

Ages 15–16 · Science

LESSON SLIDES

Life Processes

Biology · Nutrition, respiration, transport and excretion

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Life Processes

SPEAKER NOTES

Open by asking: how can we tell that something is alive? Collect answers such as movement, growth and breathing, then say that today we look at the processes that keep every living thing alive, even when it seems to be doing nothing.

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By the end of this lesson you can

- 🎯 Define life processes and why organisms need them
- 🎯 Compare autotrophic and heterotrophic nutrition
- 🎯 Explain aerobic and anaerobic respiration
- 🎯 Describe transport in humans and plants
- 🎯 Explain how kidneys filter blood

By the end of this lesson you can

SPEAKER NOTES

Read the objectives aloud. Tell students there will be a five-question quiz at the end, so they should note one key idea from each section.

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What are life processes?

- Processes that maintain a living body, even during sleep
- Repairing and maintaining cells needs a steady supply of energy
- Energy comes from food broken down inside the body
- Four core processes: nutrition, respiration, transportation, excretion

What are life processes?

SPEAKER NOTES

Stress that maintenance never stops: cells are repaired and replaced even while we sleep. Ask a student to name the four processes back to you before moving on.

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Two ways to get food

Autotrophic

- Make their own food from simple substances
- Use carbon dioxide, water and sunlight
- Examples: green plants, some bacteria

Heterotrophic

- Take in food made by other organisms
- Break complex food into simpler molecules
- Examples: animals, fungi, most bacteria

Two ways to get food

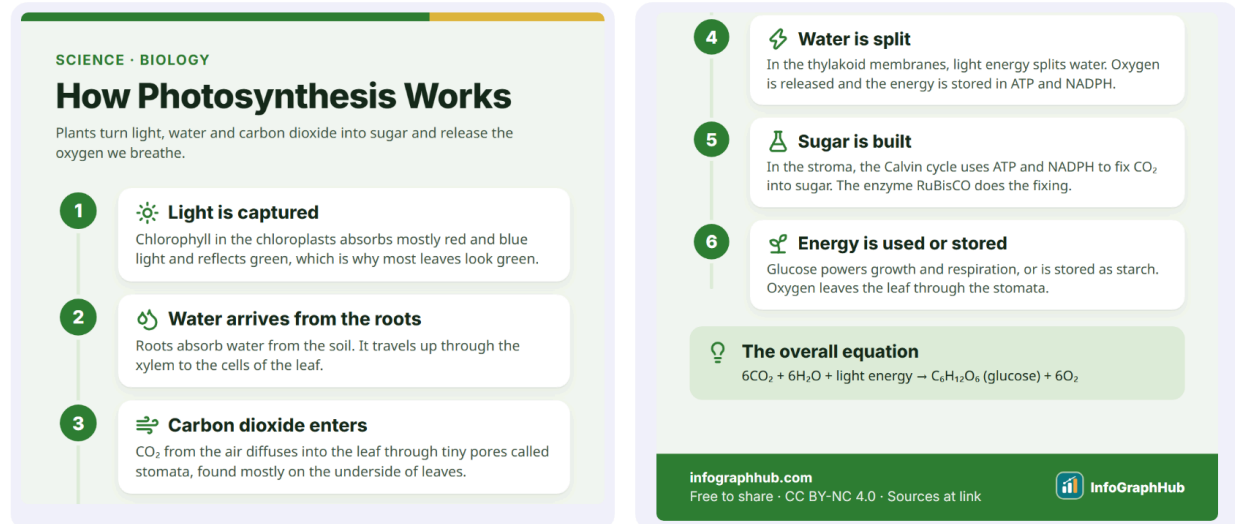
SPEAKER NOTES

Autotroph means self-feeder. Ask for examples of heterotrophic nutrition in daily life: a cow grazing, bread mould growing, a tapeworm living inside a host.

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Photosynthesis: how plants make food

- Chlorophyll absorbs light energy
- Light splits water and releases oxygen
- Carbon dioxide is fixed into glucose



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Photosynthesis: how plants make food

SPEAKER NOTES

Use the infographic to walk through the steps. Write the balanced equation on the board: $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$. Point out that CO₂ enters through the stomata.

