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4 am Batch Test

(DAY-21 - Answers)

1) Evaluate the role of deep ocean currents in the global carbon cycle. How do these currents contribute to the transport and storage of carbon dioxide in the deep ocean, and what are the implications for climate change?

UPSC Mains Syllabus topic	**Salient features of World's Physical Geography.**
Why was this question asked?	• **How do the melting of the Arctic ice and glaciers of the Antarctic differently affect the weather patterns and human activities on the Earth? Explain.** • **How do ocean currents and water masses differ in their impacts on marine life and coastal environment? Give suitable examples.**
Introduction	**Deep ocean currents play a crucial role in the global carbon cycle by facilitating the transport and storage of carbon dioxide (CO2) in the deep ocean. This process has significant implications for climate change, as it helps regulate the balance of CO2 in the atmosphere.**
Body	**I. Transport of Carbon Dioxide:** Deep ocean currents act as a conveyor belt, transporting CO2 from the surface ocean to the deep ocean. This occurs through a process known as the oceanic carbon pump, where CO2 dissolves in surface waters and is subsequently carried downwards. Key factors contributing to this transport include: a. **Thermohaline Circulation:** Deep ocean currents are driven by differences in water density caused by variations in

	temperature (thermo) and salinity (haline). These circulation patterns help distribute CO2 globally. **b. Upwelling and Downwelling:** Upwelling brings nutrient-rich deep waters to the surface, promoting photosynthesis and the absorption of CO2 by marine organisms. Downwelling carries this CO2 back into the deeper layers of the ocean. **II. Storage of Carbon Dioxide:** Deep ocean currents facilitate the long-term storage of CO2 in the deep ocean, acting as a reservoir that helps regulate atmospheric CO2 levels. Notable aspects of carbon dioxide storage in the deep ocean include: **a. Solubility Pump:** CO2 dissolves in cold, deep waters due to higher solubility at lower temperatures, effectively sequestering it from the atmosphere. **b. Biological Pump:** Organic matter produced through photosynthesis in surface waters sinks to the deep ocean, carrying carbon with it. This organic carbon becomes trapped in sediments, effectively storing it for extended periods. **Implications for Climate Change:** • **Carbon Sink:** The transport and storage of CO2 by deep ocean currents serves as a critical carbon sink, mitigating the rise of atmospheric CO2 and reducing the greenhouse effect. • **Ocean Acidification:** Increased absorption of CO2 by the oceans can lead to ocean acidification, negatively impacting marine ecosystems and biodiversity. • **Climate Feedback:** Changes in deep ocean currents due to climate change can affect the efficiency of the oceanic carbon pump, potentially amplifying or mitigating climate change. The role of deep ocean currents in the global carbon cycle highlights their importance in regulating climate and underscores the need for their protection and conservation.
Conclusion	**Understanding the complex interplay between deep ocean currents and the carbon cycle is essential for effective climate change mitigation strategies and the preservation of marine ecosystems.**

2) Give a detailed account of bottom topography of the Pacific Ocean.

UPSC Mains Syllabus topic	**Salient features of World's Physical Geography.**
Why was this question asked?	• **Discuss the geophysical characteristics of Circum-Pacific Zone.**
Introduction	**The Pacific Ocean, covering one-third of the Earth's surface, is the largest and deepest ocean. It is characterized by diverse bottom topography, including ridges, basins, and trenches.**
Body	**Shape and Size:** • The Pacific Ocean extends from the coast of Asia to America, covering a solid triangular area. It stretches approximately 16,093 km from west to east and 14,966 km from north to south. The average depth of the Pacific Ocean is around 5,000 m, with only a small portion less than 1,000 m deep. The majority of the ocean floor lies below 5,000 m. **Continental Shelf:** • The continental shelf along the Pacific Ocean varies in width depending on the coastline. On the eastern margin, the continental shelf is narrow due to the presence of mountain chains like the Rockies and the Andes. However, on the western margin, where mountain chains are absent, the continental shelf is wider. The shelves along Australia, East Indies, and East Asia are relatively wider, ranging from 160 to 1,600 km in width. **Ridges:** • Unlike other oceans, the Pacific Ocean lacks a central ridge. Instead, it features several submarine ridges and swells, mainly on the eastern margin. The East Pacific Ridge or Albatross Plateau is a significant ridge, extending southwest from the Central American coast. It includes the Cocos Ridge, San Felix-Juan Fernandez Ridge, and the South-Eastern Pacific Plateau. These ridges range from 2,000 to 4,000 m in depth.

	Basins: • The Pacific Ocean contains numerous depressions and basins separated by swells. Some notable basins include: • Aleutian Basin: Located north of the Aleutian Islands, this basin reaches depths of 4,000 m. • Philippine Basin: Situated east of the Philippine Islands, this basin extends up to 5°N and varies in depth from 5,000 to 6,000 m. • Fiji Basin: Located south of the Fiji Islands, this basin has depths exceeding 4,000 m. • South Australian or Jeffrey's Basin: Extending south of Australia, this longitudinal basin reaches depths of 5,000 m. **Trenches and Deeps:** The Pacific Ocean is renowned for its deep trenches, some of which are the deepest parts of the Earth's oceans. Important trenches and deeps include: • Aleutian Trench: Bordering the Aleutian Islands, this trench reaches a maximum depth of 7,679 m. • Mariana Trench: Located in the South Pacific, the Challenger Deep in the Mariana Trench is the deepest part of the ocean, with a depth of 10,900 m. • Philippine Trench: Running along the eastern coast of the Philippine Islands, this trench reaches a maximum depth of 10,497 m. • Peru-Chile Trench: Situated along the Andean coast, this trench consists of broken trenches and includes the Bartholomew Deep with a depth of 7,973 m.
Conclusion	**The bottom relief of the Pacific Ocean is diverse and intriguing, with ridges, basins, and trenches shaping its topography. Understanding these features is vital for studying oceanic processes, marine biodiversity, and geological phenomena.**

3) Describe the causes and consequences of sea level changes.

