Q.1) With respect to dew formation consider the following statements:

1. The ideal conditions for its formation are clear sky, calm air, high relative humidity, and cold and long nights.
2. For the formation of dew, it is necessary that the dew point is below the freezing point.
3. White frost, snow and some clouds (cirrus clouds) are produced when the temperature is more than the freezing point.

Which of the above statements is/are correct?

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

Q.1) Solution (c)

Explaination:

When the moisture is deposited in the form of water droplets on cooler surfaces of solid objects (rather than nuclei in air above the surface) such as stones, grass blades and plant leaves, it is known as dew.

The ideal conditions for its formation are clear sky, calm air, high relative humidity, and cold and long nights. For the formation of dew, it is necessary that the dew point is above the freezing point.

White frost, snow and some clouds (cirrus clouds) are produced when the temperature is lower than the freezing point. Dew, fog and clouds result even when the temperature is higher than the freezing point.

Q.2) Consider the following statements with respect to the atmosphere:

1. The proportion of gases changes in the higher layers of the atmosphere in such a way that oxygen will be almost in negligible quantity at the height of 120 km.
2. Carbon dioxide and water vapour are found only up to 90 km from the surface of the earth.
3. Nitrogen and oxygen make up nearly 99% of the clean dry air.
4. The water vapour absorbs only the long-wave terrestrial radiation (infrared or heat emitted by earth during nights).

Which of the above statements is/are correct?

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

d) 1, 2 and 3

Q.2) Solution (a)

Explanation:

The proportion of gases changes in the higher layers of the atmosphere in such a way that oxygen will be almost in negligible quantity at the height of 120 km. Similarly, carbon dioxide and water vapour are found only up to 90 km from the surface of the earth. Nitrogen and oxygen make up nearly 99% of the clean, "dry" air. The remaining gases are mostly inert and constitute about 1% of the atmosphere.

Water Vapour is one of the most variable gaseous substances present in atmosphere – constituting between 0.2% and 4% of the total volume (in cold dry and humid tropical climates respectively). 90% of moisture content in the atmosphere exists within 6 km of the surface of the earth. Like carbon dioxide, water vapour plays a significant role in the insulating action, of the atmosphere.

It absorbs not only the long-wave terrestrial radiation (infrared or heat emitted by earth during nights), but also a part of the incoming solar radiation. It is the source of precipitation and clouds. On condensation, it releases latent heat of condensation —the ultimate driving force behind all storms.

Q.3) Consider the following statements regarding insolation:

1. Insolation is only one in two billion parts of solar radiation.
2. Heat generated by volcanoes, springs and geysers is negligible compared to that received from sun.

Which of the above statements is/are incorrect:

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

Q.3) Solution (d)

Note: Incorrect options have been asked.

Explanation:

Earth intercepts only one in two billion parts of solar radiation. This intercepted radiation is called Insolation.

Some heat within the core and mantle is transferred to the surface and ocean bottoms through volcanoes, springs and geysers. But this heat received at the surface form interiors of the earth is negligible compared to that received from sun.

Q.4) Consider the following statements regarding the temperature distribution:

1. Diurnal and annual range of temperatures is minimum in the interiors of continents due to the effect of continentality.
2. Diurnal and annual range of temperatures is maximum in oceans.
3. Temperature gradients are usually higher over the eastern margins of continent and lower over the western margins of continents.
4. High temperature gradients are observed over tropics and low temperature gradients over middle and higher latitudes.

Which of the above statements are correct?

a) 1 and 2
b) 3 and 4
c) All of the above
d) None of the above

Q.4) Solution (d)

Explanation:

Diurnal and annual range of temperatures is highest in the interiors of continents due to the effect of continentiality (in continental interiors these will no moderating effect of oceans). Diurnal and annual range of temperatures is least in oceans. [High specific heat of water and mixing of water keep the range low]

Low temperature gradients are observed over tropics (sun is almost overhead the entire year) and high temperature gradients over middle and higher latitudes (sun's apparent path varies significantly from season to season).

Temperature gradients are usually low over the eastern margins of continents. (This is because of warm ocean currents) while temperature gradients are usually high over the western margins of continents. (This is because of cold ocean currents)

Other points to remember: The isotherms are irregular over the northern hemisphere due to an enhanced land-sea contrast. Because of predominance of land over water in the north, the northern hemisphere is warmer.

The thermal equator (ITCZ) lies generally to the north of geographical equator. While passing through an area with warm ocean currents, the isotherms show a poleward shift.

Q.5) Consider the following statements regarding the adiabatic lapse rate:

1. It is the rate of fall/rise in temperature of a rising or a falling air parcel adiabatically(means heat doesn't enter or leave the system).

2. Rising of a parcel of air (and associated Positive Adiabatic Lapse Rate) is the first step in the formation of Thunderstorms, Tornadoes and Cyclones.
3. Katabatic Wind is an example for a falling parcel of air(and associated with negative adiabatic lapse rate).

Which of the above statements are correct?

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

Q.5) Solution (d)

Explanation:

Adiabatic Lapse Rate is the rate of fall in temperature of a rising or a falling air parcel adiabatically(meaning heat doesn't enter or leave the system).It is governed by Gas law.

A parcel of air rises when it is less dense than the surrounding environment and it falls when its density becomes greater than the surrounding environment.

When the air parcel starts to rise, the ambient pressure on it starts to fall. With the fall in ambient pressure, the temperature falls and the volume increases. This is adiabatic (there is no heat exchange between the air parcel and the external environment. All the temperature changes are internal). This rate of fall in temperature with the rising of the air parcel is called Positive Adiabatic Lapse Rate as the Temperature is falling.

Rising of a parcel of air (and associated Positive Adiabatic Lapse Rate) is the first step in the formation of Thunderstorms, Tornadoes and Cyclones.

Similarly when an air parcel is falling, the atmospheric pressure acting on it will increase and its internal temperature will increase adiabatically. [This is Negative Adiabatic Lapse Rate as the Temperature is rising].

Katabatic Wind is a hot dry wind that blows down a mountain slope. It is an example for a falling parcel of air in which the temperature changes happen adiabatically.

