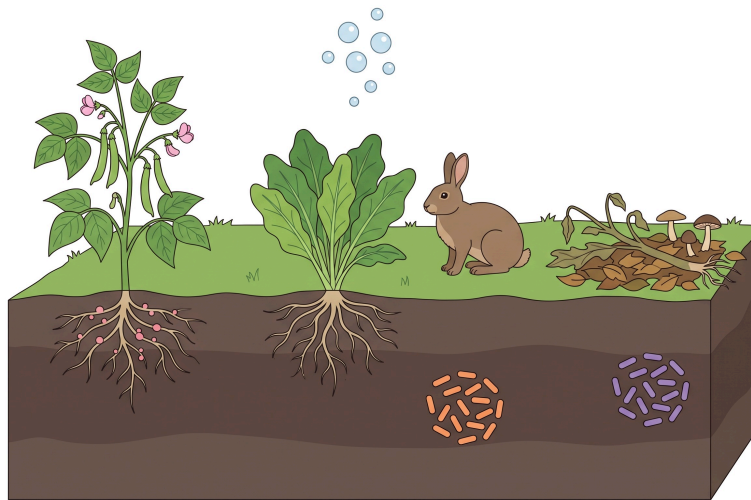


The Nitrogen Cycle

How nitrogen moves between the air, the soil and living things



7

printable sheets

17

pages

All

answer keys included

The Nitrogen Cycle Teaching Pack

How nitrogen moves between the air, the soil and living things

How to use this pack. The sheets are in a suggested teaching order: show the labeled diagram, have students label the blank one, then work through the practice sheets and finish with the quiz. Use them all over a week or pick the ones you need. The answer keys are together at the back.

What is inside

1. Teach

Nitrogen Cycle Diagram 3

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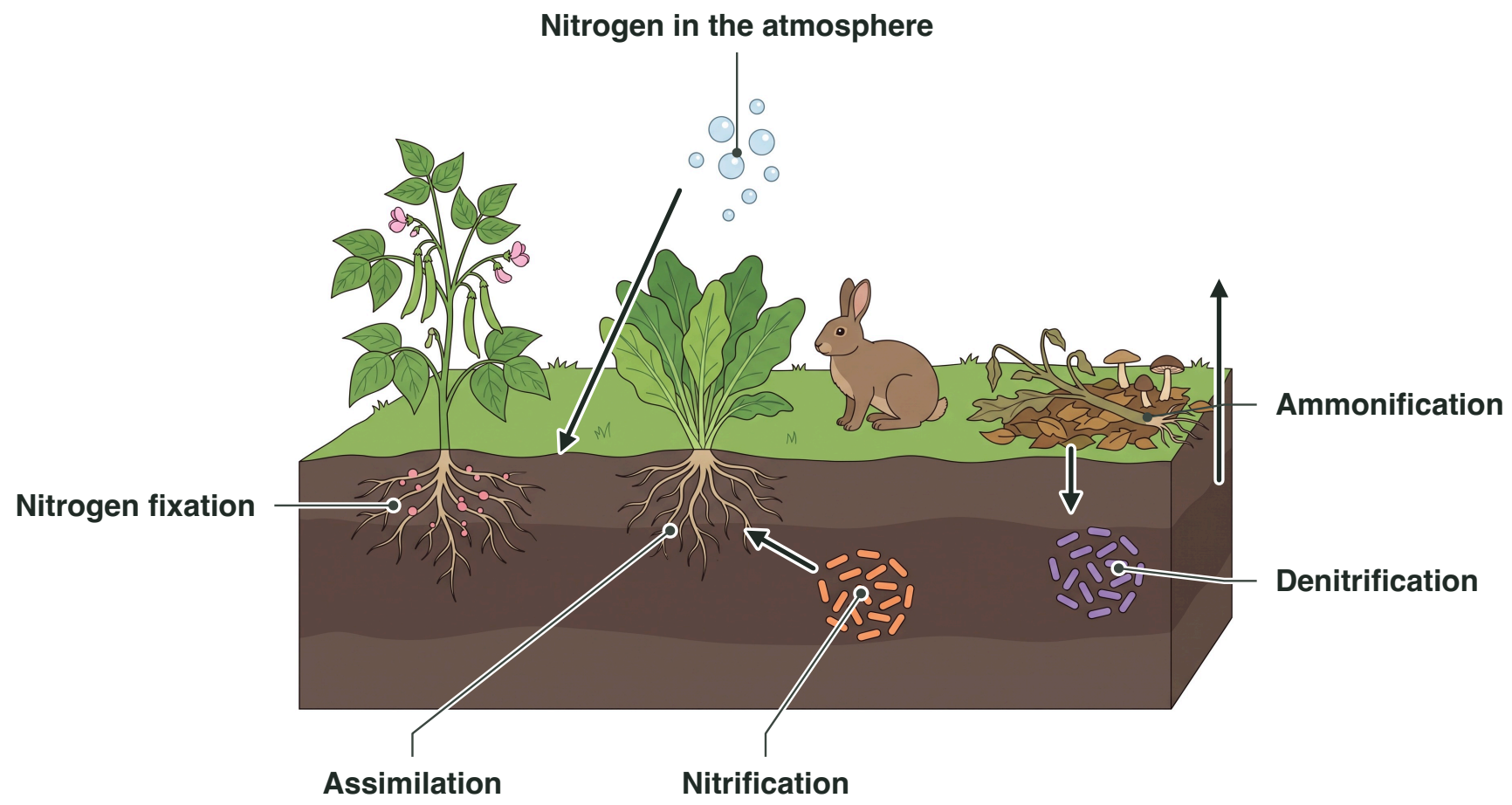
Nitrogen Cycle Quiz 10

