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Name: _____ Class: _____ Date: _____

PRIMARY 6 · SCIENCE · PHOTOSYNTHESIS AND RESPIRATION

Photosynthesis and Respiration

Theory and worked examples

Why living things need energy

All living things need energy to stay alive. They use energy to carry out life processes such as growing, moving, reproducing and keeping warm. This energy comes from food. Plants make their own food. Animals, including humans, get their food by eating plants or other animals.

KEY IDEA

Living things need energy from food to carry out life processes.

- A growing puppy uses energy to make its body bigger.
- A sparrow uses energy to fly and to keep its body warm.
- A plant uses energy to grow new leaves, flowers and fruits.
- Without food, a living thing cannot get the energy it needs, and it will die.

WORDS TO KNOW

energy	what living things need to carry out life processes and what things need to work and move
life processes	the things a living thing does to stay alive, such as growing, moving, reproducing and keeping warm

TRY THIS

Name two life processes that a cat uses energy for.

Answer: Any two: moving, growing, reproducing, keeping warm.

Respiration releases energy from food

The energy in food is not ready to use until it is released. Respiration is the process that releases energy from food. During respiration, living things take in oxygen and give out carbon dioxide. Respiration takes place in ALL living things, plants and animals, day and night, all the time. The more energy a living thing needs, the faster it respires, so the more oxygen it needs.

KEY IDEA

Respiration releases energy from food in all living things, day and night.

- Plants respire in the day AND at night, not only at night.
- Animals that live in water, such as fish and snails, also respire and give out carbon dioxide into the water.
- Breathing is how we take air into our lungs. Respiration is the process that releases energy from food. They are not the same thing.

WORDS TO KNOW

respiration	the process that releases energy from food; it takes place in all living things all the time
oxygen	a gas in the air that living things take in for respiration
carbon dioxide	a gas that living things give out during respiration

	At rest	During exercise
Energy needed by the body	less	more
Rate of respiration	slower	faster
Oxygen needed	less	more
Breathing rate	slower	faster

WORKED EXAMPLE

Daniel counted how many times he breathed in one minute. At rest, he breathed 15 times. After swimming fast for 5 minutes, he breathed 34 times in one minute. Explain why his breathing rate increased after swimming.

1. What is the question asking? Why Daniel breathed faster after swimming.
2. The science idea: moving fast needs more energy. Respiration releases energy from food, and it needs oxygen.
3. Link it: to release more energy, Daniel's body needed more oxygen, so he breathed faster to take in more oxygen.

When Daniel swam fast, his body needed more energy. He breathed faster to take in more oxygen for respiration to release more energy from food.

TRY THIS

True or false: a plant respires only at night.

Answer: False. A plant respires all the time, day and night.

The Sun: our main source of energy

The Sun is our primary (main) source of energy. It gives out light energy and heat energy. Heat from the Sun keeps the Earth warm enough for living things. Green plants use light energy from the Sun to make food. Animals get this energy when they eat plants, or when they eat other animals that ate plants. So the energy in all our food first came from the Sun.

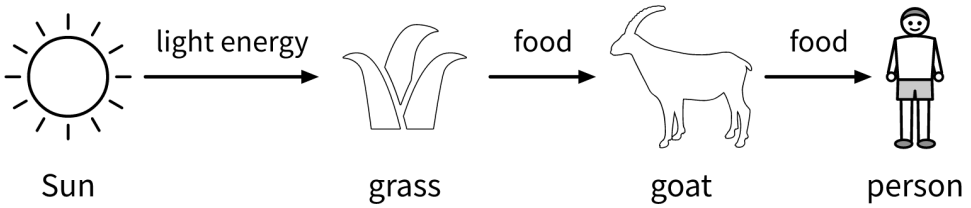
KEY IDEA

Energy from the Sun passes to animals through plants.

- Arrows show the direction in which the energy passes: from the Sun, to the plant, to the animals.
- Only plants take in energy directly from the Sun to make food. Animals get it indirectly, through food.

WORDS TO KNOW

primary source	the main source that energy comes from first: for living things, the Sun is the primary source of energy



TRY THIS

A person eats chicken. The chicken ate corn. Where did the energy in the chicken first come from?

Answer: The Sun (light energy trapped by the corn plant).

Photosynthesis: how plants make food

Plants make their own food by a process called photosynthesis. To photosynthesise, a plant needs light energy, water and carbon dioxide. The light can be sunlight or light from a lamp. The plant makes sugar (its food) and gives out oxygen. Photosynthesis takes place only when there is light.

