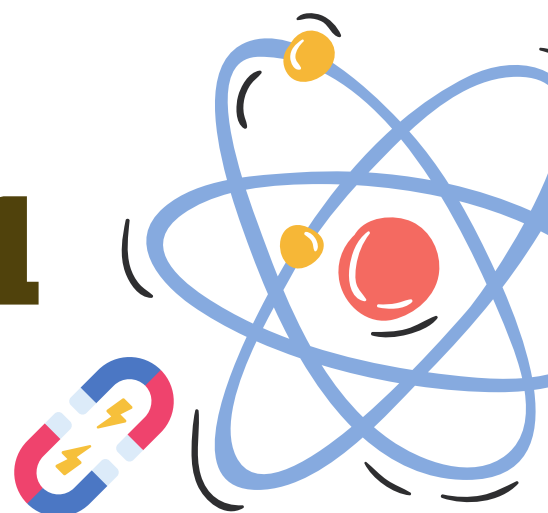




Science Education

E-MODULE 1 (PHYSICS 10)



iLab

An e-module based on DepEd CARAGA
LEAST LEARNED COMPETENCIES with
Internet-Based Laboratory Activities



Arranged by :
Elaikah Keith G. Dato-on
MAED Physics



$$d = V_0 t + \frac{1}{2} a t^2$$

$$v = \frac{d}{t}$$

$$KE = \frac{1}{2} m v^2$$

$$F = m \cdot a$$

$$\rho = \frac{m}{V}$$

$$W = m g$$

$$E = m \cdot c^2$$

Welcome to the Future of Learning Physics! Explore, Experiment, and Discover the Wonders of the Physical World!

To the Facilitator

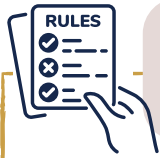
Welcome to this e-module with an Internet-Based Laboratory Activities in Physics 10, an interactive and comprehensive learning resource designed to enhance your understanding of the fundamental concepts in physics.

- As a facilitator, you are expected to orient the learners on how to use this e-module. You also need to keep track of the learners' progress while allowing them to manage their own learning at home. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the e-module.

Thank you for choosing this iLab as your learning resource. We hope your journey through this e-module is both delightful and richly rewarding.

To the Learner

Welcome to the exciting world of digital learning! As a learner, you must learn to become responsible of your own learning. We hope that this e-module will serve as a valuable tool in your learning journey, providing you with the knowledge and skills you need to excel in your studies. We encourage you to take full advantage of this resource, explore all its features, and actively participate in the interactive activities.



iLab Policies

As you go through the different activities of this e-module be reminded of the following:

Remember, the goal is not just to complete the module, but to truly understand and absorb the information it provides. Always bear in mind that you are not alone. We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. Happy learning!

Rule 1:

Active Participation: Engage actively with all the materials and activities. The more you interact, the more you learn.

Rule 2:

Pace Yourself: Don't rush through the content. Take your time to understand each concept before moving on to the next.

Rule 3:

Note-Taking: Keep a notebook handy for jotting down important points or questions that arise during your learning.

Rule 4:

Utilize Resources: Make full use of additional resources provided in this module. It is there to enhance your understanding.

Rule 5:

Reflect: After completing each section, take a moment to reflect on what you've learned and how you can apply it.



How to use these e-modules?

The e-module is composed of the following parts.

01

OVERVIEW

This provides you with the general information about the e-module.

02

PRE-TEST

This determines your background knowledge of the lesson.

03

MOTIVATIONAL ACTIVITY

This is an activity before proceeding to the lesson proper.

04

LESSON PROPER

This is the part where you can find the basic concepts about the lessons discussed

05

ILAB

These are the internet-based laboratory activities to be performed by you which will enrich your understanding of the lessons or concepts.

06

POST-TEST

This is the part that intends to determine how much you have learned from the lesson.

07

ANSWER KEY

This is the part that presents the answers to the activities included in the module.



