Checking Active Mass With Two Measurements

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

A classroom model tests a 4.00 g powder sample containing calcium carbonate and an inert filler. The filler uses no acid and produces no gas. All calcium carbonate reacts, using two moles of H^+ for each mole of $CaCO_3$ and producing one mole of CO_2. The model uses 100.0 g/mol for $CaCO_3$.

Record	**Measured amount**
H^+ used by the powder	0.060 mol
CO_2 collected	0.020 mol

1 How many moles of calcium carbonate reacted according to the acid measurement?

(1) 0.020 mol

(2) 0.030 mol

(3) 0.040 mol

(4) 0.060 mol

2 Calculate the mass of inert filler in the original sample. Use the acid record and the molar mass. [1]

Answer and work

3 A student says the CO_2 collected shows that only 0.020 mol of calcium carbonate reacted. Evaluate the claim using the independent acid record. [1]

Answer and work

A repeat uses an identical powder sample. The acid record is unchanged, and the collection system now captures all the carbon dioxide produced.

4 Predict the new carbon dioxide reading and explain whether improved collection changes the amount of filler inferred from the acid record. [1]

Answer and work