



IMPORTANT:

Read all instructions before proceeding

FUN WITH LIGHTS

OBJECTIVE: To introduce students to different aspects of light

GRADE LEVEL: 5

OHIO STANDARDS:

Grade 5 Physical Science: Light, Sound and Motion

Light and sound are forms of energy that behave in predictable ways

TIME: 45 minutes

VOCABULARY: Light, energy, spectrum, reflection, refraction, transparent, coherent

MATERIALS: (per group of 3-4 students)

BAGGIE FILLED WITH

- * Pen light or flashlight
- * Rainbow glasses
- * Red and Purple cellophane
- * Slinky
- * Coin glued to bottom of a cup
- * Little mirrors (3)
- * Post its
- * Marker
- * CD
- * Laser light
- * Pencil

ALSO HAVE ON TABLE A SEE THROUGH CUP OF WATER

In addition, laser light, CD, Large mirrors, and mist bottle

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PROCEDURE:

1. Ask the students: What is light and what is it made of?

A. Explain that light is a form of energy we can see.

B. Also, light has the properties of waves and particles.

*Using a flashlight, do a demonstration of shadows. Show how the shadows get bigger and smaller depending on where the light is.

*Next, let the students have the slinkies. Explain that light travels in waves. Ask the students if they know what ROY G BIV stands for. Have a student help you with the large slinky. Explain that wavelengths have different frequencies—the number of waves that pass a point in a given period of time. Next, show them how different colors have different wavelengths. Red waves are wide and not as intense. Demonstrate that with the slinky. As you go down the spectrum to violet, the wavelengths get closer together. Have the students use their slinkies with a partner to demonstrate this.

*After the slinkies are put away, have the students take out the see through red and purple pieces. Explain again how the waves are different. Because the wavelengths differ, the red bends light less than the purple. If you hold the red piece of to your eye, and then the purple, you should see that things appear a little more clearly with the purple.

C. Different objects allow light to pass through them differently

*Transparent—Allowing light to pass through so that objects behind can be distinctly seen

*Opaque—Color that we see because that is the one that bounces back

*Translucent—Permitting light to pass through but diffusing it so that persons, objects, etc., on the opposite side are not clearly visible. It scatters the light

2. Discuss Refraction. Refraction is the bending of light due to different mediums.

A. With a cup of water in the front of the room, show the students how one eye appears in a different position than the other. Let the students use their cup with water and a pencil in it. Have the students look at how the pencil looks bent. This is because the light that shows us the pencil is bent when it passes from the air through the glass through the water. As light passes through the three different materials, the air, the plastic, and the water, it is bent slightly as it is reflected back to your eye. Light does bend.

B. Rainbow glasses—Explain that white light is made up of a mixture of all colors of light. If they put the rainbow glasses on, it will show how they refract the light, like a prism, and create a rainbow. Discuss ROY G BIV again.

C. Coin in a Cup—Walk back just till you don't see the coin. One student will fill up the cup until their partner can see the coin "magically" rise so they can see it. This is just how a pool has objects in it that seem closer than what they really are.

3. Discuss Reflection. Reflection is the change in direction of a wave front at an interface between two different media so that the wave front returns into the medium from which it originated. The angle at which the wave is incident on the surface equals the angle at which it is reflected.

A. Have the students use their light and mirrors. They should try to get all three mirrors to reflect the light around the room.

B. Post It—Have one person designated to not look at the post it that the other members design. Put the post it on their back and ask the other members to hold the mirrors at different angles until that person can tell what the post-it picture is.

C. If time, do the same with an object on a table and a student sitting under the table

4. Diffraction—Diffraction refers to various phenomena which occur when a wave encounters an obstacle or a slit.

A. Shine a light through the hole in the CD. The light waves enter obstacles and they bend.

5. Now, ask the students what they know about laser lights? How do they differ from white light?

The laser light stays in one stream. LASER stands for Light Amplification by Stimulated Emission of Radiation. Laser light is COHERENT. Coherent means they are all the same wavelength. White light is INCOHERENT. Incoherent white light is light with a mixture of wavelengths. Remind students again of ROY G BIV and the color we see is the color that is reflected back while the other colors are absorbed.

*Pick a student to shine the laser at a wall. Have another student use the spray bottle and spray the path of the laser light.

*Have 4 students hold the large mirrors at different places throughout the room. Shine the laser on one of the mirrors. Have them reflect the light from that one to another. See how many mirrors and people you can reflect the laser off of

*Now, show the Fireball Laser to see how sound and laser lights are similar. Discuss that lasers are used for many things such as entertainment, shopping, toys, surgery, etc.

DISCUSSION:

1. What is the difference between laser light and regular light? Coherent vs. Incoherent.
2. What is refraction? What is reflection? Refraction is Refraction is the change in direction of a wave due to a change in its transmission medium. Reflection is the change in direction of a wave front at an interface between two different media so that the wave front returns into the medium from which it originated