KEY IDEA

Light energy + water + carbon dioxide: the plant makes sugar and gives out oxygen.

- Oxygen is NOT needed for photosynthesis. It is given out.
- Sugar is NOT needed for photosynthesis. It is made.
- Plants do not take in food from the soil. The soil gives them water and mineral salts, but they make their own food.

WORDS TO KNOW

photosynthesis	the process in which green plants use light energy, water and carbon dioxide to make food (sugar) and give out oxygen
sugar	the food that plants make in photosynthesis

Needed for photosynthesis	Made or given out
light energy	sugar (food)
water	oxygen
carbon dioxide	
chlorophyll (in the green parts) to trap the light energy	

TRY THIS

Name the gas that plants give out during photosynthesis.

Answer: Oxygen

The leaf: where food is made

The leaf is the main part of the plant where food is made. Water is taken in by the roots and carried up the stem to the leaves. Carbon dioxide from the air enters the leaf through tiny openings on the leaves. Oxygen leaves through the same tiny openings. The sugar made in the leaves is carried to other parts of the plant through food-carrying tubes, to be used or stored.

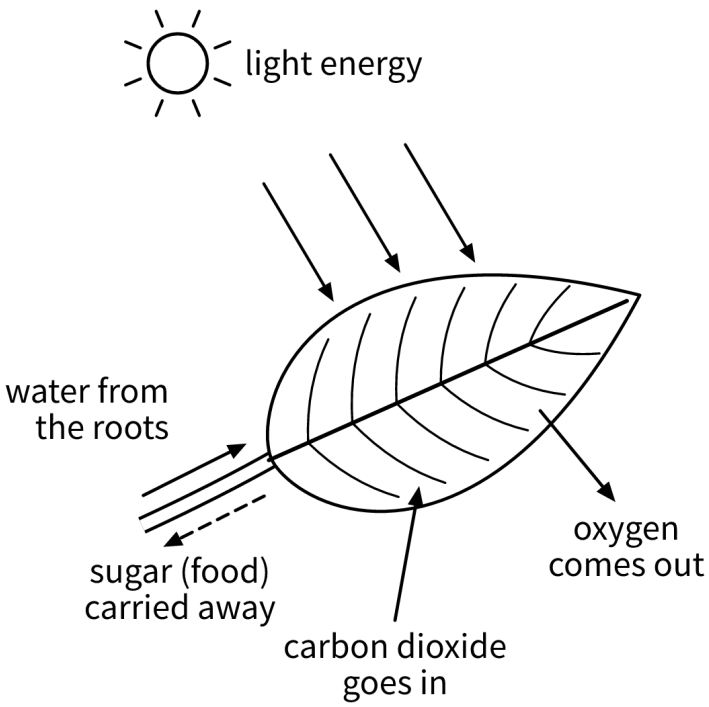
KEY IDEA

Carbon dioxide enters and oxygen leaves through the tiny openings on the leaves.

- The tiny openings allow the exchange of gases between the plant and its surroundings.
- Water vapour also escapes through the tiny openings.
- On a very hot day, the tiny openings become smaller. Less water is lost, so the plant does not wilt so easily. But less carbon dioxide is taken in, so the plant photosynthesises more slowly and makes less food.
- If the leaves are coated with oil or jelly, the tiny openings are blocked. Clear oil still lets light through, but carbon dioxide cannot enter.

WORDS TO KNOW

tiny openings	very small holes on the leaves (sometimes called stomata) that allow gases to move in and out of the leaf
exchange of gases	gases moving in and out: carbon dioxide and oxygen passing between the plant and its surroundings



CHAPTER 1

Practice Questions

Part 2: Photosynthesis and Respiration



In the practice questions

25 questions, 66 marks. For each multiple-choice question, write the number of the correct option in the brackets. Write your other answers on the lines given. The answers are on page 249.

