CLIMATE

Q. 1. Explain the term Weather and Climate.
Weather refers to the condition of the atmosphere like, temperature, atmospheric pressure, wind, humidity and precipitation over an area at any point of time. Climate refers to the sum total of weather conditions and variations over a large area for a long period of time (more than thirty years).

Q. 2. What are the elements of weather and climate?
The elements of weather and climate are the same, i.e temperature, atmospheric pressure, wind, humidity and precipitation.

Q.3. What is meant by seasons?
There is some common pattern of the atmospheric conditions over a few weeks or months, i.e. days are cool or hot, windy or calm, cloudy or bright, and wet or dry. On the basis of the generalised monthly atmospheric conditions, the year is divided into seasons such as winter, summer or rainy seasons.

Q.4. Describe the climate of India.
i) The climate of India is described as the 'monsoon' type. This type of climate is found mainly in the south and the Southeast Asia. We get ample rain fall during the months of June- July to September –October.
ii) The Tropic of Cancer passes through the middle of the country from the Rann of Kuchchh in the west to Mizoram in the east. Almost half of the country, lying south of the Tropic of Cancer, belongs to the tropical area. All the remaining area, north of the Tropic, lies in the sub-tropics.
Therefore, India's climate has characteristics of tropical as well as subtropical climates.

Q. 5. Describe the regional variations in temperature and precipitations in India.
a. In summer, the temperature occasionally reaches 50°C in some parts of the Rajasthan desert, whereas it may be around 20°C in Pahalgam in Jammu and Kashmir. ii) On a winter night, temperature at Drass in Jammu and Kashmir may be as low as minus 45°C. Thiruvananthapuram, in Kerala, on the other hand, may have a temperature of 22°C.
b. While precipitation is mostly in the form of snowfall in the upper parts of Himalayas, it rains over the rest of the country. The annual precipitation varies from over 400 cm in Meghalaya to less than 10 cm in Ladakh and western Rajasthan.
c. Most parts of the country receive rainfall from June to September. But some parts like the Tamil Nadu coast get most of its rain during October and November.

Q. 6. Explain the climatic control of a place. (or the factors affecting the climate of a place)

i) **Latitude:** Due to the curvature of the earth, the amount of solar energy received varies according to latitude. As a result, air temperature decreases from the equator towards the poles.

ii) **Altitude**: As one goes from the surface of the earth to higher altitudes, the atmosphere becomes less dense and temperature decreases. The hills are therefore cooler during summers.

iii) **The pressure and wind system**: The pressure and wind system of any area depend on the latitude and altitude of the place. Thus it influences the temperature and rainfall pattern.

iv) **The distance from the sea**: The sea exerts a moderating influence on climate: As the distance from the sea increases, its moderating influence decreases and the people experience extreme weather conditions. **This condition is known as continentality** (i.e. very hot during summers and very cold during winters).

v) **Ocean currents**: Ocean currents along with onshore winds affect the climate of the coastal areas. For example, any coastal area with warm or cold currents flowing past it, will be warmed or cooled if the winds are onshore.

vi) **Relief:** Relief too plays a major role in determining the climate of a place. High mountains act as barriers for cold or hot winds; they may also cause precipitation if they are high enough and lie in the path of rain-bearing winds.

Q.7. Describe the factors affecting India's climate.

The climate and associated weather conditions in India are governed by:

a. **Latitude:** The Tropic of Cancer passes through the middle of the country from the Rann of Kuchchh in the west to Mizoram in the east. Almost half of the country, lying south of the Tropic of Cancer, belongs to the tropical area. All the remaining area, north of the Tropic, lies in the sub-tropics. Therefore, India's climate has characteristics of tropical as well as subtropical climates.

b. **Altitude:** India has mountains to the north, which have an average height of about 6,000 metres. India also has a vast coastal area where the maximum elevation is about 30 metres. The Himalayas prevent the cold winds from Central Asia from entering the subcontinent. It is because of these mountains that this subcontinent experiences comparatively milder winters as compared to central Asia.

