Respiration and ATP

Student activity • observation and reasoning

YEAR 10 / LESSON 20 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

How can respiration support several different cellular processes?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

• Student booklet, paper models, pencil and ruler

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 2.34–2.35. ATP and cellular energy transfer.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Distinguish breathing from respiration: one ventilates a gas-exchange surface; the other is a set of cellular reactions that transfers energy.

2. Draw a simple cycle showing energy from respiration supporting the regeneration of ATP from ADP and phosphate.

3. Connect ATP breakdown to examples such as active transport, muscle contraction and building larger molecules. Do not describe ATP as a long-term food store.

4. Explain why both plant and animal cells need ATP and why photosynthesis does not remove a plant's need for respiration.

5. Compare an analogy of rechargeable tokens with real chemistry: energy is transferred through reactions, while ATP molecules are continually recycled.

6. Correct "energy is created", "only animals respire", and "breaking a chemical bond alone releases energy"; explain net energy transfer across the whole reaction.

Cleanup

- Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

ATP means adenosine triphosphate. Respiration supplies energy for ATP regeneration; ATP hydrolysis can be coupled to energy-requiring cellular processes. ATP is an immediate transferable energy resource, not a large long-term store. Net energy change depends on the full reaction, including bond breaking and bond formation.

Example / trial	Observation / evidence	Explanation / limit
ATP regeneration cycle		
Two uses in a cell		
Analogy: useful feature / limitation		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What does ATP stand for?

2. What process supplies energy to regenerate ATP?

3. Give two cellular uses of ATP.

4. Do plants respire? Explain.

5. Why is breathing not the same as respiration?

6. Give one limitation of a rechargeable-token analogy.