

LEAF

Chromatography

Life Science - Physical Science - Earth Science

Investigates the process of photosynthesis and explores the cellular composition and function of plant cells.

Introduces concepts in chromatography, the breakdown of chemicals, and light absorption and reflection.

Explores the impacts of environmental conditions on deciduous trees throughout varying seasons.



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Introduction:

The beauty of the changing leaves in fall has a very scientific explanation that can be investigated in your classroom! You have learned that photosynthesis must occur in plant cells in order to manufacture food for the growth and survival of the plant, but you may not know how this relates to the changing colors of fall foliage. Plant cells contain chloroplasts and the pigment, chlorophyll, which makes them green! Chlorophyll absorbs sunlight for photosynthesis to occur (see equation below) and the green pigment is so abundant that it overshadows all the other colored pigments in the leaves.

Light Energy

Photosynthesis:



Deciduous trees, or trees that lose their leaves each winter, lose this green pigment in the fall and change from green to yellow, orange, red, or even purple as they lose their chlorophyll. This phenomenon happens each year due to variations in precipitation levels, temperature changes, and the amount of sunlight available as the seasons change. Because they no longer need to produce the same amount of food for growth in the fall, the chlorophyll begins to break down, revealing the other colored pigments in the leaves.

By separating the green pigment from the other colored pigments, you can determine the color that different leaves will be in the fall. Complete the procedure below to explore chromatography and witness the hidden colors behind green leaves!

Materials:

- 3 leaves from 3 different species of deciduous trees
- 3 beakers
- Stirring rod
- Isopropyl alcohol (rubbing alcohol)
- Hot water bath
- Plastic wrap or paraffin covering for beakers
- 3 paper coffee filter or chromatography strips

Procedure:

1. Label three beakers with the three types of leaves you have collected.
2. Shred the leaves of each type into small pieces and place into their respective beakers.
3. Add alcohol to each beaker until the leaves are slightly covered.
4. Using a stirring rod, continue to break down the leaves until the alcohol begins to turn green.
5. Cover each beaker and place in a hot water bath. The heat energy will aid in cellular breakdown, leading to the separation of the colors.
6. After an hour or two, the beakers should contain a dark green solution. Place a chromatography strip (or vertical strip of a coffee filter) into each beaker.
7. Chromatography refers to the separation of chemicals as they pass through a medium. In this case, you are using paper chromatography to analyze the colored pigments in the cells of leaves. The strips will absorb the alcohol and the colors will separate as they move. Observe your chromatography strip and record your observations.