Checking pH and Carbon in a Model Pond

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

A pond exhibit models sealed containers of water at the same temperature. Each starts at pH 7.0. In the model, more dissolved carbon dioxide lowers pH when the other water conditions are the same. Algae can remove carbon dioxide by photosynthesis in light and release carbon dioxide through respiration.

Container	**Algae present**	**Light**	**Start CO_2 (model units)**	**Final CO_2 (model units)**	**Final pH**
P	Yes	Yes	10	6	7.5
Q	Yes	No	10	12	6.8
R	No	Yes	10	10	7.0

1 Which comparison isolates the effect of algae in the illuminated model?

(1) P and Q

(2) P and R

(3) Q and R

(4) All three together

2 Use the carbon dioxide changes in P and Q to compare which direction the net exchange goes in light and dark. [1]

Answer and work

3 A student claims the lamp by itself raises pH. Evaluate that claim using the blank and the algae trial. [1]

Answer and work

A later model repeats P, but another device adds carbon dioxide as fast as the algae remove it on balance. The dissolved carbon dioxide stays at 10 units. Other water conditions remain the same.

4 Predict whether the later model will show the same high pH as P. Explain using the comparison at 10 CO_2 units. [1]

Answer and work