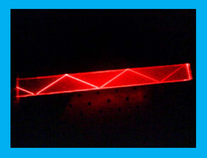
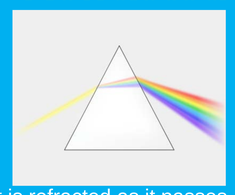
Light

light can be Reflected



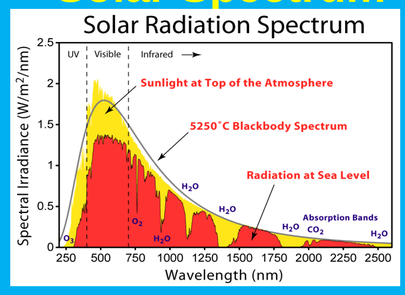
Light is reflected by mirrors or inside an optical fiber.

light can be Refracted



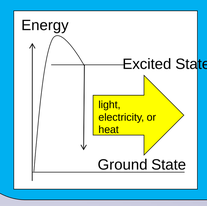
Light is refracted as it passes through a prism. Blue light bends more than red. White light spreads into a rainbow of all colors.

light can be graphed in a Solar Spectrum



As sunlight passes through the atmosphere gases absorb certain wavelengths. Much solar energy lies outside the visible part of the spectrum.

light can be Absorbed



Atoms or molecules absorb energy and reach an excited state. Then they release energy as light , electricity, or heat as they return to the ground state.

and its energy converted to Electricity

Dye sensitized solar cells and organic solar cells use chemicals to trap light.

Silicon solar cells are efficient but expensive.

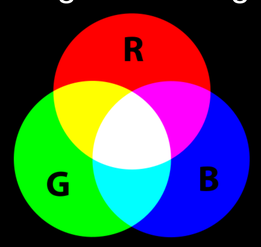
light is made of Colors

some light is invisible: Ultraviolet or Infrared

Ultraviolet light from a UV lamp, or from the sun, is powerful.

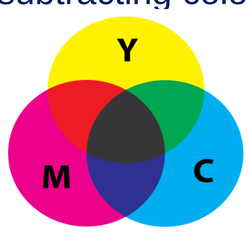
A radiant heater uses near infrared, a remote control uses far infrared radiation.

adding colored light



When red green and blue light are mixed you get white. This is how a TV makes white light.

subtracting colors



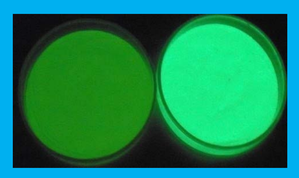
Yellow, magenta and cyan colored inks or filters remove light to make any color including black. Where there is no ink the white paper shows through.

after chemicals absorb energy they can Emit Light

We can design chemicals that absorb and emit light at exactly the wavelengths we need. The color of fireworks comes from different elements.

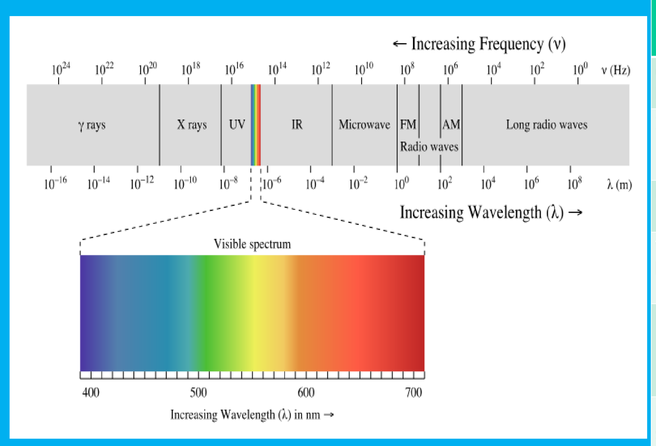
if a substance absorbs light and then emits light at a different color, that is called Luminescence

Quantum dots in solution fluoresce under UV light at different colors than they absorb. They can be combined with other materials to absorb light.



Glow in the dark paint phosphoresces for a long time after it is excited by light.

visible light is part of the Electromagnetic Spectrum



Type of EM Radiation	What it does- or is used for
Gamma Rays	Most powerful radiation, causes cancer
X rays	Passes through skin- used to photograph the insides of things
Ultraviolet	Causes sunburn – damages materials
Visible light	Colors from red to blue
Infrared	Radiant heat- used in fiber-optics for telecom, television remote control
Microwaves	Heating food , wireless telecom, cell phone
Radio Waves	Broadcast radio and TV

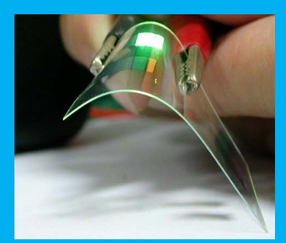
Electromagnetic radiation is described by wavelength or frequency. Certain bands have names such as visible, UV or infrared. The shorter the wavelength, the more energetic the photons.

if a chemical reaction occurs: Chemiluminescence

In a light stick, two chemicals react releasing energy in the form of light.

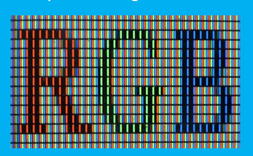
if electricity excites the material: Electroluminescence

Light emitting diodes come in different colors.



An organic light emitting diode (OLED) uses organic chemicals.

White LEDs are used for energy efficient lighting.



A liquid crystal display has red, green and blue filters over a backlight.

if a material is very hot and emits light, that is called Incandescence

The color of incandescent light varies according to the temperature. Red is cool, white is hot.

Light meets Chemistry

Researchers at the Center for Materials and Devices for Information Technology Research are designing chemicals that can control light. www.stc-mditr.org

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