

# Chromatography

Students explore concepts of science, technology and art as they use the chromatography technique to play with colors.

## Prepare the materials

### Necessary materials

Filter paper  
Food colors  
Sign pens  
Paper cup  
Water  
Color palette  
Painting brush  
Scissors

### Optional materials

Water colors  
Cotton thread

*Note: Underlined materials are to be shared among the students*

## Curiosity

Start with an activity to get students curious about the lesson.

You can ask students if they like colors and get them to share their favorite colors. You can lead this discussion towards the formation of colors and ask students if they would like to learn a technique to separate colors into their components. You can provide them with the materials to get them more curious. Remember to caution students against messiness that can happen during this lesson.

## Activity

### Chromatography

Ask students to refer to this lesson in the student guide for detailed instructions on performing chromatography. Support them if they are struggling by providing ideas and explaining unclear instructions.

When students have performed the activity, ask them the following questions to support their thinking.

- What interesting things did you notice?
- Why does the green coloring separate into blue and yellow but red coloring still remains red?
- Why do the colors move outwards in the filter paper as the water spreads in it?

### Hidden messages

Students will write a message on filter paper and conceal it with a layer of thick paint. Then they'll exchange these messages with friends and use chromatography to reveal them.

Ask students to go through this section in the student guide lesson, follow the instructions, and create their hidden messages.

## Art with water

Ask students to see the samples shown in the student guide lesson. This will help them get ideas about the art they can create using the same resources and techniques. The lesson also has instructions

Let them use various materials and play with ideas to create beautiful patterns using water rising in filter papers. At the end, students can have a quick exhibition of their work.

## Suggestions for the facilitator

We found these insights and tips to be helpful while facilitating this session.

- The rate of spread of water slows down as the wet area grows larger. So applying colors much farther from the center can take a lot of time to start work.
- Making the color solution too thick or too thin can cause difficulties in observing the proper chromatography process.
- It's easy to create a mess in this lesson as the students are handling colors and water. Firmness needs to be maintained from the beginning of the lesson to prevent mischief. It's good to caution students against careless handling before starting the activity.
- Students might need to throw used water and refill new water. It's better to let them get a bottle of water for refilling and a common container for the class to discard colored water.

## Thinking

### Reflection

Ask questions to help students reflect on their learning.

- What part of the activity was most enjoyable for you? Why was it so?
- What new questions do you now have?

You can also provide structures to support their thinking.

- Two things I learnt are \_\_\_\_\_
- I used to think \_\_\_\_\_ and I now think \_\_\_\_\_
- The most interesting part for me was \_\_\_\_\_ because \_\_\_\_\_

### Think like a ...

Ask thought provoking questions to make students think from the perspective of a professional

#### Think like a physicist

- Why do the colors move along the filter paper as the water rises?
- Why does water rise in the filter paper?

#### Think like a chemist

- Why do food color and sign pen colors move along water but pencil colors, crayons etc don't?

**Think like an artist**

- Why does green break down into yellow and blue while red doesn't?
- What kind of colors look good together and what colors don't?

**Concepts and skills**

This lesson can also be used to emphasize on scientific concepts and skills.

Some concepts and skills students explore in this lesson are:

- **Solubility**  
Some chemicals like salt and sugar break down into molecules when mixed with water. Those molecules distribute themselves uniformly among the water molecules. This property is called solubility.
- **Capillary action**  
Filter paper has extremely tiny tube-like structures in it. When such tubes are dipped in water, water rises through them. This phenomenon is known as capillary action. This process helps water from roots reach the leaves.
- **Primary and secondary colors**  
colors can be mixed to create new colors. Some colors such as red, yellow and blue, however, cannot be created by mixing other colors. They are known as primary colors. colors that are created by mixing primary colors are known as secondary colors. For example, green is made up of blue and yellow.

**Sample lesson plans****1. A 60 minute class****Learning Objectives**

To get students to experience the play based learning approach by doing the Chromatography activity. The emphasis is on getting them to explore and enjoy the process.

**Classroom context**

This sample lesson is designed for grade 8 students. The time available for the class is 60 minutes.

**Lesson Flow****Curiosity (10/10 mins)**

Ask students if they like colors and get them to share their favorite colors. Lead this discussion towards the formation of colors and ask students if they would like to learn a technique to separate colors into their components. As students will be interested, provide them with the materials to get them more curious.

Caution students against messiness that can happen during this lesson.

**Activity (30/45 mins)****Chromatography**

Provide them with the instruction sheets and let them conduct the chromatography activity. Move around and interrupt students if needed. You can ask leading questions to help them think.

Get students to share their results with neighbors and see if they all got identical results. Have a brief discussion on the observation and why might it be so.

**Art with water**

Ask students if they can use the property of water carrying the colors along with it to create some beautiful patterns of colors. Provide them with the placemats to help them get ideas about it. Let them free to use any additional materials they want for this activity.

**Thinking (10/45 mins)**

Ask questions to help students reflect on their learning experience.

- What was the most enjoyable part of the activity? Why?
- What wonderful ideas and insights did you have while doing this activity?

## 2. Two 45 minutes classes

### Learning Objectives

To get students to experience the play based learning approach by playing and experimenting with water soluble colors. The emphasis is on getting them to explore and understand some scientific concepts in the process.

### Classroom context

This sample lesson is designed for grade 7 students. The time available for the lesson is two 45 minutes classes, not necessarily consecutive.

### Lesson Flow

#### Class I

**Curiosity (10/10 mins)**

Ask students if they like colors and get them to share their favorite colors. Lead this discussion towards the formation of colors and ask students if they would like to learn a technique to separate colors into their components. As students will be interested, provide them with the materials to get them more curious.

Caution students against messiness that can happen during this lesson.

**Activity (30/45 mins)**

### **Chromatography**

Provide them with the instruction sheets and let them conduct the chromatography activity. Move around and interrupt students if needed. You can ask leading questions to help them think. Give them 15 minutes for this activity

Get students to share their results with neighbors and see if they all got identical results. Have a brief discussion on the observation and why might it be so.

Once they are done, ask them to refer to the hidden messages instruction sheet. Give them 10 minutes to create their hidden message. Ask them to exchange the messages with friends and to reveal them later in secrecy.

### **Thinking (10/45 mins)**

Ask questions to help students reflect on their learning experience.

- What was the most enjoyable part of the activity? Why?
- What wonderful ideas and insights did you have while doing this activity?

## **Class II**

### **Recalling (10/10 mins)**

Get students to sit in the same groups from the last class. Ask them to discuss among group members and recall their work from the previous class. You can get a couple of volunteers to share the key points from the discussion with the class.

### **Activity (20/30 mins)**

#### **Art with water**

Ask students if they can use the property of water carrying the colors along with it to create some beautiful patterns of colors. Provide them with the placemats to help them get ideas about it. Let them free to use any additional materials they want for this activity.

Encourage students to try radical ideas. Because it takes some minutes for the results to be visible, get students to dip the art work they have created and work on new ones while water is doing its work in them. They can also note their observations as rising water works with the colors they had set up.

### **Thinking (15/45 mins)**

Ask questions to help students reflect on their learning experience.

- What new questions do you want? What do you want to learn more about?
- Mention any two things you learnt during this lesson.

Ask questions to get them to think from the perspective of professionals.

- Why does water rise in the filter paper?
- What kind of colors look good together and what colors don't?