c. **Pressure and Winds:** It includes pressure and surface winds, Upper air circulation and western cyclonic disturbances and tropical cyclones. India lies in the region of north easterly winds. These winds originate from the subtropical high-pressure belt of the northern hemisphere. Generally, these winds carry very little moisture as they originate and blow over land. Therefore, they bring little or no rain. Hence, India should have been an arid land, but, it is not so. During winter, there is a high-pressure area north of the Himalayas. Cold dry winds blow from this region to the low-pressure areas over the oceans to the south. In summer, a low-pressure area develops over interior Asia as well as

over northwestern India. This causes a complete reversal of the direction of winds during summer. These winds blow over the warm oceans, gather moisture and bring widespread rainfall over the mainland of India. The western cyclonic disturbances experienced in the north and north-western parts of the country are brought in by this westerly flow.

Q.8. Why do we have (India) tropical and sub-tropical climate?
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Q. 9. Why does India experience milder winter than central Asia?
India has mountains to the north, which have an average height of about 6,000 metres. India also has a vast coastal area where the maximum elevation is about 30 metres, that act as a moderating factor. The Himalayas prevent the cold winds from Central Asia from entering the subcontinent. It is because of these mountains that this subcontinent experiences comparatively milder winters as compared to central Asia.

Q. 10. What is meant by Coriolis force?
An apparent force caused by the earth's rotation. The Coriolis force is responsible for deflecting winds towards the right in the northern hemisphere and towards the left in the southern hemisphere. This is also known as 'Ferrel's Law'.

Q. 11. What are Jet Streams? These are fast blowing winds of a steady velocity moving in a narrow zone of the upper layer of the atmosphere.
Their speed varies from about 110 km/h in summer to about 184 km/h in winter. Jet streams are located approximately over 27°-30° north latitude, therefore, they are known as *subtropical westerly jet streams*. A number of separate jet streams have been identified. The most constant are the mid-latitude and the sub-tropical jet stream. The western cyclonic disturbances experienced in the north and north-western parts of the country are brought in by this westerly flow.

Q. 12. Which are the important facts to keep in mind to understand the mechanism of monsoon?
a. **The differential heating and cooling of land and water** creates low pressure on the landmass of India while the seas around experience comparatively high pressure.
b. **The shift of the position of Inter Tropical Convergence Zone (ITCZ)** in summer, over the Ganga plain (this is the equatorial trough normally positioned about 5°N of the equator – also known as the monsoon trough during the monsoon season).

c. The presence of the **high-pressure area,east of Madagascar**, approximately at 20°S over the Indian Ocean. The intensity and position of this high-pressure area affects the Indian Monsoon.
d. The **Tibetan plateau gets intensely heated** during summer, which results in strong vertical air currents and the formation of high pressure over the plateau at about 9 km above sea level.
e. **The movement of the westerly jet stream to the north of the Himalayas** and the presence of the **tropical easterly jet stream over the Indian peninsula** during summer.

Q. 13. What is meant by Southern Oscillation?
Normally when the tropical eastern South Pacific Ocean experiences high pressure, the tropical eastern Indian Ocean experiences low pressure. But in certain years, there is a reversal in the pressure conditions and the eastern Pacific has lower pressure in comparison to the eastern Indian Ocean. This periodic change in pressure conditions is known as the Southern Oscillation.

Q. 14. What is 'the burst of the mansoon'?
The duration of rain in India is between 100-120 days from early June to mid-September. Around the time of its arrival, the normal rainfall increases suddenly and continues constantly for several days. This is known as the 'burst' of the monsoon.

Q. 15. What are the features of the Cold Weather Season (Winter)?
i) The cold weather season begins from mid- November in northern India and stays till February. December and January are the coldest months in the northern part of India. The temperature decreases from south to the north.
ii) The average temperature of Chennai, on the eastern coast, is between 24° - 25° Celsius, while in the northern plains, it ranges between 10° -15° Celsius. Days are warm and nights are cold. Frost is common in the north and the higher slopes of the Himalayas experience snowfall.
iii) During this season, the northeast trade winds prevail over the country. They blow from land to sea and hence, for most part of the country, it is a dry season. Some amount of rainfall occurs on the Tamil Nadu coast from these winds as, here they blow from sea to land.
iv) A characteristic feature of the cold weather season over the northern plains is the inflow of cyclonic disturbances from the west and the northwest. These low-pressure systems, originate over the Mediterranean Sea and western Asia and move into India, along with the westerly flow. They cause the much needed winter rains over the plains and snowfall in the mountains. Although the total amount of winter rainfall locally known as *'mahawat'* is small, they are of immense importance for the cultivation of *'rabi'* crops.