Overview

Practical Applications of Electromagnetic Spectrum

Learning Competency:

Cite examples of practical applications of the different regions of the electromagnetic spectrum. **(S10FE-IIc-d-48)**



The electromagnetic spectrum is essential for many modern technologies, from communication systems and medical imaging to scientific research and space exploration. However, mastering the concepts related to the electromagnetic spectrum can be challenging, particularly when it comes to understanding how different waves behave, how they are classified, and how they are applied.

Expected Outcomes:

After reading this e-module and performing the activities you should be able to:

- Cite examples of practical applications of the different regions of the electromagnetic spectrum.
- Describe how each type of electromagnetic wave is utilized in daily life.
- Explain how electromagnetic waves improved people's way of life



Pre-Test

Before we delve into our upcoming lesson, it's crucial to establish a foundational understanding of the topic at hand. This not only primes your mind for new information but also allows you to connect new knowledge with what you already know.

To facilitate this, we have prepared a set of questions designed to gauge your existing knowledge on the subject matter. These questions are not a test, but a tool to help you and us understand your current familiarity with the topic.

We encourage you to answer these questions thoughtfully and honestly. There's no need to rush - take your time to reflect on each question. Remember, the goal here is not to get all the answers right, but to provide an accurate snapshot of your current understanding.

So, let's embark on this journey of discovery together. Your responses will guide us in tailoring the upcoming lessons to your learning needs, ensuring a more effective and enjoyable learning experience.

Ready? Let's begin!

Directions: Read and understand each question carefully and encircle the letter of the best answer.

1. Which of the following is a practical application of radio waves?

- a) Broadcasting television signals
- b) Detecting broken bones in the body
- c) Sterilizing medical equipment
- d) Cooking food in a microwave oven

2. Which region of the electromagnetic spectrum has the shortest wavelength?

- a) Gamma rays
- b) X-rays
- c) Microwaves
- d) Radio waves

3. What is the primary use of microwaves in communication?

- a) Cooking food
- b) Cell phone signals
- c) MRI scanning
- d) Television broadcasting

4. Which of the following is an example of a practical application of infrared radiation?

- a) X-ray imaging
- b) Night vision goggles
- c) Radio broadcasting
- d) UV sterilization

5. Which region of the electromagnetic spectrum is most commonly used for sterilizing medical equipment?

- a) Visible light
- b) Microwaves
- c) Ultraviolet (UV) rays
- d) Radio waves

6. The visible light spectrum is part of which region of the electromagnetic spectrum?

- a) Radio waves
- b) Microwaves
- c) Infrared
- d) Optical

7. What is one practical application of radio waves?

- a) Heating food in a microwave oven
- b) Broadcasting radio and TV signals
- c) Taking X-ray images
- d) Medical treatments like radiotherapy

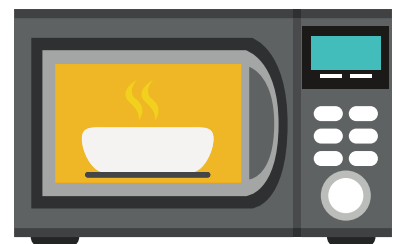
8. Which region of the electromagnetic spectrum is commonly used for medical imaging?

- a) Microwaves
- b) X-rays
- c) Infrared
- d) Gamma rays



9. What type of electromagnetic radiation is used in cooking food in a microwave oven?

- a) Microwaves
- b) Radio waves
- c) Gamma rays
- d) Infrared radiation



10. Which region of the electromagnetic spectrum is used for cancer treatment?

- a) Gamma rays
- b) Visible light
- c) Infrared radiation
- d) Microwaves



Motivational Activity

Spot the Wave!

Directions: Identify objects in a room that correspond to different types of electromagnetic waves (radio waves, microwaves, visible light, etc.) by simply encircling the object.