Answer keys

Every answer key, in the same order 12

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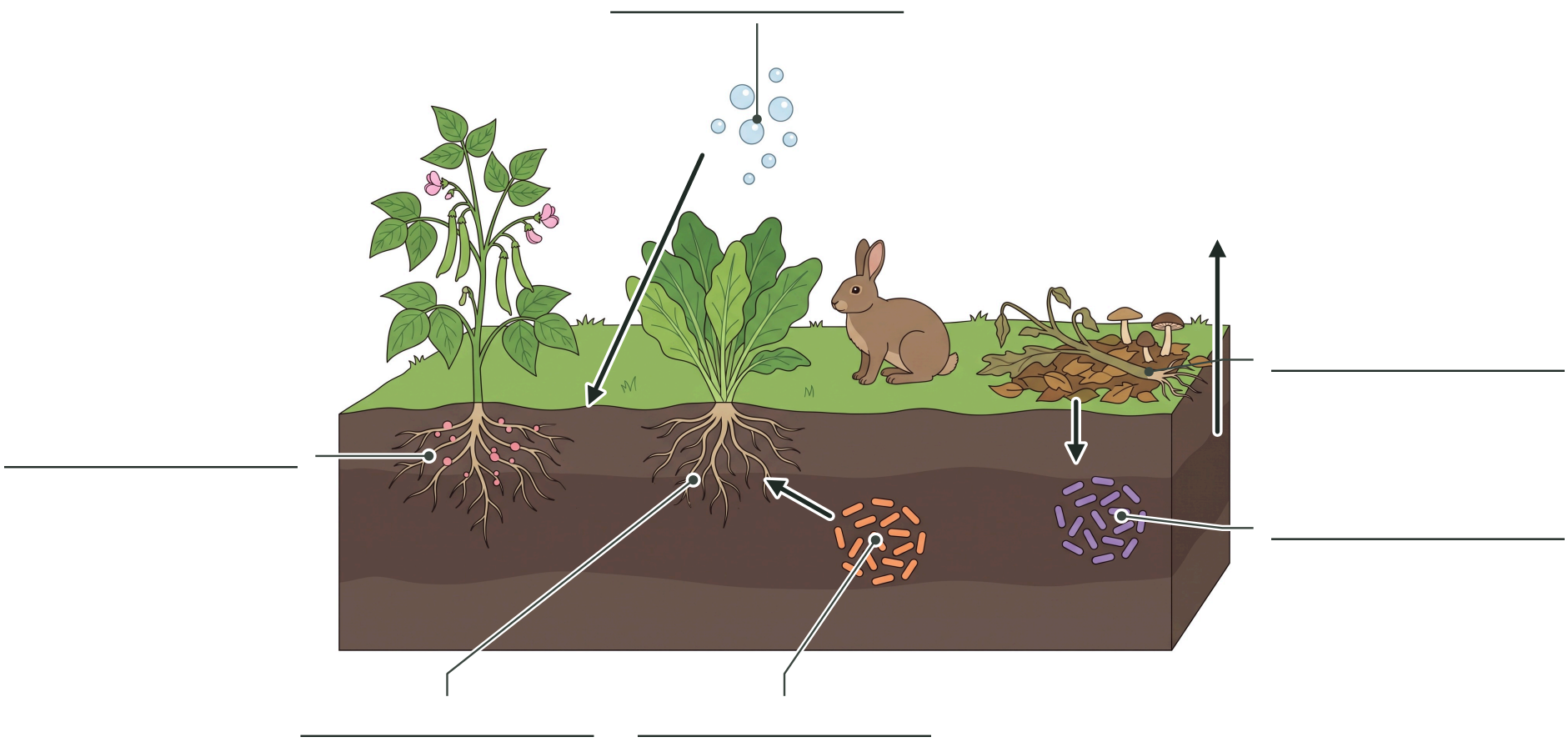
The Nitrogen Cycle



The Nitrogen Cycle

Name: _____

Write the name of each part on its line. Use the word bank.



