

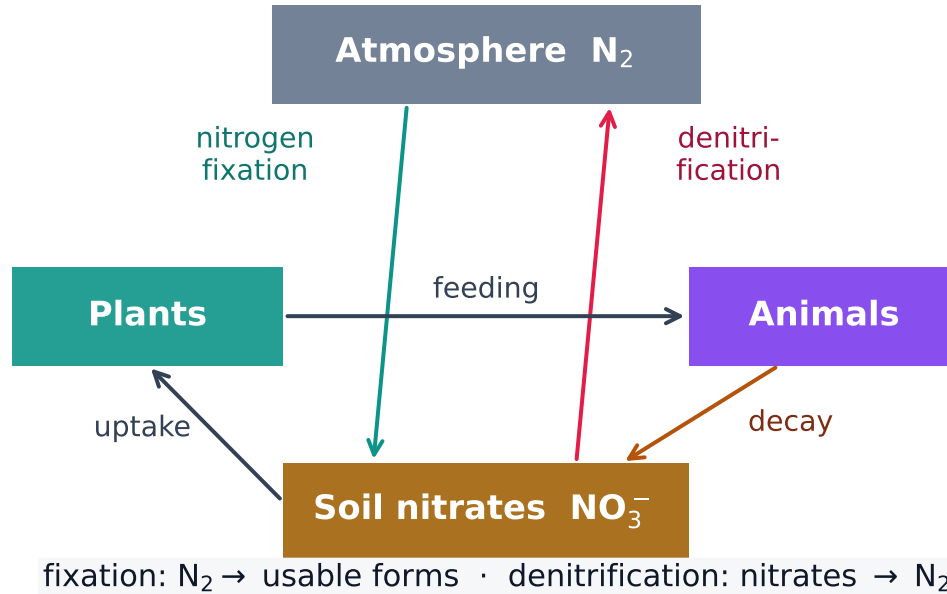
Exercise walk-through

1.5

The Nitrogen Cycle

AP Environmental Science

Nitrogen and phosphorus, in detail



Nitrogen cycles through the **air**, phosphorus only through **rock** and water. An excess of either causes **eutrophication**.

Exam tips

- Remember **energy flows and is lost** (the 10% rule) while **matter cycles** (carbon, nitrogen, phosphorus, water).
- Apply the 10% rule down a food chain and know **$NPP = GPP - \text{respiration}$** (only NPP is available to consumers).
- Learn each biogeochemical cycle's stores and how humans disturb it (burning fossil fuels adds CO_2 ; fertiliser adds nitrogen/phosphorus).
- Producers are most abundant because so little energy reaches the top.
- Use correct units and show your arithmetic on the free-response math questions (no calculator – keep numbers round).

Unit 1 – key takeaways

1

Ecosystems

biotic + abiotic; niche; competitive exclusion; symbiosis

2

Cycles

carbon, nitrogen, water recycle matter; P has no gas phase

3

Productivity

$NPP = GPP - R$ sets the food supply

4

Energy flow

~10% per level; food webs + keystone species

Exercises 2.1-2.3

2.1 Why can't most organisms use atmospheric N_2 directly?

[1]

2.2 What converts N_2 into a usable form?

[1]

2.3 What does denitrification do?

[1]

Exercises 2.1-2.3

2.1 Why can't most organisms use atmospheric N_2 directly? [1]

2.1

- N_2 is very stable/unreactive, so most organisms cannot use it directly
-

2.2 What converts N_2 into a usable form? [1]

2.2

- Nitrogen-fixing bacteria
-

2.3 What does denitrification do? [1]

2.3

- Returns nitrogen to the air as N_2

Exercise 3.1

3.1 Nitrogen fixation converts N_2 into

[1]

- ☐ **A** nitrates directly usable by all animals
- B** ammonia (a usable form)
- C** carbon dioxide
- D** oxygen

Exercise 3.1

3.1 Nitrogen fixation converts N_2 into

[1]

☐

A nitrates directly usable by all animals

B ammonia (a usable form)

C carbon dioxide

D oxygen

3.1 B

- ammonia (a usable form)

Exercise 3.2 (a)

3.2 A farmer applies nitrogen fertilizer to a field near a river.

(a) Explain how this can disturb the nitrogen cycle and harm the river.

[3]

Exercise 3.2 (a)

3.2 A farmer applies nitrogen fertilizer to a field near a river.

(a) Explain how this can disturb the nitrogen cycle and harm the river. [3]

(a)

- Excess reactive nitrogen runs off into the river; it fertilizes algae, causing an algal bloom (eutrophication); decomposition then depletes oxygen, harming aquatic life

Exercise 3.2 (b)

3.2 A farmer applies nitrogen fertilizer to a field near a river.

(b) State one natural way to add nitrogen to soil.

[1]

Exercise 3.2 (b)

3.2 A farmer applies nitrogen fertilizer to a field near a river.

(b) State one natural way to add nitrogen to soil.

[1]

(b)

- Planting legumes (nitrogen-fixing bacteria)

Exercise 3.3

3.3 Explain the role of bacteria in making nitrogen available to plants.

[2]

Exercise 3.3

3.3 Explain the role of bacteria in making nitrogen available to plants. [2]

3.3

- Nitrogen-fixing bacteria convert unusable N_2 into ammonia, and nitrifying bacteria convert it to nitrates that plants can absorb