

STEAM Experiment #2

The Beauty of Color Science

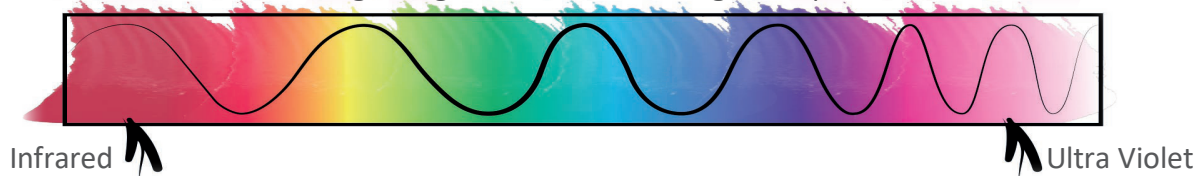


Science

Colors play an important role in our everyday lives. Colors are used to create an emotion or trigger a response. Emergency vehicles and images of them are typically red. The color red creates a sense of urgency. Yellow creates a sense of caution. Color is also a creative marketing tool as colorful advertisement can “control” a consumer’s buying habits.

Color is quite scientific, too. Light is a form of energy. When we see color, we are actually seeing light that has been reflected off of an object. Light moves from its source in waves of different lengths. When we see light, we are seeing energy from certain wavelengths. This is called the visible light spectrum which is all the colors that can be seen with the human eye. (See image below.) The spectrum presents the colors in a particular order, ranging in wavelength from 700-400 nm (nanometers): Red, Orange, Yellow, Green, Blue, Indigo, and Violet. Red forms from light with longer wavelengths. Violet forms from light with shorter wavelengths.

Visible Light Region of the Electromagnetic Spectrum



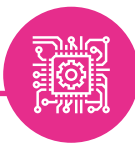
An object’s color is the light, or energy, that it did not absorb. When you see something as “red,” it is because the object has absorbed all the other visible colors except for red. The energy for red bounces off the object and is reflected back to your eyes. The colors white and black aren’t really on the spectrum. A black object is black because it does not scatter any light.

Now that you understand the power of colors and the science behind colors, complete the chart below:

? *Quickly look at the color in the left column, write down how it makes you feel. What is the first thing you think of when you see each color?*

? *Why are the colors white and black not on the spectrum? Explain what happens when you see something that is black or white.*





Technology

The color spectrum displays colors when light is dispersed by a prism. A spectrum can take on various shapes, circles, triangles or squares.

For this section, you will use your creativity skills to design a color spectrum, using Microsoft Paint.

NOTE! Review the videos and instruction sheets in the resource folder to learn more about Microsoft Paint.



Engineering

Now that you understand the color spectrum, you will engineer (design and create) your own soap crayons using some of the same colors. Follow the procedure below and be sure to think about your final product along the way. Good engineers are constantly thinking of new ways to make their product better and more advanced!

EQUIPMENT IN YOUR KIT	QUANTITY	CLASSROOM EQUIPMENT	QUANTITY
Pipette	1	Small bowl or measuring cup	1
Soap Mold	1	Spoon or spatula	1
INGREDIENTS IN YOUR KIT	FORMULATION	CLASSROOM INGREDIENTS	FORMULATION
Crayon Soap Base	1 oz	Alcohol (optional)	N/A
Colorant	1-2 drops		
Fragrance Oil	1-3 drops		

Part 1: Imagine Your Product

In order to make your own soap crayons, you need to determine how much of each ingredient you will need. Answer the questions below to make decisions about your final product.

? *What color will you select for your soap crayons? Why did you choose this color?*

? *Do you want your crayons to have a strong scent? Why or why not?*

Part 2: Plan Your Product

Based on your responses above, determine how much of each ingredient you will need.



? **You will need the following ingredient and the amount listed:**

1. 1 oz of crayon soap base

? **Determine how much of the Fragrance Oil you will need based on your product design. Circle which amount you think is appropriate.**

1. 1 drop of Fragrance Oil (faint scent); or
2. 2 drops of Fragrance Oil (medium scent); or
3. 3 drops of Fragrance Oil (strong scent).

? **Determine how much of the Colorant you will need based on your product design. Circle which amount you think is appropriate.**

1. 1 drop of Colorant (light color); or
2. 2 drops of Colorant (medium color).

Part 3: Create Your Product

Follow the procedure below using the ingredients and the amounts you selected.

1. Add 1 oz of Crayon Soap Base into the measuring cup. Place the soap base into the microwave for 10 - 30 seconds.
2. Once the soap is melted, add your chosen amount of Fragrance Oil and stir until mixed completely.
3. Place the soap mold close by and have it ready to use.

NOTE! *The soap base hardens very quickly.*

4. Pour about 0.25 oz of soap in small bowl. Add one drop of one of your chosen colors. Mix with the spoon or spatula until completely mixed. Add a second drop, if desired.
5. Pour this mixture into one of the soap molds.
6. Repeat steps 4 and 5 for the remaining 3 colors.

NOTE! *Perform these steps quickly as soap will harden fast!*

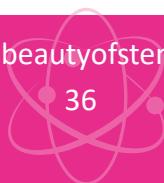
7. Spray with alcohol to get rid of any bubbles.
8. Keep the tubes in the tray until completely hardened or about 30 minutes. Once they are hardened, remove them.

Part 4: Evaluate Your Product

Reflect on the final product you have created. Answer the questions below in order to consider changes you could make that would improve your product.

