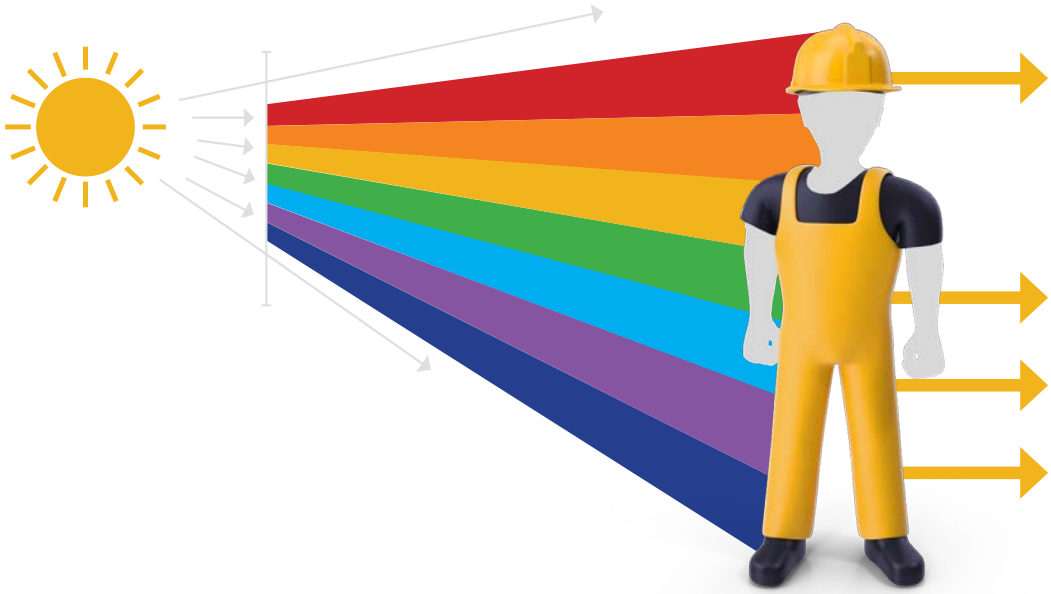
DIY Yellow For SAFETY

THE SCIENCE OF COLOR

The U.S. Department of Energy Office of Legacy Management is committed to safety. Colors not only help us find our favorite shirt hanging in a closet or juicy bites of foods on our dinner plate, but colors keep us safe from dangerous objects, help identify workers in a work zone, and communicate important information.

HOW OUR EYES PERCEIVE COLOR?

When you see a red apple or a yellow shirt, the color you see is being reflected back, while all other colors are being absorbed. Natural light — also known as “white light” — includes all the colors of the rainbow: red, orange, yellow, green, blue, indigo, and violet.



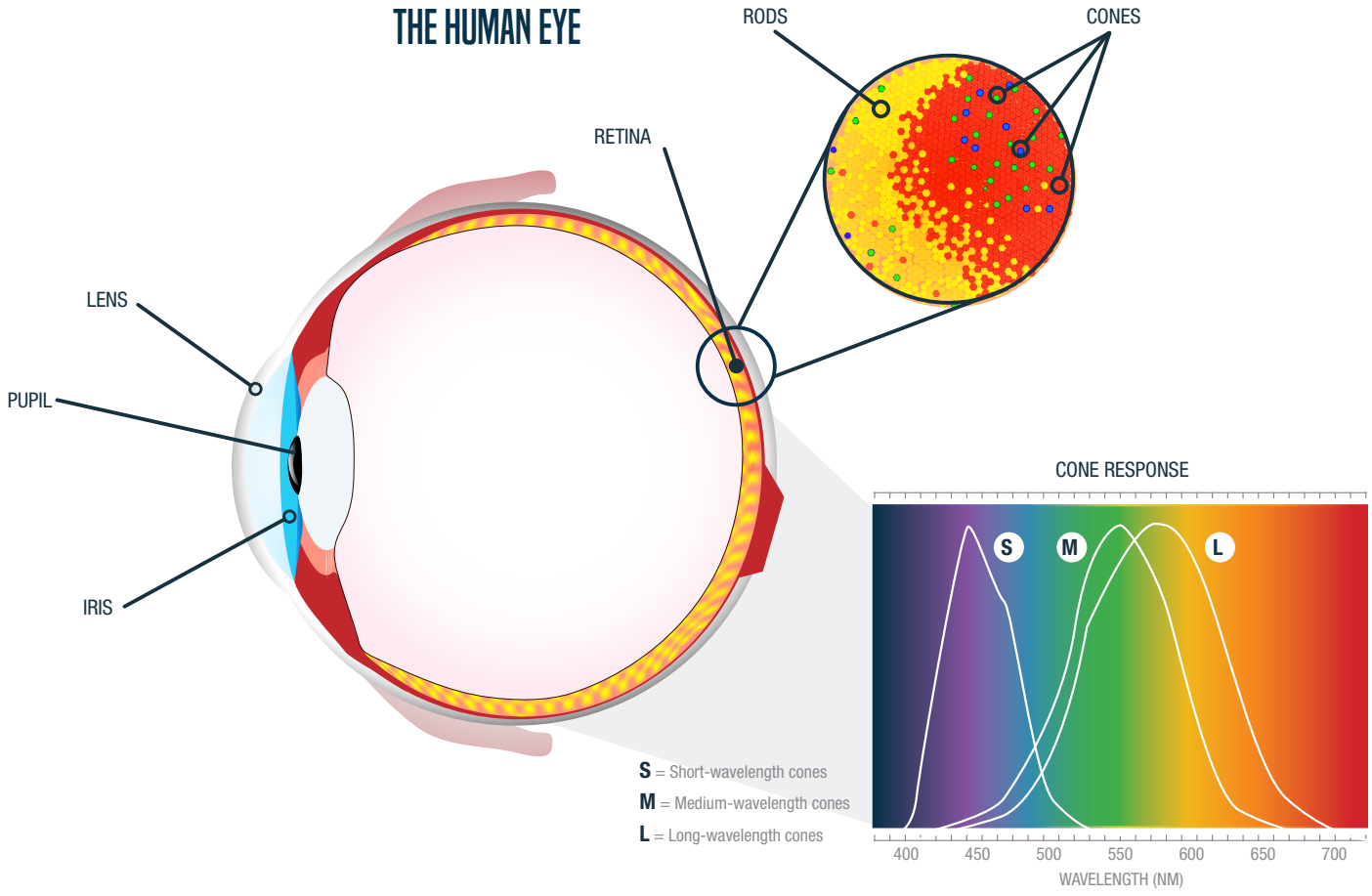
Age Level: 6-11 (elementary).
Duration: 30 minutes.
Key Definitions: Photoreceptors, rods, cones, retina, refraction.
Objective: To learn how our eyes perceive color and why the color yellow keeps us safe.

