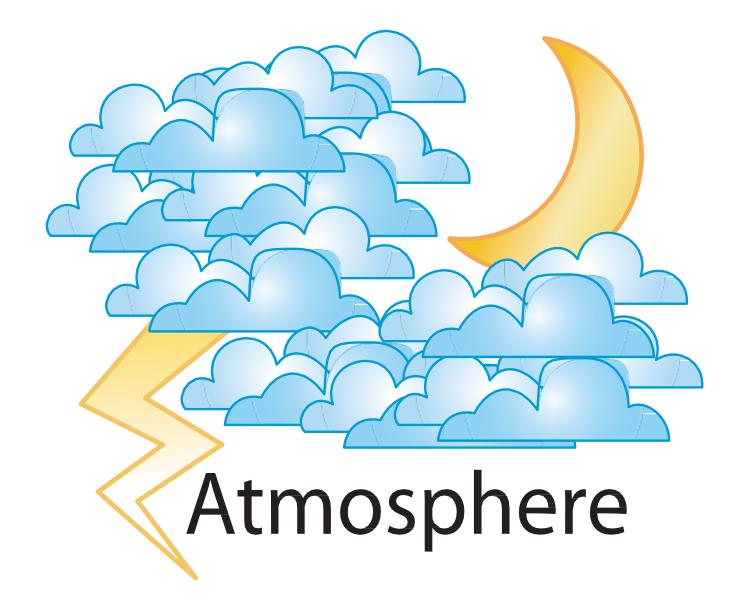
Traveling Nitrogen DICE CODES AND RESERVOIR STATION SIGNS

Instructions:

- 1. Hang these dice codes signs at stations around the classroom.
- 2. Equip each station with dice and either, a rubber stamp and ink pad, or, paper stamps from the stamp templates.
- 3. Provide each student with a passport worksheet
- 4. Distribute students so that there are a few at each station
- 5. Then everyone can begin traveling like nitrogen!

Source: The following pages are for the *Traveling Nitrogen* activity from *Windows to the Universe* (www.windows2universe.org)



If your die reads: 1 or 2 (Nitrogen Fixation/<u>Nitrification</u>) Lightning strikes! Nitrogen gas (N₂) is make into a solid (NO₃)- Nitrate and travels to the soil!

If your die reads: 3

Blue-green algae and bacteria (Nitrogen Fixation/<u>Nitrification</u>) change you into a solid, bringing you to the **soil!** (NO_x)

If your die reads: 4 Bean plants **(Legumes)** extract you from the air **(N₂)** and bring you to the **soil! (Nitrogen Fixation/<u>Nitrification)</u> (NH₃, NO₂, NO₃)**

If your die reads: 5 and 6

Some nitrogen (N₂) can get into the water in clouds and then fall as **rain**! (NH₃)- Ammonia (Ammonification)

Surface Water

If your die reads: 1 or 2

You are just the sort of nitrogen that plants need to live.(NO₃)- Nitrate You are now within a live plant! (Assimilation)

If your die reads: 3 or 4 You travel through the rivers and streams to the ocean! (NH₃)- Ammonia

If your die reads: 5 or 6 You percolate deep underground in the groundwater! (NH₃)-Ammonia



If your die reads: 1 You fall into a lake or stream so now you are part of surface water. (NH₃) Ammonification

If your die reads: 2 or 3 You fall on the land and become part of the soil! (NH₃) Ammonification

If your die reads: 4 You percolate deep underground in the groundwater(NH₃) Ammonification

If your die reads: 5 or 6 You rain into the ocean! Ammonification (NH₃)

Groundwater



If your die reads: Odd numbers (1, 3, or 5)

The groundwater you are dissolved within travels and you become part of the **surface water!**

If your die reads: Even numbers (2, 4, or 6)

The groundwater you are dissolved within travels and you become part of the **ocean**!



