
PHYSICAL SCIENCE
Just Passing Through
Light
Sally Ride Science
PASCO
012-13163A

Help System

- Save, export, print, or submit your work.
- Store your snapshots in the journal.
- Take a screenshot when you see SNAPSHOT.
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In Your World

Have you ever seen your reflection in the window of a store at the mall? You can see yourself. You can also see the jeans on display through the window. And look! Your friends are waving at you from inside the store to come in and hang out with them! So they must be able to see you, too.

How can you see your reflection *and* the window display? And how can you friends see you?

Introduction

Just Passing Through

Light from any source – the Sun or a lamp – keeps shining until it hits something. When light waves strike an object, several things can happen. The light can be absorbed, reflected, transmitted, or some combination of these effects. It all depends on the kind of matter light encounters.

In the case of the store window, some of the light is reflected, or bounced, off the glass and into your eyes. That's why you see your reflection – the glass acts as a mirror. Most of the light passes on through. When light in the store hits your friends, some of it bounces off them, passes through the glass, and enters your eyes. That's why you can see what's inside. Light reflects off you, too. So your friends can see you looking in.

Why does a window sometimes act like a mirror?

Introduction

Chain Reaction

Why do some materials let light pass through? When light waves strike glass, they set off vibrations in the atoms that produce a chain reaction. One atom absorbs light energy and re-emits it to the next atom, which re-emits it to the next atom, and so on through the glass. *Ta-da!* Light passes in one side and out the other. Glass is transparent – it lets light through.

Most things are opaque. They absorb light energy but don't re-emit it. When light hits a rock, the atoms absorb light energy. But instead of passing light to neighboring atoms, these atoms pass heat. Opaque things get warm. They don't transmit light.

Now it's your turn – explore how light interacts with materials that are transparent, translucent, and opaque.

This colored glass is translucent – you can't see through it, but it lets some light through.

Materials and Equipment

Each group needs these materials.

- Light sensor
- Sensor extension cable (optional)
- Lamp or flashlight
- Meter stick
- Transparent material
- Translucent material
- Opaque material
- Polarized sunglasses (2 pairs, optional)
- Safety goggles for each student

Safety

Add these rules to your regular classroom procedures.

- Use caution when working with a heat source.
- Handle glassware with caution.
- Wear safety goggles throughout the investigation.

Investigation – Part 1

You will set up a lamp and a light sensor 50 cm apart and measure the intensity of light shining on the sensor. Then you will place different materials, one at a time, between the lamp and the sensor and measure the amount of light transmitted. List each material you will use and predict how much light each will transmit.

SNAPSHOT

The materials I will use are . . .

I predict . . .

Investigation – Part 1

1. Connect the light sensor.
2. Position the lamp and the light sensor 50 cm apart.
3. You will place each of the materials to be tested, one at a time, 5 cm from the light sensor. Locate the mark on the meter stick that indicates this distance.
4. Turn to the next page to begin recording data.

5. Begin recording light intensity data.
6. At 15 seconds, put the transparent material in place 5 cm in front of the sensor. Hold the material steady.
7. Data recording will stop automatically after 30 seconds.
8. Remove the transparent material.

