ENERGY IN THE ECOSYSTEM

LESSON 2 – METABOLISM: AN OVERVIEW

INTRODUCTION TO THE LESSON

Bot: Hello, SCI-learner! Welcome back to our science journey here in Roxas City, where walking to school, playing basketball, and helping at home all require energy.

Bot: You learned in the previous lesson how plants store energy through photosynthesis.

Bot: Today, we'll discover how your body and other organisms release that stored energy through a process called cellular respiration.

Bot: Ready to find out where your energy really comes from?

User:

▶️ Yes, let's start!

▶️ I'm ready!

Fa-SCI-nate

Bot: Imagine this...
You're playing basketball at the Villareal Stadium. After a few minutes, your arms feel tired and your breathing gets faster.

Bot: What do you think is happening inside your cells?

User:

▶️ Cells are releasing energy
▶️ Cells are storing food
▶️ Cells are resting

Branching Response:

Bot (Correct – releasing energy): Correct! Your cells are breaking down food to release energy.

Bot (Incorrect): Not quite. During activity, cells release energy, not store or rest.

Goal SCI-tting

Bot: By the end of this lesson, you will be able to:

1. Explain what cellular respiration is
2. Identify the stages of cellular respiration
3. Differentiate aerobic and anaerobic respiration
4. Compare the energy produced in each process

Bot: These goals will help you understand how energy flows in living things.

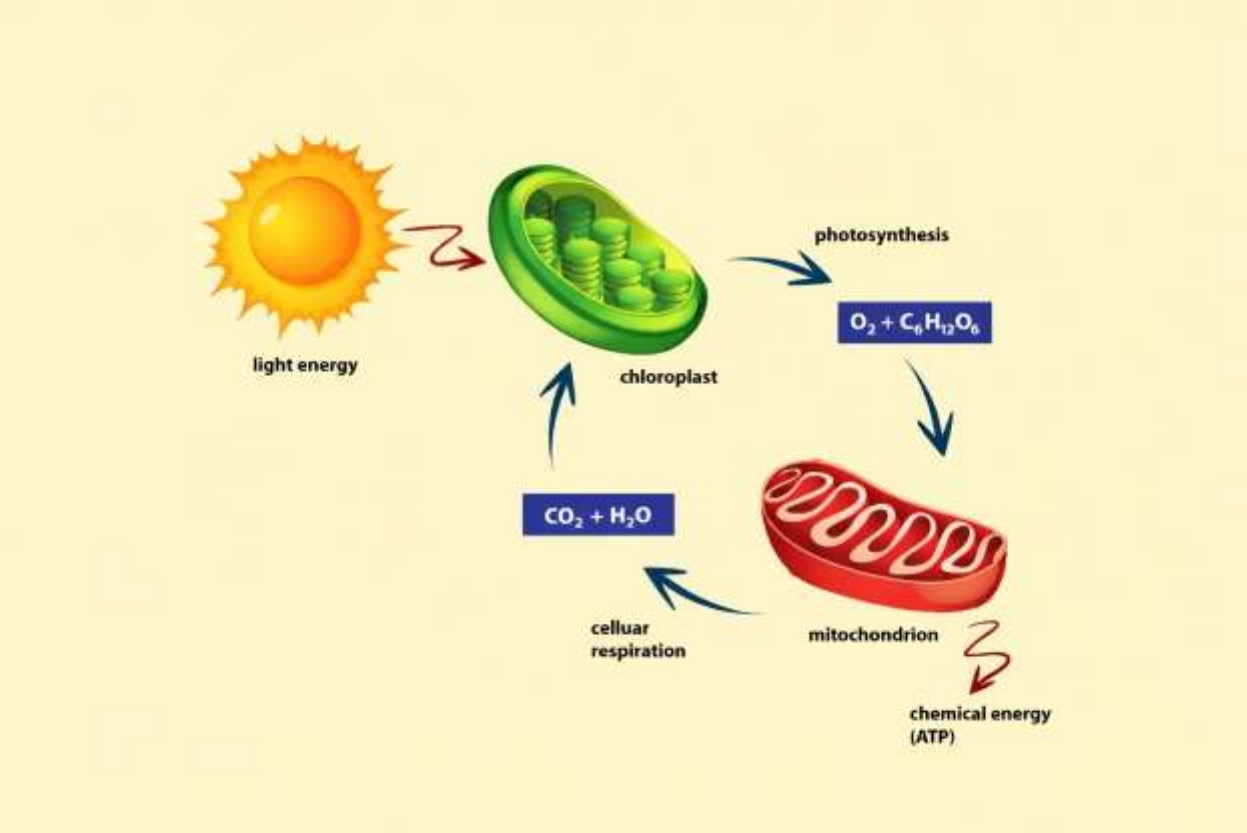
User:

▶️ Continue

Pre-SCI-ntation

Bot: All living organisms need energy to survive.

