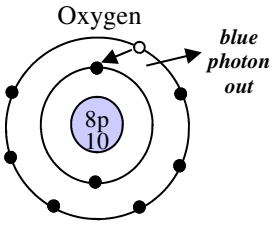
Name: _____

Period: _____

Color

Light Comes From the Atom

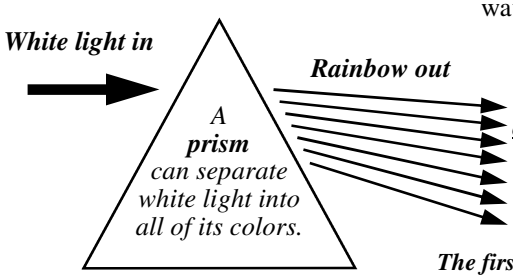
Photons (light) come from electrons falling from high electron orbits to low orbits.



When the electron falls back, a photon is given off: light!

Different Colors

Different colors come from white (sun) light. Each of these colors has its own frequency, wavelength, and energy.



Color	Frequency	Wavelength	
Red	462 THz	650 nm	Low E
Orange	500 THz	600 nm	
Yellow	517 THz	580 nm	
Green	566 THz	530 nm	
Blue	638 THz	470 nm	
Indigo	675 THz	440 nm	
Violet	750 THz	415 nm	High E

The first letters spell: ROY – G – BIV

Lights—Additive Color
RGB Model

Lights add color to a black background. The three primary lights colors are Red, Green, and Blue (RGB)

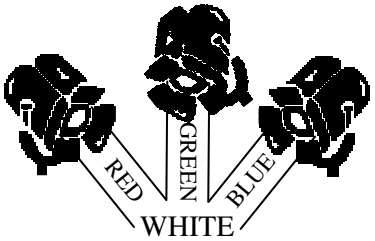
Before you turn on any lights, a room is black. By adding lights you add color. The three primary light colors are red, green, and blue. By adding different amounts of each color we can make any color we want. This method of additive color is known as RGB.

Adding Light Colors:

Red and Blue make Magenta (purple).

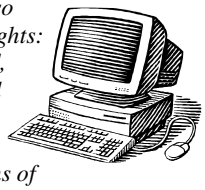
Red and Green make Yellow.

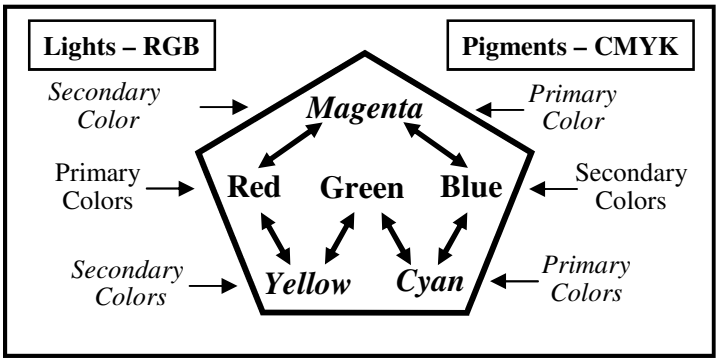
Green and Blue make Cyan (sea green).



Red, green, and blue together make white.

Computers and TVs are black when off, so they use lights: RGB. Red, green, and blue lights make all the millions of colors on your screen.





Using the Color Chart:

Lights (RGB): Follow the arrows from the lights to the color you are making. Red and Blue make *Magenta*.

Pigments (CMYK): Follow the arrows from the pigments to the color you are making. *Yellow* and *Cyan* make Green.

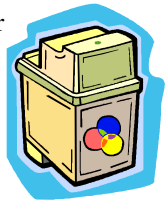
Pigments—Subtractive Color
CMYK Model

Pigments reflect color and have a white background. The three primary colors of pigments are Cyan, Magenta, and Yellow.

Pigments are ***dyes*** that color paints, inks, and even food. Pigments produce color by ***reflection***. What you see is what is reflected.

You can tell that ink uses CMYK, because the paper is white.

CMYK—As you know from your color printer at home, color pigments are very expensive. To make black by mixing three pigments (CMY) doesn't make sense. So printers add black (K) to make four colors: CMYK. (***K stands for black*** because B stands for blue.)

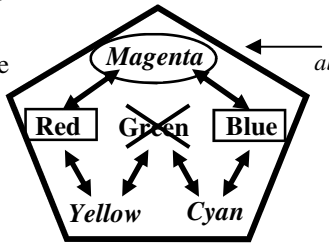


BLACK Pigments that absorb all colors look black.

WHITE Pigments that reflect all colors look white.

We see an object's color by *reflection*. A banana reflects yellow light. So it absorbs all other colors.

CMYK colors are made by *reflection*. Magenta reflects red and blue, so magenta *absorbs* green.



When you buy paint, pigments (dyes) are mixed into white paint. Yet because the store has more room than your printer, they can use more than just three dyes.

Green light is reflected off a leaf, so the leaf absorbs red and blue. To make green with CMYK you would use yellow (absorbs blue) and cyan (absorbs red).

Name: _____

Period: _____

1. Pigment	A. A color model that uses pigments on a white background.
2. Magenta	B. A color made from red and green.
3. Cyan	C. Dyes and paints are a type of this.
4. Yellow	D. A color made from blue and red.
5. RGB	E. A color model that uses lights on a black background.
6. CMYK	F. A color made from green and blue.

Draw the color chart here:

Decide if the following use RGB or CMYK and why.

Television: _____Why? _____

Paint on a wall:_____Why? _____

Movie Theater:_____ Why? _____

Color Printer: _____ Why? _____

Make the following additive colors using RGB.

Cyan _____ White _____ Yellow _____

Red _____ Magenta _____ Black _____

Make the following subtractive colors using CMYK.

Blue _____ White _____ Green _____

Red _____ Magenta _____ Black _____

What color does Magenta absorb?

What color does Cyan absorb?

What color does Yellow absorb?

What would happen if you used green light to grow plants and why?

What color is a stop sign?

Does a stop sign use additive or subtractive color?

What two colors would a printer use to make this color?

If a wave's third harmonic has a frequency of 24 Hz, what is its natural (fundamental) frequency and what is the frequency of H_6?

Find the frequency of a wave with a period of 0.5 seconds.

A wave has these characteristics: 40 Hz and 6 m. Find speed.

You hear a thunder 4 seconds after you see the lightening. How far away is the storm?

You are in a canyon and yell across. It takes 4 seconds for the echo to come back to you. How wide is the canyon?

Find its period: _____

What harmonic is this? _____

Mark the nodes and anti-nodes.

Mark one wavelength on the harmonic.

Can humans hear this frequency?_____

Find the fundamental frequency:

_____

Fifth harmonic frequency:

_____

300 Hz