Grade 7 - Quarter 3_Week 6

Name:_____Grade & Section:_____
Teacher: _____ Score:_____

Activity Sheet No. 5: Color and Intensity of Light in terms of its Waves Characteristics

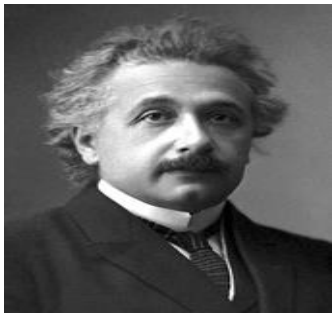
START UP

At the end of this worksheet, the learners will be able to:

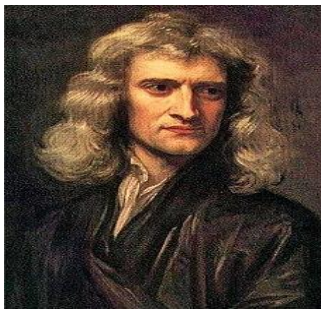
1. Describe the visible spectrum.
2. Discuss how light travels.
3. Exhibit the interaction of visible spectrum; and
4. Appreciate the use of localized material in understanding the color and intensity of light.

CAPTURE

- Light, like other waves, can be characterized in terms of speed, frequency, and wavelength. It has a shorter wavelength compared to sound and water waves.
- The speed of light depends on the medium through which it travels. Unlike mechanical waves, light does not need a medium to propagate. It can travel through vacuum. Electromagnetic waves, such as light, do not require a medium to propagate.
- In vacuum, the speed of light, which is almost the same as its speed in air, is a natural speed limit in the universe. Nothing can travel faster than the speed of light in vacuum. This idea came from Albert Einstein and is included in his special theory of relativity.
- Light travels at a constant speed in a uniform medium and takes a straight path. However, when light hits the boundary between two media at some angle, it changes its speed and direction.
- Isaac Newton considered light as a form of particle that is emitted by a source. With this idea, he was able to show that light can be reflected. This is known as the corpuscular theory of light. It was not until Robert Hooke proposed that light is a wave. This brought the wave theory of light. The experiments done by Augustin-Jean Fresnel and Thomas Young in the early 1800s showed that light can be explained by the wave theory.
- James Clerk Maxwell in the late 1800s identified light as an electromagnetic wave.



Albert Einstein



Isaac Newton

Robert Hooke

Essential Ideas

1. Light travels in a straight line.
2. Colors are light waves of different wavelengths.
3. Dispersion is the separation of white light into its component colors
4. White light is made of a band of seven colors – red, orange, yellow, green, blue, indigo, violet (ROYGBIV)- called the visible spectrum.
5. Illumination is proportional to the distance of an object from the light source.
6. Electromagnetic radiation also known as electromagnetic wave (EM wave) is arranged in an electromagnetic spectrum according to frequency or wavelength.

INTEGRATE

Learning Task No. 1: Colors of the Light Spectrum

Materials

- Table 9.1
- Flashlight
- Blue filter
- Rubber band
- Small colored objects (white, red, and blue)
- Cardboard shoebox with sealed lid, black inside
- Ruler
- Scissors

Additional small objects of various colors (optional)

Procedure

1. Make a “black box” for viewing your objects.
   a. Cut a small viewing hole (3 cm diameter) on one side of the shoebox.
   b. Cut an additional opening onto one side of the cardboard box perpendicular to the viewing hole that is the diameter of the flashlight (Fig. 9.6).