Bot: Plants store energy in food during photosynthesis.
Animals—including humans—release that energy through cellular respiration.



Bot: Cellular respiration is part of metabolism, the sum of all chemical processes in cells.

Bot: Metabolism has two parts:

- **Anabolism** – building molecules
- **Catabolism** – breaking down molecules to release energy

Inve-SCI-tigation

Part 1: What Is Cellular Respiration?

Bot: Cellular respiration is a catabolic process that produces ATP, the energy currency of the cell.

Bot: Which molecule is the main energy carrier in cells?

User:
▶ ATP

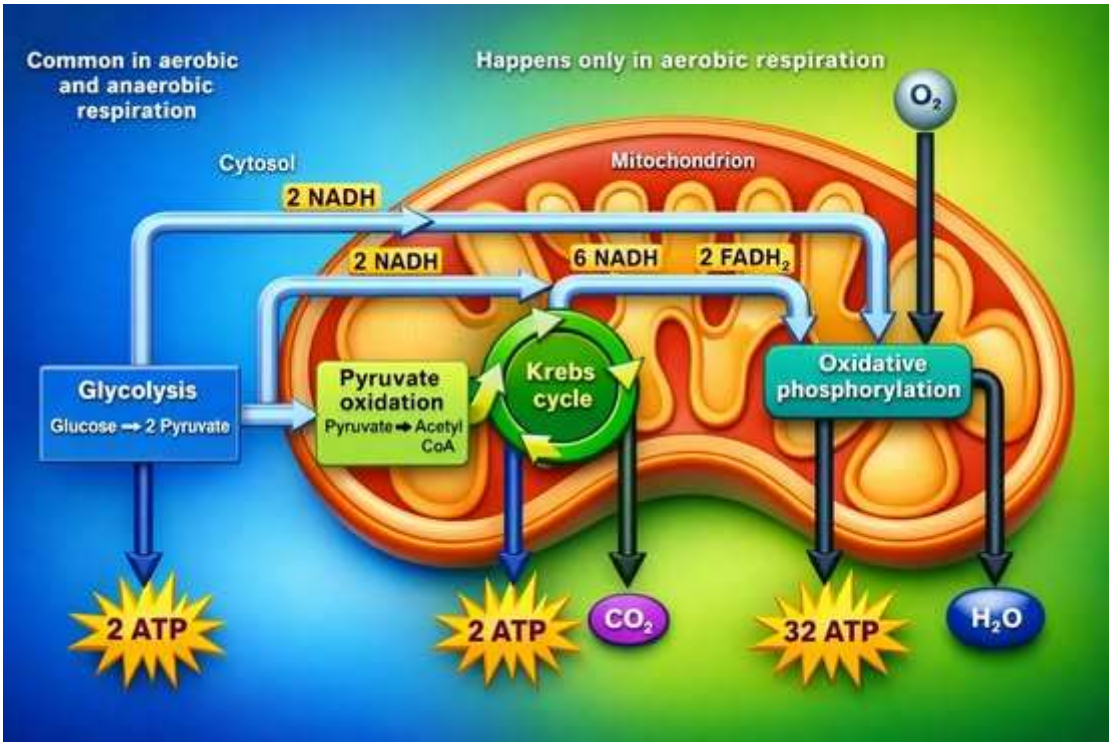
▶ Glucose
▶ Oxygen

Bot: Correct! ATP is the molecule cells use for energy.

Part 2: Stages of Cellular Respiration

Bot: Cellular respiration has three main stages:

1 **Glycolysis** – occurs in the cytoplasm
2 **Krebs Cycle** – occurs in the mitochondrial matrix
3 **Electron Transport Chain** – occurs in the inner mitochondrial membrane



Bot: Where does glycolysis occur?

User:
▶ Cytoplasm
▶ Nucleus
▶ Mitochondrion

Bot: Correct! Glycolysis occurs in the cytoplasm.

Part 3: Aerobic Respiration

Bot: Aerobic respiration happens in the presence of oxygen.

Bot: It includes:
• Oxidation of pyruvic acid

• Krebs cycle
• Electron transport chain

Bot: This process can produce up to 36 ATP molecules from one glucose.

Bot: Which gas is the final electron acceptor?