Q.6) Consider the following statements regarding the Variation of atmospheric Pressure:

1. The rate of decrease in pressure with altitude is not constant.
2. A rising pressure indicates fine, settled weather, while a falling pressure indicates unstable and cloudy weather.
3. At the height of Mt. Everest, the air pressure is about two-thirds less than what it is at the sea level.
4. The spacing of isobars expresses the rate and direction of pressure changes and is referred to as pressure gradient.

Which of the above statements are correct?

a) 1, 2 and 3
b) 2, 3 and 4
c) 1, 3 and 4
d) All of the above

Q.6) Solution (d)

Explanation:

In the lower atmosphere the pressure decreases rapidly with height. At the height of Mt. Everest, the air pressure is about two-thirds less than what it is at the sea level.

The decrease in pressure with altitude, however, is not constant. Since the factors controlling air density – temperature, amount of water vapour and gravity are variable, there is no simple relationship between altitude and pressure.

The pressure decreases with height. At any elevation it varies from place to place and its variation is the primary cause of air motion, i.e. wind which moves from high pressure areas to low pressure areas. A rising pressure indicates fine, settled weather, while a falling pressure indicates unstable and cloudy weather.

Horizontal distribution of pressure is studied by drawing isobars at constant levels. Isobars are lines connecting places having equal pressure. In order to eliminate the effect of altitude on pressure, it is measured at any station after being reduced to sea level for purposes of comparison. The spacing of isobars expresses the rate and direction of pressure changes and is referred to as pressure gradient.

Q.7) Consider the following statements regarding the Sub-Tropical High Pressure Belt:

1. The subsiding air is cold and dry, therefore, most of the deserts are present along this belt, in both hemispheres.
2. This belt is frequently invaded by tropical and extra-tropical disturbances.

Which of the above statements is/are correct?

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

Q.7) Solution (b)

Explanation:

The subsiding air in subtropical high pressure belt is warm and dry(not cold and dry) , therefore, most of the deserts are present along this belt, in both hemispheres. A calm condition (anticyclonic) with feeble winds is created in this high pressure belt. The descending air currents feed the winds blowing towards adjoining low pressure belts. This belt is frequently invaded by tropical and extra-tropical disturbances.

Q.8) Consider the following statements regarding the factors affecting wind movement:

1. The horizontal winds near the earth surface respond to the combined effect of five forces – the pressure gradient force, the frictional force, the Coriolis force, the gravitational force and the centripetal acceleration.
2. The pressure gradient is weak where the isobars are close to each other and is strong where the isobars are apart.
3. The wind direction follows the direction of change of pressure, i.e. parallel to the isobars.

Which of the above statements is correct

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

Q.8) Solution (d)

Explanation: The horizontal winds near the earth surface respond to the combined effect of three forces – the pressure gradient force, the frictional force and the Coriolis force. While the other two (gravitational force acts downwards and centripetal acceleration produces a circular pattern of flow around centers of high and low pressure).
The pressure gradient is strong where the isobars are close to each other and is weak where the isobars are apart. Since a closely spaced gradient implies a steep pressure change, it also indicates a strong wind speed. The wind direction follows the direction of change of pressure, i.e. perpendicular to the isobars.

Q.9) Consider the following statements regarding the types of winds:

1. Chinook is a hot wind of local importance in the Alps.
2. Foehn is a strong, gusty, dry and warm wind which develops on the leeward side of a mountain range (Rockies).
3. Chinook wind helps animal grazing by melting snow and aids the ripening of grapes.
4. Mistral and Sirocco are both harmful winds for humans.

Which of the above statements is/are incorrect?

a) Only 1,2,3
b) Only 2,3,4
c) Only 1,3,4
d) Only 3,4

Q.9) Solution (a)

Explanation: Foehn is a hot wind of local importance in the Alps. It is a strong, gusty, dry and warm wind which develops on the leeward side of a mountain range(alps not rockies).The foehn **not chinook** wind helps animal grazing by melting snow and aids the ripening of grapes. Chinook is Foehn like winds in USA and Canada move down the west slopes of the Rockies and is beneficial to ranchers east of the Rockies as it keeps the grasslands clear of snow during much of the winter.
Mistral brings blizzards into southern France and the Sirocco causes dusty dry conditions along the northern coast of Africa, storms in the Mediterranean Sea, and cool wet weather in Europe. Hence both are consider harmful.

Q.10) Consider the following statements regarding Temperature Inversion:

1. Long nights, so that the incoming radiation is greater than the outgoing radiation.
2. Clear skies, which allow unobstructed escape of radiation.
3. Calm and stable air, so that there is no vertical mixing at lower levels.

Which of the above statements is ideal condition for temperature inversion?

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

Q.10) Solution (b)

Explanation: Ideal condition includes
Long nights, so that the outgoing radiation is greater than the incoming radiation. (not the reverse as written in statement 1)
Clear skies, which allow unobstructed escape of radiation.
Calm and stable air, so that there is no vertical mixing at lower levels.

Q.11) Consider the following statements regarding the jet streams:

1. Jet streams are Circumpolar (situated around or inhabiting around the earth's poles)

2. They are narrow, concentrated bands of meandering, upper tropospheric, low velocity, geostrophic streams, bounded by high speed winds
3. They are a part of upper level easterlies.

Which of the above statements is/are correct?

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

Q.11) Solution (a)

Explanation:

Jet streams are Circumpolar (situated around or inhabiting around one of the earth's poles)
They are narrow, concentrated bands of meandering,upper tropospheric,high velocity, geostrophic streams, bounded by low speed winds.
They are a part of upper level westerlies.

Q.12) Consider the following statements regarding the Rossby waves:

1. In planetary atmospheres, they are due to the variation in the Coriolis Effect with latitude.
2. Rossby waves are formed when tropical air moves toward the Equator while polar air is moving poleward.
3. The existence of these waves explains the low-pressure cells (cyclones) and high-pressure cells (anticyclones)

Which of the above statements is correct

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

Q.12) Solution (c)

Explanation: The meandering jet streams are called Rossby Waves. Rossby waves are natural phenomenon in the atmosphere and oceans due to rotation of earth. In planetary atmospheres, they are due to the variation in the Coriolis effect (When temperature contrast is low, speed of jet stream is low, and Coriolis force is weak leading to meandering) with latitude. Rossby waves are formed when polar air moves toward the Equator while tropical air is moving poleward. The existence of these waves explains the low-pressure cells (cyclones) and high-pressure cells (anticyclones).