Q. 16. Why does Tamil Nadu receive winter rain fall?
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Q. 17. What are the features of the Hot Weather Season (Summer)?
i) From March to May, it is hot weather season in India. In March, the highest temperature is about 38° Celsius, recorded on the Deccan plateau. In April, temperatures in Gujarat and Madhya Pradesh are around 42° Celsius. In May, temperature of 45° Celsius is common in the northwestern parts of the country.
ii) A striking feature of the hot weather season is the *'**loo**'*. These are strong, gusty, hot, dry winds blowing during the day over the north and north western India. Sometimes they even continue until late in the evening. Direct exposure to these winds may even prove to be fatal.
iii) Dust storms are very common during the month of May in northern India. These storms bring temporary relief as they lower the temperature and may bring light rain and cool breeze.
iv) This is also the season for localised thunderstorms, associated with violent winds, torrential downpours, often accompanied by hail. In West Bengal, these storms are known as the '***Kaal Baisakhi'*** calamity for the month of Baisakh.
v) Towards the close of the summer season, pre-monsoon showers are common especially, in Kerala and Karnataka. They help in the early ripening of mangoes, and are often referred to as '***mango showers'***.

Q. 18. What are the four main seasons in India?
Four main seasons can be identified in India – the cold weather season, the hot weather season, the advancing monsoon and the retreating monsoon with some regional variations.

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Q. 20. What is meant by 'Kaal Baisakhi'?
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Q. 21 What are " Mango Showers"?
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Q. 22. Explain the features of Advancing Monsoon or the Rainy Season.
i) The monsoon rains take place only for a few days at a time. They are interspersed with rainless intervals. The breaks in monsoon are related to the movement of the monsoon trough. When the axis of the monsoon trough lies over the plains, rainfall is good in these parts.
ii) On the other hand, whenever the axis shifts closer to the Himalayas, there are longer dry spells in the plains, and widespread rain occur in the mountainous catchment areas of the Himalayan rivers. These heavy rains bring in their wake, devastating floods causing damage to life and property in the plains. The frequency and intensity of tropical depressions too, determine the amount and duration of monsoon rains.
iii) The monsoon is known for its uncertainties. These are untimely, irregular, unpredictable and unevenly distributed. The alternations of dry and wet spells vary in intensity, frequency and duration. While it causes heavy floods one part, it may be responsible for droughts in the other. It is often irregular in its arrival and its retreat. Hence, it sometimes disturbs the farming schedule of millions of farmers all over the country.

Q. 23. What are the vagaries of Indian Monsoon?
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Q.24. What are the features of Retreating Monsoon?
i) During October-November, with the apparent movement of the sun towards the south, the monsoon trough or the low-pressure trough over the northern plains becomes weaker. This is gradually replaced by a high-pressure system. The south-west monsoon winds weaken and start withdrawing gradually. By the beginning of October, the monsoon withdraws from the Northern Plains.
ii) The months of October-November form a period of transition from hot rainy season to dry winter conditions. The retreat of the monsoon is marked by clear skies and rise in temperature. While day temperatures are high, nights are cool and pleasant. The land is still moist. Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive during the day. This is commonly known as 'October heat'.

iii) In the second half of October, the temperature begins to fall rapidly in northern India. The low-pressure conditions, over northwestern India, get transferred to the Bay of Bengal by early November. This shift is associated with the occurrence of cyclonic depressions, which originate over the Andaman Sea.
iv) These cyclones generally cross the eastern coasts of India and cause heavy and wide spread rain. These tropical cyclones are often very destructive. The thickly populated deltas of the Godavari, the Krishna and the Kaveri are frequently struck by cyclones, which cause great damage to life and property. Sometimes, these cyclones arrive at the coasts of Orissa, West Bengal and Bangladesh. The bulk of the rainfall of the Coromandel Coast is derived from depressions and cyclones.