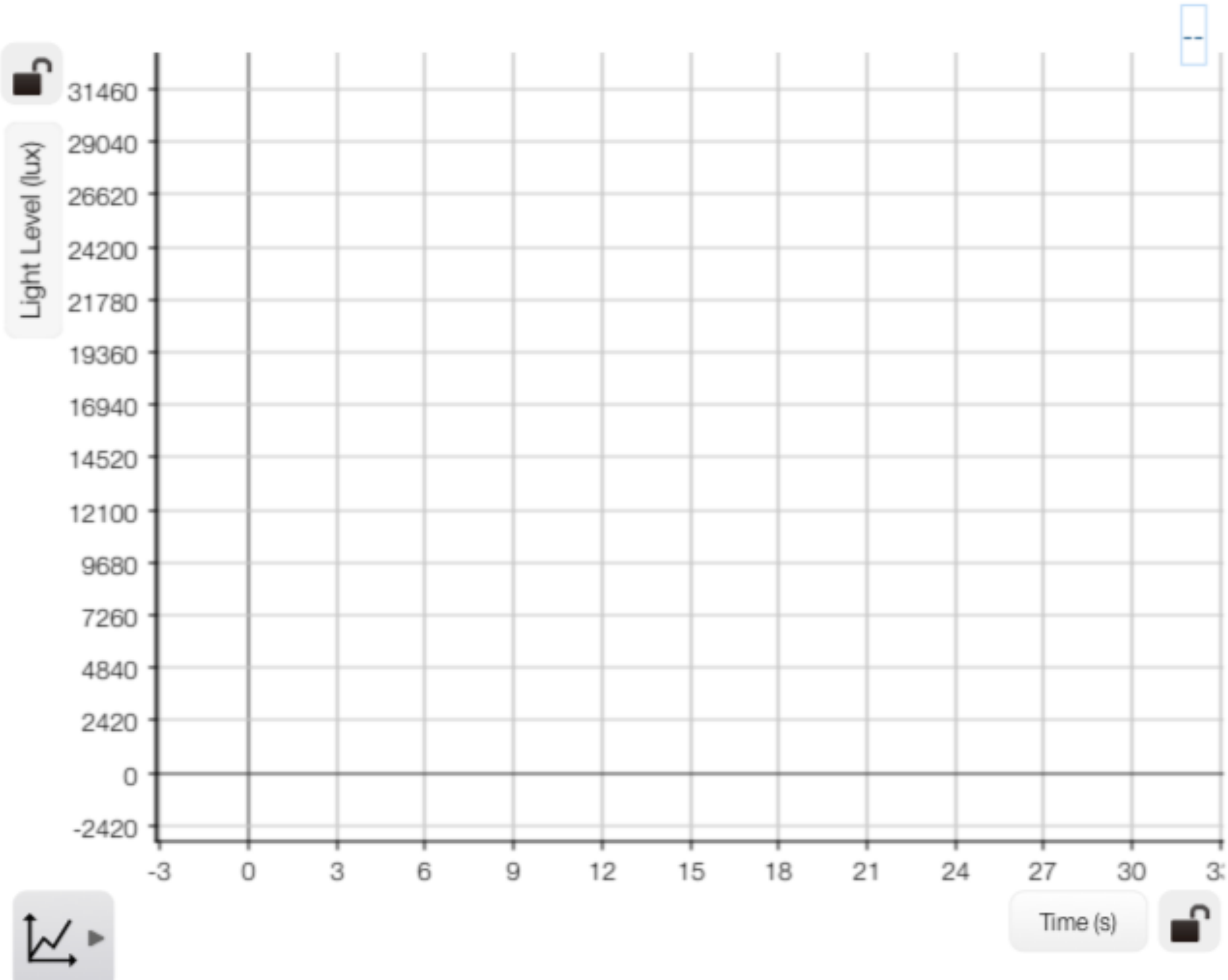
SNAPSHOT

9. Begin recording light intensity data again.
10. At 15 seconds, put the translucent material in place 5 cm in front of the sensor. Hold the material steady.
11. Data recording will stop automatically after 30 seconds.
12. Remove the translucent material.

SNAPSHOT

13. Begin recording light intensity data again.
14. At 15 seconds, put the opaque material in place 5 cm in front of the sensor. Hold the material steady.
15. Data recording will stop automatically after 30 seconds.
16. Remove the opaque material.

SNAPSHOT



17. Here is the light intensity data for your three materials.

18. Use the graphing tools to compare the changes in light intensity for the three materials.

19. What was the change in light intensity when the transparent material was placed 5 cm in front of the sensor? The translucent material? The opaque material?

20. How did the changes in light intensity compare to your predictions?

SNAPSHOT

The change in light intensity for the transparent material was . . . lux.

The change in light intensity for the translucent material was . . . lux.

The change in light intensity for the opaque material was . . . lux.

Compared to my predictions . . .

Investigation – Part 2

Most light sources, such as the Sun, emit unpolarized light waves. These waves vibrate in all directions – horizontally, vertically, and anywhere in between. Polarized lenses block out the horizontal light waves to reduce glare. These lenses only let vertical light waves through. Now you will measure the intensity of light shining through two pairs of polarized sunglasses. First you will measure the light with the lenses lined up in the same direction. Then you will measure the light with the lenses layered at right angles.

Investigation – Part 2

How do you think the amount of light reaching the sensor with the sunglasses lined up in the same direction will compare to the amount reaching the sensor with the sunglasses at right angles to each other?

