

Why do fall leaves change color???

Materials:

- Leaves in various stages of color change
- Coffee filters
- Isopropyl alcohol
- Black magic markers
- Wide mouth cups
- Water dropper

Engage- Begin lesson by asking students why they think leaves change color in the fall. What accounts for this change? What else changes during this time of year that could impact trees?

Explore- If conducted during the fall, pass out changing leaves to each student. Alternatively, go outside and have students collect their own leaves to analyze. Have students assess the various stages of leaf change. They should be able to see clearly that the new color spreads from the veins of the leaf outward. Where does this color come from?

Pass out white coffee filters, isopropyl alcohol, black magic markers, cups, and the water droppers. Have students draw a thick black circle in the center of the coffee filter. There should be a good size empty space in the center of the circle. Place the coffee filter upside down on the cup and begin to drop drops of alcohol into the center of the filter. As the alcohol spreads out it will begin to separate the colors in the black marker. Purples, blues, and reds will begin to appear. So where did they come from? Well, they've been there all along!

Explain- Just as the black markers contains many colors; leaves also contain many different pigments.

Light energy from the sun is converted into usable energy through a process called photosynthesis. Most of the year, leaves appear green because they contain chlorophyll, which is vital for photosynthesis to occur. Chlorophyll is a poor absorber of the green portion of the electromagnetic spectrum and so reflects those green colors for us to see. During short winter days, there is not enough sunlight for photosynthesis to happen so plants begin to stop food production during the shortening days of fall. Since it is no longer needed, the chlorophyll in the leaves break down. When this happens, yellow and orange pigments that have been in the leaves all along are exposed. Red colors are produced from glucose that remains trapped in the leaves from previous photosynthesis.

Elaborate- Ask the following questions upon completion of the lab so that students have an opportunity to think critically about seasonal change and inter-species relationships. These questions are meant to stimulate their ability to connect natural processes to one another. They should consider the questions and use their reasoning skills to answer them as best they can before the instructor gives explanation.

- So it seems like trees go through a sort of hibernation. Can this be related to other species?
- How do they relate?
- How might leafless trees affect other species?
- Do the leaves of all plants and trees change colors and fall off?
- What might account for the differences between species?

Evaluate- By the end of the lesson, students should gain knowledge about the process of seasonal leaf change. They should understand and be able to restate what pigments are stored in leaves and why new pigments are exposed during fall and why.

Translating the lesson: This lab is designed for 5th grade; however, it can be translated to higher grades that place more focus on in-depth photosynthesis analysis. For high school students, chromatography labs can be incorporated into biology by using ground up leaves and chromatography paper instead of markers and coffee filters. Chromatography labs can also be incorporated into forensic labs by analyzing ink (i.e. for a written piece of evidence).