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Nutrition in humans

- Mouth: teeth chew food; saliva starts breaking down starch
- Stomach: acid and pepsin begin digesting proteins
- Small intestine: digestion is completed; villi absorb nutrients
- Large intestine: absorbs water; waste is removed

Nutrition in humans

SPEAKER NOTES

Trace a bite of a sandwich through the alimentary canal. Mention the liver (bile) and pancreas (pancreatic juice) as helpers that pour secretions into the small intestine.

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Respiration: releasing energy from food

Aerobic

- Uses oxygen
- Glucose is broken down fully
- Products: carbon dioxide and water
- Releases much more energy

Anaerobic

- No oxygen
- Yeast makes ethanol and carbon dioxide
- Tired muscles make lactic acid
- Releases less energy

Respiration: releasing energy from food

SPEAKER NOTES

Both start by breaking glucose into pyruvate in the cytoplasm. Aerobic respiration continues in the mitochondria. Many syllabuses still teach that lactic acid build-up after a sprint causes cramps, so students may meet that answer in exams. Science has moved on, though: current research links cramps mainly to faulty nerve–muscle signalling in tired muscles, and lactic acid is no longer thought to cause them.

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Breathing in humans

- Air enters through the nostrils and passes down the trachea
- Bronchi branch into bronchioles ending in alveoli
- Alveoli have thin walls and a rich blood supply
- Oxygen diffuses into blood; carbon dioxide diffuses out

Breathing in humans

SPEAKER NOTES

Clarify that breathing is the physical movement of air, while respiration is the chemical release of energy in cells. Many students confuse the two.

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Transportation in humans

- The heart has four chambers and pumps blood
- Arteries carry blood away from the heart
- Veins carry blood back to the heart
- Capillaries exchange materials with cells

Transportation in humans

SPEAKER NOTES

Explain double circulation: blood passes through the heart twice in one full circuit, once to the lungs and once to the body. This keeps oxygenated and deoxygenated blood separate.

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The heart never rests

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chambers keep oxygen-rich and oxygen-poor blood apart

- Right side pumps blood to the lungs
- Left side pumps blood to the whole body

The heart never rests

SPEAKER NOTES

Mammals and birds need a lot of energy to keep a constant body temperature, so separating oxygenated blood from deoxygenated blood matters. Compare with the three-chambered heart of frogs.

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Transport in plants

Xylem

- Carries water and minerals
- Moves upward from roots
- Pulled up by transpiration

Phloem

- Carries food such as sucrose
- Moves up or down as needed
- Uses energy from ATP

Transport in plants

SPEAKER NOTES

Transpiration, the loss of water vapour from leaves, creates a suction that pulls water up. Moving food in the phloem is called translocation.

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Excretion in humans

- Kidneys filter waste such as urea from blood
- Each kidney has about a million filtering units called nephrons
- Useful substances like glucose are reabsorbed
- Urine flows to the bladder through the ureters

Excretion in humans

SPEAKER NOTES

Draw a simple nephron: Bowman's capsule, the tubule and the collecting duct. Mention dialysis as an artificial kidney used when kidneys fail.

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 Example

Real-life example: a football match

- 1 Breakfast is digested and glucose absorbed
- 2 Breathing speeds up to supply oxygen
- 3 Heart rate rises to move blood faster
- 4 Sweat and urine remove waste and extra water

Real-life example: a football match

SPEAKER NOTES

Use a familiar situation: a student playing football (soccer) on a hot afternoon. Ask the class to name which life process is at work for each bullet.

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 **Quick check**

Which blood vessels carry blood away from the heart?

A Veins

B Arteries

C Capillaries

D Nephrons

Quick check

SPEAKER NOTES

Answer: arteries. Take a show of hands before revealing the answer. Remind students that nephrons are not blood vessels at all.

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Key takeaways

- ✓ Life processes keep organisms alive and maintained
- ✓ Nutrition supplies the raw materials and energy source
- ✓ Respiration releases energy from glucose
- ✓ Transport moves materials around the body
- ✓ Excretion removes harmful waste

Key takeaways

SPEAKER NOTES

Recap with a one-line summary per process, then move to the five-question quiz on the page. Set homework: draw and label the human heart.