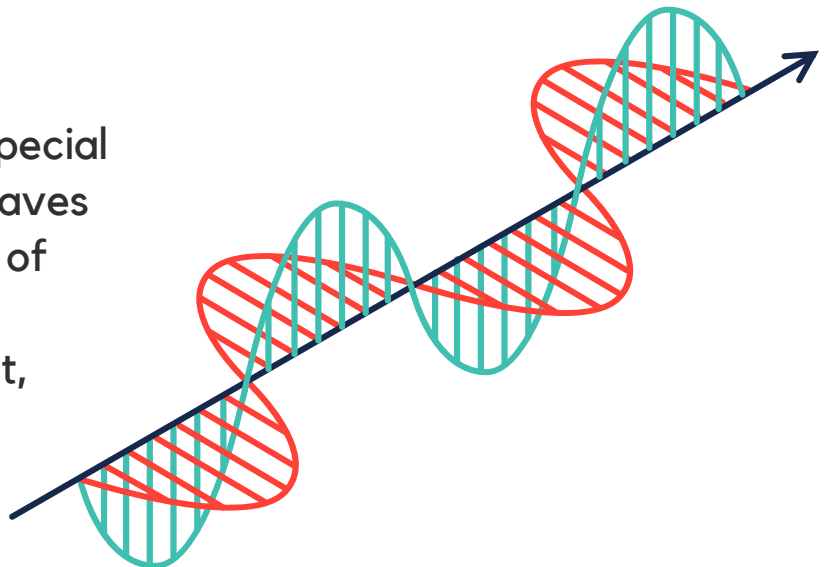
Lesson Proper

Understanding the Electromagnetic Spectrum

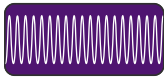
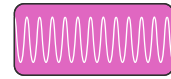
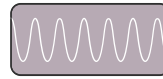
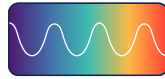
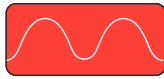
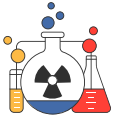
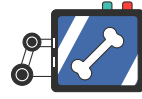
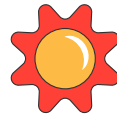
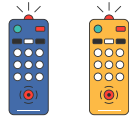


The electromagnetic spectrum is a range of all the different frequencies of electromagnetic radiation. This spectrum includes everything from the low-frequency radio waves to the high-frequency gamma rays. In this lesson, we will explore the regions of the electromagnetic spectrum, describe the properties of each region, and examine the various practical applications of these different types of electromagnetic waves.

Electromagnetic radiation is a special kind of energy that travels in waves through space. It is like a wave of energy that can move without needing anything else to carry it, even in empty space.



REGIONS OF ELECTROMAGNETIC SPECTRUM



Radio waves

Microwaves

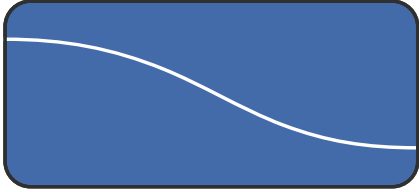
Infrared

Visible Light

Ultraviolet

X-Radiation

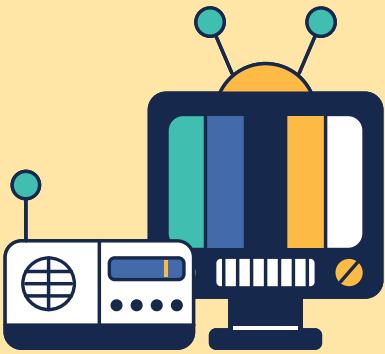
Gamma Ray



01 RADIO WAVES

Radio waves have the longest wavelength in the electromagnetic spectrum. They are produced by making electrons vibrate in an antenna. They are used to transmit sound and picture information over long distances.

Radio waves are used for communication, including AM/FM radio, TV broadcasts, and satellite transmissions.



