

# What colours are hidden in a spinach leaf?

## Background Information:

Paper chromatography is a process that uses filter paper to separate and identify the different substances in a mixture.

The pigment molecules in the mixture dissolve in the alcohol and move up the paper. The heavier molecules move up the paper more slowly. The lighter molecules move up the paper more quickly. So heavy and light substances get separated from one another on the paper.

Plants contain chlorophyll, a green pigment, as well as carotenoids, pigments that range in colour from red to orange to yellow.

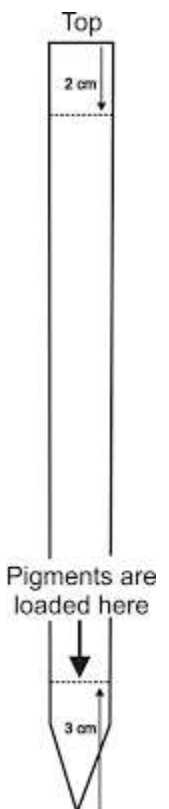
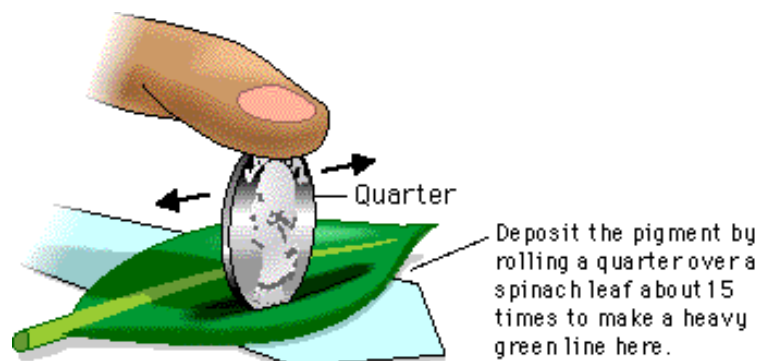
## Materials:

- Spinach leaf (other leaves also work)
- Rubbing alcohol
- Coffee filter paper or other thick paper
- Tall glass (chromatography chamber)
- Ruler
- Coin

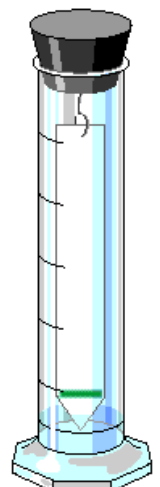


## Procedure:

1. Cut out a long rectangle from a coffee filter. Cut the tip to form a point. (see picture)
2. Use a ruler to measure and draw a light pencil line 3-cm above the bottom of the paper strip.
3. Here is the tricky part! Place the edge of the spinach leaf over the pencil line and using the edge of a coin gently press on the spinach leaf to create a single green line over the pencil line. You want this line to be thin and *concentrated* with the pigment from the spinach leaf. Therefore, repeat this edging process carefully about 5-6 times, drying the pigment **between** each layer. Be sure not to press too hard or you will poke a hole through the paper.

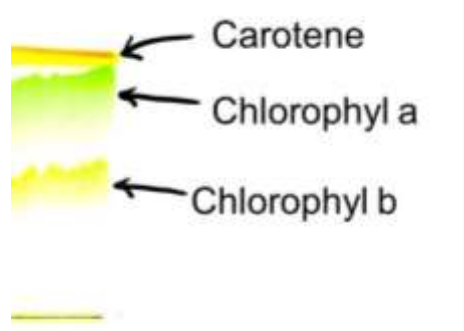


4. Pour some rubbing alcohol into the glass. (About 2 tbsp.).
5. Tape the paper to a pencil and hang it in the middle of a tall glass such that the tip is in the alcohol.
6. Observe as the solvent gets absorbed and travels up the paper by capillary action. This may take up to 20 minutes.
7. Allow the chromatograph to process until the solvent line reaches about 1 cm from the top of your paper. **DO NOT DISTURB THE GLASS TUBE WHILE IT IS PROCESSING!!**
8. Remove the strip and let it dry.



## Analysis Questions:

1. Did the leaf you test contain different pigments? If so which pigments?



\*Look at the paper with a black light if you have one. What do you notice?

2. Why did the separation of pigments in the spinach extract occur as it did? (i.e. How does paper chromatography work?)

3. What are other uses of chromatograph or similar processes?

4. Why are leaves green even though other pigments are present?

5. Why do leaves tend to change colour in autumn?