Word bank

Ammonification

Assimilation

Denitrification

Nitrification

Nitrogen fixation

Nitrogen in the atmosphere

Steps of the Nitrogen Cycle

Use the labeled nitrogen cycle diagram to help you.

Part A. Write the step or term that fits each description.

Word bank

Ammonification

Assimilation

Denitrification

Fertilizer

Legumes

Nitrates

Nitrification

Nitrogen fixation

Nitrogen in the atmosphere

1. Bacteria in the soil change ammonia into nitrates. _____

2. Plants such as beans, peas and clover. Helpful bacteria live on their roots. _____

3. Bacteria change nitrates back into a gas, which returns to the air. _____

4. It makes up about 78 percent of the air, but plants cannot use it in this form. _____

5. Plants take in nitrates through their roots and use them to grow. _____

6. A product that farmers spread on fields to help crops grow. _____

7. Bacteria take a gas from the air and change it into a form plants can use. _____

8. Compounds made by bacteria in the soil. Plants take them in through their roots. _____

9. Decomposers break down dead plants and animals and release ammonia. _____

Part B. Answer the questions.

1. Which step moves nitrogen from the air into the soil? Which step returns it to the air?

2. Air is about 78 percent nitrogen. Why can a plant still run short of nitrogen?

3. A farmer grows clover in a field and plows it into the soil. The next year the farmer plants corn there. How can the clover help the corn?

Nitrogen on the Move

Read the text. Then answer the questions on the next page.

- 1 Every living thing needs nitrogen. Your body uses it to build **proteins** and DNA. There is plenty of nitrogen around you. About 78 percent of the air is nitrogen gas. But plants and animals cannot use nitrogen gas directly. It has to be changed into other forms first. The path nitrogen takes between the air, the soil and living things is called the **nitrogen cycle**.
- 2 The cycle depends on bacteria. Some bacteria take nitrogen gas from the air and change it into **ammonia**, a compound that contains nitrogen. This step is **nitrogen fixation**. Many of these bacteria live in the soil. Others live in small bumps called nodules on the roots of **legumes**, such as beans, peas and clover. The plant gives the bacteria food, and the bacteria give the plant nitrogen.
- 3 Other soil bacteria change the ammonia into **nitrates**. This step is **nitrification**. Plants take in the nitrates through their roots and use the nitrogen to build proteins. This step is **assimilation**. Animals cannot take nitrogen from the soil or the air. They get it by eating plants or by eating other animals.
- 4 Nitrogen does not stay in living things forever. Animals leave wastes, and plants and animals die. **Decomposers**, such as bacteria and fungi, break down the wastes and remains. This releases ammonia into the soil again. The step is called **ammonification**. Bacteria can change this ammonia into nitrates, and plants can use the nitrogen once more.
- 5 One more group of bacteria completes the cycle. They change nitrates back into nitrogen gas, which returns to the air. This step is **denitrification**. People are part of the nitrogen cycle too. Farmers add **fertilizer** to give their crops more nitrogen. They can also plant legumes to add nitrogen to the soil.



Nitrogen moves between the air, the soil and living things.

Nitrogen on the Move: Questions

Go back to the text to find each answer. The paragraphs are numbered to help you.

1. What is this text mostly about?

- ☐ How farmers grow beans and peas
- ☐ Why animals need to eat plants
- ☐ How nitrogen moves between the air, the soil and living things
- ☐ How bacteria can make people sick

2. About how much of the air is nitrogen gas?

- ☐ 1 percent
- ☐ 21 percent
- ☐ 78 percent
- ☐ 100 percent

3. What must happen to nitrogen gas before plants can use it?

4. Number the steps 1, 2 and 3 to show how nitrogen gets from the air into a plant (paragraphs 2 and 3).

- ☐ Other bacteria change the ammonia into nitrates.
- ☐ A plant takes in the nitrates through its roots.
- ☐ Bacteria change nitrogen gas into ammonia.

5. How do animals get the nitrogen they need?

- ☐ By breathing in air
- ☐ By eating plants or other animals
- ☐ By drinking water
- ☐ By taking it in from the soil

6. What do decomposers do in the nitrogen cycle?

7. Which step returns nitrogen gas to the air?

- ☐ Nitrogen fixation
- ☐ Nitrification
- ☐ Assimilation
- ☐ Denitrification

8. Name two ways a farmer can add nitrogen to the soil.

The Path of a Nitrogen Atom

Follow one nitrogen atom all the way around the cycle. It starts in the air, as part of nitrogen gas. These steps are mixed up. Put them in order.

Part A. Number the steps from 1 to 7.

