

1.5 The Nitrogen Cycle

Name: _____ Class: _____ Date: _____

Total: 10 marks**KEY WORDS** nitrogen fixation 固氮 • denitrification 反硝化 • nitrogen cycle 氮循环

Objective

Build the skills to answer exam questions on the **nitrogen cycle**.

You must be able to:

- describe **nitrogen fixation** 固氮, nitrification, assimilation, and **denitrification** 反硝化
- explain why nitrogen must be “fixed” to be usable
- explain how fertilizer disturbs the cycle

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Why nitrogen must be fixed

The air is ~78% N_2 , but most organisms **cannot use** N_2 directly. It must be **fixed** into usable forms (ammonia, nitrates), mostly by **bacteria**.

■ The steps

- **Nitrogen fixation** — bacteria convert N_2 to ammonia.
- **Nitrification** — bacteria convert ammonia to nitrates.
- **Assimilation** — plants take up nitrates to build proteins/DNA.
- **Denitrification** — bacteria return nitrogen to the air as N_2 .

■ Human disturbance

Fertilizers add large amounts of reactive nitrogen. Runoff carries it to water, causing **eutrophication** (algal blooms).

■ A worked link

Legume plants host nitrogen-fixing bacteria in their roots, enriching the soil naturally — which is why farmers rotate legumes into fields.

2 Practice

Now apply the methods above.

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]

3 Exam-style questions

3.1 Nitrogen fixation converts N_2 into [1]

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

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]

(b) State one natural way to add nitrogen to soil. [1]

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