

What Goes Around...

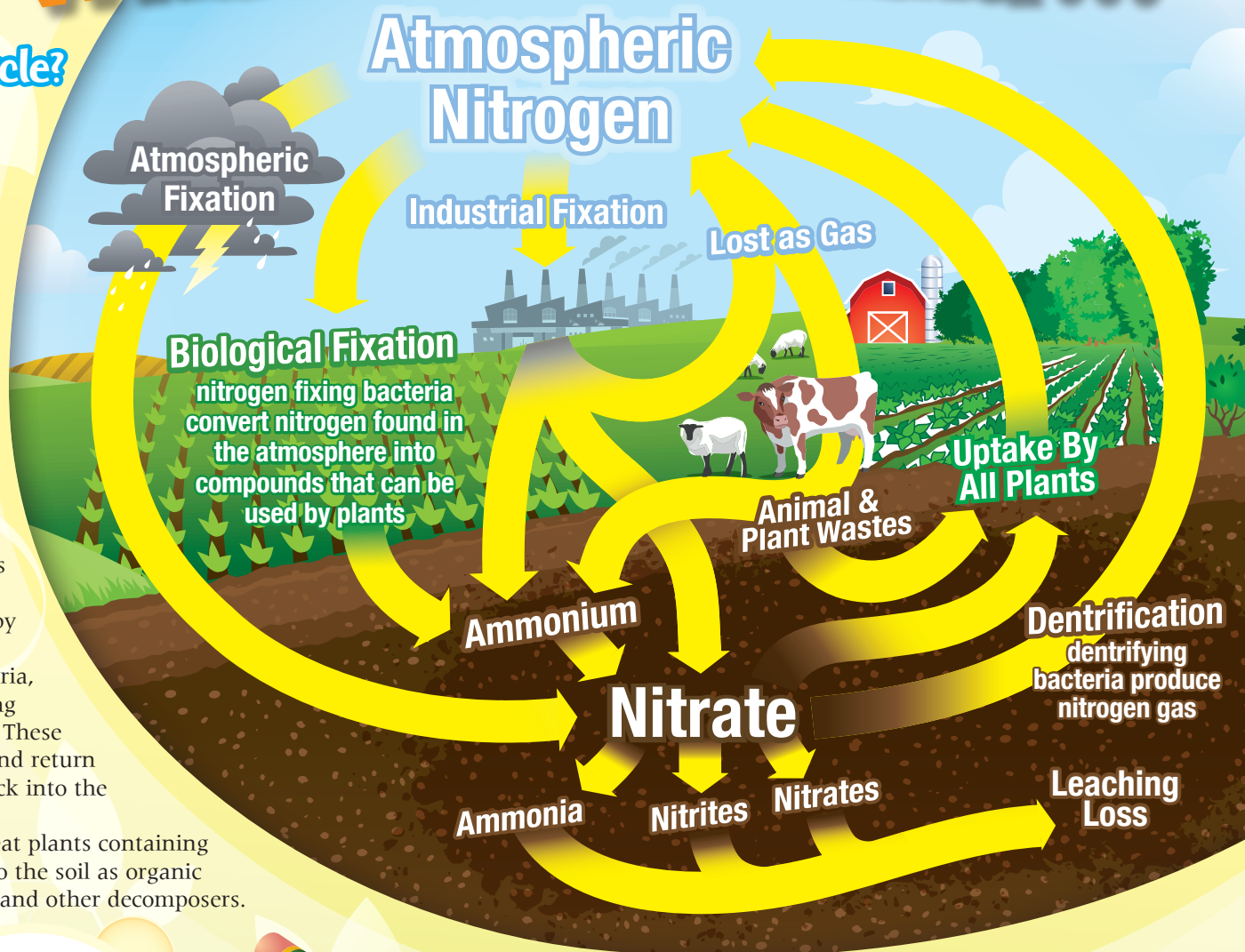
What is the nitrogen cycle?

Nitrogen is the most common gas found in the earth's atmosphere. It is necessary for plant growth and for the survival of all ecosystems. Free nitrogen—the nitrogen found in the atmosphere—is all around. Nitrogen in this form is unusable to most living things. It must first be converted or 'fixed' into a more usable form.

In the nitrogen fixation part of the cycle, nitrogen-fixing bacteria found in the soil and roots of certain plants convert free nitrogen into substances that other organisms can use. When the fixing process is finished, free nitrogen is converted into nitrates, nitrites, and ammonia. These substances can be used by plants. As the plants become food, the nitrogen can be used by animals.