- ☐ Bacteria change the ammonia from the rabbit's remains into nitrates.
- ☐ Other soil bacteria change this new ammonia into nitrates.
- ☐ A rabbit eats the plant. The nitrogen becomes part of the rabbit's body.
- ☐ Different bacteria change those nitrates into nitrogen gas, which returns to the air.
- ☐ The rabbit dies. Decomposers break down its body and release ammonia into the soil.
- ☐ Bacteria in the soil take nitrogen gas from the air and change it into ammonia.
- ☐ A plant takes in the nitrates through its roots and uses the nitrogen to build proteins.



Part B. Answer the questions.

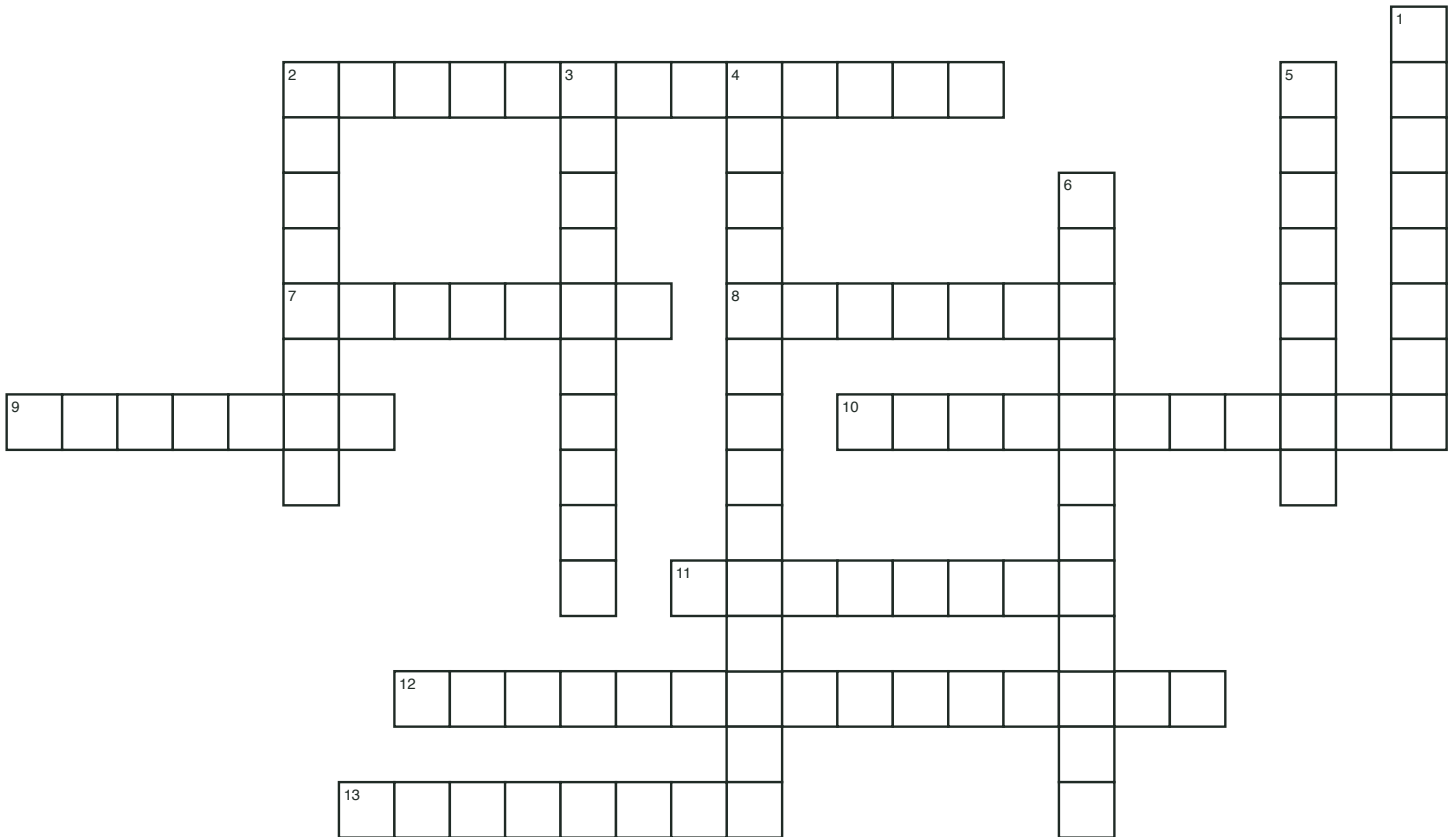
1. Which step in your order is nitrogen fixation? Which step is denitrification?

2. The rabbit did not take nitrogen from the air or from the soil. How did it get its nitrogen?

3. What would happen to the nitrogen in dead plants and animals if there were no decomposers?

Nitrogen Cycle Crossword

Read each clue. Write the answer in the puzzle, one letter in each box. Use the word bank if you get stuck.



