



Name _____



Leaf Chromatography

Background Information: **Mixtures** are a combination of compounds and elements that has not formed a new substance and whose proportions can be changed without changing the mixture's identity.

- Mixtures are not chemically combined.
- They are made of elements, compounds, or both.
- The parts of a mixture do not change their properties.
- A mixture may have any amount of parts.
- Energy is not absorbed or released when a mixture is made or separated.
- A mixture can be separated by physical means.

Leaves are nature's food factories. Plants take water from the ground through their roots. They take carbon dioxide from the air. Plants use sunlight energy to convert water and carbon dioxide into glucose.

- **Glucose** is a type of sugar.
- Plants use glucose as food for energy and as a building block for growing.
- The process of converting CO_2 and water to glucose is called **photosynthesis**.
- A chemical called **chlorophyll** helps make photosynthesis happen.
- Chlorophyll is a **pigment** that gives plants their green color. Pigments are compounds that absorb light.

Plants have several kinds of pigments. They play an important role in capturing light energy for the photosynthesis.

Pigments are responsible for the colors we see in leaves because they reflect light at that wavelength.

- Chlorophyll reflects green light
- Anthocyanins reflect red light
- Carotenoids reflect yellow light

As summer ends and autumn begins in the northern hemisphere, the Earth revolves around the sun so that the tilt of the Earth's axis is pointed further away from the sun. This means that days get shorter and shorter.

The decrease in sunlight is how trees "know" to begin getting ready for winter.

During winter, there is not enough light or water for photosynthesis. The trees will stop producing as much glucose; they live off the food stored during the summer.

The green chlorophyll breaks down in the leaves. As the bright green pigment fades away, yellow, red, and orange pigments become visible. Small amounts of these colors have been in the leaves all along. We just can't see them in the summer, because they are hidden by the green chlorophyll.

Paper Chromatography is a method to separate mixtures into their individual parts. Chromatography means "color writing."

The mixture of pigments in a leaf may be separated into bands of color by paper chromatography.

The parts of a mixture can be separated with this process.

The separation takes place by **absorption** and **capillary action**.

The paper holds the substances by absorption; capillary action is a force that pulls the substances up the paper at different rates.

Pigments are separated on the paper and show up as colored streaks.

The pattern of separated components on the paper is called a **chromatogram**.

SAFETY FIRST!



Alcohol is poisonous - keep it away from your mouth.

Wash your hands with soap when you have finished this investigation.



Goggles must be worn during this investigation.

Be Aware of the Hot water!

Problem: To use paper chromatography to separate the mixture of pigments in a leaf.

Materials:

Assorted leaves	Filter paper	Isopropyl alcohol
Beaker	Scissors	Masking tape
Stirring rod	Plastic wrap	Aluminum pan
Hot water	Hand lens	Ruler
Paper towels	Map pencils	

Procedure:

1. Use a piece of masking tape to label a beaker with your name & class period.
2. Tear a leaf into small pieces. Make the pieces as small as possible.
3. Put the pieces of leaf in a beaker.
4. Pour enough alcohol into the beaker to cover the leaf pieces completely.
5. Use the stirring rod to mix the leaf pieces and alcohol.
6. Cover the beaker with plastic wrap and set in an aluminum pan that is half full of hot water.
7. Let the leaves soak overnight.
8. Cut the filter into a strip that is 2cm wide and about 10 cm long.
9. Tape the strip of filter paper to a pencil.
10. Lay the pencil across the top of the beaker.
11. Wind the paper around the pencil so that the tip of the paper just barely touches the alcohol.
12. As you wait for the alcohol - pigment mixtures to travel up the filter paper, re-read the background material carefully.
13. Take the filter paper strip from the beaker; place it on a paper towel to dry.
14. Observe the strip with your hand lens.

Data:

<i>Draw & color your filter paper:</i>	<i>Describe your observations:</i>

Questions:

1. What was the solvent in this investigation?

2. What was the solute in this investigation?

3. What was the mixture in this investigation?

4. Describe each of the following (use your textbook or a dictionary if necessary):
 - a. Substance
 - b. Mixture
 - c. Physical property
 - d. Chemical property
 - e. Chromatography
 - f. Chromatogram
 - g. Solvent
 - h. Solute
 - i. Capillary action
 - j. Pigments
 - k. Photosynthesis