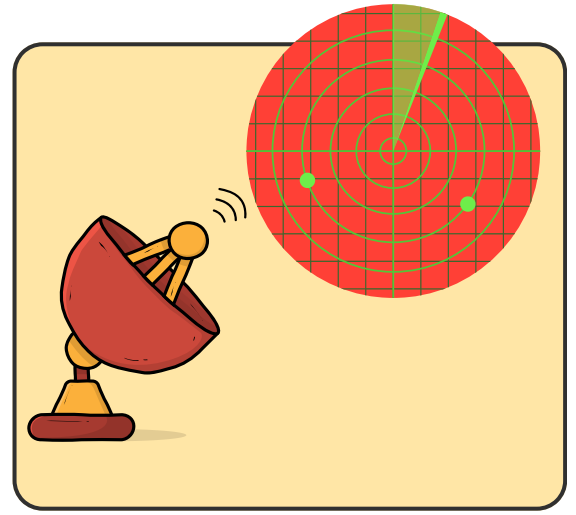
02 MICRO WAVES

Microwaves have shorter wavelengths and higher frequencies than radio waves. They are used in various technologies, including cooking (Microwave ovens), wireless communications (Wi-Fi, Bluetooth, mobile phones), and radar.



MICROWAVES AND RADAR

RADAR stands for Radio Detection and Ranging. Police use radar guns to detect over-speeding vehicles. A radar gun sends a short burst of microwaves. Microwaves reflect from the oncoming vehicle and are detected by the receiver in the radar gun. The speed of the vehicle is computed from the speed of the vehicle. Radar is used for tracking storms, detecting air traffic, and other purposes.



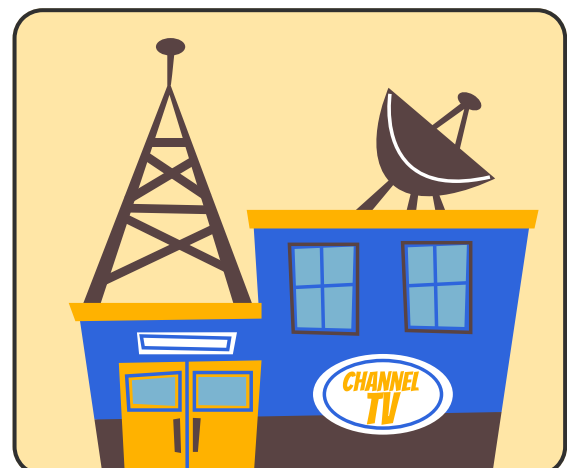
MICROWAVES AND CELLPHONES

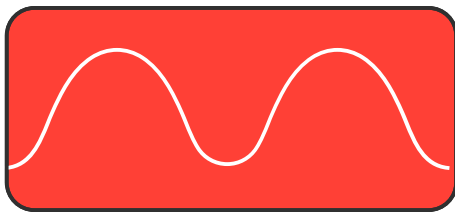
A cell phone is a radio transmitter and receiver that uses microwaves. Cellular phones depend on overlapping network of cells or areas of land several kilometres in diameter. Each cell has its tower that receives and sends microwave Signals.



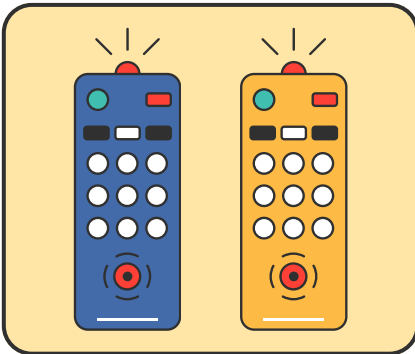
MICROWAVES AND TELEVISION

Microwaves are used to transmit television news coverage from mobile broadcast vehicles back to the station. The news Crew can also set up a small antenna to send signals to a communication satellite. This is how news are broadcasted and watched live around the world.