ACROSS

2. The step in which soil bacteria change ammonia into nitrates.
7. Nitrogen fixation changes nitrogen gas into this.
8. Small bumps on the roots of a bean plant, where bacteria live.
9. Beans, peas and clover are all _____.
10. Fungi and other living things that break down dead plants and animals.
11. Tiny living things that carry out most steps of the nitrogen cycle.
12. The step that returns nitrogen gas to the air.
13. Nitrogen _____ changes a gas from the air into a form plants can use.

DOWN

1. Living things use nitrogen to build these.
2. Plants take in these nitrogen compounds through their roots.
3. Farmers add this to the soil to give crops more nitrogen.
4. The step in which decomposers release ammonia into the soil.
5. The gas that makes up about 78 percent of the air.
6. The step in which plants take in nitrates through their roots.

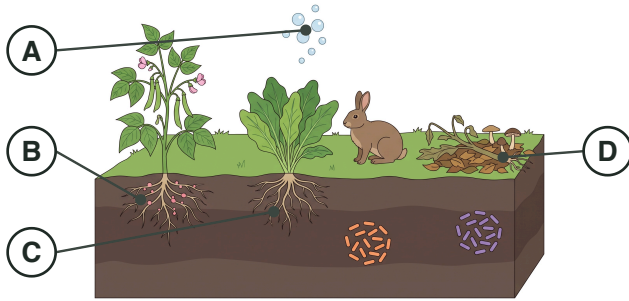
Word bank ammonia ammonification assimilation bacteria decomposers denitrification
fertilizer fixation legumes nitrates nitrification nitrogen nodules proteins

Nitrogen Cycle Quiz

Score _____ / 12

Show what you know about the nitrogen cycle.

Part A. This is the nitrogen cycle. Write the label that goes with each letter.



- A** _____
- B** _____
- C** _____
- D** _____

Ammonification · Assimilation · Nitrogen fixation · Nitrogen in the atmosphere

Part B. Choose the best answer.

- About how much of the air is nitrogen gas?**
 - ☐ 1 percent
 - ☐ 21 percent
 - ☐ 78 percent
 - ☐ 100 percent
- Which step changes ammonia into nitrates?**
 - ☐ Denitrification
 - ☐ Nitrification
 - ☐ Assimilation
 - ☐ Ammonification
- Which step returns nitrogen gas to the air?**
 - ☐ Nitrogen fixation
 - ☐ Nitrification
 - ☐ Ammonification
 - ☐ Denitrification
- Where do nitrogen-fixing bacteria live on a bean plant?**
 - ☐ In the leaves
 - ☐ In the flowers
 - ☐ In nodules on the roots
 - ☐ In the bean pods
- How do animals get the nitrogen they need?**
 - ☐ By eating plants or other animals
 - ☐ By breathing in air
 - ☐ By drinking water
 - ☐ By taking it in from the soil
- What do living things build with nitrogen?**
 - ☐ Sugar
 - ☐ Water
 - ☐ Oxygen gas
 - ☐ Proteins

Part C. Write your answer.

