Traveling Nitrogen Passport

Introduction

Nitrogen is an element that is found in both the living portion of our planet and the inorganic parts of the Earth system. It is essential for many biological processes, and is crucial for any life on earth. The complex pathway that nitrogen follows in an ecosystem is called the **nitrogen cycle**. The nitrogen cycle is one of the biogeochemical cycles and is very important for ecosystems. Nitrogen moves slowly through the cycle and is stored in reservoirs such as the atmosphere, living organisms, soils, and oceans along its way.

In this activity you will play the role of nitrogen atoms traveling through the nitrogen cycle to gain understanding of the varied pathways and the relevance of nitrogen to living things.

Essential Questions:

1. Where is carbon found?
2. How does carbon move?
3. What are the biotic and abiotic parts of this cycle?
4. What are sources and sinks for carbon?

SAFETY

Follow standard rules of laboratory safety.

MATERIALS

Per student:	Per class:
Nitrogen Passport	11 dice
Pen or pencil	11 Dice codes (signs with reservoir names)
Colored pencils	11 sets of reservoir stamps
	11 glue sticks (if stamps aren't self-stick)

PROCEDURE

1. Obtain a "Traveling Nitrogen Passport" from your teacher, and then move to the assigned reservoir where you will enter the nitrogen cycle.

2. When you get to this reservoir, fill out your start location in the space provided on your nitrogen passport, and then follow the directions given on your passport.

3. After completing the information for Trip #10, draw and color a diagram documenting your journey through the nitrogen cycle.

4. After completing your diagram, read the section titled "The Nitrogen Cycle" in the lab handout, and then answer the Analysis Questions on the student data sheet.

Traveling Nitrogen Passport Name_____

1. Fill out your start location in the space below, and place a stamp from your starting location in the space on the right.
2. Roll the die at your station location to find out where to go next. Write the "Where I'm going" and "How I'm getting there" information in the Trip#1 box.
3. Head to that location and place the stamp the Trip#1 box. Then, roll the die at that location to find out where to go next.

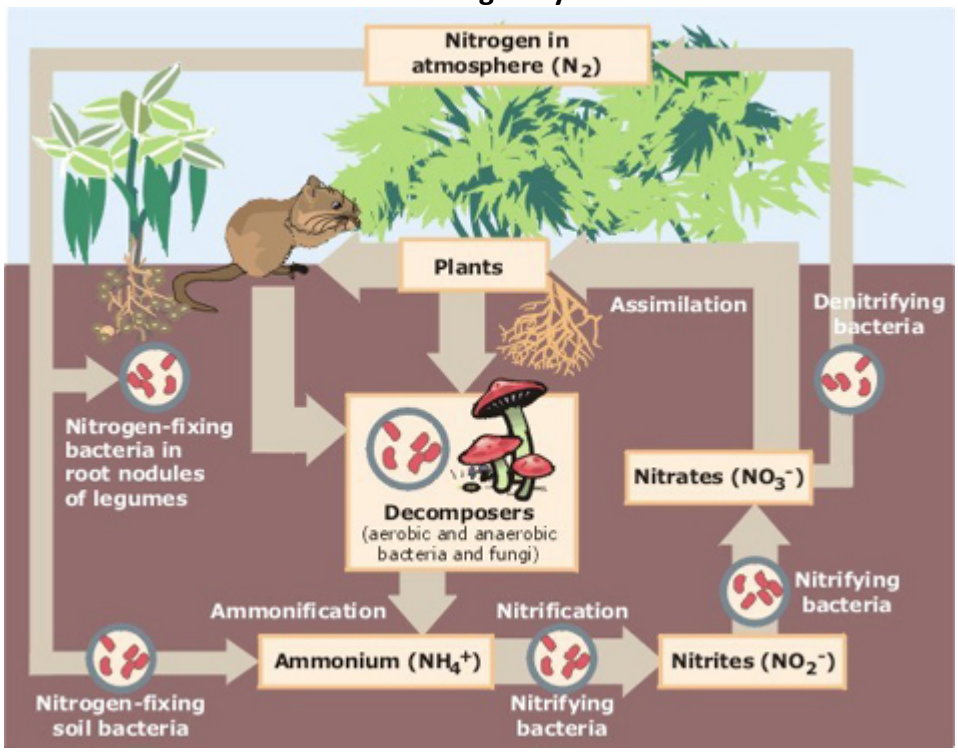
Start location stamp:

Start Location: _____

Trip#1 Where I'm going: How I'm getting there:	*Stamp below.*	**Trip#2** Where I'm going: How I'm getting there:	*Stamp below.*
Trip#3 Where I'm going: How I'm getting there:	*Stamp below.*	**Trip#4** Where I'm going: How I'm getting there:	*Stamp below.*
Trip#5 Where I'm going: How I'm getting there:	*Stamp below.*	**Trip#6** Where I'm going: How I'm getting there:	*Stamp below.*
Trip#7 Where I'm going: How I'm getting there:	*Stamp below.*	**Trip#8** Where I'm going: How I'm getting there:	*Stamp below.*
Trip#9 Where I'm going: How I'm getting there:	*Stamp below.*	**Trip#10** Where I'm going: How I'm getting there:	*Stamp below.*

STUDENT DATA SHEET **NAME**_____
TRAVELING NITROGEN **DATE**_____

The Nitrogen Cycle



ANALYSIS QUESTIONS

1. What is the nitrogen cycle?

2. Why is nitrogen important to organisms?

3. Nitrogen in the atmosphere occurs primarily in what form?

4. What do nitrogen-fixing soil bacteria do to nitrogen in the atmosphere?

5. What is the chemical formula for ammonia?

6. What compound do nitrifying bacteria of the genus *Nitrosomonas* work on?

7. What compound do these bacteria make?

8. What is the formula for nitrites?

9. What is the name of the process by which nitrifying bacteria turn ammonia into nitrates?

10. What compound do nitrifying bacteria of the genus *Nitrobacter* work on?

11. What compound do these bacteria make?

12. What is the formula for nitrates?

13. What is the name of the process by which plants get nitrates out of the soil?

14. After assimilation, the nitrogen becomes part of the plant. When an animal eats the plant, what happens to the nitrogen?

15. What are decomposers?

16. After an animal excretes or dies, what will decomposers do to the waste?

17. a. Nitrogen in plants and animals is found in DNA and protein. Decomposers break this down to what?

    b. What is this process called?

18. What organism can take nitrates form the soil, change them, and release it into the atmosphere?

19. Generally, under what conditions does denitrification occur?

20. If nitrates are not assimilated into plants, what is the other thing that could happen to them?

21. List the 4 abiotic forms of nitrogen in the cycle and give the chemical formula of each form.

22. What are the biotic forms of nitrogen in the cycle? (Re-read question # 17 for a hint.)