

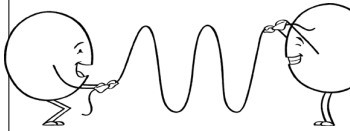
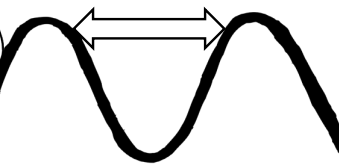
Name: \_\_\_\_\_

Class: \_\_\_\_\_ Date: **KEY**

# Electromagnetic Waves

**ESSENTIAL QUESTION:** How do electromagnetic waves transfer energy through matter or space?

VO  
CAB

<p><b>wave</b></p>  <p><b>A disturbance that transmits energy through matter or empty space.</b></p>	<p><b>wavelength</b></p>  <p><b>The distance from one crest of a wave to the next.</b></p>
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TOPIC QUESTIONS:

1

What is an electromagnetic wave?

**ELECTROMAGNETIC WAVES**  
transmit energy through matter and/or empty space.



An electromagnetic wave begins when a charged particle vibrates, causing the electric field around it to vibrate as well.

The vibrating electric field creates a vibrating magnetic field.

**ELECTRIC FIELD**

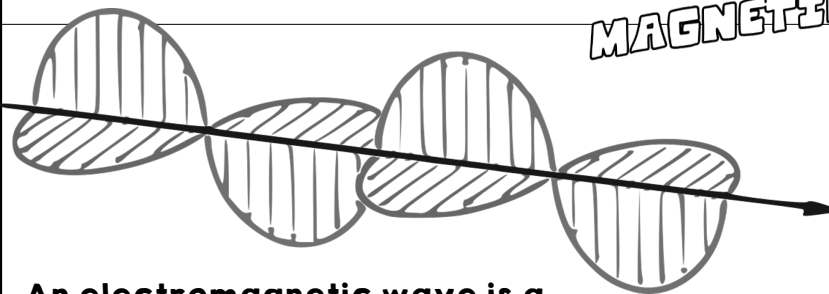
The two types of vibrating fields combine to create an electromagnetic wave.

**MAGNETIC FIELD**

**WAVE DIRECTION**

2

How does an electromagnetic wave travel?



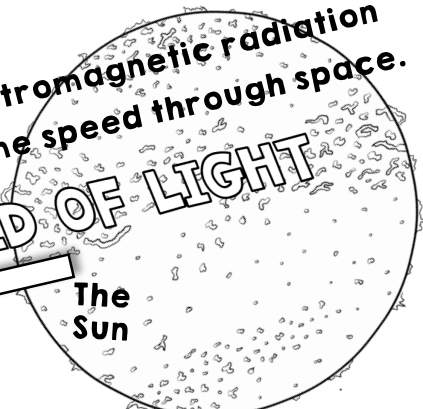
An electromagnetic wave is a transverse wave because the electric and magnetic fields that make up the wave are perpendicular to each other.

All types of electromagnetic radiation travel at the same speed through space.

**THE SPEED OF LIGHT**



The Earth

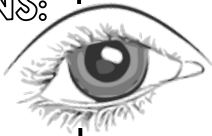


The Sun

The transfer of energy by electromagnetic waves is called electromagnetic radiation.

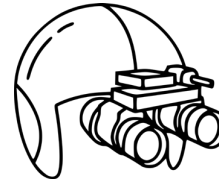
# TOPIC QUESTIONS:

# 3



What are the types of electromagnetic radiation?

The light that our eyes can see is just a sliver of the total amount of light that surrounds us.



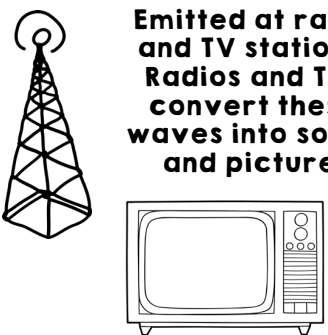
Night vision goggles help us to see wavelengths of light that are not normally accessible to our eyes.

KEY

# THE ELECTROMAGNETIC SPECTRUM

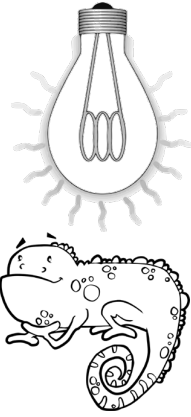
describes the entire range of light that exists.

**radio waves**



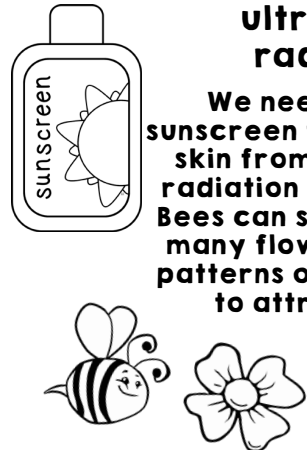
Emitted at radio and TV stations. Radios and TVs convert these waves into sound and picture.

**infrared radiation**



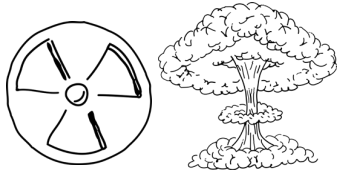
We sense this radiation as heat because it causes molecules to vibrate. Used in heat lamps for reptiles.

