

Visible Light Notes

Visible Light

- The wave energy we can _____
- Made of many _____
- Light waves travel in _____ lines

Radiant Energy

- Energy given off by the _____
- Travels in _____
- Another name for _____

Absorb

- When light waves _____ a substance and _____ into other forms of energy.
- _____ colors absorb _____ light

Reflect

- When light waves _____ off something else

Refract

- When light waves _____
- Light waves are refracted as they pass through _____.

EM Spectrum

- _____ light is made of all the colors of the _____.

ROY G BIV

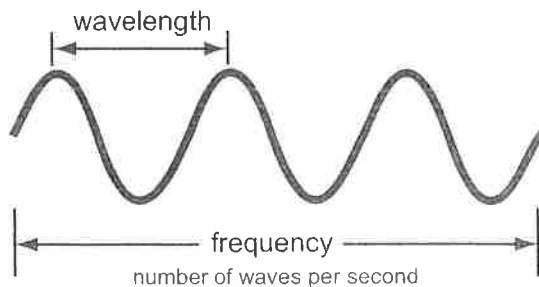
- The colors of the rainbow
- Red, _____, Yellow, _____, Blue, _____, Violet
- Red has the _____ wavelengths (bent the _____)
- Violet has the _____ wavelengths (bent the _____)

- A piece of _____ or _____ that _____ light waves

11. Sound and Light Energy

A ¹Where have you seen waves? ²When you watch a friend jump into a pool, you will see waves spread across the pool starting at the point where your friend landed in the water. ³The force of a person jumping into the water causes water molecules to vibrate. ⁴Light and sound are two more ways that waves carry energy.

B ⁵Sound waves travel through gases, liquids, and solids but cannot travel through empty space. ⁶**Sound waves** are caused by vibrations. ⁷By knocking on a door, you are forcing the molecules in the door and the air next to it to vibrate. ⁸These vibrations cause the next particles to vibrate. ⁹Once these vibrations spread through the gases in the air and reach your ear, you hear the sound of the knock. ¹⁰The measure of how fast the particles are vibrating is known as **frequency**. ¹¹Frequency is the number of sound waves per second. ¹²Fast vibrations have a high frequency and a high-pitched sound.



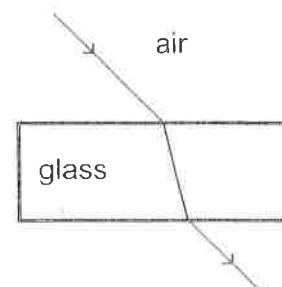
C ¹³Unlike sound waves, light waves can travel through empty space because they are not a vibration of particles. ¹⁴Light is a form of **electromagnetic wave**, which has both an electric and a magnetic effect. ¹⁵These electromagnetic waves are sometimes referred to as radiation, or rays. ¹⁶There is nothing that can travel through space as fast as light waves. ¹⁷Light travels about one million times faster than sound. ¹⁸You may have observed this during a storm when you've seen a lightning strike before you hear the thunder.

D ¹⁹Light energy can change to heat energy when it hits matter. ²⁰**Opaque** materials, such as most clothing, wood, concrete, and metals, absorb light. ²¹These materials do not allow any light to pass through, and some of the light is absorbed into the matter. ²²Darker colors

will absorb more light and therefore heat up more than lighter colors. ²³This is why it is a good idea to wear light colors on hot, sunny days. ²⁴**Translucent** materials, such as tissue paper and sheer clothing, allow some light to pass through while some light gets absorbed. ²⁵**Transparent** materials, such as glass and water, allow almost all of the light to pass through without being absorbed.

E ²⁶When light does not absorb or pass through matter, it is reflected. ²⁷**Reflection** is when light bounces off of a surface. ²⁸The smoother the surface, the more likely you are to see a reflection. ²⁹Mirrors, smooth metal, and dishes are good examples of matter that reflect light easily. ³⁰When you look into a mirror, the light from the room strikes the mirror and then reflects back, so you can see yourself. ³¹Since dark colors absorb more light than light colors, it follows that light colors reflect more light than dark colors. ³²To observe this theory, go into a dimly lit room. ³³Take notice of which items in the room are easiest to see. ³⁴What do you expect to observe? ³⁵Reflection and absorption are also why we see colors. ³⁶A blue book appears blue because it is absorbing all of the other colors except blue; blue light reflects back to your eyes.

F ³⁷Have you ever observed the way a straight drinking straw appears to be bent in a glass of water? ³⁸The light is changing speed as it moves from one material (air) to another (water). ³⁹This change in speed causes the light to change direction. ⁴⁰This bending of light is known as **refraction**. ⁴¹Refraction can also occur with other materials, like glass. ⁴²Notice in the diagram below how the light waves bend, or change direction, when they hit the glass.



1. For each statement, circle T for true and F for false. If the statement is false, replace the **bold word(s)** to make the statement true. Then write the number of the sentence(s) that best supports your answer.
 - a. T F A black hat is made of matter that **absorbs light energy and changes it into heat energy.**

 - b. T F Sound and light travel **at the same speed.** _____

 - c. T F **Both sound and light waves** are a vibration of particles. _____

 - d. T F **A rough surface** is unlikely to reflect light. _____

2. Seeing lightning before you hear the thunder during a storm proves:
 - a. that light travels about one million times faster than sound.
 - b. that there is nothing that can travel through space as fast as light waves.
 - c. that light travels faster than sound.
 - d. all of the above.

3. In what type of material is light refraction most common?
 - a. opaque
 - b. translucent
 - c. transparent
 - d. dark

4. For each item below, write whether it is opaque, translucent, or transparent.
 - a. plastic wrap _____
 - b. wax paper _____
 - c. wedding veil _____
 - d. thick rug _____
 - e. textbook _____
 - f. window _____

Write the numbers of the three sentences that best support your answers.

_____, _____, _____

5. What can you conclude about slow vibrations?

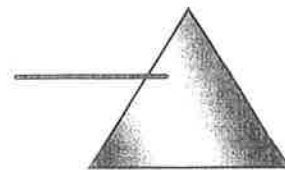
Write the numbers of the two sentences that best support your answer. _____, _____

6. Referring back to the question in paragraph E, what would you expect to see best in a dimly lit room? Explain why.

Write the number of the sentence that best supports your answer. _____

Light travels through glass at a slower speed than through air because glass is denser than air. This causes the light to refract. White light is refracted when it passes through a prism. Each color in the light is refracted at a different angle. The shorter wavelengths, like blue, bend more than the longer wavelengths, like red.

7. Complete the diagram below by first labeling the triangle as the prism and the line going into the prism as the white light. Then add other details to the diagram to show what you understand about how a prism refracts light.



8. What are the two most interesting facts you have learned from this lesson about sound energy and/or light energy?

Explain why you chose each fact.

Written Response Questions

For the following two questions, apply all of the information you've learned when answering.

9. While Monica was in the family room, she heard her sister, Sarah, close a cabinet in the kitchen. Explain why Monica heard this sound.

10. When you look at a green leaf, why do you see the color green?