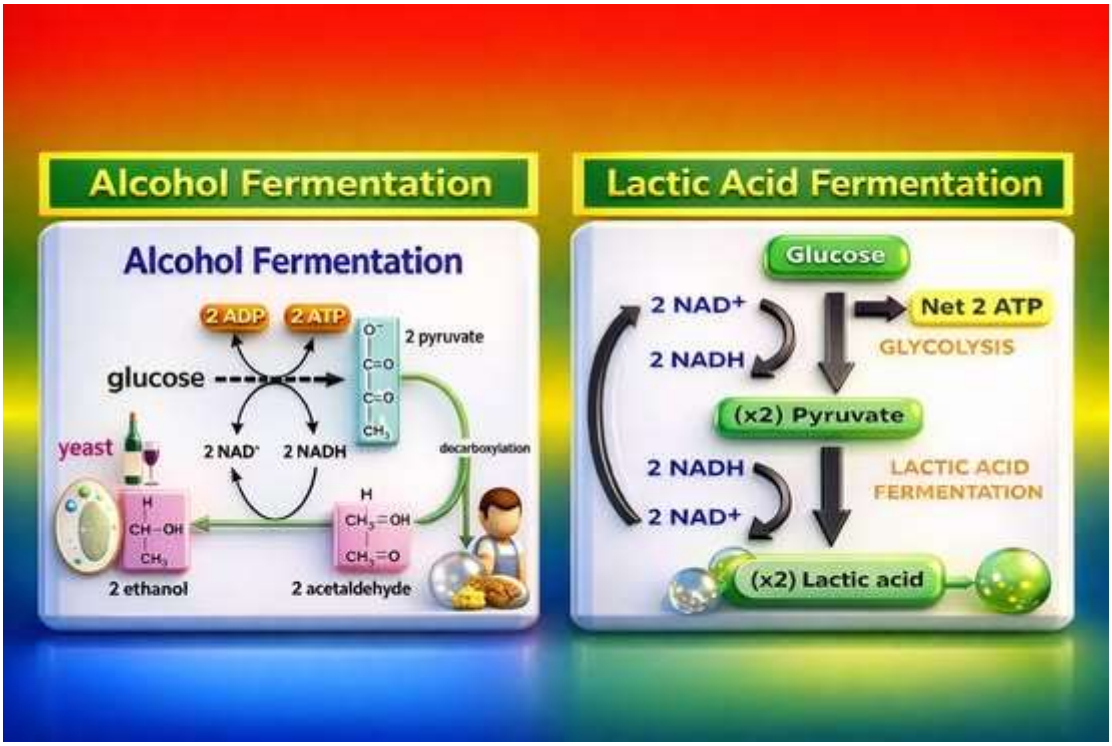
User:
▶ Oxygen
▶ Carbon dioxide
▶ Nitrogen

Bot: Correct! Oxygen is the final electron acceptor.

Part 4: Anaerobic Respiration (Fermentation)

Bot: When oxygen is limited, cells use anaerobic respiration or fermentation.

Bot: There are two types:
Alcoholic fermentation – produces alcohol and CO_2
Lactic acid fermentation – produces lactic acid



Bot: Which type occurs in human muscles during strenuous exercise?

User:
▶ Alcoholic fermentation
▶ Lactic acid fermentation

Bot: Correct! Human muscles use lactic acid fermentation.

Part 5: Energy Comparison

Bot:
Let's compare energy yield:

Aerobic respiration – 36 ATP
Anaerobic respiration – 2 ATP

Bot: Which process produces more energy?

User:
▶️ Aerobic respiration
▶️ Anaerobic respiration

Bot: Correct! Aerobic respiration produces much more ATP.

Self-A-SCI-ssment

Bot: Let's check your understanding!

Bot:
1. What is the role of ATP?
2. Why is glycolysis important?
3. Why do muscles feel tired during intense exercise?

User:
▶️ Because lactic acid builds up
▶️ Because oxygen disappears forever

Bot: Correct! Lactic acid buildup causes muscle fatigue.

SCI-pplementary

Bot: Did you know?
The energy from the rice you eat in Capiz fuels your cells through cellular respiration.

Bot: Photosynthesis and respiration are opposite but connected processes—together, they keep energy flowing in ecosystems.

Bot: Healthy food and regular exercise help your cells produce energy efficiently.

CLOSING

Bot: Great job, SCI-learner! You've learned how cells release energy through cellular respiration.

Bot: Padayon sa pagtu-on sa SCI-ensiya! Thank you!