03 INFRARED



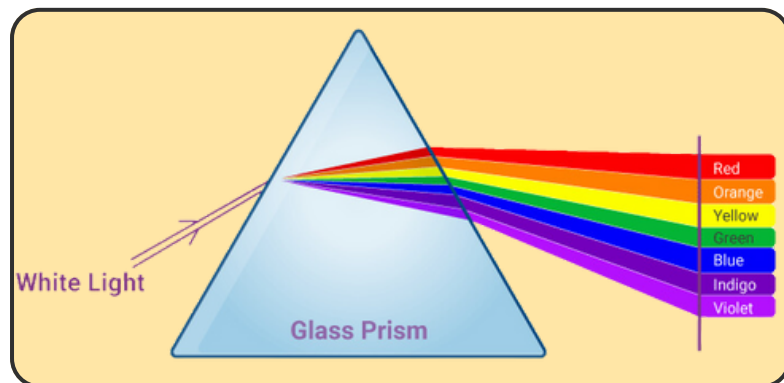
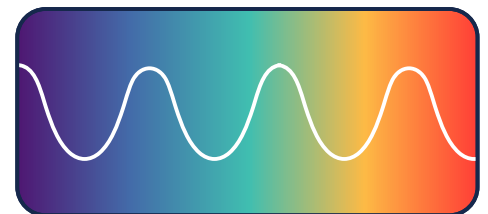
Infrared radiation is sometimes called "heat radiation" because we feel it as warmth. It has longer wavelengths than visible light. Infrared radiation is used in devices like TV remote controls, thermal cameras and night vision goggles (to detect heat from objects).



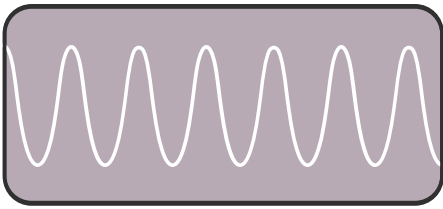
Our bodies radiate infrared and under infrared camera or a night vision goggle, our images appear in variety of colors. The differences in color determine the differences in temperature. For example, shades of blue and green indicate regions of colder temperature; and red and yellow indicate warmer temperature.

04 VISIBLE LIGHT

This is the type of electromagnetic radiation that allows us to see the world around us. Practical application of these is Optical fibers for telecommunications. Visible light comes in different colors, like red, orange, yellow, green, blue, indigo, and violet. Each color has a different wavelength.

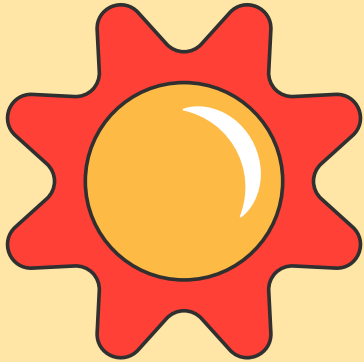


Color	Wavelength (nm)
Violet-Indigo	390 to 455
Blue	455 to 492
Green	492 to 577
Yellow	577 to 597
Orange	597 to 622
Red	622 to 700



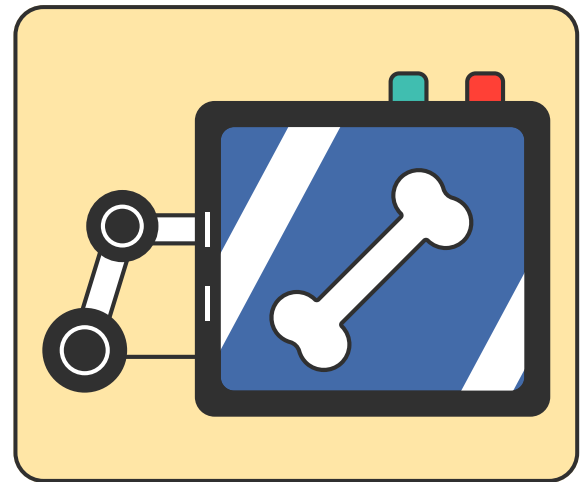
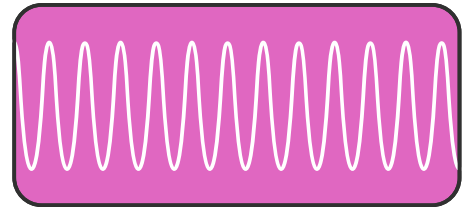
05 ULTRAVIOLET

