

# A FIXATION WITH NITROGEN

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Time: 30-90 minutes+

## Content Connections:

- Chemistry
- Botany
- Biology
- Geography (some challenges)

**Overview:** As students get introduced to the cyclical nature of plants, they start to dive deep into different functions and processes of plants day to day living, every one of these processes will cycle in a way that works out perfectly, but a problem arises when one doesn't, Nitrogen fixation

## Materials:

- Chemical Equation printouts
- (Easy)
  - Drawing supplies (crayons, markers, pencils, colored pencils)
  - Blank paper (for drawing)
  - Three Colors of Lego Brick, (Carbon, Oxygen, Hydrogen)
- (Medium)
  - Drawing supplies (crayons, markers, pencils, colored pencils)
  - Blank paper (for drawing)
  - Three Colors of Lego Brick, (Carbon, Oxygen, Hydrogen)
- (Hard)
  - Drawing supplies (crayons, markers, pencils, colored pencils)
  - Blank paper (for drawing)
  - Three Colors of Lego Brick, (Carbon, Oxygen, Hydrogen)
- (Extreme)
  - Drawing supplies (crayons, markers, pencils, colored pencils)
  - Blank paper (for drawing)
  - Three Colors of Lego Brick, (Carbon, Oxygen, Hydrogen)
- (Extension)
  - Playdoh
  - Paper Plates (To Hold Playdoh)

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# DIRECTIONS

**Step one:** Introduce the concept of photosynthesis and how plants and humans benefit from each other directly (Steps of how to introduce this concept are listed in levels based on student readiness in the chart below)

**Step two:** try acting out the plants processes using legos, and figure out how to balance the amount of elements used in each reaction( Leveled instructions are listed in the chart below)

EASY	MEDIUM	HARD	EXTREME
We breathe out CARBON DIOXIDE that plants need, and plants "Breathe out" OXYGEN that we need	Plants need two things to make themselves food, CARBON DIOXIDE and WATER, when it gets hit with sunlight It has the energy to break these three ingredients (H,C,O) apart and make something new!	What do we breathe out that plants consume?(co2) What else do plants need to create their own food? (h2o)What gives them the energy to do this? (sunlight) When they create glucose(c6h12O6), what is left over?(oxygen gas o2)	Plants are AUTOTROPHS and they make their own glucose, which looks like (c6h12o6) where does the plant get the carbon hydrogen and oxygen from? How many water molecules and carbon dioxide molecules does it take to make one glucose?(6 of each) what's left over?
Using Legos, give everyone a role in the plant. Either in breaking down elements, or rebuilding them in the correct way	With the legos Some teams are making glucose, Some take the oxygen and turn it into oxygen gas, others are taking what they receive and are breaking it down into different parts, they keep continuing in a circle to see how the	With the legos Some teams are making glucose, Some take the oxygen and turn it into oxygen gas, others are taking what they receive and are breaking it down into different parts, they keep continuing in a circle to see how the	With the legos Some teams are making glucose, Some take the oxygen and turn it into oxygen gas, others are taking what they receive and are breaking it down into different parts, they keep continuing in a circle to see how the

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	pieces make their way around in nature	pieces make their way around in nature	pieces make their way around in nature
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**Step three:** Explain what plants use nitrogen for (to create chlorophyll) and how they can't get it from the atmosphere, they have to "Fix" it from the soil around them, This video link can help with explanation, but some of the english isn't perfect (<https://youtu.be/tCrgTV20BD4> )

EASY	MEDIUM	HARD	EXTREME
Plants can't take nitrogen from the air so they have bacteria helpers in the soil, breaking it down for them into a way they can use, The same way you want to eat chocolate, Not just cocoa beans, it would be gross	Plants can't break down nitrogen on its own, We get our nitrogen from eating plants, But Plants can't do the same thing, So they have bacteria to breakdown nitrogen into a form they can use	Plants cannot break down their own nitrogen from the atmosphere to use because the bonds of nitrogen gas are triple bonded and are too strong, So they have bacteria within the soil that helps break apart this bond and fixes the nitrogen, meaning they change it from an unusable form to one they can use	Plants cannot break down their own nitrogen from the atmosphere to use because the bonds of nitrogen gas are triple bonded and are too strong, So they have bacteria within the soil that helps break apart this bond and fixes the nitrogen, meaning they change it from an unusable form to one they can use. Some other ways these bonds can break is through lightning. Nitrogen gas is turned into Nitrates NO <sub>2</sub> <sup>-</sup> , Nitrites NO <sub>3</sub> <sup>-</sup> and ammonia NH <sub>4</sub> <sup>+</sup>

**Step four:** Invent new plants that can thrive in 3 different environments, The Rainforest, The desert, and The Arctic and have them illustrate their new plants, ( or even animals) one must be able to "fix" nitrogen from the atmosphere

### EXTENSION

- Use Playdough to model and sculpt one of your new plants in a 3d medium

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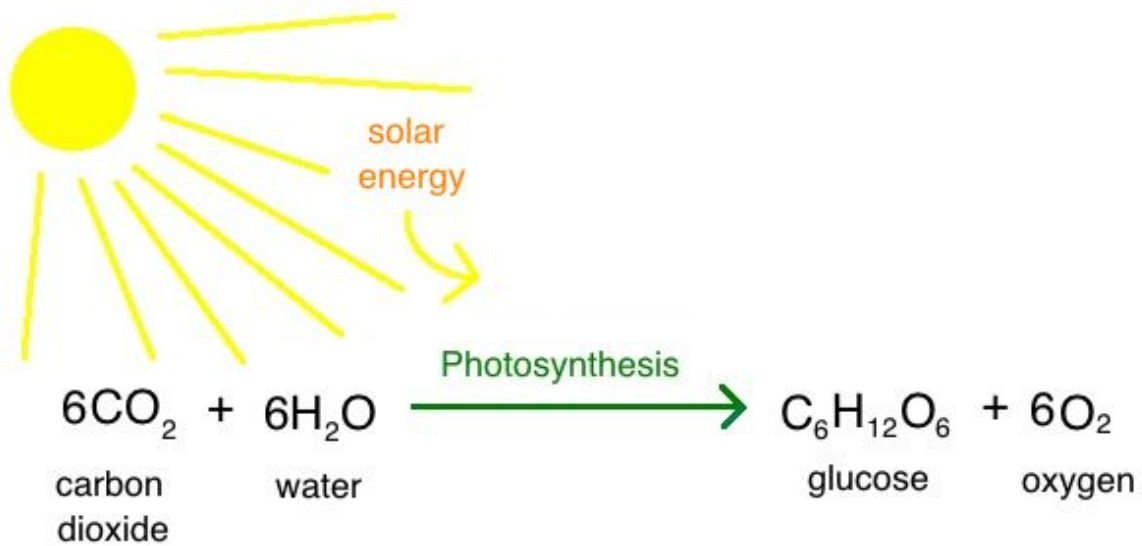
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## Chemical Equation for Photosynthesis



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