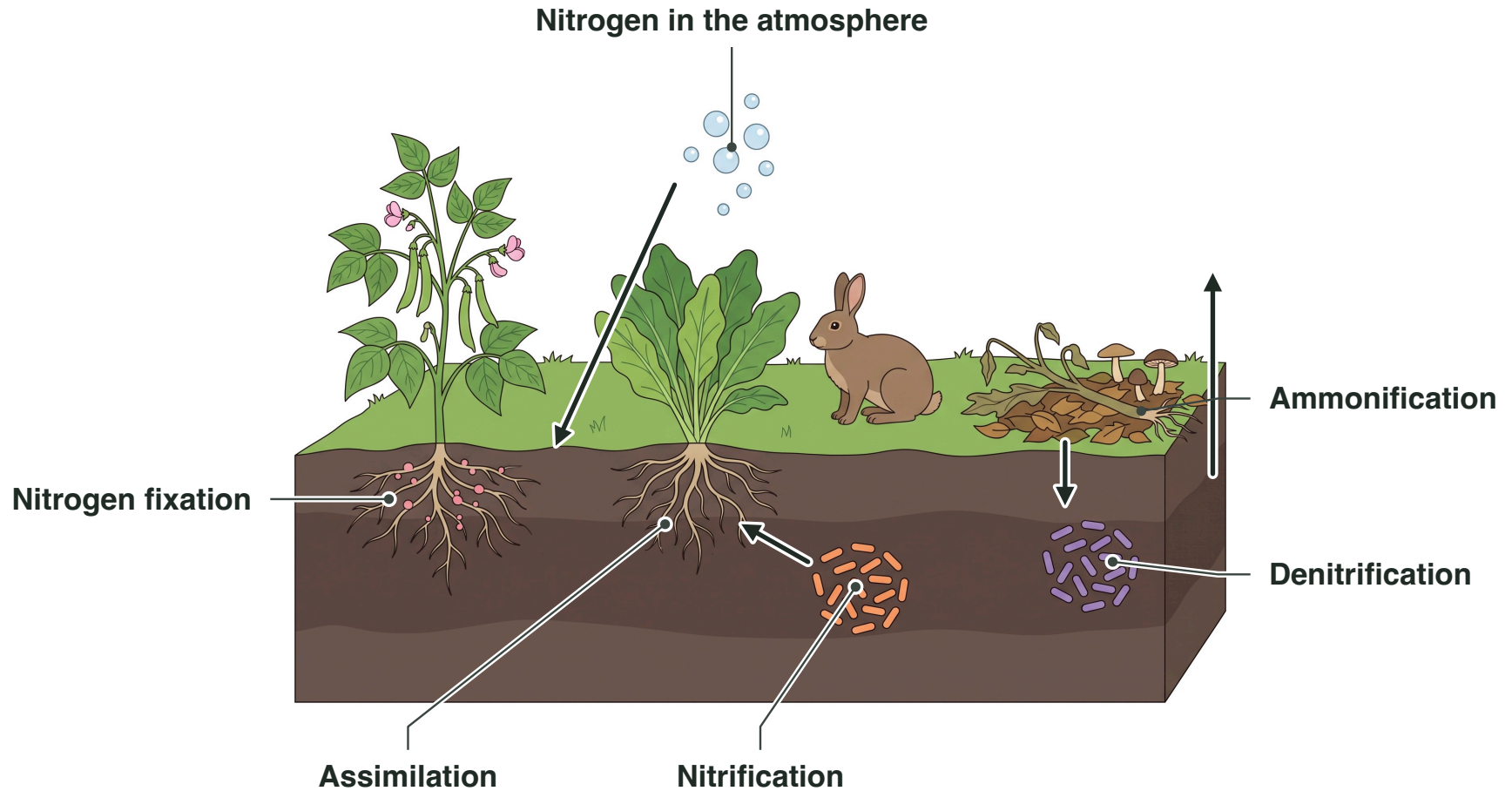
- 7. Air is mostly nitrogen. Why do plants still depend on bacteria to get nitrogen?**

- 8. What do decomposers do in the nitrogen cycle?**

Answer Keys

In the same order as the sheets.

The Nitrogen Cycle: Answer Key



Steps of the Nitrogen Cycle: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. Write the step or term that fits each description.

Word bank

Ammonification

Assimilation

Denitrification

Fertilizer

Legumes

Nitrates

Nitrification

Nitrogen fixation

Nitrogen in the atmosphere

- | | |
|---|-----------------------------------|
| 1. Bacteria in the soil change ammonia into nitrates. | Nitrification |
| 2. Plants such as beans, peas and clover. Helpful bacteria live on their roots. | Legumes |
| 3. Bacteria change nitrates back into a gas, which returns to the air. | Denitrification |
| 4. It makes up about 78 percent of the air, but plants cannot use it in this form. | Nitrogen in the atmosphere |
| 5. Plants take in nitrates through their roots and use them to grow. | Assimilation |
| 6. A product that farmers spread on fields to help crops grow. | Fertilizer |
| 7. Bacteria take a gas from the air and change it into a form plants can use. | Nitrogen fixation |
| 8. Compounds made by bacteria in the soil. Plants take them in through their roots. | Nitrates |
| 9. Decomposers break down dead plants and animals and release ammonia. | Ammonification |

Part B. Answer the questions.

- Which step moves nitrogen from the air into the soil? Which step returns it to the air?
Nitrogen fixation moves it into the soil. Denitrification returns it to the air.
- Air is about 78 percent nitrogen. Why can a plant still run short of nitrogen?
Plants cannot use nitrogen gas. They take in nitrogen compounds such as nitrates from the soil, and the soil can run low on them.
- A farmer grows clover in a field and plows it into the soil. The next year the farmer plants corn there. How can the clover help the corn?
Bacteria on the clover roots fix nitrogen from the air. When the clover breaks down, that nitrogen goes into the soil for the corn to use.

Nitrogen on the Move: Answer Key

Answers are in green. Written answers will vary; these are examples.

1. What is this text mostly about?

- ☐ How farmers grow beans and peas
- ☐ Why animals need to eat plants
- ☒ **How nitrogen moves between the air, the soil and living things**
- ☐ How bacteria can make people sick

2. About how much of the air is nitrogen gas?

- ☐ 1 percent
- ☐ 21 percent
- ☒ **78 percent**
- ☐ 100 percent

3. What must happen to nitrogen gas before plants can use it?

Bacteria must change it into another form, such as ammonia. (This is nitrogen fixation.)

