Comparing Gas Tracers Through a Model Film

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

A class models a thin film between two gas chambers. Equal starting amounts of tracer P and tracer Q are placed on the upstream side in separate runs. The downstream side initially has none of the tracer. Film area, temperature, and the starting partial-pressure difference for the tracer match in the two runs.

Tracer	**Amount upstream at start (mmol)**	**Amount found downstream after 5 min (mmol)**
P	5.0	1.5
Q	5.0	0.50

1 Calculate the fraction of each starting tracer amount found downstream after five minutes. [1]

Answer and work

2 What comparison is supported under the matched conditions?

(1) P transfers a larger fraction in five minutes.

(2) Q transfers a larger fraction in five minutes.

(3) Both transfer the same fraction.

(4) The larger fraction cannot be found without knowing the molar masses.

A student repeats Q with a different film and finds 1.5 mmol downstream. In that trial the starting difference in Q’s partial pressure across the film is larger than before.

3 Explain why the new result alone cannot show that the different film lets Q transfer more readily. [1]

Answer and work

4 Describe a matched test that isolates the film effect on Q. Identify which gas pressure difference should be kept the same and what to measure. [1]

Answer and work