UPSC Mains Syllabus topic	**Salient features of World's Physical Geography.**
Why was this question asked?	• **Bring out the relationship between the shrinking Himalayan glaciers and the symptoms of climate change in the Indian sub-continent.**
Introduction	**Sea level changes occur due to various natural and anthropogenic factors, resulting in both short-term and long-term fluctuations. These changes have significant implications for coastal regions, ecosystems, and human populations.**
Body	**Short and Long-term Causes of Sea Level Changes:** • **Oscillations of Sea level on Short-term Scale:** Short-term sea level changes are influenced by tides, storm surges, atmospheric pressure, wind circulations, river discharges, oceanic currents, and other factors. These changes can occur on daily, weekly and seasonal scales. • **Oscillations of Sea Level on Long and Very Long-term Scales:** Long-term sea level changes are driven by tectonic effects, melting of ice sheets and glaciers, changes in coastal sediments, crustal movements, and sub-crustal movements. These changes can occur over geological time scales, ranging from centuries to thousands of years. **Consequences of Sea Level Changes:** • **Coastal Erosion and Flooding:** Rising sea levels increase the risk of coastal erosion and flooding, resulting in the loss of land, damage to infrastructure, and displacement of coastal communities. Low-lying areas and deltaic regions are particularly vulnerable. • **Salinization of Coastal Aquifers:** As sea levels rise, saltwater intrusion into coastal aquifers can occur, contaminating freshwater resources and affecting agricultural practices and drinking water supplies. • **Coastal Habitat Loss:** Coastal ecosystems, including mangroves, salt marshes, and coral reefs, are threatened by sea level changes. These habitats provide critical nurseries for marine species, protect coastlines from erosion, and support local economies through tourism and fisheries.

	• **Impact on Human Settlements:** Sea level changes pose risks to human settlements, especially in densely populated coastal cities. Infrastructure damage, increased vulnerability to extreme weather events, and the need for costly adaptation measures are some of the consequences. • **Disruption of Coastal Industries:** Sea level changes can disrupt coastal industries such as fishing, shipping, tourism, and agriculture. Changes in water levels and salinity can affect the availability and productivity of marine and agricultural resources.
Conclusion	**Sea level changes are complex phenomena influenced by a combination of natural and anthropogenic factors. The consequences of sea level changes extend beyond coastal areas, affecting ecosystems, economies, and human societies. It is imperative to understand and monitor these changes to develop effective mitigation and adaptation strategies that can minimize the risks and impacts associated with sea level rise.**

4) "Love and compassion are necessities, not luxuries. Without them humanity, cannot survive"- Dalai Lama

What does the above statement mean to you?

Answer:

The quote by Dalai Lama emphasizes that love and compassion are not merely luxuries, but essential for the survival of humanity.

Case Study 1:

- In India, the practice of untouchability in certain communities highlights the absence of love and compassion, leading to social divisions and injustice.

Case Study 2:

- Globally, the refugee crisis reveals the dire consequences of lacking love and compassion, as displaced individuals face hardships and are often denied basic human rights.

Traits implied in the above case studies:

- **Social Cohesion:** Love and compassion foster social harmony, bridging gaps and promoting inclusivity.
- **Justice and Equality:** Embracing love and compassion ensures fairness and equal treatment for all members of society.

- **Empathy and Understanding:** Cultivating love and compassion enables individuals to empathize with others' struggles and perspectives.
- **Humanitarianism:** Love and compassion drive humanitarian efforts to alleviate suffering and provide aid to those in need.
- **Ethical Responsibility:** Integrating love and compassion in our actions is a moral imperative to protect human dignity and promote a just society.

To create a sustainable future, it is vital to integrate love and compassion as fundamental values. This entails fostering social cohesion, upholding justice and equality, cultivating empathy and understanding, engaging in humanitarian work, and recognizing our ethical responsibility to promote the well-being and dignity of all individuals. Only by embodying love and compassion can humanity thrive and overcome its challenges.

5) Optional Self-Practice Questions:

ANTHROPOLOGY:

- **Briefly describe the various methods used in genetic study of Man.**

HISTORY:

- **Identify the different categories of Persian literature which emerged during the Delhi Sultunate.**

PUBLIC ADMINISTRATION:

- **"Developments in the field of administrative law reflect an increasingly blurred boundary between state and society, and between justice and administration." Has administrative law become more constitutional than the constitution itself? Argue.**

SOCIOLOGY:

- **"Globalization involves deterritorialization." Examine with reference to the nation - state.**

GEOGRAPHY:

- **Boundaries have replaced the frontiers in the contemporary world. Comment**