Q.13) Consider the following statements regarding the Subtropical jet stream:

1. The sub-tropical jet stream is produced by the earth's rotation and temperature contrast between tropical and sub – tropical regions.
2. During summers, the Subtropical jet stream is nearly continuous in both hemispheres.
3. The subtropical jet stream exists all year in the northern hemisphere.
4. It is intermittent in the southern hemisphere during summer when it migrates south.

Which of the following statements is incorrect?

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

Q.13) Solution (b)

Explanation : The sub-tropical jet stream is produced by the earth's rotation (Coriolis force) and temperature contrast between tropical and sub – tropical regions. During winter, the STJ is nearly continuous in both hemispheres. The STJ exists all year in the southern hemisphere. However, it is intermittent in the northern hemisphere during summer when it migrates north.

Q.14) Which of the following are conditions for the formation of Air masses?

1. Source region should be extensive with gentle, divergent air circulation.
2. Areas with low pressure but high pressure difference or pressure gradient are ideal source regions.

Select the code from below:

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

Q.14) Solution (a)

Explanation:

Conditions for the formation of Air masses:

1. Source region should be extensive with gentle, divergent air circulation (slightly at high pressure).

2. Areas with high pressure but little pressure difference or pressure gradient are ideal source regions.

Note: There are no major source regions in the mid-latitudes as these regions are dominated by cyclonic and other disturbances.

Q.15) Consider the following statements:

1. Occluded front is formed when a cold air mass overtakes a warm air mass and goes underneath it.
2. The formation Mid-latitude cyclones involve the formation of occluded front.

Which of the above statements is correct

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

Q.15) Solution (c)

Explanation: Occlusion is a process by which the cold front of a rotating low-pressure system catches up the warm front, so that the warm air between them is forced upwards. Such a front is formed when a cold air mass overtakes a warm air mass and goes underneath it. Frontolysis begins when warm sector diminishes and the cold air mass completely undertakes the warm sector on ground.

Thus, a long and backward swinging occluded front is formed which could be a warm front type or cold front type occlusion.

Weather along an occluded front is complex. The formation Mid-latitude cyclones [temperate cyclones or extra-tropical cyclones] involve the formation of occluded front.

Q.16) Consider the following statements regarding the different types of clouds:

1. Cirrus clouds are formed at high altitudes with a thin, detached and feathery appearance.
2. Cumulus clouds look like cotton wool with a flat base.
3. Stratus clouds are generally formed either due to loss of heat or the mixing of air masses with different temperatures.
4. Nimbus clouds are always white in color.

Which of the above statements is correct:

a) 1, 2 and 3
b) 1, 2 and 4
c) 2, 3 and 4
d) All of the above

Q.16) Solution (a)

Explanation: Cirrus clouds are always white while the Nimbus clouds are black or dark gray.

Q.17) Consider the following statements:

1. Smog is similar to haze but there is condensation in smog.
2. Photochemical smog is also known as "Los Angeles smog"
3. Sulfurous smog (classical) is also called "London smog,"
4. Photochemical smog is aggravated by dampness and a high concentration of suspended particulate matter in the air.
5. Sulfurous smog causes a light brownish coloration of the atmosphere, reduced visibility, plant damage, irritation of the eyes, and respiratory distress.

Which of the above statements is correct?

a) 1,2,3
b) 2,3,4
c) 3,4,5
d) 1,3,5

Q.17) Solution (a)

Explanation: sulfurous smog is aggravated by dampness and a high concentration of suspended particulate matter in the air. Photochemical smog causes a light brownish coloration of the atmosphere, reduced visibility, plant damage, irritation of the eyes, and respiratory distress.

Q.18) Consider the following statements regarding the polar vortex:

1. Polar vortex is closely associated with jet streams [Rossby waves].
2. It is formed mainly in winter and gets weaker in summer.
3. The polar vortex will remain in its place when the easterlies along with the polar jet are strong
4. Strong polar vortex means there is huge temperature contrast between the temperate and polar regions.

Which of the above statements is correct?

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

Q.18) Solution (b)

Explanation: The polar vortex will remain in its place when the westerlies along with the polar jet are strong.

Q.19) Consider the following differences between China type and Mediterranean type climate:

1. The region with China type climate receives more rainfall than region with Mediterranean type climate in same latitude.
2. While regions with China type climate receive almost uniform rainfall throughout the year, regions with Mediterranean type climate receive maximum rainfall in winter

Which of the above statements is/are correct?

a) 1 Only
b) 2 Only
c) Both 1 & 2
d) Neither 1 nor 2

Q.19) Solution (c)

Factual Question.
Both statements are correct

Q.20) Consider the following questions regarding Conditions Favourable for Tropical Cyclone Formation:

1. Large sea surface with temperature higher than 27° C.
2. Presence of the Coriolis force enough to create a cyclonic vortex.
3. High variations in the horizontal wind speed.
4. A pre-existing weak low-pressure area or low-level-cyclonic circulation.
5. Upper divergence below the sea level system.

Which of the above statements are correct?

a) 1, 2 and 3
b) 1, 2 and 4
c) 1, 3 and 5
d) 3, 4 and 5

Q.20) Solution (b)

Explanation: Conditions Favourable for Tropical Cyclone Formation includes:
Large sea surface with temperature higher than 27° C,
Presence of the Coriolis force enough to create a cyclonic vortex,
Small variations in the vertical wind speed,
A pre-existing weak low-pressure area or low-level-cyclonic circulation,
Upper divergence above the sea level system

Q.21) Consider the following statements regarding difference between a River Basin and a Watershed:

1. Both river basins and watersheds are areas of land that drain to a particular water body, such as a lake, stream, river or estuary.
2. In a river basin, some of the water drains to a large river. The term watershed is used to describe a smaller area of land that drains to a smaller stream, lake or wetland.
3. There are many smaller watersheds within a river basin.

