Nitrogen cycling and bacterial roles

Student activity • observation and reasoning

YEAR 11 / LESSON 110 / BIOLOGY ONLY

The question

How does nitrogen become available to plants and return to the atmosphere?

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

Equipment

- Student booklet, pencil and ruler
- Nitrogen-pool and microbial-process cards

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

Course coverage: Biology only: 4.11B. Nitrogen cycle.

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. Draw atmospheric nitrogen, soil ammonium/nitrate, plant proteins, animal proteins and dead/waste material as separate pools.

2. Explain nitrogen fixation as conversion of atmospheric nitrogen into biologically usable compounds by certain microorganisms.

3. Show plant uptake of mineral nitrogen and incorporation into amino acids/proteins, followed by feeding.

4. Show decomposition returning ammonium compounds from organic material.

5. Distinguish nitrification in oxygenated conditions from denitrification returning nitrogen gas under low-oxygen conditions.

6. Correct the claim that most plants absorb nitrogen gas directly through their roots.

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

Nitrogen-fixing, decomposing, nitrifying and denitrifying microorganisms have different roles. Nitrification converts ammonium through nitrite to nitrate; denitrification can convert nitrate to nitrogen gas in low-oxygen conditions. Specific bacterial names are not required.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

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 is nitrogen fixation?

2. What do plants commonly take up from soil?

3. What can decomposition return?

4. What does nitrification produce?

5. What does denitrification return?

6. Do most plants directly use atmospheric N_2?