

Reading Science A - The Electromagnetic Spectrum from Modeling Light Waves

1. As the storm clouds thin and the last of the rain slowly stops, something magical happens. The Sun peeks through the storm clouds. A beautiful rainbow appears. Its bright colors bend in an arch through the sky. The rainbow shows you the visible colors of the electromagnetic spectrum.



Astronomers are scientists who study space. They use the electromagnetic spectrum to learn about different objects in the universe.

2. The electromagnetic spectrum is made of all the electromagnetic waves that are emitted from the Sun. Other objects in the universe emit radiation in the electromagnetic spectrum. To better understand the spectrum, it is broken into smaller categories based on wavelength. From the longest to the shortest waves, the categories are: radio waves, microwaves, infrared light, visible light, ultraviolet rays, x-rays, and gamma rays.
3. Radio waves have the longest wavelength in the electromagnetic spectrum. A single wave can be the length of a football field. Some may even be a mile long. These types of waves have low frequencies and low energy. Radio waves bring music to your ears, or a call to your cell phone. Scientists use radio waves to learn about what galaxies, stars, comets, and planets are made of. Astronomers use radio telescopes put into large arrays to collect the waves that are emitted by these objects.
4. Microwaves are the next category of the electromagnetic spectrum. Their wavelengths

can be less than an inch in length, or as long as a foot. You have probably used microwaves to pop some popcorn or heat up your food. Scientists use microwaves a little differently. These waves can pass through different kinds of weather. They can send images back to Earth from space, even on a cloudy day. Astronomers also use microwaves to learn about the structure of our galaxy. They can also study galaxies that are close to us.


5. Infrared light comes after microwaves on the electromagnetic spectrum. The shortest infrared wavelengths are almost microscopic. The largest are the size of a pinhead. You feel infrared light every day. The warmth you feel from the Sun or a fire are examples of heat emitted by infrared light. Some of the shorter infrared waves are used by remote controls for your television or stereo. Astronomers use infrared light to map the dust between stars. They can also use infrared images of Earth to study cloud structure or ocean temperatures.
6. In the middle of the spectrum is visible light. Think back to the rainbow that appeared after the storm. The seven colors of light that you see are known as visible light. Visible light is the only part of the electromagnetic spectrum that you can actually see. Red has the longest wavelength. Violet has the shortest. White light is made of all the colors combined.
7. Ultraviolet (or UV) light has a shorter wavelength than visible light. Have you ever been in the sun for too long? What happened to your skin? The ultraviolet light emitted from the Sun probably gave you a sunburn. This wavelength of light cannot be seen by your eye alone. Astronomers place ultraviolet telescopes on satellites. This helps them learn about the structure and evolution of galaxies.
8. The next electromagnetic wave on the spectrum is x-rays. These types of waves have high frequencies and high energy. If you have ever had a broken bone, then you have been exposed to x-rays. X-rays can pass through your skin, but not your bones or teeth. Doctors use the images on the x-ray film to tell if your bone is broken. Astronomers use x-ray telescopes with x-ray detectors placed on satellites to study objects in space. The x-ray telescopes cannot be placed on Earth. Earth's atmosphere does not allow x-rays to

pass through.

9. Gamma rays are the last electromagnetic wave on the spectrum. They have the shortest wavelength and the most energy. They have the potential to kill cancerous cells. Astronomers use gamma rays to study how the universe began, its age, and how fast it is expanding.
10. Through the use of the electromagnetic spectrum, scientists find a vast amount of scientific information to study. From radio waves to visible light to gamma rays, each wavelength provides a different answer to the mystery of the universe.

QUESTION 1

The statements below compare the similarities of ultraviolet light and microwaves. Which choice does NOT belong in this list?

- ☐ Neither can be seen by the human eye.
- ☐ Scientists use both to study the structure of galaxies.
- ☒ They both have wavelengths that are longer than visible light. 
- ☐ They are both types of radiation emitted by the Sun.

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QUESTION 2

What is the best wavelength to use if an astronomer wants to study the composition of planets and stars?

☐ Gamma rays

☐ Radio waves



☐ Visible light

☒ Microwaves



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QUESTION 3

Complete the following analogy.

RADIO WAVES : LONGEST WAVELENGTH :: _____ : SHORTEST WAVELENGTH

☐ INFRARED LIGHT

☐ ULTRAVIOLET LIGHT

☐ X-RAYS

☒ GAMMA RAYS



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QUESTION 4

The term emit is used in paragraph 2. Based on the context, emit means to–

☐ absorb.

☒ send out.



☐ collapse.

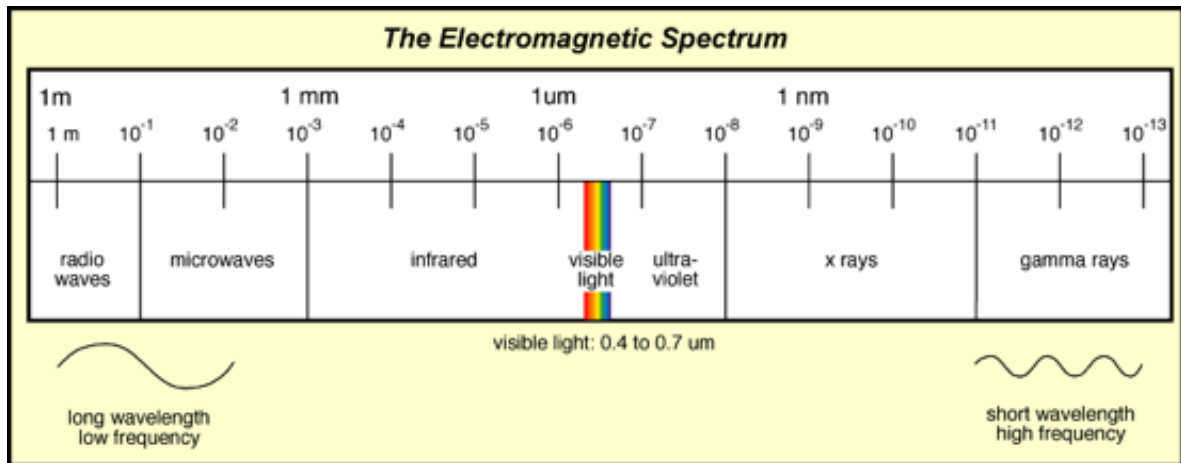
☐ review.

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QUESTION 5



Examine the diagram of the electromagnetic spectrum shown above. Which category of electromagnetic waves has a wavelength of 10^{-8} m?

☒ Ultraviolet



☐ Radio waves

☐ Microwaves

☐ Red

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