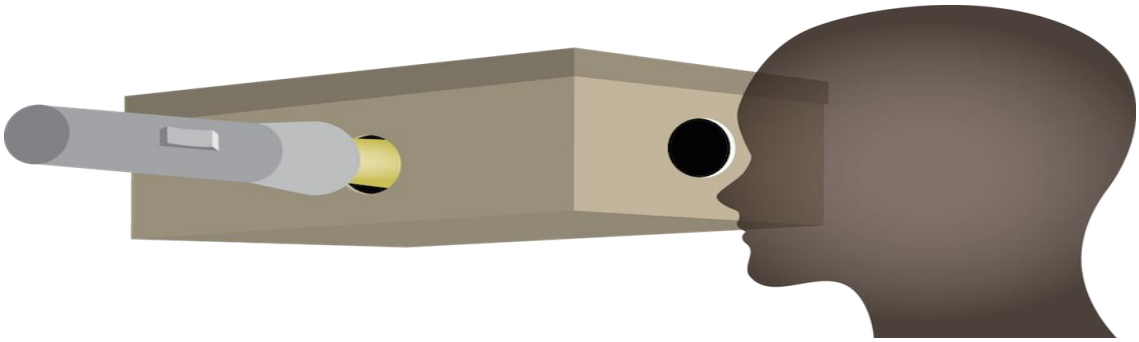


Fig. 9.6. A "black box" is used to visualize objects of different colors.
Image by Byron Inouye

2. Predict what color each of the objects will appear when you shine the flashlight on them in the black box. Record your predictions and the reasoning for your predictions in Table 9.1.
3. Predict what color each of the objects will appear when you shine blue light on them in the black box. Record your predictions and the reasoning for your predictions in Table 9.1.
4. Shine the flashlight into the box.
5. Place the white object into the box and close the lid.
6. Use the viewing hole to observe the color of the object in the box. Record your observations in Table 9.1.
7. Repeat steps 4 through 6 for the red and blue objects.
8. Place the blue filter over the flashlight. Hold the filter onto the flashlight with a rubber band.
9. Repeat steps 4 through 6 for the red, white, and blue objects using the flashlight with the blue filter.
10. (Optional) Look at additional small objects that are different colors under white and blue light. Make sure to record your color predictions and observations.

Table 9.1. Predicted and observed color of objects viewed in the black box

Light color	Object Color	Color Prediction (and reasoning for prediction)	Color Observation
White (no filter)	**White**		
	Red		
	Blue		
Blue (with filter)	**White**		
	Red		
	Blue		

Activity Questions:

1. Were all the objects the same color with and without the blue filter? If they appeared different, hypothesize why?

   _____
   _____
   _____

2. Think about viewing objects in the ocean. What do you think the flashlight represents in this model? What does the blue filter represent?

   _____
   _____
   _____

3. What are some of the limitations of this model? How do you think you can improve it?

   _____
   _____
   _____

4. Many fish, especially those that are nocturnal or live-in deeper water, are red. What advantages do you think being red gives these fish in the deep ocean?

   _____
   _____
   _____

ENRICH

Performance Task No. 3

Colored Lights

Objectives: Investigate the effects of adding colored lights.

Materials: Three flashlights, cellophane (red, green and blue) white cardboard

Procedure:

1. Cover the three flashlight with cellophane (I,e., one color of cellophane for one flashlight)
2. Flash the red light and the blue light on the white cardboard. Make it overlap between the two lights. Observe the intersection of the lights.

3. Repeat step 2 using red and green lights. Observe the intersection.
4. Repeat step 2 using green and blue lights. Observe the intersection.
5. Using the three lights, flash them on the board and have them overlap. Observe their intersection.
6. Make a creative presentation of the activity you have done through pictures and narrative report about it.

Rubrics for Presentation of Lights

Criteria	**4**	**3**	**2**	**1**
Content	Shows better understanding of the concept	Shows good understanding of the concept	Shows fair understanding of the concept	Shows poor understanding of the concept
Knowledge gained	Students can accurately answer all questions related to the activity.	Students can accurately answer most questions related to the activity.	Students can accurately answer about 75% of questions related to the activity.	Students appear to have insufficient knowledge about the activity.
Presentation	Presentation is orderly and visually appealing.	Presentation is orderly and effective.	Presentation is somewhat orderly and effective.	Presentation is not orderly.
Organization	Pictures have labels and properly arranged.	Pictures have labels and are not properly arranged.	Pictures do not have labels but properly arranged.	Pictures do not have labels and are not properly arranged.

Highest Possible Points: 16
Lowest Possible Points: 4

References:

Lilia M. Rabago, et.al. *Science and Technology*. Quezon City: Vibal Publishing House Inc. 2014

Ian Mark F. Allas, Ph.D. et.al. *Discover Science*. Makati City: Diwa Learning System Inc... 2013

Colors of Light Spectrum." Accessed January 30, 2021. *https://manoa.hawaii.edu/exploringourfluidearth/physical/ocean-depths/light- ocean/activity-colors-light-spectrum*