Which of the above statements are correct?

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

Q.21) Solution (c)

Explanation: In a river basin, all the water drains to a large river (not some of the water). First and Third statements are self explanatory.

Q.22) Consider the following statements regarding the drainage pattern:

1. A drainage pattern is described as discordant if it does not correlate to the topology.
2. The difference between antecedent and superimposed river drainage is that whereas antecedent river drainage involves uplifting of river slope along with surrounding area, the superimposed drainage involves not changing the original slope.
3. Both antecedent and superimposed river drainage are examples of concordant drainage pattern.

Which of the following statements are correct?

a) Only 1
b) Only 2
c) Only 1,3
d) Only 1,2

Q.22) Solution (a)

Explanation:
Both antecedent and superimposed river drainage involves river sticking to their original slope.

In case of antecedent river drainage, part of a river slope and the surrounding area gets uplifted and the river sticks to its original slope, cutting through the uplifted portion like a saw and forming deep gorges.
In case of superimposed river drainage, a river flowing over a softer rock stratum reaches the harder basal rocks but continues to follow the initial slope, it seems to have no relation with the harder rock bed.
Both antecedent and superimposed river drainage are examples of discordant drainage pattern.

Q.23) Consider the following statements:

1. The Chambal, Sind, Ken, Betwa, Tons and Son meet the Yamuna and the Ganga at right angles.
2. They are the subsequent drainage of the Ganga drainage system.
3. Godavari, Krishna and Cauvery, descending from the Western Ghats and flowing into the Bay of Bengal, are some of the subsequent rivers of Peninsular India.

Which of the above statements is correct?

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

Q.3) Solution (a)

Explanation:

Rivers like Godavari, Krishna and Cauvery, descending from the Western Ghats and flowing into the Bay of Bengal, are some of the consequent(not subsequent) rivers of Peninsular India.
The rivers which follow the general direction of slope are known as the consequent rivers. Most of the rivers of peninsular India are consequent rivers.

A tributary stream that is eroded along an underlying belt of non-resistant rock after the main drainage pattern (Consequent River) has been established is known as a subsequent river.
The peninsular drainage is mainly Concordant except for few rivers in the upper peninsular region.

Q.4) Consider the following statements regarding the peninsular drainage:

1. The main water divide in peninsular rivers is formed by the Western Ghats, which run from north to south close to the western coast.
2. The velocity of water in the rivers and the load carrying capacity of the streams is low due to high gradient.
3. The west flowing rivers of Narmada and Tapi as well as those originating from the Western Ghats and falling in the Arabian Sea form estuaries in place of deltas.
4. Mahanadi, the Godavari, the Krishna and the Tapi flow eastwards and drain into the Bay of Bengal. These rivers make deltas at their mouths.

Which of the above statements are correct?

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

Q.24) Solution (c)

Explanation:

The velocity of water in the rivers and the load carrying capacity of the streams is low due to low (not high) gradient.
Mahanadi, the Godavari, the Krishna flow eastwards(tapi flow westward) and drain into the Bay of Bengal. These rivers make deltas at their mouths.-tapi was written to check if student is reading the last options minutely or not.
The main water divide in peninsular rivers is formed by the Western Ghats, which run from north to south close to the western coast.
The velocity of water in the rivers and the load carrying capacity of the streams is low due to low gradient.
Most of the major rivers of the peninsula such as the Mahanadi, the Godavari, the Krishna and the Cauvery flow eastwards and drain into the Bay of Bengal. These rivers make deltas at their mouths.
But the west flowing rivers of Narmada and Tapi as well as those originating from the Western Ghats and falling in the Arabian Sea form estuaries in place of deltas.

Q.25) Consider the following statements related to Indus water system:

1. Indus River originates from Kailash range in Tibet near Lake Manasarovar and it flows between Ladakh and Pir Panjal ranges in Jammu and Kashmir before it passes on to Pakistan.

2. Indus River is joined by Zaskar River near Indo-China border, Shyok River at Leh and near Skardu, it is joined by the Dhar river.
3. Jhelum is the smallest and most western of the five rivers of Punjab and the Kishenganga (Neelum) River, is the largest tributary of the Jhelum.
4. The Ravi which enters Punjab Plains (India) near Madhopur is the largest of Five Punjab Rivers with seul, baira, tant gari and buddhi as its tributaries. River Ravi is also called as the "River of Amritsar".
5. River Ujh is one of the most important tributaries of Ravi River which joins Ravi in Indian side of Punjab. The Ujh dam is a proposed hydroelectricity and irrigation multipurpose project in the pathankot district of Punjab over the Ravi River to help India utilize its share of water mandated under Indus water treaty.

Which of the following statements are correct?

a) Only 1 and 2.
b) Only 3 and 4.
c) Only 1, 4 and 5.
d) None of the above

Q.25) Solution (d)

All the given statements are incorrect.

Note: - Level of the question is extremely difficult.

Kindly do not get disheartened if you didn't have it right. UPSC has a tendency to throw in surprises related to river and its tributaries. The idea is NOT to frame extraordinary difficult questions to dishearten the candidates. The idea is to cover issue comprehensively so that bouncer thrown by UPSC can be tackled easily in exam hall.

This issue of Indus water treaty is in news since past 4 years because of surgical strikes conducted in 2016 after the Uri attack and the recent Balakot air strikes. Many Newspapers carried reports on how India initiated 3 national level projects on Ravi River to utilize its 20% share of water mandated under Indus Water Treaty. This question is an attempt to link the current issue with static one and have better understanding of both.

For your Information:

Indus River originates from Kailash range in Tibet near Lake Manasarovar and it flows between Ladakh and Zaskar ranges in Jammu and Kashmir before it pass on to Pakistan.

Indus River is joined by Dhar River near Indo-China border, Zaskar River at Leh and near Skardu, it is joined by the Shyok river.

Jhelum is the largest and most western of the five rivers of Punjab and the Kishenganga (Neelum) River, is the largest tributary of the Jhelum.