WHY IS YELLOW USED FOR SAFETY?

Our eyes are able to see colors because of **photoreceptors**, which are special sense organs located in the **retina**, the light-sensitive area at the back of the eye.

These photoreceptors are either **rods** or **cones.** Rods are generally concentrated around the exterior of the retina. Rods are responsible for dim light and respond well to movement, but not color. Generally located in the center of the retina, cones are responsible for processing brighter light and perceiving colors reflected by objects. There are also three types of cones, each specializing in perceiving red, green, and blue colors.

Yellow invokes a response by two of the three cones. When you see yellow, more of your eye is able to see and transmit the image to your brain — therefore, making you more likely to see and notice the object versus red or blue. Even some individuals who experience colorblindness can identify yellow. While varying degrees and different types of colorblindness exist, yellow is easier to perceive in comparison to other colors, helping more people stay safe.



COMPARE DIFFERENT COLORS OF SAFETY. WHICH WORKER DO YOU SEE THE BEST?

WHAT HAPPENS WHEN YOU...

1. **Move this image into bright and dim lighting. What do you notice?**
2. **Look away so you can only see the workers in your peripheral vision. What color stands out the most?**

MAKE YOUR OWN RAINBOW!

Another way to learn about light is through rainbows. We've already learned that natural light contains all the colors of a rainbow. One way to see all of these colors is **refraction**, the process of light passing through an object causing colors to separate at different speeds. Explore refraction by shining natural light through these objects:

PRISM

1. CUT A NARROW SLIT IN A WHITE PIECE OF CARDBOARD.
2. SHINE SUNLIGHT THROUGH THE SLIT ONTO A BLACK PIECE OF CARDBOARD, CREATING A THIN BEAM OF LIGHT.
3. PLACE A PRISM OVER THE LIGHT.
4. ROTATE THE PRISM UNTIL YOU SEE THE FULL SPECTRUM OF COLORS.

GLASS OF WATER

1. CUT A SMALL SLIT IN THE MIDDLE OF A PIECE OF PAPER.
2. TAPE THE PAPER ONTO THE SIDE OF A SMOOTH, CLEAR GLASS OF WATER, SO THE SUNSHINE CAN PASS THROUGH THE CUT AND APPEAR ON THE SURFACE OF THE WATER.
3. PLACE THE GLASS ON TOP OF A WHITE SURFACE (E.G., WHITE TILE, PAPER).
4. A SMALL RAINBOW SHOULD APPEAR BELOW THE GLASS.

HOSE

1. GRAB A HOSE AND TURN ON THE WATER.
2. STAND IN A SPOT IN YOUR YARD WITH THE SUN BEHIND YOU.
3. PLACE YOUR THUMB OVER THE HOSE NOZZLE, CREATING A MISTING SPRAY WITH THE WATER.
4. HOLDING THE HOSE IN FRONT OF YOU, WATCH FOR A RAINBOW TO APPEAR ABOVE THE WATER.

MIRROR

1. PROP UP A MIRROR INSIDE A GLASS CONTAINER (E.G., A FISHBOWL, A PITCHER).
2. FILL THE CONTAINER UNTIL THE MIRROR IS HALFWAY SUBMERGED.
3. PLACE THE CONTAINER NEAR A WINDOW WITH DIRECT SUNLIGHT.
4. REFLECT THE LIGHT OFF THE MIRROR ONTO A WHITE PIECE OF PAPER.
5. MOVE THE PIECE OF PAPER UNTIL YOU SEE THE COLORS.

An optical prism is a transparent optical element with flat, polished surfaces that refract light. The most common shape of a prism is a pyramid.