Just as there are nitrogen-fixing bacteria, some bacteria have the job of denitrifying the soil to keep the nitrogen in balance. These bacteria take the nitrogen compounds and return them to nitrogen gas that is released back into the atmosphere.

In another part of the cycle, animals eat plants containing usable nitrogen. That nitrogen returns to the soil as organic material and is decomposed by bacteria and other decomposers.



Activity

Determine the number of atoms in each compound.

California Standards:
NGSS: MS-PS1-1, MS-PS1-5

Nitrate: NO_3^-

N = ___ O = ___

Nitrite: NO_2^-

N = ___ O = ___

Ammonium: NH_4^+

N = ___ H = ___

Activity

Use print and digital reference materials (dictionaries, thesauruses, glossaries) to determine the pronunciation and meaning of the terms. Match each term with its definition.

Term	Definition
___ Nitrogen cycle	a. Nitrogen in the atmosphere is converted into ammonia.
___ Nitrogen	b. A product of nitrogen fixation, used as a fertilizer in agriculture.
___ Bacteria	c. An organism in the soil involved in every step of the nitrogen cycle.
___ Ammonia	d. The primary gas in the atmosphere.
___ Denitrification	e. Bacteria convert ammonia into nitrites, and then to nitrates.
___ Deficiency	f. To lack something, such as necessary nutrients.
___ Nitrogen fixation	g. Bacteria convert nitrates back to gaseous forms.
___ Nitrification	h. The continuous recycling of nitrogen.

Tech Check

Visit www.growingthenextgeneration.com for kid-friendly videos, educational games, interactive visualizations, and a forum called "Ask the Agronomist."

Comes Around Plant Nutrients

A fertilizer is any type of substance that is added to soil or water to increase the nutrients available to plants.

Letter to a Farmer

Dear Farmer Kenny,
Who helps farmers decide how much fertilizer to put on their soils so that crops are healthy?
Sincerely,
Olivia
Fresno, CA

Dear Olivia,

Farmers need to know a lot about their fields in order to determine the right amount of fertilizer to put on their crops, but there are no magic answers. Here are some of the things farmers use to determine the amount of nutrients their crops need:

The amount of useable nitrogen already in the soil—this can be determined by taking samples and sending them to a laboratory.

The kind of soil the farmer has—some soils are a better storehouse of nitrogen and other nutrients, others need more nutrients added.

The crop the farmer intends to grow—some crops, like alfalfa and soybeans, can make their own nitrogen, with the help of soil microbes.

The amount of crop the farmer wishes to grow—the larger the crop, the more nutrients needed.

Sincerely,
Farmer Kenny



Activity

Nitrogen is all around us! It is a naturally occurring element in the earth's atmosphere. Complete the chart by converting the percentages to decimal and fraction form. Create a pie chart to illustrate the amount of each element in the atmosphere.

Element	Percent	Decimal	Fraction
Nitrogen	78		
Oxygen	21		
Other (argon, carbon dioxide)	1		

California Standards: Math CCSS: 4.NF.2, 4.NF.5, 4.NF.6, 5.NBT.3a, 6.RP.3c

Activity

Identify the element symbol for each nutrient. Draw a personalized graphic that represents the agricultural benefit of each nutrient.

	Benefit	Element Symbol	Origin	Graphic
Nitrogen	Helps plants grow quickly, promotes fruit and seed development.	<input type="text"/>	Nitrogen is everywhere. Primarily found in the earth's atmosphere, it also occurs in all living organisms.	
Phosphorus	Stimulates root growth, helps flowers bloom.	<input type="text"/>	Phosphorus comes from fossilized sea creatures mined from rock deposits in the earth.	
Potassium	Helps plants resist pests, disease and drought, essential for photosynthesis.	<input type="text"/>	Potassium comes from potash, a salt that is mined from evaporated ocean beds.	

Activity

Determine the main idea of the farmer's letter and list the key points.

The Main Idea



Key Points

- 1
- 2
- 3
- 4

California Standards: ELA CCSS: RI.3-5.3, RI.6-8.2

Conservation Connection

Firefighters use clay and fertilizer as a fire retardant. The mixture helps control wildfires while providing the nutrients needed for re-growth.

Activity

Check your local newspaper ads for bags of fertilizer. Record the N-P-K ratio and calculate the cost per pound.

(N) (P) (K)

Cost per pound: _____

California Standards: Math CCSS: 4.MD.2, 5.NF.3