



Light



Light:

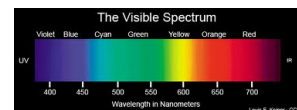
- A type of energy that travels as a wave

F. Y. I.

- *Light is different from other kinds of waves. Other kinds of waves, such as sound waves must travel through matter. Light waves do not need to travel through matter. However, light waves can go through matter, such as air, water, and glass.*

Rainbow colors:

- ROY G BIV
 - > Red (longest wavelength)
 - > Orange
 - > Yellow
 - > Green
 - > Blue
 - > Indigo
 - > Violet (shortest wavelength)



If you put this red apple on a blue piece of paper, where it would fit in the visible spectrum.

1. Which color in the rainbow has the longest wavelength?
2. Which color in the rainbow has the shortest wavelength?
3. Which color in the rainbow carries the greatest amount of energy?
4. Which color in the rainbow carries the least amount of energy?



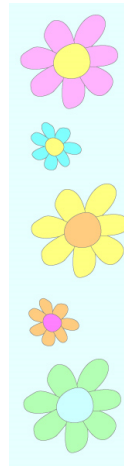
Spectroscope



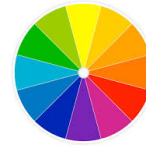
What colors of the visible spectrum can you see emitted when looking through the spectroscope at different gas tubes?

White Light

- You get white light by combining **all** colors of light!



Color Wheel



What do you see when I spin the color wheel?

You can get light that **appears** white by adding just three colors of light together: **red**, **blue**, and **green**... “The Primary Colors of Light”



Red, Blue, and Green Flashlights



What do you see when the three flashlights are pointed on the same spot?

Combining colors of light is called **color addition**.

When two primary colors of light are added together, you see **secondary colors** of light.

Blue + Green = =

Cyan

Blue + Red =

Magenta

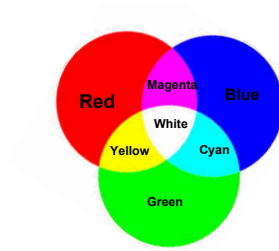
Red + Green =

Yellow



Red, Blue and Green Circles

What do you see when red, blue, and green are combined?



Color and label the Venn Diagram.

Reflection:

Happens when light waves bounce off an object (such as a mirror or glass)



Hold a mirror in one hand and try to write your name on a piece of paper in the same way that it normally would appear on an assignment that you would hand in.



1. Was it as easy to write your name while looking into the mirror as it normally is?
2. How is it possible to see your hand's image in the mirror? (How does the light interact with the mirror?)
3. This is an example of absorption, diffraction, reflection, or refraction?



Look at the two shirts.

1. If you are biking outside on a hot summer day in Shoreview, MN, which shirt would you probably wear? Why?
2. Between the white and the black shirt, which one would be absorbing more light?
3. Which of these two shirts absorbs all wavelengths of light?
4. Which of these two shirts reflects all wavelengths of light?
5. Describe a situation where you would choose wearing the black shirt over the white shirt.
6. (Describe the climate conditions.)

What's going on?

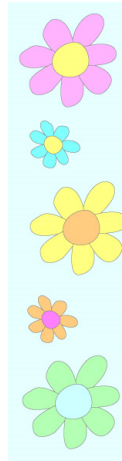
- *Imagine you and a friend are at a lake. Your friend wades into the water. You look at her, and her feet appear to have separated from her legs!!! You know her feet did not fall off. How do you explain this? It has to do with refraction!*

Refraction:

- **The bending of a wave as it passes at an angle from one substance, or type of matter, to another**

Answer:

- ***In the case of your friend and her “detached” feet, the light wave was bent as it passed from the air (a gas) to the water (a liquid). Whew!!!***



Put the colored pencil into the plastic cup filled half full with water tilted to the side (not towards or away from your face).

1. What do you notice about the pencil?
2. This is an example of absorption, diffraction, reflection, or refraction?
3. The wave _____ (bends or straightens out) as it passes from the air into the water.
4. Name another object that would have the same affect as a pencil.



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- ***White light is composed of all the wavelengths of visible light. Humans see the different wavelengths as different colors. White light can be separated into different colors during refraction. Color separation by refraction is responsible for the formation of rainbows. Rainbows are created when sunlight is refracted by water droplets!***

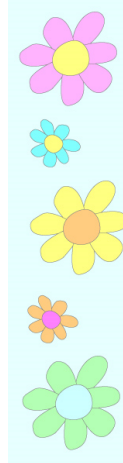
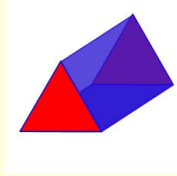


Please **DO NOT** shake the bottle of Windex! Shine a flashlight on the bubbles. Take a close look at the bubbles.

1. What do you notice about the colors that appear on the surface of the bubbles?
2. This is an example of absorption, diffraction, reflection, or refraction.
3. Where else in everyday life would you see this same type of phenomenon?



Prisms produce rainbows through refraction. Light passing through a prism is refracted twice – once when it enters and once when it leaves.



Using a flashlight, experiment with the prism and try to make a rainbow.

1. Was it easier to make a rainbow with the flashlight straight on the prism or at an angle?
2. This is an example of absorption, diffraction, reflection, or refraction?



Diffraction:

- The bending of waves around barriers or through openings

F. Y. I.

- *The wavelength of light is very small (100 times thinner than a human hair).*
- *Since light waves are so thin, they cannot diffract very much around large obstacles. Thus, you cannot see around corners.*
- *You can observe light waves diffracting if you examine the edges of a shadow. Diffraction causes the edges of a shadow to be blurry.*

Diffraction Video Clip

<https://www.youtube.com/watch?v=kH57Di7Sj0c>

Transparent:

- Matter through which light is easily transmitted
- Examples: air, glass, plastic wrap, and water

Translucent:

- Matter that transmits light but also scatters the light as it passes through the matter
- Example: frosted glass

Opaque:

- Matter that does not transmit any light
- Example: metal, wood, and aluminum foil
- Material that absorbs light is opaque



Examine the black block, the clear block, and the wax paper.



1. Which item is transparent?
2. Name an object in everyday life that is transparent?
3. Which item is opaque?
4. Name an object in everyday life that is opaque?
5. Which item is translucent?
6. Name an object in everyday life that is translucent?

Question:

- Why is the sky **blue**?

Answer:

- As light moves through the atmosphere, most of the longer wavelengths, such as **red**, **orange**, and **yellow** pass straight through.
- However, much of the shorter wavelength light is absorbed by the gas molecules in the air. The absorbed **blue** light is then radiated in different directions. It gets scattered all around the sky. Whichever direction you look, some of this scattered **blue** light reaches you. Since you see the **blue** light from everywhere overhead, the sky looks **blue**.

Scattering explains why light becomes weaker with distance. **Blue** has a very short wavelength and scatters more than any other color.

Question:

- If **violet** has the shortest wavelength, why isn't the sky **violet**?

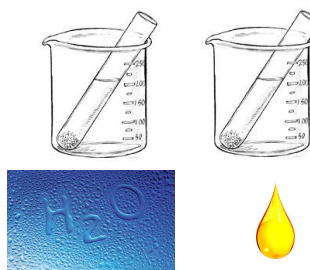
Answer:

- There are two reasons why the sky is not **violet**:
 1. There is not enough **violet** in visible light.
 2. The wavelength is too short.

Book Work
Read Pages 74-80



Test Tubes and Beakers



Refractive Indexes

Material	Approximate Refractive Index
Air (gas)	1
Water (liquid)	1.33
Corn oil (liquid)	1.47
Pyrex glass (solid)	1.47