Comparing Weathering in a Limestone Model

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A class simulates acidic water touching a limestone panel. The limestone in the model is calcium carbonate. Equal samples with the same exposed area start in separate solutions of equal volume. The class measures the calcium ions released to each solution after ten minutes.

$CaCO_3(s) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + CO_2(g) + H_2O(l)$

Trial	Starting hydrogen ions (mmol)	Temperature (°C)	Calcium ions measured at 10 min (mmol)
J	2.0	20	0.30
K	2.0	30	0.50
L	4.0	30	0.85

1 Which pair best isolates a temperature change in this set of trials?

(1) J and K

(2) J and L

(3) K and L

(4) All three together

2 Use those two trials to explain which temperature gives faster average calcium release over the first ten minutes. [1]

Answer and work

3 Use the equation to calculate how many millimoles of hydrogen ions were consumed by the calcium carbonate in trial L at ten minutes. [1]

Answer and work

The class takes one more reading after both J and K stop releasing calcium. Both solutions contain 1.00 mmol of calcium ions. Assume both panels still have some solid left.

4 Explain how K can give a higher early reading and still reach the same final amount as J. [1]

Answer and work

5 A student says the final data show that temperature had no effect on the reaction. Use the early and final results to respond. [1]

Answer and work