Breezes by the Bay

Use coastal weather data to trace causes and effects.

ESS.7 "Obtain, evaluate, and communicate information about the role of energy transfer in wind, precipitation, cloud formation, and front formation. a. Obtain and communicate information to explain how water cycles through the atmosphere..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each cause of a change in wind or clouds. Circle the effect that follows each cause, then number the cause-and-effect pairs.

Why the Breeze Turns

1 At a coastal weather station, students measure surface temperatures and air pressure over land and nearby water. The table shows two snapshots from the same day. Land heats and cools faster than water. When land becomes warmer than water, air above it can become less dense and rise. Surface air then moves toward the area of lower pressure, creating wind.

COASTAL CONDITIONS

Time	Land surface (°C)	Water surface (°C)	Pressure over land (hPa)	Pressure over water (hPa)
Dawn	15	19	1015	1012
Afternoon	29	22	1009	1013

2 At dawn, the table shows warmer water and higher pressure over land. Air near the surface flows from land toward water, forming a land breeze. By afternoon, the warmer land has lower pressure than the water. Air flows from water toward land, forming a sea breeze. The wind reverses because the pressure pattern changes.

3 The afternoon sea breeze brings moist air inland. As rising air cools to its dew point, water vapor condenses into tiny droplets that can form clouds. Relative humidity rises as air cools if its water vapor content stays the same. If droplets grow large enough, rain can fall. Wind alone does not guarantee clouds or rain.

2 ANSWER WITH EVIDENCE

Use the passage

1. At dawn, which way does surface air move? Use the two pressure readings to explain why.

2. How do the afternoon temperature and pressure readings help explain the sea breeze?

3. What changes between dawn and afternoon cause the wind direction to reverse?

4. How could the afternoon sea breeze contribute to clouds and rain, and why might rain not fall?

3 YOUR TURN

Your own words

A cold night follows a hot day. In three sentences, invent nighttime land and water temperatures and pressures that differ from every table value, predict the surface wind direction, and explain how cooling air could form clouds.

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PART 1 · READ AND MARK

Underline each cause of a change in wind or clouds. Circle the effect that follows each cause, then number the cause-and-effect pairs. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	At dawn, which way does surface air move? Use the two pressure readings to explain why.	**It moves from land toward water because pressure is higher over land (1015 hPa) than over water (1012 hPa).**
2	How do the afternoon temperature and pressure readings help explain the sea breeze?	**Land is warmer than water (29°C versus 22°C). Pressure is lower over land (1009 hPa versus 1013 hPa), so surface air moves from water toward land.**
3	What changes between dawn and afternoon cause the wind direction to reverse?	**Land changes from cooler than water to warmer than water. Pressure changes from higher over land to lower over land, reversing the direction of surface airflow.**
4	How could the afternoon sea breeze contribute to clouds and rain, and why might rain not fall?	**The breeze brings moist air inland. If rising air cools to its dew point, droplets can form clouds; rain falls only if droplets grow large enough.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At midnight, land is 12°C and water is 17°C, with air pressure of 1018 hPa over land and 1014 hPa over water. Surface air flows from higher pressure over land toward lower pressure over water, making a land breeze. If moist air rises over the warmer water and cools to its dew point, condensation can form clouds.

Accept explanations that correctly connect airflow to a difference in pressure. For the open task, invented values must differ from the table values and support the predicted wind direction.