

## Unit 1: How Do the Ocean and Atmosphere Interact?

Scoring Level	Student Response
<b>4</b> <i>(beyond expectations)</i>	<p>A. Science Content Goal: <b>The Ocean as a Heat Reservoir</b>            Students describe what causes onshore and offshore winds, and how the ocean moderates temperatures near the coast, including the idea that water absorbs more heat energy than air before increasing in temperature.  <i>During the night, ocean water slowly releases the heat energy it has absorbed, causing the air over the ocean to warm and rise. The colder, denser air near land then flows toward the warmer, rising ocean air.</i>  <i>During the day, the land and the surrounding air absorb heat energy and are warmed more than ocean water and surrounding air. This causes the warmer air over land to rise, and then the colder, denser air near the ocean flows toward the land, causing daytime air currents to flow in the opposite direction as nighttime air currents.</i></p> <p>B. Science Content Goal: <b>Density and Movement of Ocean and Air Currents</b></p> <ol style="list-style-type: none"> <li>1. Student correctly links density and temperature to the movement of both water and air currents.  <i>Differences in density, caused by differences in temperature and/or salinity of ocean water in different places, set vertical (convection or thermohaline) ocean and air currents in motion.</i></li> <li>2. Student correctly explains how the movement of different densities of ocean water create ocean currents.  <i>Cold, dense water sinks and moves toward areas with warmer, less dense water. As the cold, dense water moves toward the warmer region, it warms up, becomes less dense, and rises nearer to the surface. Warmer waters move along near the surface toward the colder region and replaces the denser water that has sunk.</i></li> <li>3. Student explains how air currents (wind) set ocean surface currents in motion.  <i>Wind blowing across the surface of the water sets horizontal currents in motion at the surface of the water.</i></li> <li>4. Student describes how molecules in all substances move more quickly, and are less closely packed together when heat energy is added.  <i>When water or air cools, the molecules are more closely packed together and this causes water or air to increase in density and sink.</i></li> <li>5. Student accurately explains how the arrangement of molecules changes in different salinities of water, and how this affects the density.</li> <li>6. Student explains that El Niño is a change in the strength of the Pacific trade winds, which then affects ocean surface currents. (Student may also describe some of the global changes that El Niño's cause, noting that these changes take place because Earth's ocean and atmosphere are connected.)</li> </ol> <p>C. Science Content Goal: <b>Water Cycle</b>            Student accurately explains how freshwater moves through the water cycle. Explanations should include how density of water molecules is involved in the water cycle and how heat energy moves between the ocean and the atmosphere.  <i>When heat energy is added to water on Earth, the water molecules move faster and escape into the atmosphere as a vapor in a process called evaporation. Water molecules evaporate and rise until they lose enough heat energy to condense into a liquid in the atmosphere, which form clouds. When enough of these liquid water molecules get together they form water drops that fall to Earth as rain.</i></p>

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3 <i>(appropriate understanding)</i>	Student accurately describes as in level 4, but doesn't provide the depth of detail or understanding.
2 <i>(partial understanding)</i>	<p>A. Science Content Goal: <b>The Ocean as a Heat Reservoir</b> Student describes that there are onshore and offshore winds, dependent on the time of day, but does not explain why this occurs or how the ocean serves as a heat reservoir and moderates temperatures on land.</p> <p>B. Science Content Goal: <b>Density and Movement of Ocean and Air Currents</b></p> <ol style="list-style-type: none"> <li>1. Student describes the movement of water of different salinities or temperatures, but does not explain how the arrangement of molecules relates to the density.</li> <li>2. Student accurately describes the movement of ocean water in currents, but does not provide an explanation of how the movement occurs.</li> <li>3. Student describes some of the global effects of an El Niño, but doesn't describe that it occurs due to the connection between the ocean and atmosphere.</li> </ol> <p>C. Science Content Goal: <b>Water Cycle</b> Student accurately describes the movement of freshwater through the water cycle, but does not provide an explanation of how the movement occurs.</p>
1 <i>(inaccurate understanding)</i>	<p>A. Science Content Goal: <b>The Ocean as a Heat Reservoir</b> Student does not describe accurately how the ocean acts as a heat reservoir.</p> <p>B. Science Content Goal: <b>Density and Movement of Ocean and Air Currents</b> Student provides an inaccurate description and/or explanation of how currents move in the ocean.</p> <p>C. Science Content Goal: <b>Water Cycle</b> Student provides an inaccurate description of how freshwater moves through the water cycle.</p>
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