4. Number the steps 1, 2 and 3 to show how nitrogen gets from the air into a plant (paragraphs 2 and 3).

- 2** Other bacteria change the ammonia into nitrates.
- 3** A plant takes in the nitrates through its roots.
- 1** Bacteria change nitrogen gas into ammonia.

5. How do animals get the nitrogen they need?

- ☐ By breathing in air
- ☒ **By eating plants or other animals**
- ☐ By drinking water
- ☐ By taking it in from the soil

6. What do decomposers do in the nitrogen cycle?

They break down wastes and dead plants and animals. This releases ammonia into the soil.

7. Which step returns nitrogen gas to the air?

- ☐ Nitrogen fixation
- ☐ Nitrification
- ☐ Assimilation
- ☒ **Denitrification**

8. Name two ways a farmer can add nitrogen to the soil.

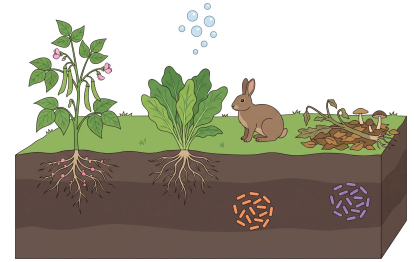
Add fertilizer, or plant legumes such as beans, peas or clover.

The Path of a Nitrogen Atom: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. Number the steps from 1 to 7.

- 6** Bacteria change the ammonia from the rabbit's remains into nitrates.
- 2** Other soil bacteria change this new ammonia into nitrates.
- 4** A rabbit eats the plant. The nitrogen becomes part of the rabbit's body.
- 7** Different bacteria change those nitrates into nitrogen gas, which returns to the air.
- 5** The rabbit dies. Decomposers break down its body and release ammonia into the soil.
- 1** Bacteria in the soil take nitrogen gas from the air and change it into ammonia.
- 3** A plant takes in the nitrates through its roots and uses the nitrogen to build proteins.



Part B. Answer the questions.

1. Which step in your order is nitrogen fixation? Which step is denitrification?

Step 1 is nitrogen fixation. Step 7 is denitrification.

2. The rabbit did not take nitrogen from the air or from the soil. How did it get its nitrogen?

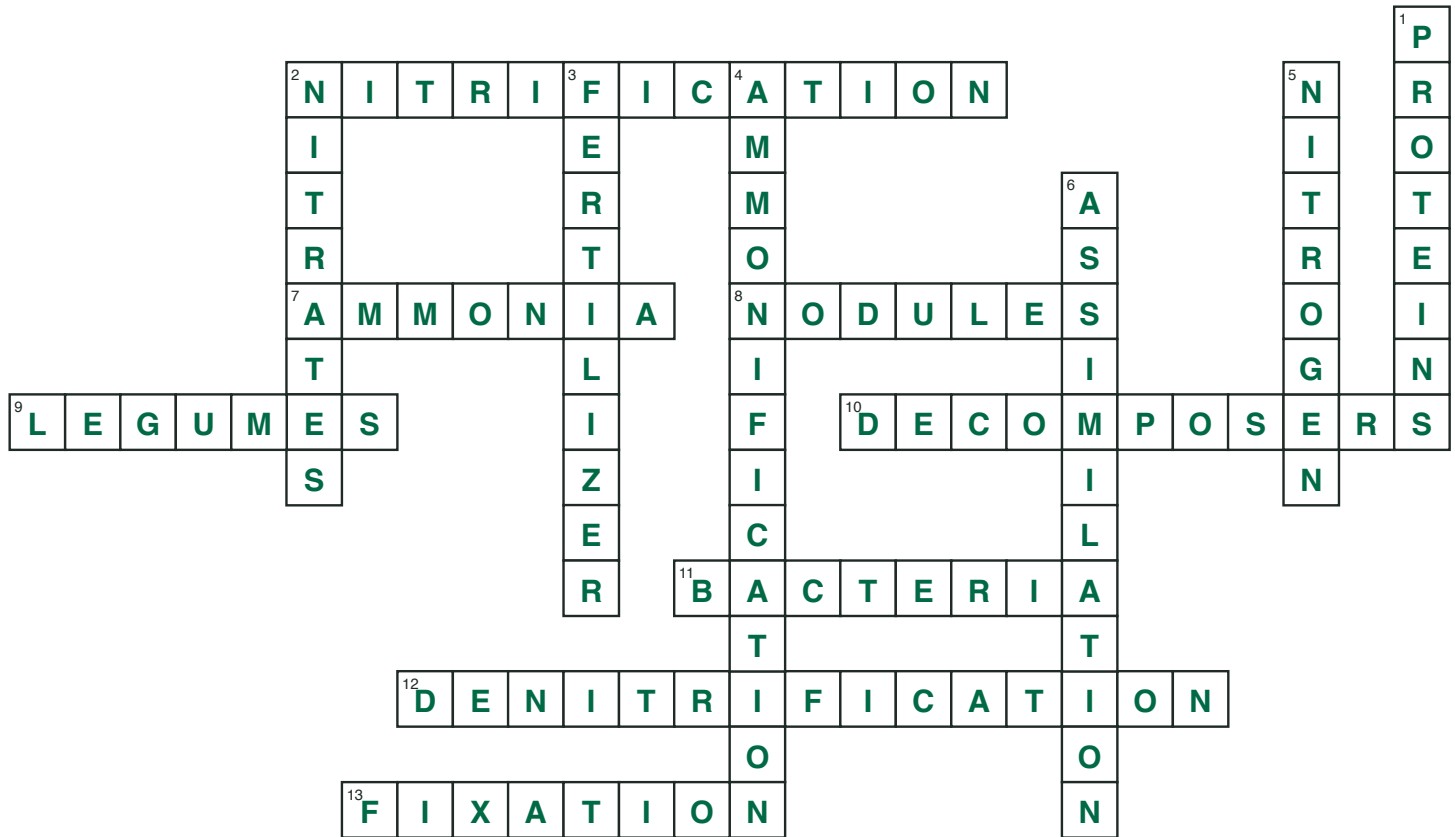
It ate a plant. The nitrogen was in the plant's proteins.

