Sambhav

Day 67

Question 1: Discuss tri-cellular model of atmospheric circulation with emphasis on the forces responsible for this model. (250 Words)

Question 2: What do you understand by term precipitation. Illustrate the world distribution of rainfall. (250 Words)

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Approach / Explaination / Answer

Answer 1

Approach

- Start answering with the introduction of a tri-cellular model of atmospheric circulation.
- Describe the forces on which these models depend.
- Write a holistic and appropriate conclusion.

Introduction

- The **tri-cellular model of atmospheric circulation** helps to explain the general patterns of **atmospheric circulation** and weather patterns that are observed around the world.
- The **tri-cellular model** of **atmospheric circulation** is a conceptual model that describes the **large-scale circulation patterns** in the atmosphere. It consists of three distinct cells: the **Hadley cell, the Ferrell cell,** and the **polar cell.**

Body

- **The Hadley cell:** This is located near the equator and is characterized by rising air at the equator and sinking air at about 30 degrees latitude. This creates a low-pressure area at the equator and high-pressure areas at about 30 degrees latitude.
- **The Ferrell cell:** This is located between the **Hadley cell** and the **polar cell,** and is characterized by rising air at about **60 degrees latitude** and sinking air at about **30 degrees latitude.**
- This creates a **low-pressure area a**t about **60 degrees latitude** and a **high-pressure** area at about **30 degrees latitude.**
- **The polar cell**: This cell is located near **the poles** and is characterized by rising air at about **60 degrees latitude** and **sinking air at the poles.**

- This creates a l**ow-pressure area at about 60 degrees latitude** and a **high-pressure area** at the **poles.**

Forces on which these models depend:

- The tri-cellular model of atmospheric circulation is driven by a combination of forces. These forces include the **Coriolis effect, the pressure gradient force,** and **the thermal forcing.**
    - **Coriolis Force:** The **Coriolis force/effect** is caused by the **rotation of the Earth**, which causes the winds to **deflect to the right** in the **Northern Hemisphere** and to the **left** in the **Southern Hemisphere.**
    - This causes the winds in the **Hadley cell** to blow **westward** and the **Ferrell** and **polar cells** to blow **eastward**.
    - **Pressure Gradient:**
        - The **pressure gradient force** is caused by differences in **air pressure.**
        - Air will flow from **high-pressure areas to low-pressure areas** in an attempt to equalize the pressure.
        - This causes the air in the **Hadley cell** to rise at the equator and **sink at** about **30 degrees latitude**, and causes the air in the **Ferrel cell** to rise at about **60 degrees latitude** and **sink** at about **30 degrees latitude.**
    - **Thermal forcing:**
        - It is caused by the **unequal heating of the Earth's surface** by **the sun.**
        - The equator receives the most **direct sunlight** and is therefore the **warmest,** which causes the air to rise in the **Hadley cell.**
    - **The poles:**
        - It is the coldest and the air sinks in the polar cell.
        - All these forces work together to drive the tri-cellular model of atmospheric circulation, with the **Hadley cell** near the **equator,** the **Ferrel cell** between the **Hadley** and **Polar cells,** and the **Polar cell** near the poles.
        - This model helps to explain the general patterns of **atmospheric circulation** and weather patterns that are observed around the world.

Conclusion

The tri-cellular model of atmospheric circulation is driven by the differential heating of the Earth's surface near the equator and the poles, the Coriolis effect, and the cooling of the Earth's surface near the poles. These forces work together to create large-scale circulation patterns in the Earth's atmosphere, which have a significant impact on weather patterns and climate.

Answer 2

Approach

- Start answering with the introduction of precipitation.
- Describe the world distribution of rainfall.
- Write a holistic conclusion.

Introduction

Precipitation refers to the process by which **water droplets** or **ice crystals** fall from the **atmosphere to the Earth's surface.** This can include forms such as **rain, snow, sleet, and hail.**

- **Convective rainfall:**
    - It is a type of rainfall that occurs when **warm, moist air rises and cools, forming thunderstorms and heavy downpours.**
    - This type of rainfall is caused by **convection,** the process of heat transfer by the movement of a fluid, typically a gas or liquid.
    - As the **warm, moist air rises,** it cools and the moisture condenses, forming clouds and eventually precipitation.

    - **Precipitation** refers to the process by which **water droplets** or **ice crystals** fall from the **atmosphere to the Earth's surface.** This can include forms such as **rain, snow, sleet,** and **hail.**
- **Orographic rainfall:**
    - It is a type of rainfall that occurs when air is forced to **rise over a mountain range**, causing it to cool and form precipitation.
    - This happens because as the air moves over the mountains, it cools as it rises and expands, which causes the moisture in the air to condense and form clouds.
    - This results in precipitation falling on the **windward side** of the mountain range, and often results in higher amounts of rainfall on the **windward side of the mountain** compared to the **leeward side.**
    - This type of rainfall is common in areas with **mountainous terrain** and can lead to the formation of **rivers, lakes, and waterfalls.**
- **Frontal rainfall:**
    - It is a type of rainfall that occurs when a **cold front collides with a warm front,** causing the **warm, moist air to rise** and form **precipitation.**
    - A front is a boundary separating two different air masses, and cold and warm fronts form as a result of the movement of these air masses.
    - This type of rainfall can be **moderate to heavy** and can last for several hours.
    - It is often associated with **extratropical cyclones,** which are l**arge-scale weather systems** that occur outside the tropics.

Body

- The world distribution of rainfall is highly variable. Some areas, such as the **tropical rainforests,** receive **very high levels of rainfall** throughout the year.
- **Tropical regions** near the equator tend to receive the highest levels of rainfall, as the warm, moist air in these regions rises and cools, leading to the formation of **clouds** and **precipitation.**
- This is why the **tropical rainforests,** such as the **Amazon rainforest in South America** and the **Congo rainforest in Africa,** are among the **wettest places on Earth.**
- In contrast, **deserts** and **semi-arid regions** tend to receive **very little rainfall.**
    - This is because the **air in these regions is hot and dry,** making it difficult for **clouds** and **precipitation** to form.
        - Examples of **desert regions** with **low rainfall** include the **Sahara Desert in Africa** and the **Atacama Desert** in **South America.**
- Between these **two extremes**, there are also regions that receive moderate levels of rainfall, such as the **savannas and grasslands.**
- These regions tend to receive enough rainfall to support vegetation, but not so much that it becomes a hindrance to human and animal life.
- **Climate** patterns such as **monsoons, trade winds** and **ocean currents** also play a major role in the distribution of rainfall.
- **Monsoons,** for example, are **seasonal wind patterns** that bring **large amounts of rainfall** to certain regions, while trade winds can divert moisture-rich air away from other areas.

Conclusion

Precipitation is the process of water droplets or ice crystals falling from the atmosphere. The world distribution of rainfall is variable and depends on various factors such as temperature, pressure, wind patterns, and geography. Climate patterns such as monsoons, trade winds, and ocean currents also play a role in the distribution of rainfall. Understanding these factors is crucial for understanding weather patterns and predicting future climate changes.

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