Name: _____ **Date:** _____

Crush the Deep: 8th Grade Oceanic Systems Quest

Students synthesize data on thermohaline circulation and isotopic signatures to analyze how planetary energy imbalances drive global water movement.

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1. How would a significant increase in glacial meltwater in the North Atlantic specifically disrupt the 'Global Conveyor Belt' (Thermohaline Circulation)?

A. It increases surface salinity, accelerating the sinking of water masses.
B. It decreases water density, preventing the downwelling necessary to drive the current.
C. It raises the water temperature, causing immediate evaporation and atmospheric cooling.
D. It creates a vacuum effect that pulls warm tropical waters north faster than usual.

2. The process where deep, cold, nutrient-rich water rises to replace surface water moved by winds is known as _____.

A. Advection
B. Downwelling
C. Upwelling
D. Transpiration

3. True or False: The residence time of a water molecule in the ocean is significantly longer than the residence time of a water molecule in the atmosphere.

A. True
B. False

4. In the context of the water cycle's energy budget, what is the primary role of 'latent heat' during the process of evaporation from the ocean surface?

A. It cools the surrounding atmosphere by releasing thermal energy.
B. It provides the kinetic energy needed for water to infiltrate the soil.
C. It is stored in water vapor and later released into the atmosphere during condensation.
D. It increases the salinity of the ocean by bonding with sodium ions.

5. The _____ describes the deflective force resulting from Earth’s rotation that causes currents to veer right in the Northern Hemisphere.

A. Bernoulli Principle
B. Coriolis Effect
C. Hadley Cell
D. Milankovitch Cycle

6. True or False: As seawater freezes to form sea ice, the surrounding unfrozen water becomes less saline.

A. True

Name: _____ **Date:** _____

B. False

7. Which of these scenarios best illustrates a 'negative feedback loop' within the ocean-water cycle system?

A. Increased evaporation leads to more clouds, which reflect sunlight and cool the ocean surface.
B. Rising ocean temperatures melt permafrost, releasing methane that warms the ocean further.
C. More precipitation increases runoff, which carries more sediment into the ocean.
D. Warmer waters hold less dissolved oxygen, leading to higher fish mortality rates.

8. The transition layer between warmer mixed surface water and the much colder deep water, characterized by a rapid temperature change, is called the _____.

A. Halocline
B. Pycnocline
C. Thermocline
D. Bathypelagic Zone

9. How does the 'Rain Shadow Effect' demonstrate the interaction between the water cycle and geography near a coastal mountain range?

A. Moist air loses all salt content before reaching the mountains, causing freshwater rain.
B. Descending air on the leeward side warms and absorbs moisture, creating arid conditions.
C. The mountains block the ocean currents, preventing warm water from reaching the coast.
D. Colder water at the coast causes air to sink before it can reach the mountain peaks.

10. True or False: Subduction in plate tectonics is the primary mechanism that returns water from the Earth's crust back into the deep mantle, completing a 'geologic' water cycle.

A. True
B. False