Checking Two Carbonate Samples With Acid

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

A classroom simulation compares carbonate ions and hydrogen carbonate ions. Each reacted ion releases one carbon dioxide molecule. The equations show the different amounts of hydrogen ions used. The model supplies enough acid to react with all carbonate and hydrogen carbonate present.

$CO_3^{2-} + 2H^+ \rightarrow CO_2 + H_2O$

$HCO_3^- + H^+ \rightarrow CO_2 + H_2O$

Sample	**CO_2 formed (mol)**	**H^+ consumed (mol)**
P	0.020	0.040
Q	0.020	0.030

1 Which record distinguishes P and Q even though they form the same amount of carbon dioxide?

(1) Only the carbon dioxide amounts

(2) The amounts of hydrogen ions used

(3) The formula of carbon dioxide

(4) The fact that both make water

2 Explain which ion could make up all of sample P under the stated model. [1]

Answer and work

3 Calculate the amount of each ion in Q. Use both recorded amounts. [1]

Answer and work

4 A student says the equal amounts of carbon dioxide require the same ratio of the two ions in the starting samples. Select whether the evidence supports or refutes that claim, and explain. [1]

Select one

☐ Supports the claim

☐ Refutes the claim

Answer and work