

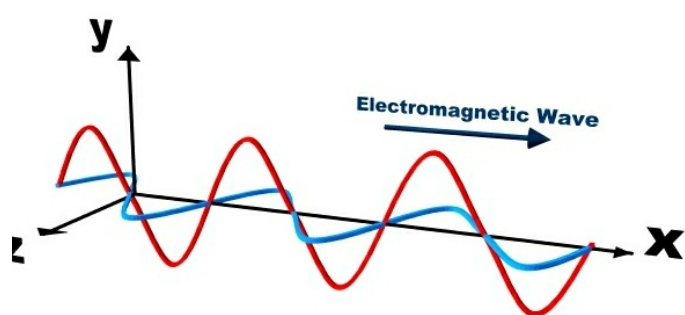
**Science 8**  
**Unit 3: OPTICS**  
**Topic 5: Electromagnetic Spectrum-Beyond Visible Light**



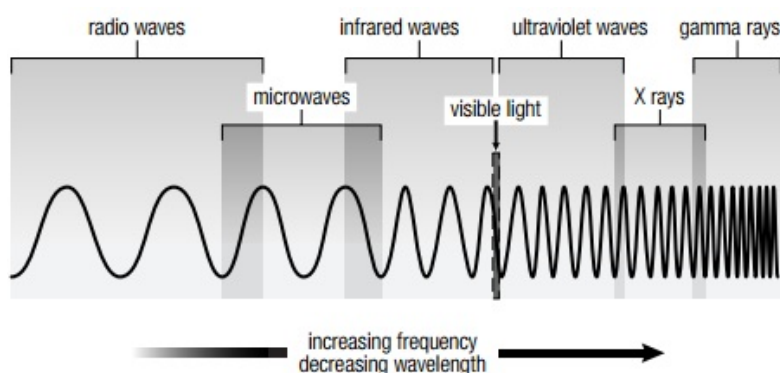
Student Name: \_\_\_\_\_

**Radiant Energy:** refers to energy that spreads out, or radiates, from its source in all directions.

**Electromagnetic Radiation (EMR)** is the transmission of radiant energy by waves due to vibration of electrical and magnetic fields



**Electromagnetic Spectrum** is the range of all types of electromagnetic radiation. The electromagnetic spectrum includes radio waves, which can have wavelengths that are kilometres long. It also includes gamma rays, which can have wavelengths smaller than an atom. The spectrum includes all the electromagnetic waves in between.



Important Notes:

- All three types of radiation move in the form of waves.
- All three types of radiation move at the same speed.
- All three types of radiation carry energy
- High frequency means higher energy
- Radio waves are long waves and gamma rays are small waves

Types of electromagnetic Radiation:

1. Radio waves: the longest wavelength and lowest energy and frequency.  
Ex. Can be used to help us see the inside of our bodies to diagnose illness. ( MRI)
2. Microwaves: have the shortest wavelength and the highest frequency of all radio waves.  
Ex. Microwave ovens, telecommunication satellites, radio telescopes, radar (remote sensing)
3. Infrared Waves: longer wavelength and lower energy and frequency. Infrared means below red. Also called heat radiation  
Ex. Remote controls, computer, heat lamps, motion sensors
4. Visible Light Spectrum

Ex. Can be continually detected by our eyes

5. Ultraviolet Waves: shorter wavelength and higher energy and frequency. Very energetic  
Have the ability to kill bacteria in food and water and medical supplies.

Ex. Detect fingerprints

6. X-Rays: have a shorter wavelength, and higher energy and frequency than UV.

Ex. Used to photograph teeth, bones and the inside of machines, security screening

7. Gamma Rays: have the highest energy and frequency and the shortest wavelength.

Result from nuclear reactions.

Produced by the hottest regions of the universe.

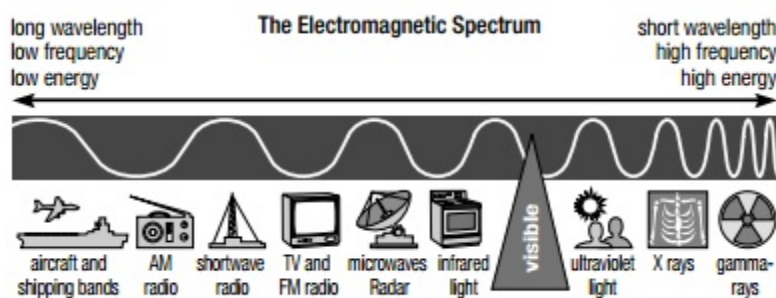
#### Positive and Negative Effects to Exposure to Electromagnetic Radiation

	X-Rays	Ultraviolet	Radio Waves
Positive Effects	Medical detection	Used to treat jaundice in babies	Improved telecommunication
Negative Effects	Over-exposure can lead to cancer	Skin cancer	Uncertain of long-term exposure

#### PART A: MULTIPLE CHOICE.

Instruction: Circle the correct answer below each question. Also, transfer your answers to the bubble sheet provided.