UV radiation has shorter wavelengths and higher frequencies than visible light. It comes from the sun and is responsible for causing sunburns. We can't see UV radiation, but it can be harmful to our skin and eyes. Applications of UV are on Sterilizing medical equipment, Tanning beds and sun lamps

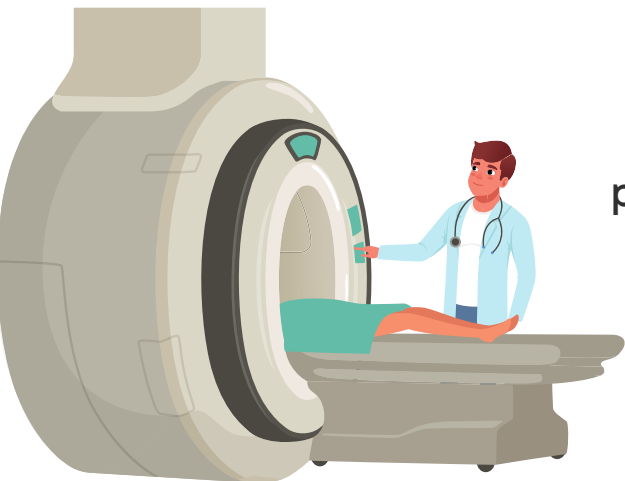


06 X-RAY

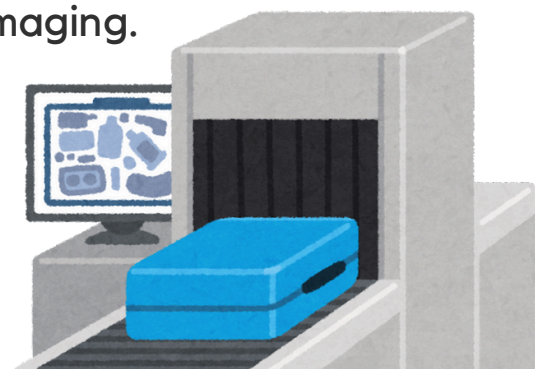
X-rays have even shorter wavelengths and higher frequencies than UV radiation. They can pass through our bodies and are used in medical imaging, like X-ray machines, to see our bones and organs.

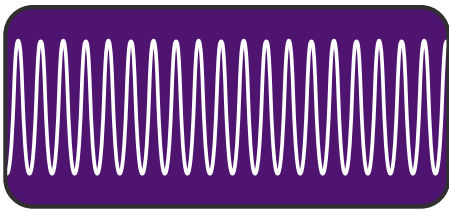


Medical Imaging: X-rays are used to create images of the internal structures of the body, particularly bones. They are absorbed by denser materials (like bones) but pass through softer tissue, creating a contrast that enables clear imaging.



Security: X-ray scanners are common in airport security for scanning baggage and identifying concealed items.





