

PHYSICS

Balloon Popping



Balloon Popping

NGSS

4-PS3-2; 4-PS4-1; 5-PS1-4

Objective

The student will understand that light is made up of different wavelengths and the reflection or absorption of those wavelengths is related to color and heat energy.

The student will be able to explain why objects react to light differently by using lenses to direct sunlight onto different-colored objects.

Vocabulary

Wavelength: The distance between peaks of a wave (such as waves of light or sound).

Absorption: When a wave comes into contact with and causes the molecules of an object to vibrate, thereby absorbing the wave energy rather than reflecting it.

Convex Lens: A lens that is thicker in the middle; these lenses focus light waves.

Heat: A transfer of energy; caused by objects near each other having different temperatures.

Background

Light is a type of energy, made of waves and particles called photons. Different wavelengths of light have different energies. Of the wavelengths that make up visible light, for example, red light has less energy than green light and green light has less energy than violet light. White light is made up of all the different wavelengths of light. Objects appear different colors depending on the wavelength(s) of light they reflect. Black objects look black because they absorb almost all wavelengths of light and convert the energy into heat. Conversely, white objects look white because they reflect all the wavelengths of light.

In this experiment, when the magnifying glass is aimed at the balloons, the black balloon absorbs the white light while the transparent balloon reflects it. This causes the black

balloon to pop while still inside the transparent balloon.

Materials

Per Group of 2-3 Students:

- 1 magnifying lens
- 1 transparent balloon
- 1 black balloon
- Sunlight

Procedure

1. Partially inflate the transparent balloon. Do not fill it completely or tie off the end.
2. Insert the deflated black balloon into the opening of the transparent balloon. Make sure to leave the end of the black balloon hanging out the end of the transparent balloon.
3. Inflate the black balloon and tie off both ends.
4. In direct sunlight, position the magnifying lens to focus on the center of the balloons.
5. Observe. Did any balloons pop?

Guiding Questions

Why does only one balloon pop? i.e. What determines whether the light will cause each balloon to pop?

Do you think this experiment would work with another transparent balloon (instead of black) inside the first?

Career/Future Application

Optometrist, Photographer, Thin Film Engineer

Sources

Dark Colors Absorbing Light: <https://sciencing.com/colors-absorb-heat-8456008.html>

Wavelength and Color: <https://www.sciencelearn.org.nz/resources/47-colours-of-light>