Separating Reaction Time From Detector Delay

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

Two teams model the same gas-forming reaction at the same temperature and with identical starting amounts. Their sensors report cumulative gas volume. The P sensor reports each measurement immediately. The Q sensor displays each measurement 10 s after it was taken, but displays the current clock time next to that delayed value.

Time displayed (s)	P displayed volume (mL)	Q displayed volume (mL)
10	6	0
20	11	6
30	15	11
40	18	15
50	18	18

1 Which two displayed readings compare P and Q at the same actual reaction time of 20 s?

(1) P at 10 s and Q at 10 s

(2) P at 20 s and Q at 20 s

(3) P at 20 s and Q at 30 s

(4) P at 30 s and Q at 20 s

2 Use Q’s record to find its average gas production rate from 10 s to 30 s of actual reaction time. [1]

Answer and work

3 A student claims Q had produced less gas than P by the actual 30 s mark. Use one displayed time and volume for each sensor to evaluate the claim. [1]

Answer and work

A third sensor has an unknown delay. The team can give that sensor and the immediate sensor the same sudden change in test gas volume at a known clock time.

4 Describe how to compare the immediate sensor with the third sensor to measure the third sensor’s delay. State which events to record and how to calculate the delay. [1]

Answer and work