The Ravi which enters Punjab Plains (india) near Madhopur is the smallest of Five Punjab Rivers with seul, baira, tant gari and buddhi as its tributaries. River Ravi is also called as the "River of lahore" since that city is on its eastern bank.

River Ujh is one of the most important tributaries of Ravi River which joins Ravi at Nainkot in Pakistan. The Ujh dam is a proposed hydroelectricity and irrigation multipurpose project in Kathua district of Jammu over the Ravi River with a capacity to generate 196 MW of electricity. The main tributaries of the Ujh river are the Naaz and Bhinni Nallahs. It will help india utilize its share of water mandated under Indus water treaty.

India has decided to fast-track three projects, including construction of two dams, to arrest the unutilised water of its share under the bilateral Indus Waters Treaty with Pakistan. The three projects include the Shahpur Kandi dam project, a second Sutlej-Beas link in Punjab and the Ujh Dam project in Jammu and Kashmir. All three have been declared national projects in 2009.

https://economictimes.indiatimes.com/news/politics-and-nation/india-to-expedite-3-projects-to-stop-its-share-of-indus-waters-from-flowing-into-pakistan/articleshow/66793674.cms

https://www.business-standard.com/article/current-affairs/three-dam-projects-pose-challenge-to-government-stop-water-decision-119022201063_1.html

Q.26) Consider the following statements:

1. Tributaries of the Ganga and the Yamuna such as the Chambal, the Betwa, the Ken, the Son and the Damodar flow in the north-westerly direction.
2. The Mahanadi, the Godavari, the Krishna, the Cauvery and several smaller rivers drains south-east into the Bay of Bengal.

Which of the above statements is correct?

a) Only 1
b) Only 2
c) Both
d) None

Q.26) Solution (b)

Explanation:

Tributaries of the Ganga and the Yamuna such as the Chambal, the Betwa, the Ken, the Son and the Damodar flow in the north-easterly (not north westerly) direction.

Q.27) Consider the following statements regarding the Himalayan river system:

1. These rivers receive water both from the monsoons and melting snow hence they are seasonal in nature.
2. These rivers flow across the young fold mountains and are still in a youthful stage.
3. Himalayan rivers are highly tortuous and enter the plains with high water pressure.
4. These are examples of antecedent drainage.

Which of the above statements is correct?

a) Only 1, 2
b) Only 2, 3
c) Only 2, 4
d) Only 1, 4

Q.27) Solution (c)

Explanation:
The Himalayan Rivers are perennial in nature, i.e., water flows throughout the year in these rivers. These rivers receive water both from the monsoons and snow-melt. The perennial nature of these rivers makes them useful for irrigation.
The upper reaches of the Himalayan Rivers are highly tortuous. When they enter the plains, there is a sudden reduction in the speed of flow of water. Under these circumstances these rivers form meanders and often shift their beds.

Q.28) Giri River is a tributary of:

a) Ganga

b) Yamuna
c) Brahmaputra
d) Godavari

Q.28) Solution (b)

Explanation:

PLEASE SEE THE LINK TO UNDERSTAND THE LOCATION OF RENUKA MULTIPURPOSE DAM PROJECT.

https://static.toiimg.com/img/67495919/Master.jpg

Giri river (a tributary of the Yamuna) is in news as recently Centre signed pact with 5 States [Uttar Pradesh, Rajasthan, Uttarakhand, Delhi, Himachal Pradesh] — to restart construction of the Renuka multipurpose dam project in the Upper Yamuna Basin.
The Renuka dam project has been conceived as a storage project on the Giri River (a tributary of the Yamuna) in Sirmaur district of Himachal Pradesh.

https://timesofindia.indiatimes.com/city/delhi/6-northern-states-sign-on-renukaji-dam-to-augment-water-flow-in-yamuna/articleshow/67495103.cms

Q.29) Consider the following statements regarding the jet streams:

1. Jet streams have distinct peaks (ridges) and troughs.
2. Ridges occur where the cold air mass pushes against the warm air mass. Troughs occur where warm air mass drops into cold air.
3. The region on earth below the trough is at low pressure and the region below ridge is at high pressure.
4. Usually the trough region creates cyclonic condition (high pressure) at the surface of earth whereas the ridge regions create anticyclonic condition.

Which of the above statements are incorrect?

a) Only 1, 3
b) Only 2, 4
c) Only 1, 2
d) Only 3, 4

Q.29) Solution (b)

Explanation: Statement 2 and 4 are incorrect.
Ridges occur where the warm air mass pushes against the cold air mass. Troughs occur where cold air mass drops into warm air.
Usually the trough region [the region exactly below the jet stream trough] creates cyclonic condition (low pressure not high pressure) at the surface of earth whereas the ridge regions create anticyclonic condition.

Extra information:

PLEASE SEE THE LINK TO UNDERSTAND THE POLAR VORTEX AND ITS RELATION WITH JET STREAM.

https://www.noaa.gov/image_download/3913?itok=5yZosn1E

Recently Tens of millions of Americans braved Arctic-like temperatures on January 31 as low as minus 49 degrees Celsius that paralysed the U.S. Midwest and were blamed for 21 deaths. Cause is said to be polar vortex phenomenon . Polar vortex refers to the upper level jet stream that circulates around both the North and South Poles, keeping the coldest air there. When that jet stream occasionally weakens and buckles, it disrupts weather patterns — bumping warmer air into Alaska and pushing cold winds down into the U.S. Midwest and East Coast.

Q.30) Consider the following statements regarding the Role of Sub-Tropical Jet Stream (STJ) in Indian Monsoon:

1. Sub-Tropical Jet stream plays a significant role in both hindering the monsoon winds as well as in quick onset of monsoons.
2. The burst of monsoons depends upon the upper air circulation which is dominated by STJ.
3. In winter STJ flows along the southern slopes of the Himalayas but in summer it shifts northwards.
4. Northward movement of the subtropical jet is the first indication of the onset of the monsoon over India.