? **Did your product turn out the way you imagined it would be in Part 1? Why or why not?**

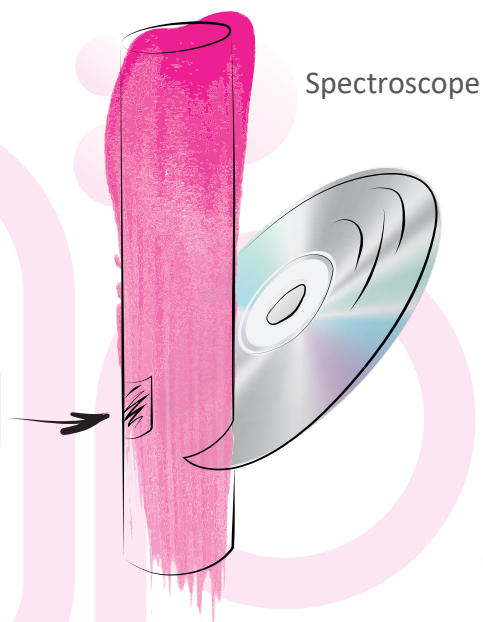
? **What are some additions you could make to the formula of your product? Are there any ingredients you would like to add that would improve the quality? Give an explanation for each addition.**





Art

Let's take a fresh look at light and build a spectroscope! Because we cannot "see" the separate wavelengths in any light source, we need a device to split them apart and examine different kinds of light sources in school, at home, and around the city. Make a spectroscope using simple materials like a cereal box, tape, CD, etc. Use the internet and a search engine to find ideas on how to make a spectroscope. Remember to be creative, use your engineering, research and problem solving skills. Spectrometers are also used by scientists to split light into an array of colors. This allows scientists to see the details in light from a distance.



Mathematics

Now that your soap crayons have been created you must calculate the correct dimensions of your box. All five tubes need to fit inside without using excess paper. The dimensions for each tube are given below. Use the space to measure out (or sketch) all five soap crayons according to their proper dimensions. Then calculate the length, width and height of the box you will need to package them. This formula is often abbreviated as $V = l \times w \times h$.

? Soap Crayon Dimensions

*If each tube have a length of 3 in, width of 0.6, and height of 2.7 in, what is the volume of the box?
Show your work here:*

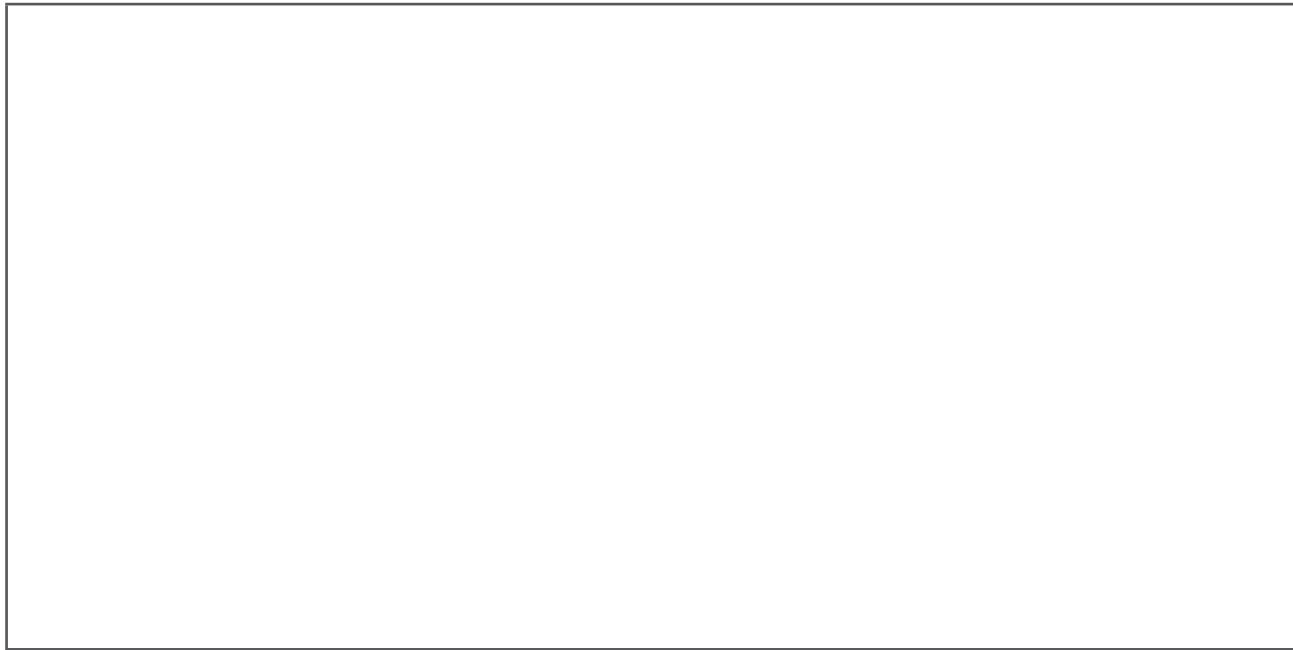


Now that your soap crayons have been created, you must calculate the correct dimensions of your box. All 5 tubes need to fit inside without using excess paper. The dimensions for each tube are given below. Use the space to measure out (or sketch) all 5 soap crayons according to their proper dimensions. Then calculate the length, width and height of the box you will need to package them (Recall: $V = l \times w \times h$).

? Box Dimensions

Determine the length, width and height of the box that will fit all 5 crayons side by side.
1 crayon = 2.7 in. high, 0.6 in. wide, and 3 in. long.

Sketch the crayons side by side according to the height and width calculated. Use the space below:



Use a ruler to outline the crayons in your image above.

Measure the width and height of the box and record them below.

Width of the box: _____

Height of the box: _____

Determine the length of the box. It should be equal to the length of 1 crayon tube.

Length of the box: _____

List the final dimensions of the box: _____ x _____ x _____

