

Name \_\_\_\_\_  
 Date \_\_\_\_\_ Period \_\_\_\_\_

### Lab: The Nitrogen Cycle

Nitrogen cycles through the environment in a number of forms: Nitrogen gas ( $N_2$ ), ammonia ( $NH_3$ )/ammonium ( $NH_4^+$ ), nitrate ( $NO_3$ ), nitrite ( $NO_2$ ), and as protein. The proteins are composed of amino acids. While all living things utilize this element, the primary mediators of its movement and availability are bacteria. Various species of bacteria use each of the forms listed. More complex forms of life such as plants and animals use nitrogen to manufacture protein: plants can make use of ammonia/ammonium, and nitrate, while animals must receive the nitrogen as part of protein, and can make no use of the other compounds.

Beginning at your own table, roll the die and record the result. Next, find the table with the cycle stage you rolled and move to that table. Roll the die you find there and continue the process for thirty die rolls. Record all your results in the table below.

Die Roll	Outcome	Die Roll	Outcome	Die Roll	Outcome
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

1. Calculate the percentage of time spent at each station.

Station	Percentage	Station	Percentage
Nitrogen Gas ( $N_2$ )		Bacterial Protein	
Ammonia/Ammonium ( $NH_3/NH_4^+$ )		Plant Protein	
Nitrate ( $NO_3$ )		Animal Protein	
Nitrite ( $NO_2$ )			

2. In what ways were you able to leave the nitrogen gas station?

3. What living organisms influence the nitrogen cycle the most?

4. Draw the nitrogen cycle on the back of this sheet based on the stations you just experienced.

## **Station 6 – PLANT PROTEIN**

**Rolled a 1 or 2 – You are eaten by an ANIMAL**

**Rolled a 3 or 4 – The plant you are part of dies, bacteria decompose the plant, and you are released as AMMONIA**

**Rolled a 5 or 6 – You are reused by the plant as it recycles protein (stay here)**

## **Station 5 – BACTERIAL PROTEIN**

**Rolled a 1, 2 or 3 – You have been eaten by an  
ANIMAL**

**Rolled a 4 or 5 – You are used by bacteria and  
released as AMMONIA**

**Rolled a 6 – You are reused by the bacteria as it  
recycles protein (stay here)**

**Station 4 – NITRITE (NO<sub>2</sub>)**

**Rolled a 1 or 2 – You are used by bacteria to give it energy, releasing NITRATE**

**Rolled a 3, 4 or 5 – You are used by bacteria to give it energy, releasing NITROGEN GAS**

**Rolled a 6 – You stay in the soil as NITRITE**

**Station 3 – NITRATE (NO<sub>3</sub>)**

**Rolled a 1 or 2 – A PLANT root takes you up and you are used to make protein**

**Rolled a 3 or 4 – You are used by BACTERIA to make a protein**

**Rolled a 5 – You are used by bacteria to give it energy, releasing NITRITE**

**Rolled a 6 – You stay in the soil as NITRATE**

**Station 2 – Ammonia (NH<sub>3</sub>) / Ammonium (NH<sub>4</sub><sup>+</sup>)**

**Rolled a 1 or 2 – You are used by BACTERIA to make protein**

**Rolled a 3 or 4 – A PLANT root takes you up and you are used to make protein**

**Rolled a 5 or 6 – You are used by bacteria to give it energy, releasing NITRITE**

**Station 1 – Nitrogen Gas (N<sub>2</sub>)**

**Rolled a 1, 2, 3 or 4 – Stay as NITROGEN GAS**

**Rolled a 5 – You are struck by lightning and turned into AMMONIA**

**Rolled a 6 – You are used by BACTERIA to make protein**

## **Station 7 – ANIMAL PROTEIN**

**Rolled a 1 – You are excreted in the animals urine, bacteria use the urine, and you are released as AMMONIA**

**Rolled a 2 – You are excreted in the animals feces and BACTERIA use you to make protein**

**Rolled a 3 – The animal you are part of dies, bacteria decompose the animal, and you are released as AMMONIA**

**Rolled a 4 – The animal you are part of dies and the BACTERIA use you to make protein**

**Rolled a 5 or 6 – You have been eaten by a larger ANIMAL (stay here)**