Level	Exploring Light Waves
Middle School	

Time Required	Lesson Summary
60 minutes	This hands-on lesson introduces students to the fundamental properties of light and optics through interactive experiments at five learning stations. Each station focuses on a different physical phenomenon—reflection, refraction, diffraction, internal reflection, and polarization—allowing students to discover how light behaves in different environments. By rotating through stations, students will directly engage with concepts that are central to physics and modern technology (e.g., fiber optics, holograms, and optical devices).

Standards

MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Vocabulary	Objectives
Wave Reflection Transmission Absorption Refraction Diffraction interference	Students will be able to observe and describe examples of reflection, refraction, diffraction, internal reflection, and polarization. Students will connect these wave behaviors to real-world technologies (holograms, optical fibers, lenses, etc.)

Materials

- Transparent acetate sheets
- cardboard with black paper glued to it
- Smartphone or tablet (with hologram video/image)
- Beakers (clear, glass preferred)
- Test tubes
- Water
- Glycerin
- Cooking oil

- CD (used as diffraction grating)
- Flashlight, candle, or phone flashlight
- Scissors, tape, silicone or glue
- Red laser pointer
- 2 polarizing discs (or polarized lenses)
- Sample digital images (for polarization activity)
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Pre-Requisites
None

Safety Considerations
None

Before the Lesson
Set up the 5 stations. See the Teacher Station Page for detailed instructions.

Assessments	**Classroom Instructions**
Pre-Activity Assessments	**Introduction**
Listen to student ideas and redirect as necessary	• Start with a guiding question: *"What happens to light when it hits an object or passes through a material?"* • List student ideas under **Reflected, Transmitted, Absorbed**. • Explain that each station will model one or more of these possibilities.
Activity Embedded Assessments	**Activities**
Walk around during the activity monitoring behavior and answering questions.	1. Assign students to groups of 3 or 4. 2. Hand out station worksheets and go over instructions. 3. Assign starting locations for each group and explain the procedure for moving between stations.

Post Activity Assessments	Closure
	• Review the class chart: add examples of **Reflected, Absorbed, Transmitted** light from each station. • Ask groups to sketch one simple model (diagram) for their favorite station showing light waves interacting with the material. • Exit Ticket: *"Which interaction—reflection, absorption, or transmission—do you think is most important in technology today? Why?"*

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Below is a list of the lesson titles included in the series. All lessons can be accessed from this web page, https://superknova.org/educational-resources/.

Middle School

Introduction to Satellites
Weather Predicting
Introduction to Radio Wave Communication
The Importance of Radio Astronomy
Cubesat Model Building
Understanding FM Radio
Radio Frequency Technology
Who Decides if You Get 5G?

High School

The Uses of Radio Waves and Frequency Allocation
Is Radio Technology Safe?
Diffraction of Radio Waves
Measuring Sea Surface Temperatures with Satellites
Marine Animal Tracking and Bathymetry
How to Design Your Own Crystal Radio
How Radio Waves Changed the World
Simple Wireless Communication

Seeing and Hearing the Invisible
Local Wireless Radio Frequency Communication
Investigating the Internet Connection
The Geometry of Radio Astronomy

Informal

Modeling Radio Astronomy