Q. 25 Describe the distribution of rainfall in India.
i) The western coast and northeastern India receive over about 400 cm of rainfall annually. However, it is less than 60 cm in western Rajasthan and adjoining parts of Gujarat, Haryana and Punjab. Mawsynram, in the southern range of the Khasi hills receives the
highest average rainfall in the world.
ii) Rainfall is equally low in the interior of the Deccan plateau, and east of the Sahyadris. A third area of low precipitation is around Leh in Jammu and Kashmir. The rest of the country receives moderate rainfall.
iii) Snowfall is restricted to the Himalayan region. Owing to the nature of monsoons, the annual rainfall is highly variable from year to year. Variability is high in the regions of low rainfall such as parts of Rajasthan, Gujarat and the leeward side of the Western Ghats.
As such, while areas of high rainfall are liable to be affected by floods, areas of low rainfall are drought-prone.

Q. 26. What is meant by the October – heat?
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Q. 27. Why the deltas of the Godawari and the Krishna and the Kaveri are frequently struck by cyclones?
The low-pressure conditions, over northwestern India, get transferred to the Bay of Bengal by early November. This shift is associated with the occurrence of cyclonic depressions, which originate over the Andaman Sea. These cyclones generally cross the eastern coasts of India, including the deltas of the Godawari and the Krishna and the Kaveri, cause heavy and widespread rain. These tropical cyclones are often very destructive. The thickly populated

deltas of the Godavari, the Krishna and the Kaveri are frequently struck by cyclones, which cause great damage to life and property. Sometimes, these cyclones arrive at the coast of Orissa, West Bengal and Bangladesh. The bulk of the rainfall of the Coromandel Coast is derived from depressions and cyclones.

Q.28. How does Monsoon act as a Unifying Bond?
The seasonal alteration of the wind systems and the associated weather conditions provide a rhythmic cycle of seasons. Even the uncertainties of rain and uneven distribution are very much typical of the monsoons. The Indian landscape, its animal and plant life, its entire agricultural calendar and the life of the people, including their festivities, revolve around this phenomenon. Year after year, people of India from north to south and from east to west, eagerly await the arrival of the monsoon.

Q. 29. What is the impact of variation in the climatic conditions in India?
The variations have given rise to a variety in the lives of people- their food, clothing, housing, etc. Its impact is seen the main economic activity i.e. the agriculture, sowing and harvsting a variety of crops in India. Even the uncertainties of rain and uneven distribution are very much typical of the monsoons. The Indian landscape, its animal and plant life, its entire agricultural calendar and the life of the people, including their festivities, revolve around this phenomenon.

Q.30. Why do Peninsular plateau get moderate temperature but the northern plain not?
Due to the triangular shape of the peninsular plateau, the moderating influence of the surrounding ocean and the sea extent over a large area. The presence of wind in this area moderates both the low and high temperature. The northern plain being away from the sea do not have any moderating influence.

Q. 31. What role does Himalayas play in the modification of the climate in India?
i) The Himalayas protect the Indian sub-continent from the cold and chilly northern winds which originate in Central Asia. It is because of this mountain that India enjoys a comparatively warmer climate during winter and the temperature differences are minimized between the tropical and sub-tropical India.
ii) We receive ample rain fall in India due to the presence of the Himalayas which prevent the rain bearing winds to cause wide spread rain fall in India especially in the north eastern parts .

Q.32. Why does seasonal reversal of wind direction take place over the Indian sub-continent?

i) During winter, there is a high-pressure area north of the Himalayas. Cold dry winds blow from this region to the low-pressure areas over the oceans to the south.

ii) In summer, a low-pressure area develops over interior Asia as well as over north-western India. Air now starts moving from a high pressure area located over the Indian Ocean in the south to the low pressure area in the north. This causes a complete reversal of the direction of winds during summer.

iii) These winds blow over the warm oceans, gather moisture and bring widespread rainfall over the mainland of India. The western cyclonic disturbances experienced in the north and north-western parts of the country are brought in by this westerly flow.