Name: _____ **Date:** _____

Answer Key: Thermohaline Dynamics and Global Water Flux: 4th Grade Mastery Quiz

Students analyze complex interactions between salinity, thermal energy, and phase changes to evaluate the global distribution of Earth's water.

---

1. If a large section of the Greenland ice sheet melts into the North Atlantic, how would the increase in freshwater affect the local ocean water density and current movement?

Answer: B) Density decreases, potentially slowing down deep-sea currents

Freshwater is less dense than saltwater. Adding freshwater to the North Atlantic makes the surface water lighter, which can prevent it from sinking and disrupt the 'conveyor belt' of global ocean currents.

2. The total amount of water on Earth remains relatively constant even as it changes states between gas, liquid, and solid.

Answer: A) True

This represents the law of conservation of mass within Earth's closed system; while water moves and changes form, it is rarely created or destroyed on a large scale.

3. Most of the thermal energy that fuels the water cycle by turning liquid water into vapor is sourced from _____.

Answer: C) Solar radiation

The sun provides the necessary heat energy for evaporation to occur, especially over the vast surface area of the oceans.

4. In an arid region like the Dead Sea, evaporation rates are higher than freshwater input. What is the most likely result for the water that remains?

Answer: C) The salinity increases as minerals are left behind

When water evaporates, only the H2O molecules leave as gas. The dissolved salts and minerals stay behind, leading to a higher concentration or salinity.

5. Deep ocean currents are primarily driven by surface winds like the trade winds.

Answer: B) False

Name: _____ **Date:** _____

While surface currents are driven by wind, deep ocean currents are driven by differences in density caused by temperature and salinity (thermohaline circulation).

6. During the process of _____, water vapor loses thermal energy and transforms into liquid droplets, forming clouds.

Answer: D) Condensation

Condensation occurs when water vapor cools down (loses energy), allowing the molecules to slow down and cluster into liquid droplets.

7. If you were tracking a molecule of water that just fell as snow on a mountain, which path would it most likely take to return to the ocean?

Answer: B) Melting and becoming surface runoff or infiltration

Snow usually melts into liquid water, which then flows over land (runoff) or soaks into the ground (infiltration/groundwater) to eventually reach the sea.

8. The Kuroshio Current near Japan moves warm water toward the north, meaning it acts as a heat transfer system for the planet.

Answer: A) True

Ocean currents act like a global conveyor belt, moving warm water from the equator toward the poles, which helps regulate Earth's climate.

9. The continuous movement of water through the atmosphere, lithosphere, and hydrosphere is known as the _____.

Answer: B) Hydrologic Cycle

The Hydrologic Cycle is the scientific term for the water cycle, encompassing all phases and movements of water across the planet.

10. Analyze why coastal cities often have milder winters than inland cities at the same latitude. What property of the ocean causes this?

Answer: B) The ocean has a high heat capacity and releases heat slowly

Water absorbs and stores a large amount of heat energy and releases it slowly, which prevents the air temperature in coastal areas from changing as drastically as it does over land.