- **Section A: Multiple-Choice Questions: 16 questions, 32 marks**
- **Section B: Open-Ended Questions: 9 questions, 34 marks**

Name: _____ Class: _____ Date: _____

PRIMARY 6 · SCIENCE · PHOTOSYNTHESIS AND RESPIRATION

Photosynthesis and Respiration

INSTRUCTIONS

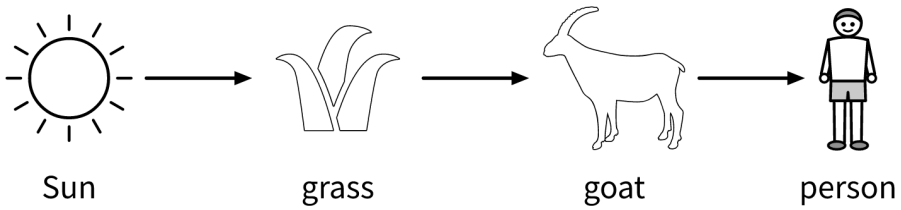
- 25 questions, 66 marks in total.
- Answer all questions in the spaces provided.
- For multiple-choice questions, write the option number in the brackets.
- Write your other answers on the lines given, in full sentences.

Section A: Multiple-Choice Questions

1 Which statement about respiration is correct? ( ) [2]

(1) It takes place only in animals.
(2) It takes place in plants only at night.
(3) It releases energy from food in all living things.
(4) It makes food from carbon dioxide and water.

2 The diagram shows how energy passes from the Sun to a person. Which statement is correct? ( ) [2]



(1) The goat gets its energy directly from the Sun.
(2) The grass uses light energy from the Sun to make its own food.
(3) The person makes food using light energy from the Sun.
(4) The grass gets its food from the goat.

3 Which of the following are needed by a plant to make food?
A: light energy
B: oxygen
C: carbon dioxide
D: water ( ) [2]

(1) A and B only (2) C and D only (3) A, B and D only (4) A, C and D only

4 Which substance in the green parts of a plant traps light energy? ( ) [2]

(1) chlorophyll (2) oxygen (3) sugar (4) water

5 Which process takes carbon dioxide out of the air? ( ) [2]

(1) respiration in mushrooms
(2) photosynthesis in green plants
(3) respiration in plants at night
(4) breathing out by people

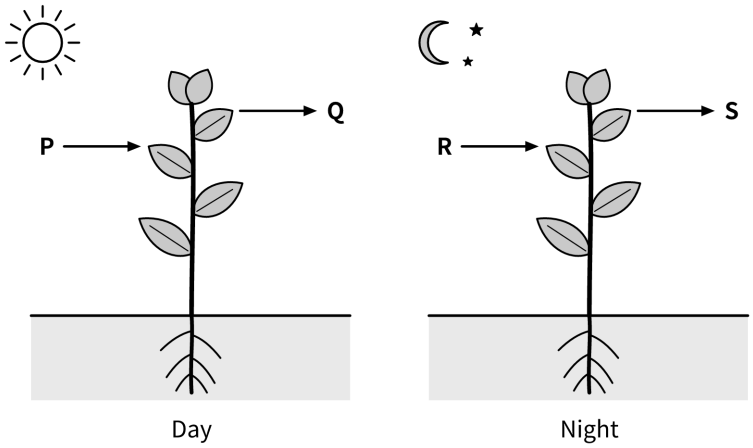
6 Which of the following correctly describes how a plant and a rabbit obtain energy? ( ) [2]

(1) Plant: makes its own food using light energy. Rabbit: eats plants.
(2) Plant: takes in food from the soil. Rabbit: eats plants.
(3) Plant: makes its own food using light energy. Rabbit: makes its own food using light energy.
(4) Plant: takes in food from the soil. Rabbit: takes in light energy from the Sun.

7 When does a mango tree respire? ( ) [2]

(1) only in the day
(2) only at night
(3) only when there is no light
(4) day and night, all the time

8 The diagram shows the main gases taken in and given out by a plant in the day and at night. Which letters stand for carbon dioxide? ( ) [2]



① P and R ② P and S ③ Q and R ④ Q and S

9 On a very hot afternoon, the tiny openings on the leaves of a plant became smaller. Which of the following happened as a result?
A: Less water was lost from the plant.
B: Less carbon dioxide was taken in.
C: More oxygen was given out. ( ) [2]

① A only ② B only ③ A and B only ④ A, B and C

10 Jun Hao coated both sides of a leaf with clear oil, which lets light through. After 3 days in sunlight, the coated leaf had made much less food than the other leaves. Which is the best reason? ( ) [2]

① The coated leaf could not trap light energy.
② The coated leaf had no chlorophyll.
③ The coated leaf could not take in water from the roots.
④ The coated leaf could not take in carbon dioxide through its tiny openings.