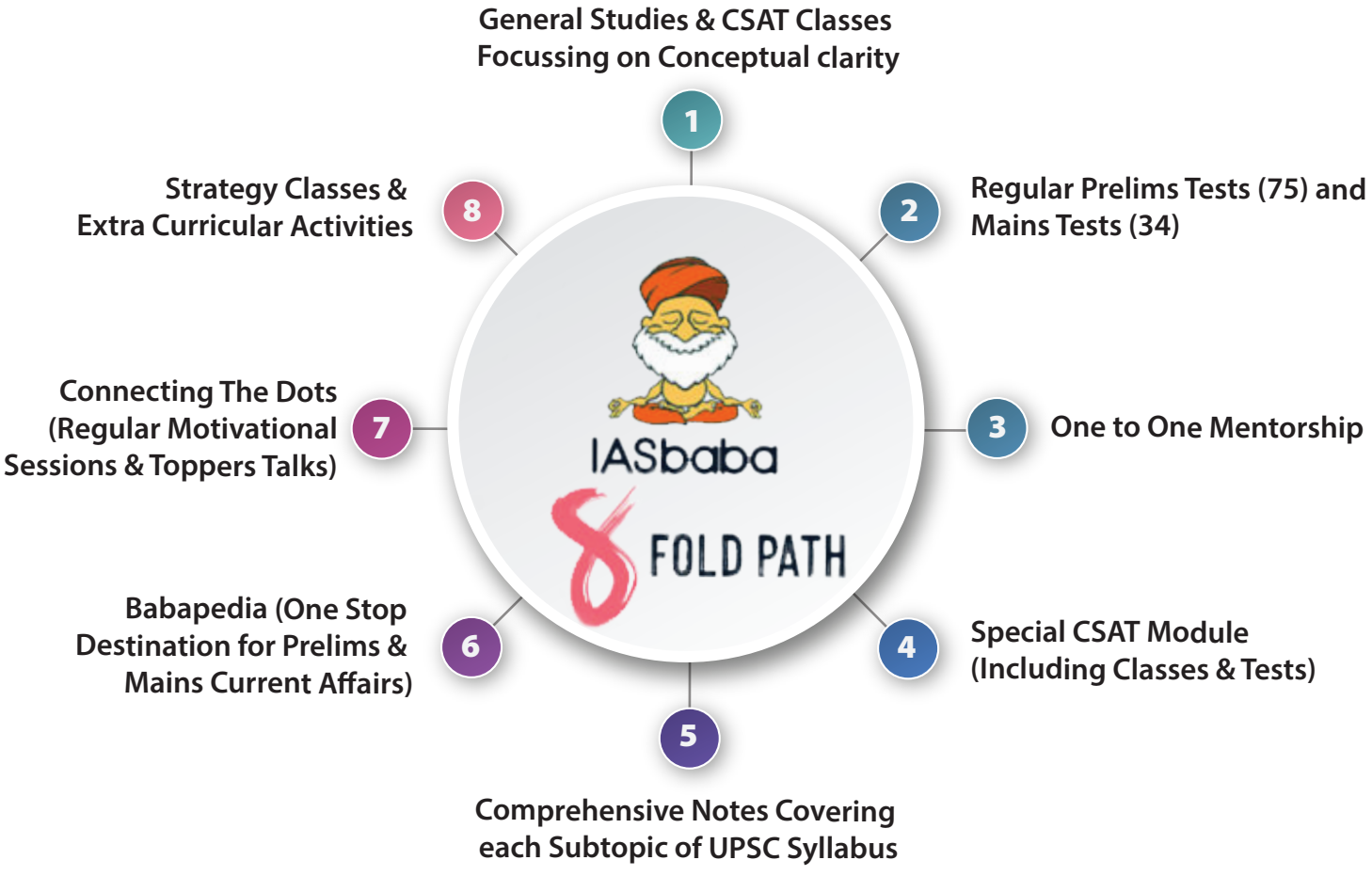

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