

LESSON SLIDES

Life Processes

Biology · Nutrition, respiration, transport and excretion

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

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

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

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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How Photosynthesis Works

Plants turn light, water and carbon dioxide into sugar and release the oxygen we breathe.

1

Light is captured

Chlorophyll in the chloroplasts absorbs mostly red and blue light and reflects green, which is why most leaves look green.

2

Water arrives from the roots

Roots absorb water from the soil. It travels up through the xylem to the cells of the leaf.

3

Carbon dioxide enters

CO₂ from the air diffuses into the leaf through tiny pores called stomata, found mostly on the underside of leaves.

4

Water is split

In the thylakoid membranes, light energy splits water. Oxygen is released and the energy is stored in ATP and NADPH.

5

Sugar is built

In the stroma, the Calvin cycle uses ATP and NADPH to fix CO₂ into sugar. The enzyme RuBisCO does the fixing.

6

Energy is used or stored

Glucose powers growth and respiration, or is stored as starch. Oxygen leaves the leaf through the stomata.

7

The overall equation

$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 \text{ (glucose)} + 6\text{O}_2$

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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

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

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

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

The heart never rests

4 chambers keep oxygen-rich and oxygen-poor blood apart

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

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

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

 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

 Quick check

Which blood vessels carry blood away from the heart?

A Veins

B Arteries

C Capillaries

D Nephrons

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