07 GAMMA

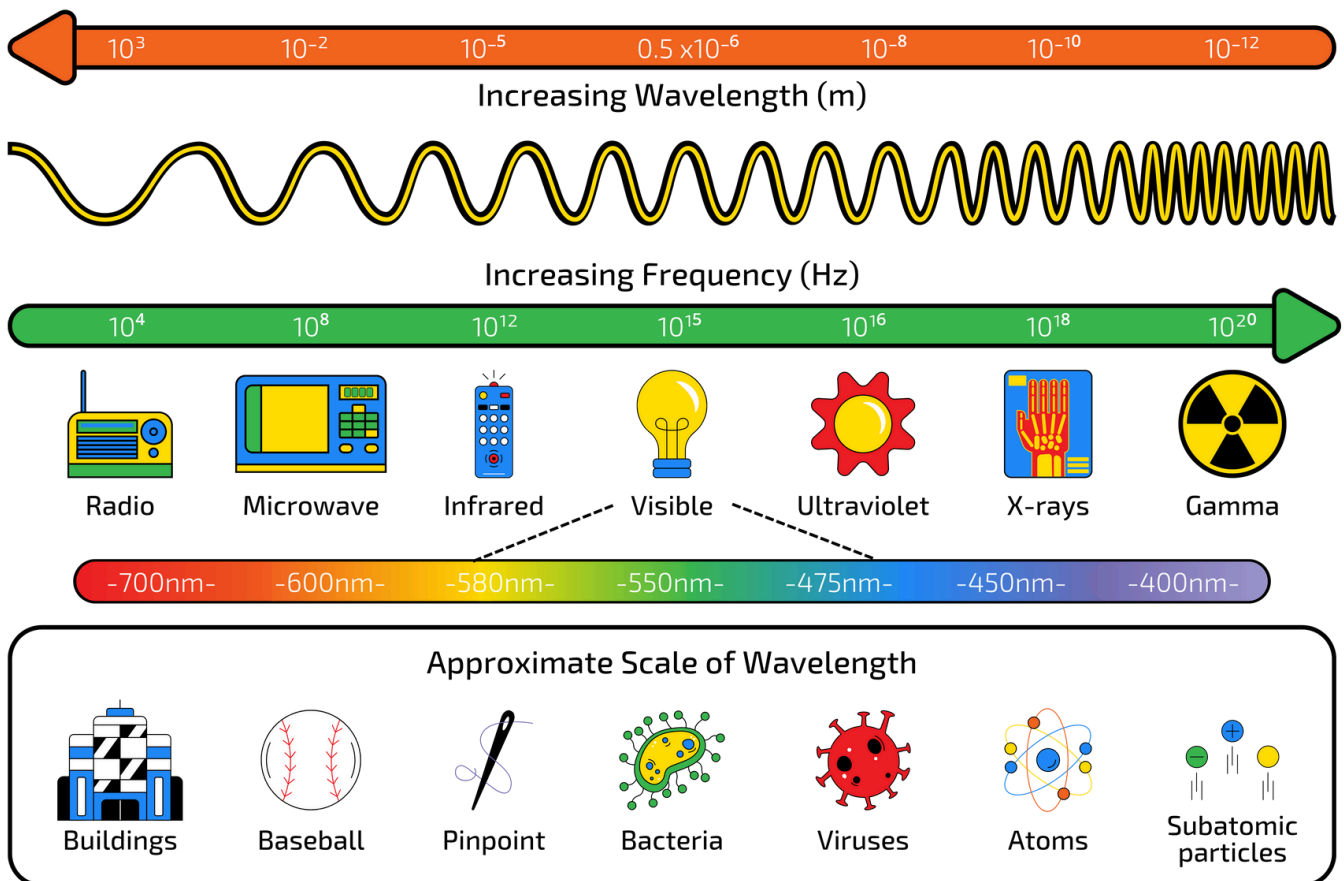


Gamma rays have the shortest wavelengths and highest frequencies of all the radiations. They are produced during nuclear reactions and can be very harmful. In radiotherapy, controlled doses of gamma rays are used to target and destroy cancer cells. Scientists use gamma rays to treat cancer.

Industrial Sterilization: Gamma rays are used to sterilize medical equipment, as their high energy destroys microorganisms.



ELECTROMAGNETIC SPECTRUM





Exploring the Visible and Ultraviolet Light Spectrum

Objective:

- Understand how humans and bees perceive light in the visible and ultraviolet spectrum.
- Compare the visible light spectrum for humans and bees.
- Explore how UV light and visible light differ in terms of wavelength and energy.

Materials Needed:

- Access to the LabXchange simulation Link:
https://www.labxchange.org/library/items/lb:LabXchange:1dae84a2:lx_simulation:1?fullscreen=true
- Computer or tablet with internet access.
- Notebook or digital device for recording observations and answers.

Activity Instructions:

1. Observe how the simulation allows you to visualize the different wavelengths of light visible to both humans and bees.
2. Adjust the sliders to view the visible spectrum for both humans and bees.