Which of the above statements are correct?

a) Only 1, 2, 3
b) Only 1, 3, 4
c) Only 2, 3, 4
d) All of the above

Q.30) Solution (d)

Explanation:

Sub-Tropical Jet stream plays a significant role in both hindering the monsoon winds as well as in quick onset of monsoons. Sub-Tropical Jet stream is a narrow band of fast moving air flowing from west to east [Westerlies].
The burst of monsoons depends upon the upper air circulation which is dominated by STJ.
In winter STJ flows along the southern slopes of the Himalayas but in summer it shifts northwards, rather dramatically. The periodic movement of the Jet stream is often the indicator of the onset and subsequent withdrawal of the monsoon. Northward movement of the subtropical jet is the first indication of the onset of the monsoon over India..

Q.31) Consider the following statements:

1. There is no south west monsoon in winters because ITCZ has left India.
2. During winter, the southern branch of Sub Tropical Jet stream is strong and is to the south of Himalayas.
3. There is already a strong high pressure over Tibet.

Which of the above statements contribute to no south-west monsoons during winter?

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

Q.31) Solution (d)

Explanation:

Reasons behind the no south-west monsoons during winter include:

Reason 1: ITCZ has left India (the winds that blow over India are mostly offshore — land to land or land to ocean — so they carry no moisture).

Reason 2: During winter, the southern branch of STJ is strong and is to the south of Himalayas. The ridge of the jet lies over north-western India and is associated with strong divergence of winds and creates a high pressure region (sub-tropical high pressure belt) over entire north

India. [This is how the mechanism of jet streams influence Indian Monsoons in winter season]
Reason 3: There is already an strong high pressure over Tibet. [High Pressure due to STJ + High Pressure over Tibet = strong divergence = no rainfall]

Q.32) Consider the following statements regarding the rivers in North East India:

1. The Sunderban delta is formed by Ganges river system and Brahmaputra river system only.
2. The Barak River originates in Nagaland and it flows into Assam past the town of silchar and after that it gets divided into two parts of Surma River and Kushiyara River.
3. River Brahmaputra is called as Yarlung Tsangpo in Tibet, Dihang in mountainous course and Siang in plain valley area of Arunachal Pradesh, Brahmaputra in Assam and Padma in Bangladesh.
4. Brahmaputra is a classic example of a braided river and is highly susceptible to channel migration and avulsion. It is also one of the few rivers in the world that exhibit a tidal bore.

Which of the above statements are correct?

a) 1 and 2.
b) 1, 2 and 4.
c) Only 4.
d) All of the above

Q.32) Solution (c)

Note: - Level of the question is very difficult.

This question has been asked due to many reasons such as:-

Chinese refused to share Brahmaputra river data with us after Doklam incident in 2017 and also China is building many dams on Brahmaputra River.
Clashes in the Barak river valley and Brahmaputra valley due to citizenship amendment bill. This issue dominated headlines for most part of the year and we have no reasons as why not to include a question based on this in the geography section.
PM of India has inaugurated many bridges in past 4-5 years over Brahmaputra.
Frequent Floods in Brahmaputra River displacing lakhs of people every year during south west monsoons.

Hence Candidates are advised to look into this aspect very carefully. It is not possible to cover all angles in one question but we have tried our best. Kindly do have a good look at this by referring the internet.

Explanation:

FIRST OF ALL PLEASE SEE THE LINK FOR UNDERSTANDING THE LOCATION OF BARAK VALLEY AND BRAHMAPUTRA VALLEY.

https://images.indianexpress.com/2018/07/assam-nrc-8.jpg

The Surma-Meghna River System is a river complex in the Indian Subcontinent, one of the three that form the Ganges Delta, the largest on earth. The other two are Ganges and Brahmaputra river system. The River rises in the Manipur Hills of northeast India as the Barak River and flows west becoming the Surma River and then flows south as the Meghna River.

After entering into south Assam, Barak divides in two, with the northern branch being called the Surma River and the southern branch the Kushiyara River. At this point the river enters the Sylhet Depression (or trough) which forms the Surma Basin.

The Surma is fed by tributaries from the Meghalaya Hills to the north, and is also known as the Baulai River after it is joined by the south-flowing Someswari River.

The Kushiyara receives tributaries from the Sylhet Hills and Tripura Hills to the south, the principal one from the Tripura Hills being the Manu. The Kushiyara is also known as the Kai River after it is joined by a major offshoot (distributary) from the Surma.

When the Surma and the Kushiyara finally rejoin in Kishoreganj District above Bhairab Bazar, the river is known as the Meghna River.

River Brahmaputra is called as Yarlung Tsangpo in Tibet, Siang in mountainous course and Dihang in plain valley area of Arunachal Pradesh, Brahmaputra in Assam and Jamuna in Bangladesh.

Brahmaputra flows southwest through the Assam Valley as Brahmaputra and south through Bangladesh as the Jamuna (not to be mistaken with Yamuna of India). In the vast Ganges Delta, it merges with the Padma, which is the popular name of the river Ganges in

Bangladesh, and finally the Meghna (surma + kushiyara) and from here it is known as Meghna before emptying into the Bay of Bengal.

http://wikimapia.org/river/679971/Dihang-or-Siang

Extra Information:-

PLEASE SEE THE LINK TO UNDERSTAND THE LOCATION OF CURRENT AND PROPOSED BRIDGES ON RIVER BRAHMAPUTRA.

https://images.indianexpress.com/2019/03/river.jpg

The Cabinet Committee on Economic Affairs approved the construction of a four-lane bridge over the Brahmaputra. It will be the country's longest, and will boost connectivity and commerce in the region.

At 19.28 km, it will connect Dhubri in Assam to Phulbari in Meghalaya. It is projected to reduce the travel distance between these two places from 205.3 km to 19.282 km, and travel time from 5 hours to 20 minutes.

The current longest road and rail-road bridges of the country are already over the Brahmaputra.

The Dhola-Sadiya bridge (road) runs 9.15 km, and the Bogibeel bridge (rail-road) is 4.94 km.

The bridge will be built under the North-East Road Network Connectivity Project with loan assistance from Japan International Cooperation Agency.

https://indianexpress.com/article/explained/why-the-brahmaputra-needs-long-bridges-5612765/

Q.33) Which one of the following statements regarding the Monsoons is incorrect?

