

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Crush the Thermohaline Challenge: 10th Grade Ocean Systems Quiz

Calculate density variables and predict global climatic shifts by analyzing the complex feedback loops between salinity, heat, and deep-water formation.

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**1. Deep-water formation in the North Atlantic serves as a primary engine for the 'Global Conveyor Belt.' Which mechanism initiates the sinking of this water mass near the Greenland Sea?**

- A. Brine rejection during sea ice formation increasing localized salinity
- B. Increased thermal expansion due to solar radiation at high latitudes
- C. Reduced atmospheric pressure causing upwelling of deep sediments
- D. Excessive freshwater input from glacial melt increasing buoyancy

**2. The zone of the ocean where density increases rapidly with depth is known as the \_\_\_\_\_, serving as a barrier to nutrient mixing.**

- A. Thermocline
- B. Halocline
- C. Pycnocline
- D. Epipelagic

**3. The Coriolis effect causes surface currents in the Southern Hemisphere to deflect to the right of the wind direction.**

- A. True
- B. False

**4. Ekman Transport describes the net movement of water at a 90-degree angle to the wind direction. How does this process contribute to coastal upwelling?**

- A. Onshore winds push surface water against the coast, forcing it downward
- B. Offshore winds pull deep water directly to the surface via suction
- C. Winds blowing parallel to the coast move surface water offshore, drawing deep water up
- D. Static high-pressure systems prevent the mixing of surface and deep layers

**5. In the context of the global water cycle, the residence time of a water molecule in the \_\_\_\_\_ is significantly longer than in the atmosphere.**

- A. Troposphere
- B. Biosphere
- C. Cryosphere
- D. River system

**6. Latent heat release during the condensation of water vapor in the atmosphere provides the primary energy source for tropical cyclones.**

- A. True

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B. False

**7. Which of the following scenarios would likely lead to a weakening of the Atlantic Meridional Overturning Circulation (AMOC)?**

- A. Sustained increase in Arctic sea ice thickness
- B. Rapid melting of the Greenland Ice Sheet creating a 'freshwater lens'
- C. Increased evaporation rates in the tropical Atlantic
- D. A strengthening of the North Atlantic Oscillation (NAO) winds

**8. The total mass of dissolved inorganic solids in seawater is termed \_\_\_\_\_, typically measured in practical salinity units (PSU).**

- A. Conductivity
- B. Salinity
- C. Molarity
- D. Turbidity

**9. The Pacific Decadal Oscillation (PDO) is a short-term weather event that occurs strictly in the troposphere over the Indian Ocean.**

- A. True
- B. False

**10. How does the high specific heat capacity of the oceans affect global continental temperature ranges?**

- A. It causes extreme seasonal temperature swings in coastal regions
- B. It isolates the atmosphere from any heat exchange with the lithosphere
- C. It acts as a thermal buffer, moderating temperature fluctuations in coastal areas
- D. It accelerates the cooling of land masses during the daytime