



Mains Practice Question

Q. The Coriolis force plays a fundamental role in determining not just the formation but also the behavior and characteristics of tropical cyclones. Discuss **(250 words)**

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Approach

- Introduce the answer by defining Coriolis Force
- Give Role of Coriolis Force in Determining Behavior and Characteristics of Tropical Cyclones
- Conclude suitably.

Introduction

The **Coriolis force** is an apparent force that arises from the **Earth's rotation**, causing moving objects, such as **air or water currents**, to be **deflected to the right in the northern hemisphere** and to the **left in the southern hemisphere**.

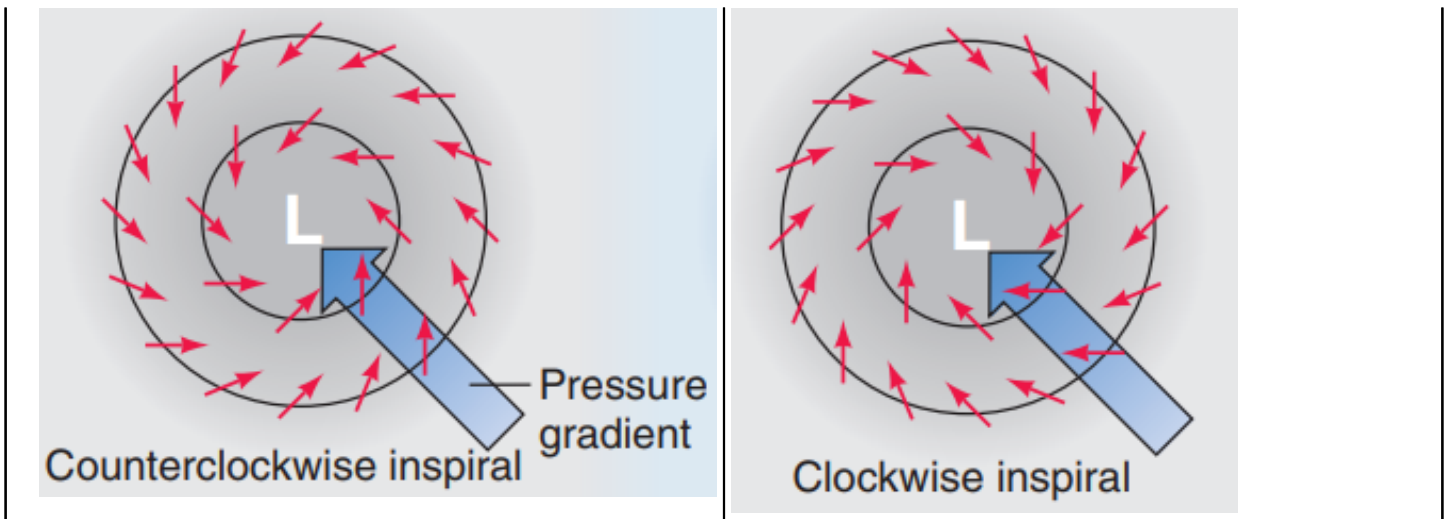
- It is crucial in shaping large-scale atmospheric and oceanic circulation patterns, **influencing the movement of weather systems like tropical cyclones**.

Body

Role of Coriolis Force in Determining Behavior and Characteristics of Tropical Cyclones:

- **Role in Cyclone Formation:**
 - **Initiation of Rotation:** The Coriolis force provides the necessary spin for cyclones to form.
 - Without it, **converging winds around low-pressure areas would simply flow straight toward the center**, inhibiting the development of a rotating storm system.
 - **For instance**, tropical cyclones **do not form near the equator (within 5° latitude)**, where the **Coriolis force is negligible**, because there is insufficient spin to initiate cyclone formation.
- **Cyclone Structure and Rotation**
 - **Deflection of Winds:** The Coriolis effect **deflects the winds around the low-pressure center**, creating a **counterclockwise rotation in the Northern Hemisphere** and a **clockwise rotation in the Southern Hemisphere**.

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- **Impact on Cyclone Intensity and Wind Speed**

- **Wind Circulation Speed:** Coriolis force **aids in maintaining high wind speeds** by sustaining the rotational flow around the cyclone's center.
- **Influence on Energy Balance:** The Coriolis effect helps balance centripetal forces, which allows the system to efficiently draw energy from warm ocean waters, intensifying the cyclone.

- **Influence on Cyclone Dissipation:**

- **Extratropical Transition:** As cyclones move towards higher latitudes, the Coriolis force increases, which often results in **structural changes as cyclones transition into extratropical systems.**
 - This process causes cyclones to dissipate or lose their typical tropical characteristics.

Conclusion

The Coriolis force is crucial to the **formation, behavior, and trajectory of tropical cyclones**, influencing them from inception to dissipation. By **initiating rotation, steering paths, and affecting wind dynamics**, it shapes the lifecycle and characteristics of these powerful storms.