1. The term monsoon has been derived from the Arabic word mausim meaning 'season'.
2. The monsoon is a double system of seasonal winds – They flow from sea to land during the summer and from land to sea during winter.
3. Monsoons are peculiar to Indian Subcontinent, South East Asia, parts of North Western America.

4. South-west monsoons are formed due to intense low pressure system formed over the Tibetan plateau whereas the North-east monsoons are associated with high pressure cells over Tibetan and Siberian plateaus.

Q.33) Solution (c)

Explanation:

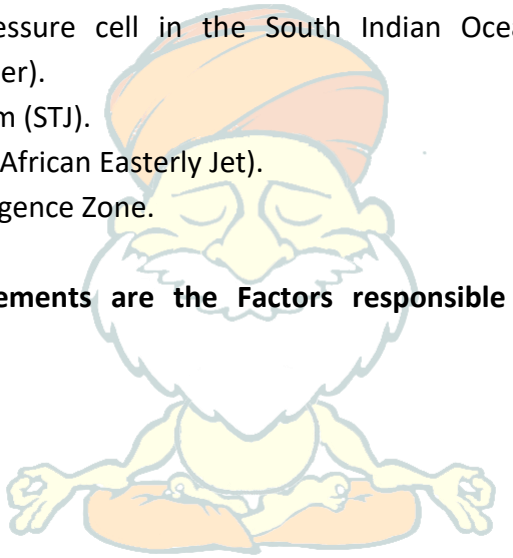
Monsoons are peculiar to Indian Subcontinent, South East Asia, parts of central Western Africa (Not North Western America)

Q.34) Consider the following statements:

1. Intense heating of Tibetan plateau during summer months.
2. Permanent high pressure cell in the South Indian Ocean (east to north-east of Madagascar in summer).
3. Subtropical Jet Stream (STJ).
4. Tropical Easterly Jet (African Easterly Jet).
5. Inter Tropical Convergence Zone.

Which of the above statements are the Factors responsible for south-west monsoon formation?

a) Only 1, 2
b) Only 1, 2, 3
c) Only 2, 3, 4, 5
d) All of the above



Q.34) Solution (a)

Subtropical Jet Stream (STJ), Tropical Easterly Jet (African Easterly Jet) and Inter Tropical Convergence Zone are the Factors that influence the onset of south-west monsoons. They are not the Factors responsible for south-west monsoon formation. They just influence onset.

The Intense heating of Tibetan plateau during summer months and the Permanent high pressure cell in the South Indian Ocean (east to north-east of Madagascar in summer) are the Factors that are not just responsible for south-west monsoon formation but they also influence onset of south west monsoon.

Q.35) Consider the following statements regarding the El Nino condition:

1. In an El Nino year, air pressure drops over large areas of the central Pacific and along the coast of South America.
2. Because of El Nino severe droughts occur in Australia, Indonesia, India and southern Africa.

Which of the above statements are correct?

a) Only 1
b) Only 2
c) Both
d) None

Q.35) Solution (c)

Explanation:

El Niño 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.

In an El Niño 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). These changes in pressure pattern causes the trade winds to be reduced == Weak Walker Cell. Sometimes Walker Cell might even get reversed.

This reduction allows the equatorial counter current (current along doldrums) to accumulate warm ocean water along the coastlines of Peru and Ecuador. This accumulation of warm water causes the thermocline to drop in the eastern part of Pacific Ocean which cuts off the upwelling of cold deep ocean water along the coast of Peru.

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. Effects of El Nino includes the warmer waters had a devastating effect on marine life existing off the coast of Peru and Ecuador.

Fish catches off the coast of South America were lower than in the normal year (Because there is no upwelling). Severe droughts occur in Australia, Indonesia, India and southern Africa and heavy rains in California, Ecuador, and the Gulf of Mexico.

Q.36) Consider the following statements regarding the ENSO [El nino southern oscillation]:

1. The formation of an El Niño [Circulation of Water] is linked with Pacific Ocean circulation pattern known as the southern oscillation.
2. Southern Oscillation, in oceanography and climatology, is a coherent inter-annual fluctuation of atmospheric pressure over the tropical Indian Ocean region.

Which of the above statements is/are incorrect?

a) Only 1
b) Only2
c) Both
d) None

Q.36) Solution (b)

Explanation:

Southern Oscillation, in oceanography and climatology, is a coherent inter-annual fluctuation of atmospheric pressure over the tropical Indo-Pacific (not Indian Ocean) region.

Extra info:

El Nino and Southern Oscillation coincide most of the times hence their combination is called ENSO – El Nino Southern Oscillation.

Only El Nino = [Warm water in Eastern Pacific + Cold water in Western Pacific].
Only southern oscillation = [Low Pressure over Eastern Pacific + High Pressure over Western Pacific]
ENSO = [Warm water in Eastern Pacific + Low Pressure over Eastern Pacific] + [Cold water in Western Pacific + High Pressure over Western Pacific].

Q.37) The north-east trade winds cause which of the following in India?

a) Winter rain in northwest India
b) Winter rain in Chennai
c) Excess dryness in Rajasthan region
d) Mild winter in East India

Q.37) Solution (b)

Explanation: Winter rains in Chennai are caused by north-east trade winds.

Q.38) Consider the following statements regarding North East Monsoon (NEM):

1. While Southwest Monsoon covers entire country, Northeast Monsoon (NEM) affects only five sub-divisions of Tamil Nadu, Kerala, South Interior Karnataka, Rayalaseema and Coastal Andhra Pradesh.
2. Unlike Southwest Monsoon, there is no official onset date for Northeast Monsoon (NEM) as well as the Monsoon sets in one go over the region.
3. Rainfall variation is much more in Northeast Monsoon as compared to Southwest Monsoon.
4. Usually intense cyclonic systems cause rainfall and improve the NEM's performance, at least in the southern states, but that did not happen with the southern peninsula this time (end of 2018).

Which of the above statements are correct?

a) 1, 2 and 3
b) 2, 3 and 4
c) 1, 3 and 4
d) All of the above

Q.38) Solution (d)

Note: - Level of the question is very difficult.

