

Light Basics

❖ *What is light?*

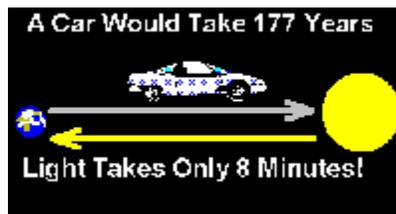
It's a kind of energy called "electromagnetic (EM) radiation" (but this kind of radiation is not harmful, except for an occasional sunburn). There are other kinds of EM radiation too (radio waves, microwaves, x-rays, etc.), but light is the part WE can see, the part that makes the rainbow.

❖ *How does light travel?*

FAST and STRAIGHT.

❖ *How FAST?*

About 186,000 miles per second [300,000 kilometers per second], so light from the sun takes about 8 minutes to go 93 million miles [149 million kilometers] to earth. Does this seem SLOW? Well, if you could DRIVE to the sun at 60 mph [100 kph], it would take you 177 years to get there! In one second, light can go around the earth 7 times!



❖ *How STRAIGHT?*

Perfectly straight, until something bends it. The straight paths of light are called LIGHT RAYS.

Why do we **CARE** about controlling light **ANYWAY?**

! Well, some important, useful, and very cool "things" depend on being able to produce, control, and/or detect light in special ways:

Your eyes

Eyeglasses and contact lenses

Lenses for TV, movie, and photographic cameras

Photocopiers and fax machines

Binoculars and telescopes

Microscopes and magnifiers

Projectors (overhead, movie, slide, TV)

CD players

Supermarket product code laser scanners

Weather and spy satellites

Medical systems (to look inside the body)

Solar energy systems

...and many more (not to mention a little thing like **PLANTS** which use light to grow and to make the oxygen we breathe - but engineers don't make plants).

<http://www.phy.ntnu.edu.tw/demolab/kidoptics/kidoptx.html>

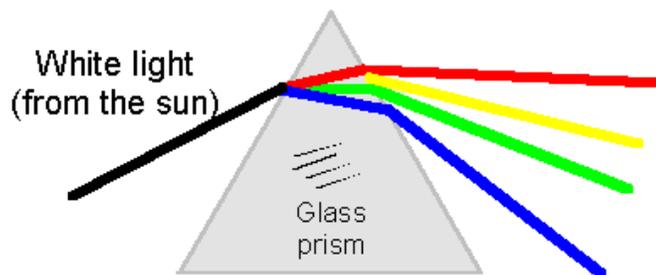
White Light and Laser Light

☒ What is "White light?"

Regular light from the sun or from a light bulb really contains all the colors of the rainbow. But you have to split it up to see this.

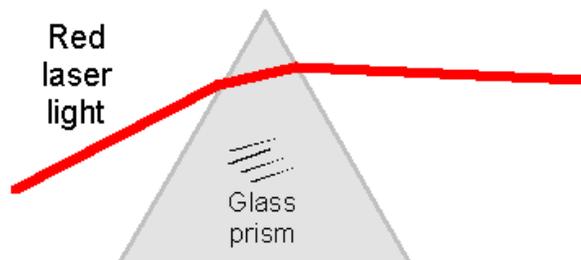
❖ Can light split???

YES! You can split up white light into its colors with a prism (raindrops act like tiny prisms when they make a rainbow in the sky, and a CD can break the light up into colors because it has fine grooves like a diffraction grating or a hologram)



❖ So what's a laser?

A laser is a special source of light of only one pure color (or WAVELENGTH). You can't break up laser light into other colors.



Make 2 different spectroscopes:

http://scitoys.com/scitoys/scitoys/light/cd_spectroscope/spectroscope.html

The Primary Colors of Light are
RED, GREEN and BLUE.

Calculator Riddles:

What is the only thing that gets larger
the more you take away?

$$25,000 - 68 - 952 - 8,956 - 11,320 =$$

(Turn it upside down to read the answer.)

It's strange. These come in many
different sizes but they are always
exactly one foot long. What are they?

$$(53 \times 40 \times 5 + 9) \times 5 = ?$$