

Explorations with
The Winston™

Falling for Fluorescence

Version 121422

Students will be able to determine the differences between seasonal changes and chlorophyll presence within a leaf. Students will be able to relate chlorophyll presence to overall gross primary production (GPP). Students will be able to describe the role of GPP in the global carbon cycle.

Laboratory Safety

1. Wear lab coats, gloves, and eye protection as required by district protocol.
2. Use caution with all electrical equipment such as PCR machines and electrophoresis units.
3. Wash your hands thoroughly after handling biological materials and chemicals.

Materials Required

Item	Quantity per group
Microcentrifuge tubes (1.5 mL or 2.0 mL)	8
Deciduous tree leaves, as fresh as possible. Dry leaves release much less pigment. (one green and three autumn leaves of various colors, can substitute vegetables from the grocery store if you don't have access to autumn leaves)	4 leaves
Isopropanol	2 mL
The Winston Fluorescence Reader with Photohood	1
Microcentrifuge tube rack	1
100 - 1000 μ L adjustable volume micropipette with tips	1
Electronic balance (optional)	1

Pre lab questions:

1. Draw the carbon cycle.
2. Explain how fluorescence can measure photosynthesis.
3. Explain how GPP changes throughout the year.
4. Predict: What would GPP look like near the equator? Or closer to the poles?

Purpose: In this hands-on activity, students compare the fluorescence of various colors of leaves and see why the color of fluorescence emission doesn't necessarily match the color of the leaf, and explore how a change in chlorophyll content causes autumn leaves to change color.

Protocol

- Label the 8 microcentrifuge tubes as follows.
 - 2 tubes: Leaf A
 - 2 Tubes: Leaf B
 - 2 Tubes: Leaf C
 - 2 Tubes: Leaf D
- Tear up a small piece of each of the leaves (~0.1 gram) and put the pieces in a labeled microcentrifuge tube.
- Add 500 μ L isopropanol to each of the tubes. Use a pipette tip to crush the leaves until the liquid changes color, taking care to not clog the pipette tip.
- Allow the leaf pieces to settle to the bottom of the tubes.
- Use a micropipette to transfer the supernatant from each tube to the other clean, labeled microcentrifuge tube.
- Use the table below to record your observations on the appearance of the solution in each tube in room light.
- Place your tubes in The Winston Fluorescence Reader and put the photo hood on top. Take a picture of the tubes with your cell phone camera. Record your observations on the appearance of the solutions in the table below.

Observations

	Room Light	The Winston Fluorescence Reader
Leaf A		
Leaf B		
Leaf C		
Leaf D		