Name: _______________ **Date:** _______________

Answer Key: Oceanic Circulations and Global Heat Transfer 10th Grade Quiz

Sophomores analyze thermohaline layering and heat transport mechanisms during this rigorous unit review or formative assessment on Earth's hydro-atmospheric interactions.

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1. Which mechanism explains why the deep ocean floor remains cold even near the equator, far from the influence of seasonal solar heating?

Answer: B) Thermohaline circulation sinking cold, salty water at high latitudes

Thermohaline circulation (the Ocean Conveyor Belt) transports cold, dense water from the poles along the ocean floor toward the equator.

2. The process where deep, nutrient-rich water replaces surface water moved by winds, often boosting primary productivity in coastal regions like California, is called _____.

Answer: D) Upwelling

Upwelling is driven by Ekman transport, bringing cold, nutrient-dense waters to the surface, which supports massive blooms of phytoplankton.

3. Seawater density is inversely proportional to salinity; therefore, as the salt content of a water mass increases, its density decreases.

Answer: B) False

Density is directly proportional to salinity. Dissolved salts increase the mass of the water per unit volume, making it denser.

4. If global temperatures rise significantly, freshwater input from melting glaciers in the North Atlantic could potentially disrupt the water cycle and climate by:

Answer: B) Lowering the salinity and preventing surface water from sinking

Freshwater is less dense than saltwater. If too much glacier melt enters the North Atlantic, it can stop the sinking of water that drives global thermohaline circulation.

5. In the hydrological cycle, the total amount of water moving between reservoirs remains relatively constant due to the principle of _____.

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Answer: A) Mass balance

The global water cycle is a closed system on human timescales, where the mass of water is conserved across evaporation, condensation, and precipitation.

6. The Agulhas Current, flowing along the coast of South Africa, is an example of an eastern boundary current characterized by cold, shallow water.

Answer: B) False

The Agulhas Current is a Western Boundary Current, which are typically narrow, deep, and carry warm water toward the poles.

7. During the process of advection, how is heat primarily transferred through the Earth's systems?

Answer: B) Through the horizontal movement of water or air masses

Advection is the horizontal transport of heat or matter by the flow of a fluid, such as ocean currents moving tropical heat to higher latitudes.

8. The transition layer between the warmer mixed surface layer and the colder deep water, where temperature decreases rapidly with depth, is known as the _____.

Answer: C) Thermocline

The thermocline is the layer in the ocean where temperature changes most rapidly with depth, acting as a barrier to mixing.

9. Rain shadows, such as the Atacama Desert in Chile, are formed when the water cycle interacts with topography, forcing precipitation on the windward side of mountains.

Answer: A) True

This is known as the orographic effect, where moist air is forced upward, cools, and precipitates before crossing the mountain range.

10. Specific heat capacity is a property of water that heavily influences global climate. How does the high specific heat of the ocean affect coastal cities compared to inland cities?

Answer: B) It allows coastal cities to have more moderate temperatures year-round

Water absorbs and releases heat slowly. This thermal inertia moderates coastal temperatures, preventing the sharp peaks and troughs found in continental climates.

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