

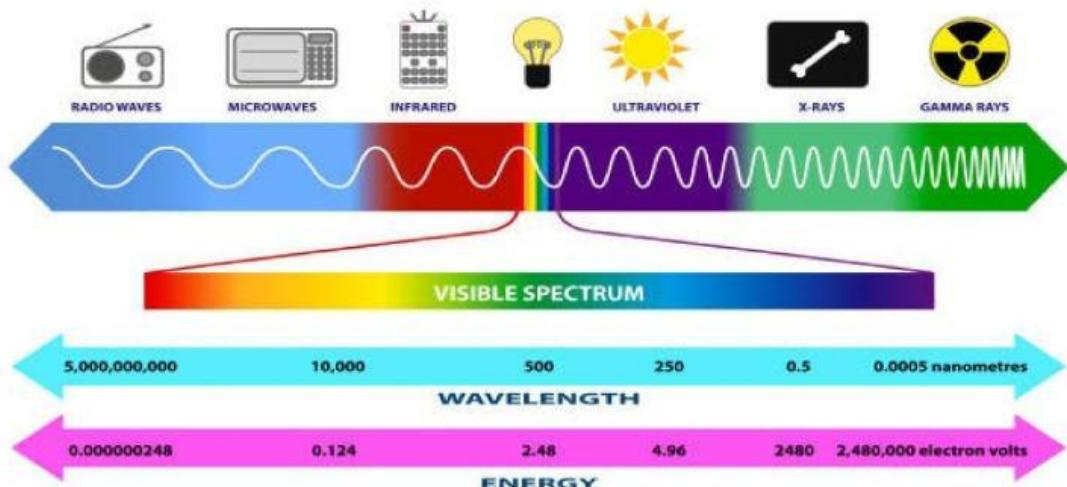
Learning Target: I can construct an explanation using data to illustrate the relationship between the electromagnetic spectrum and energy.

[Exploring the Electromagnetic Spectrum & Energy Interactive Activity](#)



Part 1: Understanding the Electromagnetic Spectrum: Analyze the diagram to answer questions.

## ELECTROMAGNETIC SPECTRUM



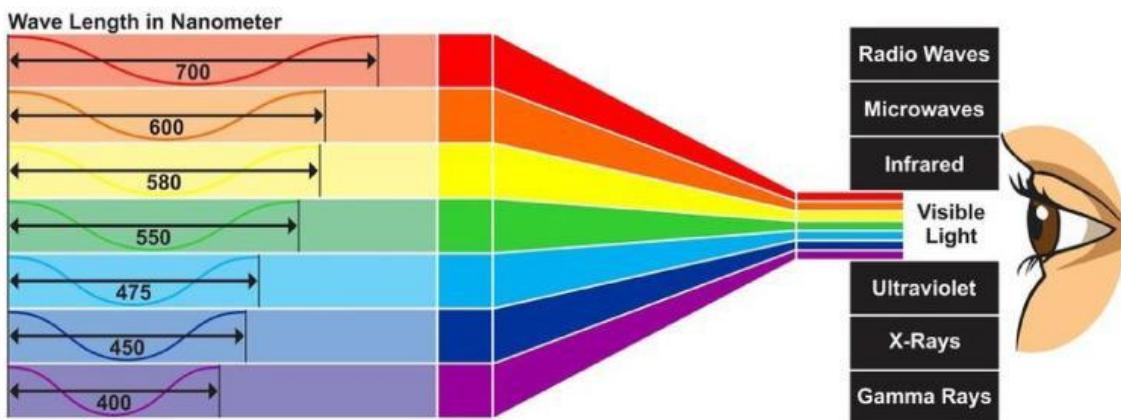
**Questions:**

1. Which type of electromagnetic wave has the longest wavelength?
  - a. Gamma rays
  - b. Visible light
  - c. Radio waves
  - d. X-rays
2. What does the wave with the longest wavelength tell us about the amount of energy of it is carrying?
  - a. It carries the most amount of energy
  - b. It has the highest frequency
  - c. It carries the least amount of energy
  - d. It travels faster than all of the other waves on the spectrum
3. Arrange the following types of electromagnetic waves in order of increasing frequency: microwaves, ultraviolet, X-rays, and visible light. \_\_\_\_\_
4. What is the relationship between the wavelength and energy of electromagnetic waves? \_\_\_\_\_
5. Why are microwaves considered less dangerous than ultraviolet waves? \_\_\_\_\_
6. Why are gamma rays considered more dangerous than radio waves? \_\_\_\_\_
7. Which waves penetrate the furthest into the body? \_\_\_\_\_  
Explain why. \_\_\_\_\_
8. Which waves penetrate the least into the body? \_\_\_\_\_  
Explain why. \_\_\_\_\_

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## Part 2: Visible Light and Energy

### Chart: Colors of Visible Light



**Activity:** Using the chart, answer the following:

1. Which color of light has the shortest wavelength? \_\_\_\_\_  
What does that say about the energy of this color? \_\_\_\_\_
2. Which color of light has the longest wavelength? \_\_\_\_\_  
What does that say about the energy of this color? \_\_\_\_\_
3. Which color of light has the lowest energy? \_\_\_\_\_  
What does that say about the wavelength of this color? \_\_\_\_\_  
Which color of light has the highest energy? \_\_\_\_\_  
What does that say about the wavelength of this color? \_\_\_\_\_
4. If a light wave has a wavelength of 500 nm, what color is it likely to be? \_\_\_\_\_  
700 nm \_\_\_\_\_ 400 nm \_\_\_\_\_ 600 nm \_\_\_\_\_

### Critical Thinking:

Why do objects appear a specific color under white light? \_\_\_\_\_

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### Part 3: Applications of Electromagnetic Waves

#### Scenario-Based Questions:

1. **Medical Imaging:** X-rays are commonly used to look inside the human body. Explain how the energy of X-rays makes them suitable for this purpose. \_\_\_\_\_
2. **Communication:** Cell phones use microwaves to transmit signals. Why are microwaves chosen over higher types of waves? \_\_\_\_\_
3. **Infrared Technology:** Night vision goggles detect infrared waves. What property of infrared waves allows this technology to work? \_\_\_\_\_

### Part 4: Experiment Simulation

#### Data Table: Energy and Wavelength

Type of Wave	Wavelength (m)	Energy (J)
Radio Waves	$10^{-3}$	$10^{-12}$
Microwaves	$10^{-2}$	$10^{-8}$
Infrared	$10^{-5}$	$10^{-5}$
Visible Light	$10^{-7}$	$10^{-3}$
Ultraviolet	$10^{-8}$	$10^{-2}$
X-rays	$10^{-10}$	$10^2$
Gamma Rays	$10^{-12}$	$10^4$

#### Analysis Questions:

1. What is the trend between wavelength and energy as you move from radio waves to gamma rays? \_\_\_\_\_
2. Calculate the difference of energy between X-rays and radio waves using the data in the table. \_\_\_\_\_
3. Calculate the difference of energy between microwaves and visible light using the data in the table. \_\_\_\_\_
4. Calculate the difference of energy between infrared and ultraviolet using the data in the table. \_\_\_\_\_