SNAPSHOT

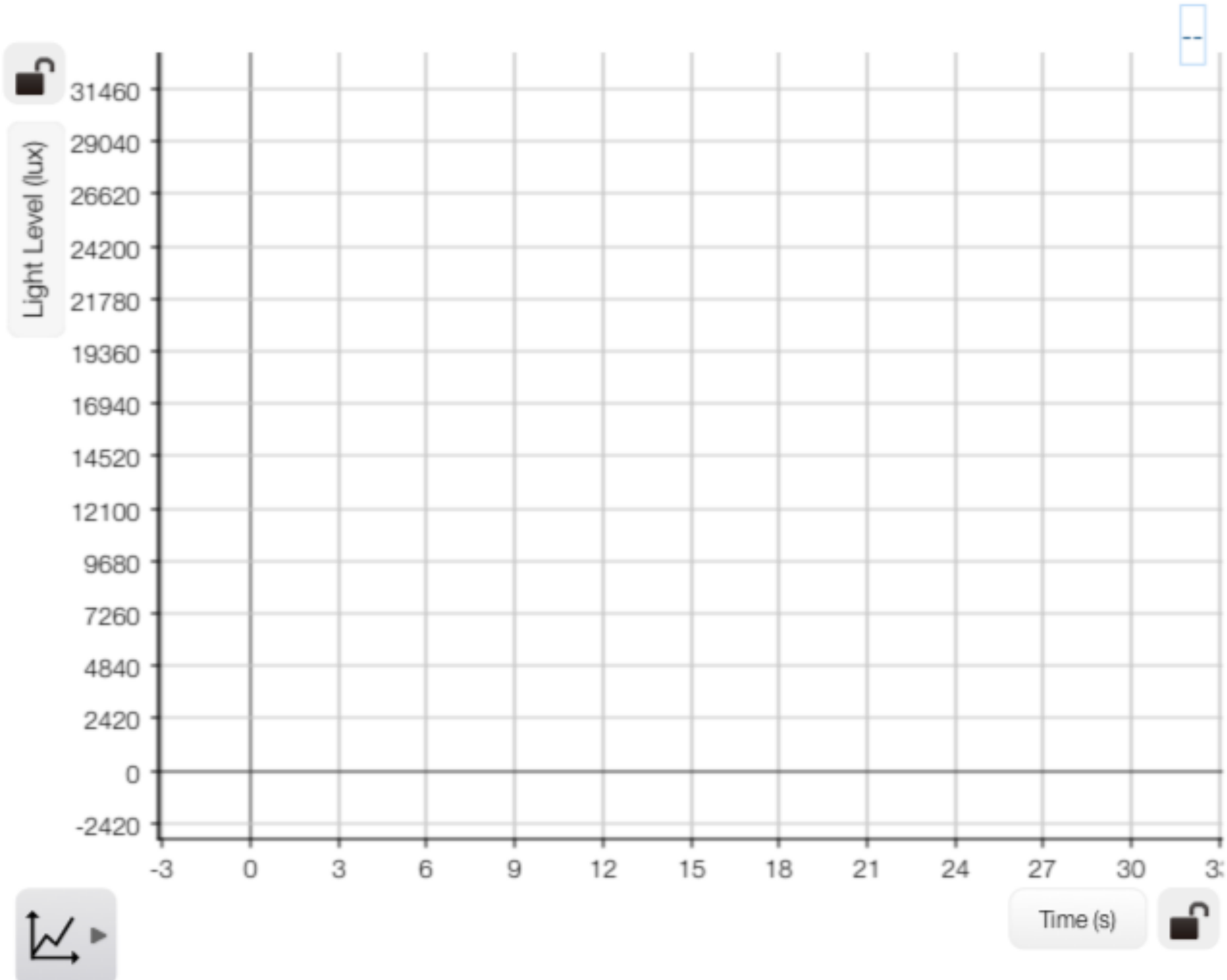
With the glasses lined up in the same direction, I predict . . . compared to when they are at right angles.

1. Begin recording light intensity data.
2. Hold both pairs of sunglasses together in the same orientation.
3. At 15 seconds, put the layered lenses 5 cm in front of the sensor. Hold the sunglasses steady.
4. Data recording will stop automatically after 30 seconds. Remove the sunglasses.

SNAPSHOT

5. Begin recording light intensity data again.
6. Hold the two pairs of sunglasses at right angles to each other with one lens in front of the other.
7. At 15 seconds, put the layered lenses 5 cm in front of the sensor. Hold them steady.
8. Data recording will stop automatically after 30 seconds.

SNAPSHOT



9. Here is the light intensity data for both trials with your sunglasses.

10. Use the graphing tools to compare the change in light intensity for the two trials.

SNAPSHOT

11. Was there a difference in the intensity of light depending on how the pairs of sunglasses were oriented to each other? If so, describe the difference and suggest possible reasons for it.

12. How did the results compare to your prediction?

SNAPSHOT

There was/was not a difference in the light intensity depending on the orientation . . . because . . .

Compared to my prediction . . .

Interpretation

1. **How do you think the temperatures of the transparent, translucent, and opaque materials changed when you shined the light on them? Which one do you think experienced the greatest temperature change? Why?**

SNAPSHOT

The temperatures of the materials . . .

2. A material that is transparent . . .

a) absorbs light.
b) bounces light back to its source.
c) lets light pass through.
d) is easily breakable.

3. To darken your classroom to show a video, you should cover the windows with . . .

a) an opaque material.
b) a translucent material.
c) one layer of polarized plastic.
d) thicker glass.

SNAPSHOT

Write the letter of your answer:

Explain why you chose this answer.

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Explain why you chose this answer.

Interpretation

4. **How could two pieces of polarized material, like the kind used to make sunglasses, be used to vary the amount of light that passes through a window into a room?**

SNAPSHOT

Two pieces of polarized material could . . .