Forecasting the Bay

Build a climate argument from observations, mechanisms, and limits.

MAQ.2.4 "Research, analyze, and communicate scientific arguments to support climate models that predict how global and regional climate change can affect Earth's systems (e.g...."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two observations that can test climate models, circle two processes that explain predicted changes, and number two limits on regional predictions.

What a Changing Bay Can Tell Us

1 A crab trap in Chesapeake Bay can tell a climate story, but one trap cannot prove a trend. Scientists test climate models against many observations. Satellites show that average global sea level has risen since the early 1990s, while ocean measurements show that the upper ocean has gained heat. Models driven by increasing greenhouse gases reproduce broad patterns of warming and rising seas. As seawater warms, it expands; melting land ice adds water to the ocean. Melting floating sea ice has little direct effect on sea level because it already displaces water. These mechanisms connect model projections to measurable changes.

2 A global projection does not tell the whole story of one bay. Along much of the Chesapeake coast, land is sinking, so local water levels can rise faster relative to the shore than the global average. Tide gauges record water height relative to land, while satellites measure sea level over the ocean. Comparing both records helps researchers separate local land movement from ocean change. Warmer air can hold more water vapor, but that does not guarantee more rain everywhere. Regional model runs differ in how they project seasonal rainfall around the bay, making precipitation a less certain local prediction than continued global warming.

3 Rainfall also affects the bay's chemistry and living things. After heavy rain upstream, rivers can deliver more freshwater, lowering salinity in parts of the estuary. River gauges and salinity sensors can test whether that link holds over time, although tides and winds also move salty water. Coastal flooding can become more frequent as baseline sea level rises, even if storm strength does not change. A defensible forecast therefore states a cause, cites observations, and names limits: different emissions paths change the amount of future warming, and local rain and salinity depend on season and place. No single storm proves a model right or wrong.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which two observations support a model prediction of rising seas? Explain how warming can cause sea level to rise.

2. Why might a Chesapeake tide gauge show faster water-level rise than a global satellite record? How does comparing the records strengthen an argument about the bay?

3. Suppose a model projects heavier spring rain upstream. Predict a change in bay salinity and name two measurements that could test your reasoning.

4. A scientist says one unusually dry spring proves regional climate models are useless. Evaluate that claim using the passage, and identify a real limit of a local rainfall projection.

3 YOUR TURN

Your own words

A high-emissions model projects less summer rain and warmer nearby ocean water for a coastal lagoon. Write four or five sentences predicting two changes in or near the lagoon, citing two observations from the passage, explaining both cause-and-effect links, and identifying one uncertainty.

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PART 1 · READ AND MARK

Underline two observations that can test climate models, circle two processes that explain predicted changes, and number two limits on regional predictions. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which two observations support a model prediction of rising seas? Explain how warming can cause sea level to rise.	**Satellites show rising global sea level, and ocean measurements show that the upper ocean has gained heat. Warmer seawater expands, raising sea level; warming can also melt land ice, which adds water.**
2	Why might a Chesapeake tide gauge show faster water-level rise than a global satellite record? How does comparing the records strengthen an argument about the bay?	**Sinking land can make water rise faster relative to the Chesapeake shore. Comparing tide-gauge and satellite records helps distinguish local land movement from ocean change.**
3	Suppose a model projects heavier spring rain upstream. Predict a change in bay salinity and name two measurements that could test your reasoning.	**Salinity could decrease because rivers may bring more freshwater into the bay. River-gauge readings and salinity-sensor measurements could test the prediction.**
4	A scientist says one unusually dry spring proves regional climate models are useless. Evaluate that claim using the passage, and identify a real limit of a local rainfall projection.	**One dry spring does not establish a long-term trend or disprove a model. Regional model runs differ on seasonal rainfall, so the amount and timing of local rain remain uncertain.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Satellite records show that global sea level has risen since the early 1990s, and measurements show that the upper ocean has gained heat. Warmer seawater expands, so higher water levels could increase flooding near the lagoon. With less summer rain, less river freshwater might enter the lagoon, allowing salinity to rise. This follows the passage's explanation that added freshwater lowers salinity in an estuary. Tides and winds could change local salinity, and the size of the rainfall change remains uncertain.

Accept other supported cause-and-effect predictions. For Part 3, look for two distinct observations, two explained changes, and a specific uncertainty.