Checking What Stopped a Carbonate Model

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

A classroom simulation models an acid reacting with a carbonate solid to produce a gas. The model produces measurable gas whenever both reactants are available, and it needs both to produce any gas. The class prepares two identical trials. Each stops producing gas after it reaches 24 mL. The model holds temperature and pressure fixed.

Trial after gas production stops	Change made	New gas produced (mL)
P	Add more of the same acid	12
Q	Add more of the same carbonate	0

1 Which starting reactant was still available in P when gas production first stopped?

(1) The acid

(2) The carbonate

(3) Both reactants

(4) Neither reactant

2 A student says both reactants had been used up when the first reading reached 24 mL. Evaluate the claim using the two follow-up results. [1]

Answer and work

A fresh trial uses an acid solution with the same volume as the original but twice the number of acid particles. The carbonate amount stays the same. In this model the original carbonate can produce at most 36 mL of gas, and the fresh acid is sufficient to react with all of it.

3 Predict the final gas volume in the fresh trial and explain why doubling the acid particles does not double 24 mL. [1]

Answer and work

4 After the fresh trial stops, would adding more acid alone produce extra gas? Explain using the model. [1]

Answer and work