The question contains 6 statements instead of the usual 4 because monsoon has been a complex issue and we wanted to complete much of it in as little space as possible. Also, the north east monsoon is usually given less importance by students as compared to the south west monsoon, so it is to be taken as a learning curve.

The tough and detailed question on North East Monsoon was asked due to many current developments related to it:

In 2015, there was copious rainfall over Chennai which resulted in severe floods. One of the reasons was the extreme activity of the North East Monsoon. Please see the info graphic from DownToEarth for better understanding.

https://cdn.downtoearth.org.in/uploads/0.97807300_1451544231_49-1-2016-01-15.jpg

The 2018 Kerala floods were due to excessive activity of both South West Monsoon and North East Monsoon. Kindly see the info graphic from times of India and note down the finer details for complete understanding of the issue.
https://timesofindia.indiatimes.com/city/kochi/kerala-floods-it-is-very-bad-and-getting-worse/articleshow/65432466.cms

In January of 2019, it was reported that the south west monsoon last year was around 9% deficient but the north east monsoon in end of 2018 was deficient to the tune of 44% causing adverse effect on both winter sown rabi crop as well as the winter precipitation over Himalayas. Kindly see the link from DownToEarth given below. Its last paragraph also addresses the point 6 of the above question.
https://www.downtoearth.org.in/news/environment/poor-northeast-monsoon-spells-trouble-for-rabi-season-62747

Climate change has been a burning issue since past many years and this year is no exception with reports being circulated of setting up of a weak El-Nino this year. The following link is of February 2019 which indicates that El-Nino may affect Indian Monsoon this year. When we talk of Indian Monsoon both SW and NE are included. Since SW is covered in detail by routine questions the focus was on NE monsoon.
https://weather.com/en-IN/india/news/news/2019-02-15-weak-el-nino-forms-in-pacific-may-affect-monsoon

The first five statements, all of them which are correct were taken from the following link of skymet.
https://www.skymetweather.com/content/weather-news-and-analysis/know-how-northeast-monsoon-is-different-from-southwest-monsoon/

Q.39) The concept of differential heating was primarily given to explain which of the following geographical phenomena in India?

a) Monsoon
b) Subtropical Jet streams
c) Anti Cyclones
d) Desert storms

Q.39) Solution (a)

Explanation: The concept of differential heating about the origin of Indian Monsoon was given by Halley.

Q.40) Which of the following rivers does not flow into the Arabian Sea?

1. Ulhass River.
2. Sabarmati
3. Mandovi/Mahadayi
4. Narmada

Choose from the following options:

a) 1 and 2 Only
b) 3 and 4 Only
c) 1,3 and 4 Only
d) All of the above

Q.40) Solution (d)
All of the above flow into Arabian Sea.

Explanation:-

Mandovi or Mahadayi River is in news because of 3 reasons:

First the Goa government has given 6 month extension to casinos.
Second, a new cable strayed bridge has been inaugurated on it.
Thirdly, 50 year old dispute between Karnataka and Goa has been ended by the Mahadayi river water tribunal.

https://www.financialexpress.com/india-news/goa-government-gives-mandovi-river-casinos-6-month-extension/1331110/

http://www.tourismnewslive.com/2019/01/25/new-cable-stayed-bridge-over-river-mandovi-in-goa-to-be-inaugurated-on-sunday/

https://www.news18.com/news/india/karnataka-will-get-13-5-tmc-mahadayi-water-tribunal-ends-50-year-old-water-dispute-with-goa-1844471.html

Ulhass River is in news because of 4 reasons:

Firstly, a boat ride service has been started at thane creek which is formed by Ulhass River.
Secondly, a case is going on in the Supreme Court related to pollution of Ulhass River.

Thirdly, Thane creek was declared as a flamingo sanctuary by the Maharashtra government in 2015.
Fourthly, a museum on history of ulhass river basin has been inaugurated recently.

https://www.mid-day.com/articles/untreated-sewage-continues-to-deface-ulhas-river/20571186

http://www.asianage.com/metros/mumbai/271018/boat-ride-at-thane-creek-to-start-from-november.html

https://www.hindustantimes.com/mumbai-news/coming-soon-ulhas-river-basin-s-history-in-a-museum/story-QsWbAACvwy2OJ8VbnhKS6O.html

Explanation 1:

The Mahadayi/Mandovi River also known as Mahadayi or Mhadei River is described as the lifeline of the Indian state of Goa. The Mandovi and the Zuari are the two primary rivers in the the Mormugao harbour.
Panaji, the state capital and Old Goa, the former capital of Goa, are both situated on the left bank of the Mandovi.

It originates from Bhimgad in the Western Ghats in the Belagavi district of Karnataka. With its cerulean waters, Dudhsagar Falls and Varapoha Falls, it is also known as the Gomati in a few places.

Three large freshwater isles — Divar, Chorão and Vanxim are present in the Mandovi near the town of Old Goa. The island of Chorão is home to the Salim Ali Bird Sanctuary, named after the renowned ornithologist Salim Ali.

Explanation 2:

A river that has its beginnings in pristine streams flowing down from the Western Ghats at Rajmachi near Lonavala, the Ulhas ends as a smelly creek in the Arabian Sea.

The Ulhas begins its 122-km journey to Mumbai and the sea near Tungarli dam, where it is a fairly shallow water body. As it travels, it swells in volume and size with mountain streams feeding it.

The river flows via Pune, Raigad and Thane districts, where the inhabitants of its banks use it for various purposes including washing clothes and fishing. The river flows through Khandala valley and interior Karjat. It then flows through Bhivpuri, Neral, Badlapur, Ambernath, Ulhasnagar, Shahad, Kalyan and Dombivli before joining the the Vasai creek and, eventually, reaching the Arabian Sea.

The Maharashtra Government has declared the area along the western bank of the Thane Creek as the "Thane Creek Flamingo Sanctuary". It will be Maharashtra's second marine sanctuary after Malvan sanctuary.
The location of the places has been taken from the following link:-

https://www.thehindu.com/news/cities/mumbai/ulhas-river-how-a-river-dies/article8610049.ece