Additional Investigation: Carbon Dioxide and Photosynthesis

INQUIRY SKILLS

- ○ Questioning
- ● Hypothesizing
- ○ Predicting
- ○ Planning
- ● Conducting
- ● Recording
- ● Analyzing
- ● Evaluating
- ● Communicating

In this investigation, you will analyze leaves from plants that have received a supply of CO_2 and those that have been deprived of CO_2, and will test for the presence of starch.

Question

Do plants require carbon dioxide to produce starch?

Hypothesis

(a) Construct a hypothesis regarding the need for carbon dioxide to produce starch.

Materials

safety goggles
laboratory apron
black paper or photographic negative
scissors
plant that has been kept in the dark for 48 h
paper clips
250-mL beaker
hot plate
two 20 mm × 200 mm test tubes
wax pencil
ethanol
test-tube rack
2 glass, or plastic, petri dishes
large test-tube holder
Lugol's iodine solution in dropper bottle
KOH pellets
50-mL beaker
two bell jars
petroleum jelly

Procedure

1. Put on your safety goggles and lab apron.
2. Remove the two plants from the darkroom. Place one plant on a tray and cover it with a bell jar, using petroleum jelly to seal the jar to the tray. Place the other plant on another tray with a 50-mL beaker half filled with KOH pellets. Cover the plant and beaker with the second bell jar and seal with petroleum jelly.
3. Place the two plants on a sunny windowsill or under a bright light source for one or two days.
4. After a few days, place 100 mL of water into the 250-mL beaker and heat to a boil on the hot plate.
5. Label a 20 mm × 20 mm test tube "CO_2" and another test tube "without CO_2."
6. Pour 50 mL of ethanol into each of the two labelled test tubes and place the tubes in a test-tube rack.

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7. Place a leaf from the plant that was not with KOH pellets into the test tube labeled "CO_2."
8. Remove a leaf from the plant that was kept with the KOH pellets and place it in the test tube labeled "without CO_2."
9. Put the test tubes into the beaker containing boiling water and leave the tubes in the beaker until the leaves are colourless.
10. Label one petri dish "CO_2" and the other petri dish "without CO_2."
11. Use tongs to remove the test tubes from the boiling water bath.
12. Pour the ethanol into a container designated by your teacher, then remove the leaves from the test tubes and place them in their corresponding petri dishes.
13. Wash the leaves gently under running tap water.
14. Put a few drops of iodine solution onto each leaf and observe the results.
15. Discard the plant leaves in the regular garbage and dispose of the other materials according to instructions provided by your teacher.

Analysis

(b) Reread the Question and answer it.

(c) Why was KOH kept in the bell jar with one of the plants?

(d) Why were the leaves placed in boiling ethanol?

Evaluation

(e) In your report, evaluate your hypothesis, taking into account possible sources of error. Draw reasonable conclusions.

(f) Describe how you could improve the experimental procedure.