

Promoting the Use of Educational Technology in Learning and Teaching in Science (S1-3) Learning and Teaching Resources

Photosynthesis






Integrated Science
(Secondary 2)

How do plants make their own food?

Do plants exhibit the seven characteristics of living things?



A hand is shown from the bottom left, holding a vibrant green leaf. The leaf is in sharp focus, showing its veins and texture. The background is a soft, out-of-focus green, suggesting a lush garden or forest. A large, semi-transparent white circle with a thin green border is overlaid on the left side of the image, containing the text.


Nutrition

What do plants
need to grow?

Part 1:

- Share your ideas in groups. Come to a consensus on what do plants need to grow.
- Write your consensus on the blackboard



A close-up photograph of a hand holding a vibrant green leaf. The leaf is held gently between the fingers, and its intricate vein structure is clearly visible. The background is a soft, out-of-focus green, suggesting a lush, natural environment. A semi-transparent white circle with a thin green border is overlaid on the left side of the image, containing text.

Photosynthesis
is the process
that plants make
their own food

Experiment:

- You are going to investigate if the assigned factor is essential for photosynthesis.
- The food produced will eventually be turned into *starch* which turns iodine *dark blue*



Experiment: Task 1

Task:

1. Identify independent variable, dependent variable and control variable for your experiment
2. Do we need a control? Why?



Experiment: Task 1


Discussion on experimental design:

1. How to remove the factor under study in the control?
2. How do we ensure that the starch is formed during the experiment but not before the experiment?
3. How long do we need before taking the iodine test? How can we speed up the process?

Experiment: Task 1

How to prepare your leaves for the iodine test
(refer to textbook p.X)

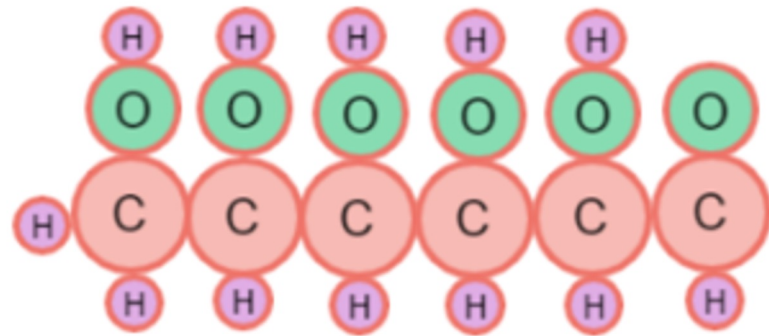
- Take pictures of your results
- Answer the question: Is the assigned factor essential for photosynthesis?

A close-up photograph of a hand holding a green leaf. The background is a soft-focus scene of sunlight filtering through trees, creating a bokeh effect. The text is overlaid on the image in a white, sans-serif font.

Carbon dioxide and sunlight are
essential factors for
photosynthesis

How is food formed from photosynthesis?

- **Water is another essential factor for photosynthesis.** Together with carbon dioxide, they act as raw materials for photosynthesis
- We simplify the food made from photosynthesis as glucose $C_6H_{12}O_6$




Task 2

How is food formed from photosynthesis?

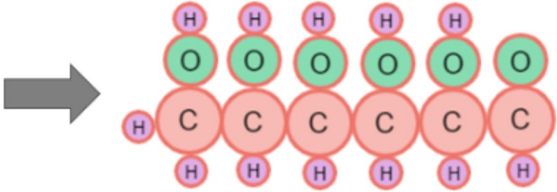
- Construct a diagram to show the raw materials needed for the production of glucose in the *Drag Game* activity.

Construct a model to propose how the food is formed in photosynthesis by dragging the atoms provided below.

Materials used in photosynthesis	Food made in photosynthesis	
- Carbon dioxide (CO ₂)	- Glucose (C ₆ H ₁₂ O ₆)	
- Water (H ₂ O)		

Guiding questions:

1. How does your model help you to make sense of how food is formed in photosynthesis?
2. How does your model help you to explain the source of mass of a plant?



- Try to explain *how* glucose is formed from the raw materials

A glowing lightbulb hangs from the ceiling, casting a warm light over a group of people sitting around a table in a meeting room. The background is blurred, showing a modern office environment with plants and a whiteboard.

**Share your ideas
with your classmates.**

In a group, read the assigned diagram

1. compare the assigned diagram with your diagram and evaluate which diagram better represents what happens at the particle level for explaining how matter transforms
2. give reason for your choice



Consider the following questions:

- How do we represent raw materials? Why?
- Should the number of particles change before and after the reaction? Why?
- Is there anything else can be predicted from the diagram?

Share your
ideas
with your
classmates.

- We think that our/our peer's diagram best represents what happens at the particle level
because
- *How* is glucose formed from carbon dioxide and water?
- Is matter conserved? How do you know?
- What else can be predicted from the diagram?
- How does the food eventually become part of the plant in its growth?

Let's self
assess if
we can:

state that carbon dioxide, water and light are essential factors for photosynthesis

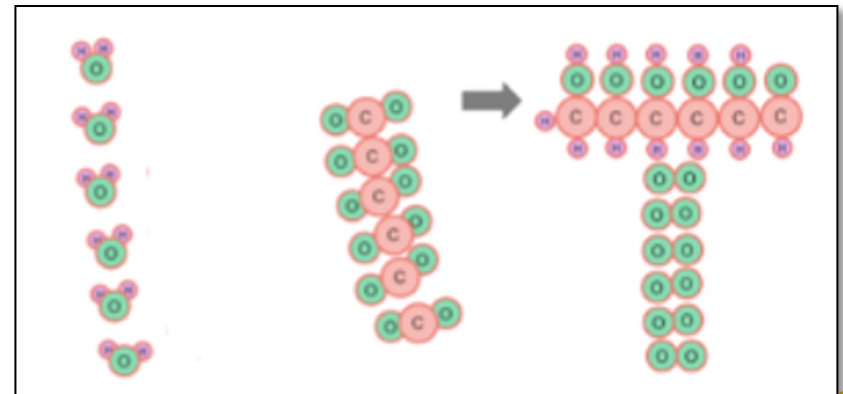
explain the formation of photosynthetic products in terms of rearrangement of atoms of the carbon dioxide and water

create and evaluate particle level diagrams for explaining macroscopic observations related to matter transformation and conservation

conduct fair tests to investigate factors essential for photosynthesis

Assignment

Design a set-up to collect the gas produced in photosynthesis (predicted from the particle diagram we discussed before).



A background image of a water splash, with water droplets and ripples in shades of light blue and white against a white background.

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