## Names of group members:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Period:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Nitrogen from Fertilizers: Too Much of a Good Thing

**Directions:**  *Before reading*, in the first column, write “A” or “D” to indicate your agreement or disagreement with each statement. As you read, compare your opinions with information from the article. In the space under each statement, cite information from the article that supports or refutes your original ideas.

|  |  |  |
| --- | --- | --- |
| **Me** | **Text** | **Statement** |
|  |  | 1. Most plants can use nitrogen directly from the air.
 |
|  |  | 1. Plants depend on bacteria to change ammonia (NH3) or the ammonium ion (NH4+) from fertilizer into usable ions for making proteins.
 |
|  |  | 1. Lightning and some plants can break up nitrogen molecules (N2) from the air into nitrogen atoms.
 |
|  |  | 1. Some bacteria convert ammonia and ammonium ion into nitrogen gas.
 |
|  |  | 1. The nitrogen cycle is enhanced through the use of synthetic fertilizers.
 |
|  |  | 1. Excess nitrogen fertilizer can contribute to climate change and ozone depletion.
 |
|  |  | 1. Fertilizers provide only a small amount of the nitrogen needed for the worldwide production of food.
 |
|  |  | 1. Annual plants have shorter and less developed roots than perennial plants.
 |
|  |  | 1. Organic farms use no fertilizer.
 |
|  |  | 1. The process of taking nitrogen from the air to synthesize ammonia was developed in the 18th Century in China.
 |

***Directions:*** In the chart below, describe each method and explain how each method would help to reduce synthetic fertilizer use and waste.

|  |  |
| --- | --- |
| **Small local farms** | **Growing long-lived crops** |
|  |  |

In the chart below, describe some different environmental problems caused by excessive fertilizer use.

|  |  |
| --- | --- |
|  | **Environmental Problems** |
| **1.** |  |
| **2.** |  |

* 1. The article lists three chemical elements needed for plant growth. Name them.
	2. Most plants cannot use diatomic nitrogen to help them grow. Name three plants that can use N2 and explain why they are able to use N2.
	3. In what form is nitrogen present in most fertilizers?
	4. Nitrogen makes up what percent of the air?
	5. In what ways can nitrogen harm the environment?
	6. How can changing annual crops (like wheat, corn, sorghum and sunflowers) to perennial crops reduce the need for fertilizer?