Tracking Carbon Between Two Leaf Regions

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

A plant exhibit models two regions of one leaf. A lamp reaches region P, and a cover shades region Q. Only the air beside P contains carbon dioxide with a detectable carbon label. The label behaves like ordinary carbon. The two air supplies stay separate, and the model tracks labeled carbon in sugars inside the leaf.

Time (min)	Labeled carbon in P sugars (model units)	Labeled carbon in Q sugars (model units)
0	0	0
5	6	0
15	10	3

1 Which observation shows that carbon supplied beside P later appears in Q?

(1) At 0 min neither region shows the label.

(2) At 5 min only P shows the label.

(3) At 15 min Q sugars contain 3 units of labeled carbon.

(4) At 15 min P contains more labeled carbon than Q.

2 Explain how the carbon label could first appear in sugars in P. [1]

Answer and work

The simulation repeats the same light and air conditions but blocks the internal transport pathway between P and Q. At 15 min P still contains labeled sugar, while Q shows no label.

3 Use both runs to explain how the pathway test supports a transport explanation for the first Q reading. [1]

Answer and work

4 A student says the first run proves Q carried out photosynthesis. Explain why the labeled-carbon result alone does not establish that conclusion. [1]

Answer and work