OLD SALEM EXPLORATORIUM

LESSON PLAN

Subject: Physical Science **Lesson:** Harnessing Light Waves in the 18th Century

Standard Addressed: Illustrate the wave interactions of reflection, refraction, diffraction, and interference. (NC.PSc.3.2.4)

Objective:

- Students will be able to explore and describe the ways light waves interact with various materials.

Materials Needed:

- Device for showing *Harnessing Light Waves in the 18th Century* video
- "Light up the 18th Cen" activity

Outline:

- Prior to this lesson, students should know light moves in transverse waves and transmits energy. Students should also understand the relationships among velocity, frequency, and wavelength.
- Show the video.
- Discuss the activity prompt.
- Students finish the activity independently or with a partner.

Take It Further: Students explore their own homes or outdoor environments to find examples of places where light waves are interacting with materials in interesting ways. Students photo or describe the way light is behaving, labeling each picture or description with correct term for the interaction (reflection, refraction, diffraction, interference).

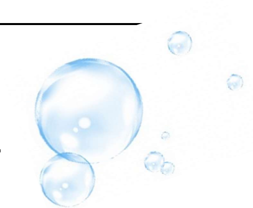
Cross-Curriculum Connection: Students research "Camera Obscura" and make their own using recycled materials. After constructing their cameras, students explain the relationship between the radius for the pinhole and the distance to the pinhole and to the film.

OLD SALEM EXPLORATORIUM

LIGHT UP THE 18th CENTURY

Physical Science

Student Name: ____ Date: _____________



PART 1: INTERACTIONS OF LIGHT

The video showed examples of light interacting with materials in interesting ways.

1. *Describe examples of light waves being reflected.*

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2. *Describe examples of light waves being refracted.*

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3. *Describe examples of light waves interacting with one another through interference or diffraction.*

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PART 2: COLOR AND WAVELENGTH

1. When light is refracted by a prism, we perceive different wavelengths of the light as color. *Using what you know about wavelength and frequency, explain why violet light has more energy than red?*

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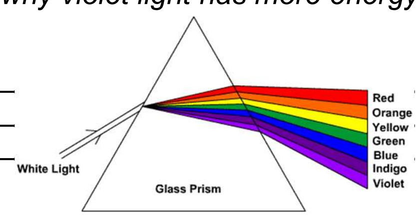

2. White light is the sum of all colors of light.
Knowing this, explain why light-colored clothing helps us feel cooler than dark-colored clothing.

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OLD SALEM EXPLORATORIUM

LIGHT UP THE 18th Century

Physical Science

Answer Key

PART 1: INTERACTIONS OF LIGHT

The video showed examples of light interacting with materials in interesting ways.

1. *Describe examples of light waves being* *<u>reflected</u>.*
Possible answers include:
descriptions of places where wavelengths of various colors are reflected and perceived; description of light waves reflecting (bouncing) off the tin sconce; description of light waves reflecting (bouncing) off ceiling or walls

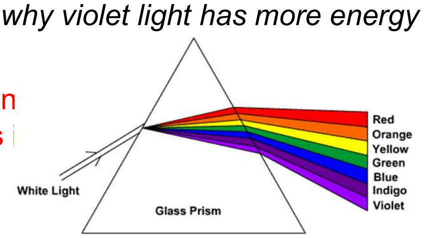
2. *Describe examples of light waves being* *<u>refracted</u>.* Possible answers include:
description of light waves refracting (bending) when looking at the flower stem in a jar of water; description of light waves refracting (bending) when traveling through the oiled paper of the illumination; description of light waves refracting (bending) when entering the globes of the shoemaker's lamp

3. *Describe examples of light waves interacting with one another through* *<u>interference</u>* *or* *<u>diffraction</u>.*
Possible answers include:
description of light waves interfering as they strike bubbles of soap, causing colors; description of light waves widening (diffracting) as the enter the openings of the shutters or as they leave the openings in the tin lantern

PART 2: COLOR AND WAVELENGTH

1. When light is refracted by a prism, we perceive different wavelengths of the light as color.
Using what you know about wavelength and frequency, explain why violet light has more energy than red?

Violet light has a wavelength of 400 nm, while red light's wavelen
the wavelength, all light travels at a constant speed. This results i
frequency than does red light; thus, more energy.



2. White light is the sum of all colors of light.
Knowing this, explain why light-colored clothing helps us feel cooler than dark-colored clothing.
Light-colored clothing reflects most light waves, whereas dark-colored clothing absorbs most light waves. Heat is increased in situations of greater light absorption.