3. What would happen to the nitrogen in dead plants and animals if there were no decomposers?

It would stay locked up in the dead plants and animals. It would not go back into the soil for plants to use.

Nitrogen Cycle Crossword: Answer Key

Answers are in green.



ACROSS

2. The step in which soil bacteria change ammonia into nitrates.
7. Nitrogen fixation changes nitrogen gas into this.
8. Small bumps on the roots of a bean plant, where bacteria live.
9. Beans, peas and clover are all ____.
10. Fungi and other living things that break down dead plants and animals.
11. Tiny living things that carry out most steps of the nitrogen cycle.
12. The step that returns nitrogen gas to the air.
13. Nitrogen ____ changes a gas from the air into a form plants can use.

DOWN

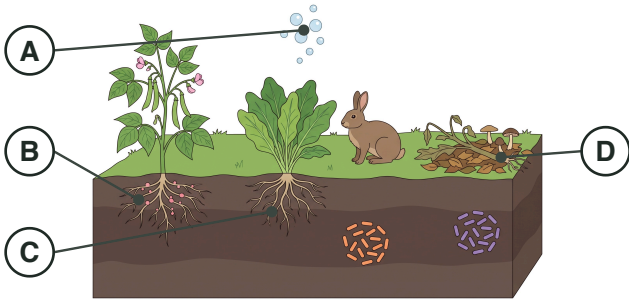
1. Living things use nitrogen to build these.
2. Plants take in these nitrogen compounds through their roots.
3. Farmers add this to the soil to give crops more nitrogen.
4. The step in which decomposers release ammonia into the soil.
5. The gas that makes up about 78 percent of the air.
6. The step in which plants take in nitrates through their roots.

Word bank ammonia ammonification assimilation bacteria decomposers denitrification
fertilizer fixation legumes nitrates nitrification nitrogen nodules proteins

Nitrogen Cycle Quiz: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. This is the nitrogen cycle. Write the label that goes with each letter.



A Nitrogen in the atmosphere

B Nitrogen fixation

C Assimilation

D Ammonification

Ammonification · Assimilation · Nitrogen fixation · Nitrogen in the atmosphere

Part B. Choose the best answer.

1. About how much of the air is nitrogen gas?

- ☐ 1 percent
- ☐ 21 percent
- ☒ **78 percent**
- ☐ 100 percent

2. Which step changes ammonia into nitrates?

- ☐ Denitrification
- ☒ **Nitrification**
- ☐ Assimilation
- ☐ Ammonification

3. Which step returns nitrogen gas to the air?

- ☐ Nitrogen fixation
- ☐ Nitrification
- ☐ Ammonification
- ☒ **Denitrification**

4. Where do nitrogen-fixing bacteria live on a bean plant?

- ☐ In the leaves
- ☐ In the flowers
- ☒ **In nodules on the roots**
- ☐ In the bean pods

5. How do animals get the nitrogen they need?

- ☒ **By eating plants or other animals**
- ☐ By breathing in air
- ☐ By drinking water
- ☐ By taking it in from the soil

6. What do living things build with nitrogen?

- ☐ Sugar
- ☐ Water
- ☐ Oxygen gas
- ☒ **Proteins**

Part C. Write your answer.

7. Air is mostly nitrogen. Why do plants still depend on bacteria to get nitrogen?

Plants cannot use nitrogen gas. Bacteria change it into forms that plants can take in.

8. What do decomposers do in the nitrogen cycle?

They break down wastes and dead plants and animals. This releases ammonia into the soil.