

SPECTRUM LAB :

An online learning environment for authentic inquiry





HARVARD & SMITHSONIAN

Welcome to Spectrum Lab

What can light reveal about an object or phenomenon, beyond what our eyes can see?



Astronomy

Objects in space are thousands, millions, or billions of light years away from us.



Astronomers use the light that objects emit to understand all kinds of characteristics of distant stars, planets, and galaxies.



Chemistry

Light helps chemists identify the composition of a substance.



Light helps us understand the structure and behavior of atoms and molecules.



Art History

Light helps historians identify forged paintings.



Earth Science

Light helps scientists diagnose the health of our oceans and forests.



Environmental Chemistry

Light helps scientists understand what's in the air we breathe so we can reduce our exposure to harmful pollutants.



Theater Lighting Design

Theater lighting designers use their understanding of light and color to create different moods and effects on a stage.





Module 1: Light

How does the interaction of light and matter affect the colors we see?



POLL When green glass is placed between the flashlight and the white movie screen, a green spot appears on the screen. If both a green glass and a red glass are placed between the flashlight and the movie screen, what will happen to the spot?



- a. It will turn green.
- **b**. It will turn yellow.
- c. It will turn brown.
- d. It will turn red.
- e. It will disappear.

Color Filters: Predict and Investigate

How do colored filters work?



Make a prediction

Answer questions **a.** and **b.** in **Color Filters, Part I** of your **Spectrum Notebook**



2

3

Do **NOT** look through any of the colored gels before making your prediction!

Check your prediction

Look at this image through the **RED** colored gel. What do you see?



Check the other gels

Now look through the **BLUE** colored gel. What do you see?



Check the other gels

Now look through the GREEN colored gel. What do you see?



Now what do you think?

Answer questions **c.** and **d.** in **Color Filters, Part 2** of your **Spectrum Notebook**



Discuss with your partner

Answer question **e.** in **Color Filters, Part 2** of your **Spectrum Notebook**



and Color Mixing

Open the Photons & Color section of Module 1: Light in the Spectrum Tool

Complete all questions in the **Photons & Color** and **Color Mixing** sections of your **Spectrum Notebook** as you work through the PhET Simulation.



What are the behaviors of light that we have learned about?

Which behaviors have we observed so far?

Emission photons are given

off by an object

(as from a light bulb or a star)



https://phet.colorado.edu/sims/html/color-vision/latest/color-vision_en.html

Absorption

photons are taken up by a substance

Transmission

photons pass through a substance (as with a colored filter) Q. What is being **absorbed** and what is being **transmitted** by this **red** filter? **Filter Color**

Reflection

photons bounce off a substance

(as a leaf or car's paint)

Scattering photons **reflect** off a substance in random directions

(as sunlight off air molecules in our sky)



Why is a leaf green?

Why is the sky blue?

Reconsider these circles

Answer Question 1 in Section 4 of your Spectrum Notebook, then move on to answer Questions 2-4.



 RE-POLL When green glass is placed between the flashlight and the white movie screen, a green spot appears on the screen. If both a green glass and a red glass are placed between the flashlight and the movie screen, what will happen to the spot?



- a. It will turn green.
- **b.** It will turn yellow.
- c. It will turn brown.
- d. It will turn red.
- e. It will disappear.

End of Module 1: Light

What questions do you still have?

