SCIENCE FOUNDATIONS

Photosynthesis

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how the plants in your garden turn sunlight, air, and water into food and oxygen, feeding nearly everything alive on Earth. A farmer watches the weather because a cloudy week slows the growth of the whole crop. A houseplant by a bright window grows faster than the same plant in a dark corner for the same reason. Knowing photosynthesis tells you where the oxygen you breathe comes from, and why nearly every food chain starts with a plant catching sunlight.



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Worked examples

EXAMPLE 1

Q Write the balanced equation for photosynthesis.

SOLUTION

This is a balancing question, so count each kind of atom. Start with carbon: the left side has 6 CO_2, so the right side needs 6 carbons, and glucose, $C_6H_{12}O_6$, has exactly 6.

Now hydrogen: the left side has 6 H_2O, 12 hydrogens in all, and glucose has 12.

Oxygen: the left has 6 x 2 + 6 = 18, and the right has 6 + 6 x 2 = 18. It balances.

So the equation is $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$, with light energy coming in.

EXAMPLE 2

Q A plant is kept in a dark cupboard for a week. It stops growing and its leaves turn yellow. Why?

SOLUTION

This is a what-happens-without-light question, so ask what light is for. Light energy is one of the inputs of photosynthesis, along with carbon dioxide and water.

With no light, photosynthesis stops, so the plant makes no new glucose and has nothing to grow with. The green pigment chlorophyll also breaks down without light, which is why the leaves turn yellow.

So the plant stops growing because it cannot photosynthesise in the dark.

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Practice questions

1 Name the reactants of photosynthesis.

- A Carbon dioxide, water and light energy
- B Glucose, oxygen and light energy
- C Carbon dioxide, oxygen and water
- D Glucose, water and carbon dioxide

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2 Name the products of photosynthesis.

- A Carbon dioxide and water
- B Glucose and oxygen
- C Glucose and carbon dioxide
- D Oxygen and water

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3 Where in the cell does photosynthesis happen?

- A Chloroplasts
- B Mitochondria
- C Nucleus
- D Ribosomes

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4 What pigment traps the light energy for photosynthesis?

- A Chlorophyll
- B Carotene
- C Haemoglobin
- D Melanin

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5 Where does the oxygen released by photosynthesis come from?

- A Water
- B Carbon dioxide
- C Glucose
- D Light energy

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6 What are stomata?

- A Tiny openings in leaves that let in carbon dioxide
- B Tiny openings in leaves that let in oxygen
- C Green pigment that traps light energy
- D Parts of the cell where photosynthesis happens

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7 **The light intensity is increased. What happens to the rate of photosynthesis, up to a point?**

A It decreases

B It stays the same

C It increases

D It stops

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8 **True or false: plants only photosynthesise and never respire.**

A True

B False

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9 **A plant has plenty of light and water, but very little carbon dioxide in the air around it. What limits how fast it can photosynthesise?**

- **A** Carbon dioxide
- **B** Light
- **C** Water
- **D** Temperature

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10 **How are photosynthesis and respiration opposite?**

- **A** Photosynthesis stores energy; respiration releases energy
- **B** Photosynthesis releases energy; respiration stores energy
- **C** Both store energy in glucose
- **D** Both release oxygen

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ANSWER KEY

1. Carbon dioxide, water and light energy
2. Glucose and oxygen
3. Chloroplasts
4. Chlorophyll
5. Water
6. Tiny openings in leaves that let in carbon dioxide
7. It increases
8. False
9. Carbon dioxide
10. Photosynthesis stores energy; respiration releases energy

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