**ultraviolet radiation**

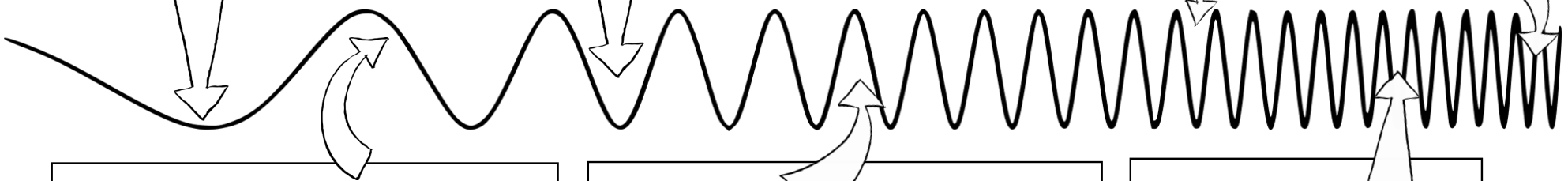


We need to wear sunscreen to protect our skin from this type of radiation from the sun. Bees can see UV light so many flowers have UV patterns on their petals to attract bees.

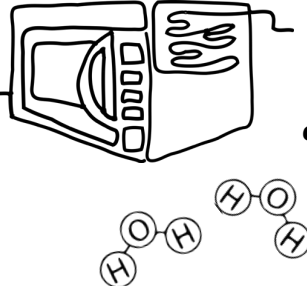
**gamma rays**



Extremely high frequency waves that are emitted during a nuclear explosion and by radioactive materials.




**microwaves**



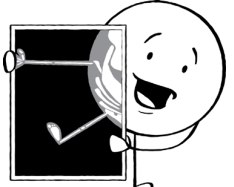
Emitted by power source in a microwave oven. Water molecules absorb microwaves and increase temperature of food.

**visible light**



The only light that our eyes can see. Our eyes detect this light as colors. In a rainbow, the shortest wavelength of color (violet) is closest to Earth and the longest wavelength color (red) is at the top of the arc.

**X-rays**



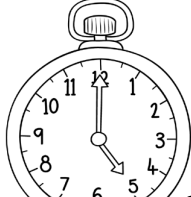
Bones and teeth block X-rays, making it possible to take 'pictures' of them.

TOPIC QUESTIONS:

4

How do wavelength and frequency differ between the different types of electromagnetic radiation?

**FREQUENCY?**  
Study the diagram and imagine the wave's motion. What is meant by a wave's frequency?



The number of crests that pass a certain point in a given amount of time.

5

How does white light break into the visible light spectrum?



A prism breaks white visible light into the colors of the rainbow (ROYGBIV), which each have a different wavelength. Red has the longest wavelength and violet has the shortest. Color each section of the rainbow coming out of the prism. Red should be on the top.

Since we can't see almost all of the types of electromagnetic radiation, we can use examples to help us visualize the size of each wavelength as in the diagram below.

KEY

LONGEST WAVELENGTH

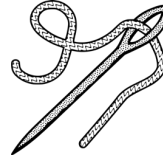
SHORTEST WAVELENGTH

radio waves



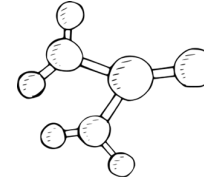
size of a building

infrared



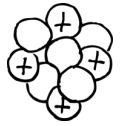
size of a needle point

ultraviolet



size of a molecule

gamma rays



size of an atom's nucleus

microwaves



size of a fly

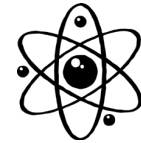
visible light



size of a microorganism

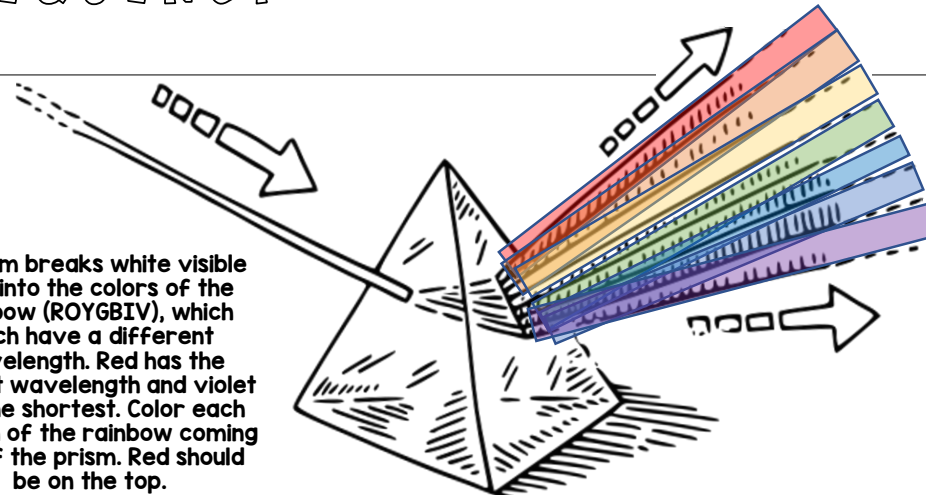
size of an atom

X-rays



LOWEST FREQUENCY

HIGHEST FREQUENCY



QUICK WATCH:

TEde: Light Waves  
<https://tinyurl.com/y9a95k4a>

Write a \$2 summary of the video.  
Each word costs 10 cents.