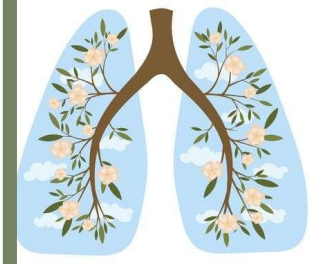


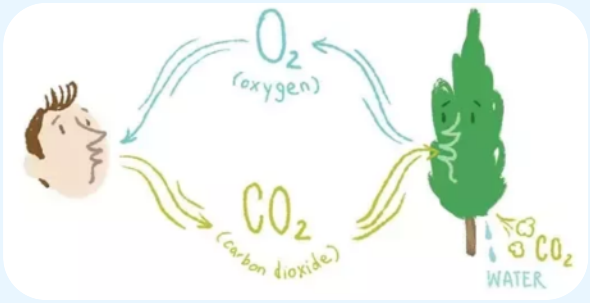
Leaf Transpiration

A fun and simple experiment to explore a tree's role in the water cycle!

For ages 10-12

Photosynthesis

You might not know the term "photosynthesis," but you likely know that plants make their own food. Photosynthesis is the process they use to do this. During photosynthesis, trees take in a gas called carbon dioxide and release oxygen. Humans, on the other hand, inhale oxygen and exhale carbon dioxide. These opposite cycles allow humans and trees to naturally help each other. Just by breathing, you are providing trees with the carbon dioxide they need to survive.



Transpiration

To take in carbon dioxide, leaves open up tiny pores on their surfaces called **stomata**. Meanwhile, the tree is pulling water up from its roots all the way to its leaves. When the stomata open, a little bit of the leaf's water "falls out," and is released as water vapor. This release is called **transpiration**, and it's a little bit like humans sweating. Transpiration releases water vapor, the gas form of water, into the air.

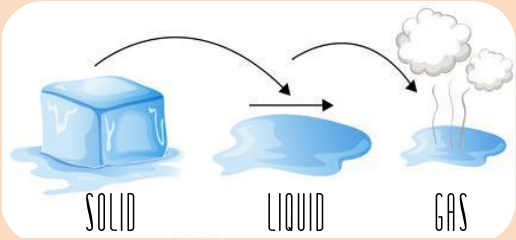
Transpiration Experiment

Because trees release water vapor, which is an invisible gas, we can't directly see transpiration in action.

So how do we know that trees are transpiring?

Remember that water can be a solid, a gas, or a liquid. Solid water is ice, gas water is water vapor, and liquid water is just regular water. We can see water and ice, but not gas. But is there any way we can turn the water vapor trees release into a visible liquid or solid?

On the next page, you will see a procedure that tries to do just that! If we put a plastic bag over a branch of a tree, it should fill with the water vapor that the tree is releasing. If there is enough water vapor in the bag, it will condense into the liquid form of water, and we will be able to see it. Let's see if it works!



Procedure:

Time: 10 min setup, 2 hour wait, 10 min observation

Materials: Plastic bag, rubber band or twist tie, tree with large leaves

1. On a sunny day, go outside with your materials and select a tree with large, broad leaves.

2. Place a plastic bag completely over a sunny section of a tree branch, making sure several leaves are inside of the bag. Secure the opening with a rubber band or twist tie.

3. Make a prediction! Using what you know about transpiration, what do you think will happen inside the bag? Record your prediction below.

I predict _____

_____

_____

_____

_____

4. Observe the leaf and the bag a few minutes after you finish your setup. Does anything seem different? Do these changes match your prediction? You might not see anything just yet, but you may be able to find some clues of what will happen next.

5. Here is the hard part: wait. It will take a couple of hours for the changes in the bag to finish, so leave the tree and come back in about two hours. In the meantime, go on a walk outside or try another outdoor activity!

6. Come back two hours later and observe the leaves and the bag. What looks different? If you have a magnifying glass, you can use it to make close observations. If not, your eyes will work just fine! Record your observations below.

I observe _____

_____

_____

_____

Did You Notice?

When you come back to your bag, there should be a little bit of water in the bottom of it. This water is proof that transpiration occurred! The tree pulled water all the way up from its roots, and released some as water vapor when it opened up its stomata to photosynthesize. Instead of going into the air like usual, this water vapor filled the plastic bag. It eventually became liquid water again, which you can see as droplets inside of the bag. You just saw transpiration in action!

7. Try repeating the experiment with different trees! Do some trees transpire more than others? Does it matter if the tree is in the sun or in the shade? Do plants besides trees transpire, too? Does the experiment work at night? Try it, and find out!

8. Based on your repeated experiments, make conclusions about transpiration. The amount of water that gathers in the bag will tell you how quickly the tree is transpiring. So if you see water accumulate in the bag quickly, then transpiration is happening quickly!

The Importance of Transpiration

Transpiration isn't just a cool trick that plants do--it's actually a very important part of the water cycle, the journey water takes as it travels between the sea, the sky, and land. You have probably heard of *evaporation*, the main way that liquid water changes into water vapor. But about 10% of the water vapor in the air actually comes from *transpiration*! Trees and other plants help balance the water cycle by making sure there is always plenty of moisture in the air.