

Light & Optics Part 2

EM WAVES

- What are the 8 major types of electromagnetic waves:
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____
 7. _____
 8. _____
- Note: Some texts combine long radio waves and radio waves into one type – radio waves.
- The different types of electromagnetic waves make up the _____.

LONG RADIO WAVES

- What are long radio waves?
 - _____
 - _____
- Long radio waves are also called _____.
- Long radio waves are important to _____ and _____.
- Long radio waves were important to early _____, such as Morse Code.

RADIO WAVES

- What are radio waves?
 - _____
 - _____
- Radio waves are naturally made by _____ and _____.
- Radio waves are artificially made and used for radio _____, TV _____ and _____.
- When listening to the radio, the numerical ____ or ____ radio station corresponds to the _____ of a specific radio wave.

MICROWAVE

- What are microwaves?

- _____

- Microwaves are used for _____. Specifically, they are important to _____, _____ and _____ (mobile) _____.
- Microwaves are also used for _____ and _____. Specifically, they are important to _____, air traffic control, _____ forecasting and speed limit _____.
- Microwaves are also used for _____ food.
- A microwave _____ is an appliance that generates intense microwaves. These waves carry _____. The energy of the microwaves is _____ by the food. When the food _____ energy, its _____ rises and the food is cooked.
- A microwave oven is constructed of _____ and thick _____ to keep the microwaves _____ the microwave oven.

INFRARED

- What are infrared waves?

- Infrared is associated with _____ energy. Objects that emit thermal energy (_____) are giving off _____ radiation.
- Although you cannot see or hear infrared, you can _____ it.
- What is an infrared camera?

- Infrared cameras produce images based on the amount of _____ emitted by an object. These cameras are especially helpful in producing images of _____ things. Living things emit _____ energy and thus, infrared.

VISIBLE LIGHT

- What is visible light?

- White light is a combination of all the _____ of visible light.

- There are ____ colors of visible light. These colors are:
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____
 7. _____
- *Label the color that has the longest wavelength/lowest frequency and color that has the shortest wavelength/highest frequency.*
- An object appears a certain color because of how white light _____ off of it.
- For example, a red object appears red because _____ light reflects off the object while all other _____ of light are absorbed by the object.
- Why would an object appear white?
- _____

- Why would an object appear black?
- _____

ULTRAVIOLET LIGHT

- What is ultraviolet light?
- _____

- Ultraviolet light is _____ to humans but can be seen by some _____ and _____.
- UV light has both _____ and _____ effects on living things.
- Summarize the positive and negative effects of UV light.

Positive Effects of UV light	Negative Effects of UV light
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- How does a Bug Zapper work?

X-RAYS

- What are X-Rays?

- X-Rays are used to produce _____ that show what is _____ an object or living things.
- X-Rays are used in _____ imaging (radiology) to see the internal structures of a person. This helps doctors diagnose _____ or anatomy _____.
- X-Rays are also used in _____ security. They help security agents observe what is _____ luggage.
- _____ to x-rays can _____ cells and cause them to become _____ or cancerous. Interestingly, x-rays can be used to _____ cells intentionally. _____ is treatment that uses _____ or _____ to cure cancer.
- How does radiation therapy work?

GAMMA RAYS

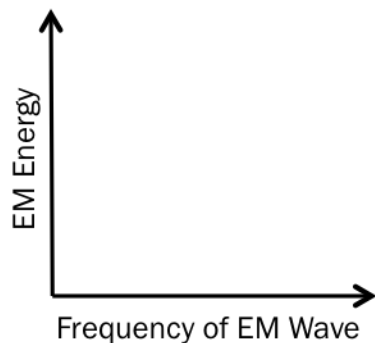
- What are gamma rays?

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-
- Gamma rays are produced by _____ substances undergoing _____ decay.
 - Gamma rays are also produced during _____ (the _____ of atoms).
 - Like x-rays, gamma rays _____ and kill cells.
 - Why are gamma rays considered more dangerous?
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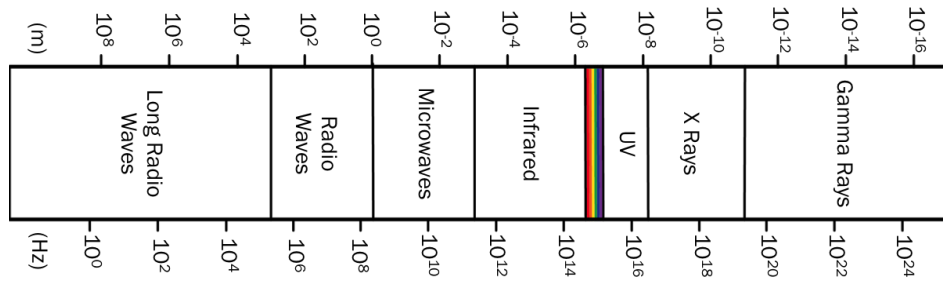
- Exposure to gamma radiation can cause _____. The greater the exposure to gamma radiation, the more _____ the radiation poisoning.
- Radiation poisoning can cause _____ in weeks (4-6 weeks in _____ cases) or _____ (1-2 days in _____ cases).

EM ENERGY

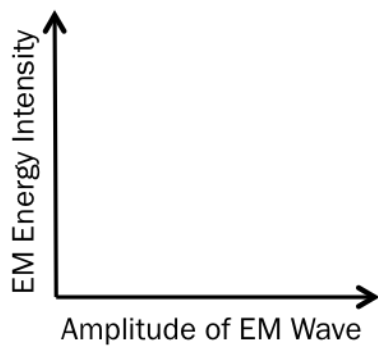
- Graph and explain the relationship between EM energy and frequency of an EM wave.



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- As you've just learned, the electromagnetic energy (also called radiation) carried by electromagnetic waves can be _____ and even _____.
 - The radiation of _____ light, _____ and _____ rays is the most harmful. These electromagnetic waves have the highest _____ and thus, the most _____.
 - In the diagram below, label increasing wavelength and increasing frequency. Also, mark the EM radiation that have the most electromagnetic energy.



- Explain the relationship between intensity of EM energy and amplitude of an EM wave.



EM WAVES & THE SUN

- The _____ emits electromagnetic radiation. This electromagnetic radiation is extremely important to _____ on Earth. In fact, _____ on Earth would not _____ without the sun!
- Complete the table below with information about electromagnetic radiation emitted by the sun.

EM Radiation emitted by the Sun	Importance to Life on Earth

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WAVE EQUATION

- What is the wave equation?
- _____ = _____ x _____
- Remember, the speed of light is _____. You need this value to determine the _____ or _____ of an electromagnetic wave.
- All electromagnetic waves travel at _____ in a vacuum or dry _____. Therefore, this equation is used for _____ types of electromagnetic waves.
- When using the wave equation, you must use correct units:
 - Speed of light is measured in _____
 - Wavelength is measured in _____
 - Frequency is measured in _____
- If necessary, you must _____ to these units before plugging values into the wave equation.
- Example: An unknown electromagnetic wave has a wavelength of 100 meters. What is the frequency and type of the electromagnetic wave?

- Explain the relationship wavelength and frequency for all electromagnetic waves.