If your die reads: 1 or 2

You dissolve and wash into the surface water! (NO_x)

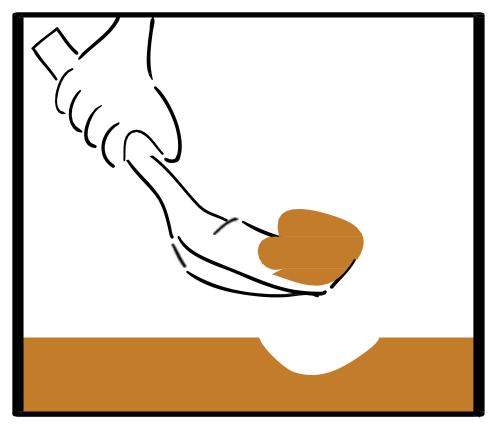
If your die reads: 3 or 4

You become part of the soil! (NOx)

If your die reads: 5 or 6

You are just the sort of nitrogen that plants need to live. You are now within a **live plant! (NO₃) Assimilation**

Soils



If your die reads: 1

You dissolve and wash into the groundwater! (NOx)

If your die reads: 2

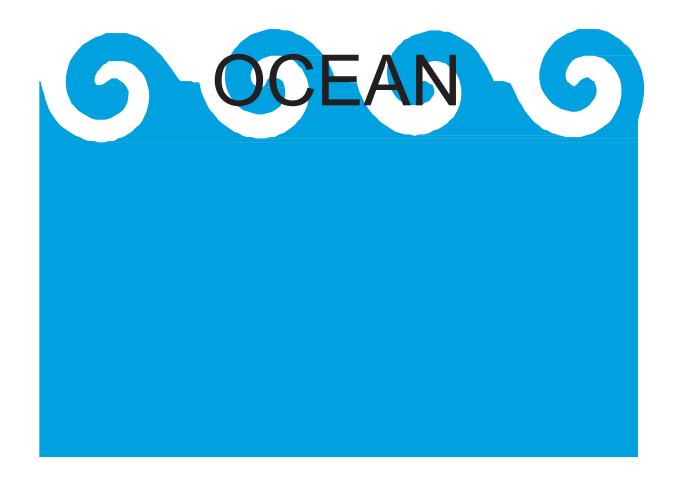
You dissolve and wash into the surface water! (NOx)

If your die reads: 3 or 4

You are just the sort of nitrogen that plants need to live. You are now within a **live plant! (NO₃)- Nitrate (Assimilation)**

If your die reads: 5 or 6

Bacteria have transformed you into nitrogen gas and you are now part of the atmosphere! (N₂)- Denitrification



If your die reads: 1

Look out! Water is on the move! You have washed into the groundwater!

If your die reads: 2 or 3

You are just the sort of nitrogen that plants need to live. You are now within a **live plant! (NO₃)- Assimilation**

If your die reads: 4, 5, or 6

Bacteria have transformed you into nitrogen gas and you are now part of the atmosphere! (N_2)- Denitrification

Live Animals

If your die reads: Odd numbers (1, 3, or 5) The animal that you are within has died. (NO₃) —>(NO₂)- Denitrification Go to dead plants and animals.

If your die reads: Even numbers (2, 4, or 6)

Congratulations! The animal that you were within has excreted and you are in its waste. Go to animal waste! (NO₃) —>(NH₃)- Ammonification

Animal Waste

If your die reads: 1 or 2

Look out before someone steps in you! Now you are decomposing in the soil! (NO₃) —> (NO₂)

If your die reads: 3 or 4 A farm supply company has picked you up and made you into fertilizer! (Industrial Nitrification)

If your die reads: 5 or 6 What's that in the water? You have dissolved into **surface water!**

Dead Plants and Animals

If your die reads: 1 or 2

You are decomposed and become part of the **soil!** (NO₃) —> (NH₃) Ammonification

If your die reads: 3 You are decomposed and become dissolved in surface water! (NH₃)

If your die reads: 4 You are decomposed and become dissolved in the ocean! (NH₃)

If your die reads: 5 or 6

Forest Fire! The wood you were within is burnt and you have been released into the **atmosphere**. (N_2) - **Denitrification**

Live Plants

If your die reads: Odd numbers (1, 3, or 5)

The plant that you are within has died. Go to dead plants and animals. (NO₃) \longrightarrow (NO₂) \longrightarrow (NH₃) (Decomposition)

If your die reads: Even numbers (2, 4, or 6) An animal has eaten the plant that you are within! Go to live animals! (Assimilation)