Use the following diagram of the electromagnetic spectrum to answer questions 1 to 11.



1. Which of the following types of radiation has the highest frequency?

- (A) AM radio waves
- (B) Gamma radiation
- (C) Infrared light
- (D) Visible light

2. Which of the following is generally associated with radio waves?

- (A) High-frequency waves
- (B) High-energy waves
- (C) Long-wavelength waves
- (D) Visible radiation

3. Which of the following types of radiation gives off the lowest amount of energy?
- (A) Gamma rays
  - (B) Microwaves
  - (C) X rays
  - (D) Visible light
4. Which of the following correctly places these electromagnetic waves in order from shortest wavelength to longest wavelength?
- (A) Visible light, radio waves, ultraviolet light, infrared radiation
  - (B) Radio waves, visible light, infrared radiation, ultraviolet light
  - (C) Ultraviolet light, visible light, infrared radiation, radio waves
  - (D) Ultraviolet light, infrared radiation, radio waves, visible light
5. Which of the following has a higher frequency than visible light?
- (A) Infrared waves
  - (B) Microwaves
  - (C) Radio waves
  - (D) X rays
6. Which of the following forms of electromagnetic energy has a longer wavelength than infrared waves?
- (A) Visible light
  - (B) X rays
  - (C) Microwaves
  - (D) Ultraviolet waves
7. Which of the following forms of electromagnetic energy has a higher frequency than ultraviolet waves?
- (A) Visible light
  - (B) Infrared waves
  - (C) Microwaves
  - (D) X rays
8. Which of the following forms of electromagnetic energy has the longest wavelength?
- (A) Radio waves
  - (B) Infrared waves
  - (C) Microwaves
  - (D) Visible light
9. The electromagnetic waves that are detectable by the human eye have
- (A) A lower frequency than infrared waves.
  - (B) A shorter wavelength than ultraviolet waves.
  - (C) A shorter wavelength infrared waves.
  - (D) A wavelength that falls in between ultraviolet waves and X rays.
10. Compared to the other forms of electromagnetic radiation, radio waves
- (A) Have the lowest energy and lowest frequency.
  - (B) Have the highest energy and lowest frequency.
  - (C) Have the lowest energy and highest frequency.
  - (D) Have the highest energy and highest frequency

11. Where on the electromagnetic spectrum is visible light found?
- (A) between X-rays and gamma rays  
 (B) between x-rays and UV rays  
 (C) between radio waves and microwaves  
 (D) between infrared rays and UV rays
12. What form of electromagnetic radiation is used in radar?
- (A) Short wavelength microwaves  
 (B) Short wavelength infrared waves  
 (C) Long wavelength ultraviolet waves  
 (D) Long wavelength radio waves
13. Infrared radiation is also known as
- (A) heat radiation.  
 (B) magnetic resonance waves.  
 (C) radar.  
 (D) radio signals.
14. Which of the following can the human eye see?
- (A) Gamma Rays  
 (B) Infrared  
 (C) Radiowaves  
 (D) Visible Light
15. Which of the following is a type of wave that causes sunburn?
- (A) Gamma  
 (B) Microwave  
 (C) Ultraviolet  
 (D) Visible Light

**PART B: MATCHING**

Match the electromagnetic radiation (on the left ) likely to be used in each of the following technologies(to the right).

<b>Electromagnetic Radiation</b>	<b>Technology</b>
15. _____ X ray	A. Radio Broadcast signals
16. _____ Microwaves	B. In a hospital to keep surgical equipment sterile
17. _____ Gamma rays	C. Use in a hospital to determine a broken bone
18. _____ Radio waves	D. Lamp used to warm a baby chick
19. _____ Infrared waves	E. Used by an oncologist ( a physician who studies and treats cancer).
20. _____ Ultraviolet waves	F. Cell phone

**PART C: FILL IN THE BLANK**

Use the word list below to fill in the blanks

Electromagnetic Radiation	Gamma Rays	Radiant Energy
Electromagnetic Spectrum	Visible Light	Infrared Waves
Radio Waves	Wavelength	Frequency
Microwaves	Ultraviolet rays	X -rays

1. The \_\_\_\_\_ represent the different forms of electromagnetic radiation
2. Light is classified as \_\_\_\_\_ because electrical and magnetic fields vibrate in a light wave.
3. \_\_\_\_\_ is energy that travels by radiation. An example of this is light.
4. Heat radiation, also known as \_\_\_\_\_, can not be seen by your eyes but can be felt by your skin.
5. Microwaves are one type of \_\_\_\_\_.
6. \_\_\_\_\_ can be used to communicate with satellites.
7. Because \_\_\_\_\_ have the highest energy of all electromagnetic radiation, they are the most damaging to human skin.
8. Compared to all other types of electromagnetic radiation, radio waves have the lowest \_\_\_\_\_.
9. An overexposure to \_\_\_\_\_ can result in sunburns and skin cancer.