Key Questions:

1. How does understanding the differences in light perception help us understand the behaviors of animals like bees?
2. What is the importance of UV light in natural environments?
3. How does the human inability to see UV light impact technology and design (e.g., in UV detection and cameras)?



Exploring the Electromagnetic Spectrum

Objective:

- Identify the different regions of the electromagnetic spectrum.
- Describe the characteristics of each region.
- Cite practical applications for each region of the electromagnetic spectrum through hands-on exploration and analysis.

Materials Needed:

- Access to the simulation Link: <https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190715/InspireScience6-8CA/CT05/index.html>
- Computer or tablet with internet access.
- Notebook or digital device for recording observations and answers.

Activity Instructions:

1. Navigate through the interactive interface to explore the different regions of the electromagnetic spectrum.
2. Investigate the Different Wave Types
3. Complete the interactive challenges:

You might be asked to match each region of the spectrum with its corresponding application or identify the correct characteristics of a given wave.

4. Answer the following key questions.

Key Questions:

1. Provide examples of practical application on each electromagnetic spectrum in improving our everyday life?
2. Why do different regions of the electromagnetic spectrum have different applications?
3. How does understanding the electromagnetic spectrum help improve technology and everyday life?



Post-Test

As we conclude our lesson, it's important to assess your understanding of the topic we've just explored. This step not only helps reinforce your new knowledge but also enables you to connect the concepts you've learned with your existing understanding.

To assist in this, we've prepared a set of questions designed to gauge how well you've grasped the key points of the lesson. These questions are not a test, but a valuable tool to help both you and us assess your progress.

Take your time to reflect on each question and answer thoughtfully. There's no rush – the goal here is not to get every answer right, but to give an honest and accurate snapshot of your current understanding.

This process will guide us in refining future lessons to better meet your learning needs, ensuring a more effective and enjoyable experience moving forward.

So, let's continue on this journey of discovery! Ready? Let's begin!

Directions: Read and understand each question carefully and encircle the letter of the best answer.

1. Which of the following is a region of the electromagnetic spectrum?

- a) Radio waves
- b) Electric fields
- c) Sound waves
- d) Magnetic fields

2. Which region of the electromagnetic spectrum has the longest wavelength?

- a) Gamma rays
- b) X-rays
- c) Radio waves
- d) Microwaves

3. What is the primary use of microwaves in medical applications?

- a) To treat cancer
- b) To take X-ray images
- c) For MRI scanning
- d) For sterilization

4. Which of the following is a practical application of ultraviolet (UV) radiation?

- a) Night vision goggles
- b) Sunburns
- c) Radio communication
- d) Cooking food in a microwave oven

5. Which region of the electromagnetic spectrum is most commonly used in satellite communication?

- a) X-rays
- b) Microwaves
- c) Infrared
- d) Radio waves

6. The visible light spectrum is part of which region of the electromagnetic spectrum?

- a) Optical
- b) Ultraviolet
- c) Infrared
- d) Gamma rays

7. What is one practical application of X-rays in the medical field?

- a) Detecting heat emissions in buildings
- b) Visualizing internal organs in the body
- c) Sterilizing medical equipment
- d) Sending signals to space

8. Which region of the electromagnetic spectrum is most commonly used for the detection of heat from objects?

- a) Microwaves
- b) Infrared radiation
- c) Gamma rays
- d) Ultraviolet radiation

9. What type of electromagnetic radiation is used to kill bacteria and viruses?

- a) Infrared radiation
- b) X-rays
- c) Ultraviolet (UV) rays
- d) Radio waves

10. Which region of the electromagnetic spectrum is used in cancer treatment?

- a) Microwaves
- b) Gamma rays
- c) Visible light
- d) Radio waves

Compare your answers with the pre-test to see how much you've learned and retained.



Answer Key

Pre-test

1. Which of the following is NOT a region of the electromagnetic

spectrum?

- a) Radio waves
- b) Microwaves
- c) **Electric fields**
- d) Gamma rays

2. Which region of the electromagnetic spectrum has the

shortest wavelength?

- a) **Gamma rays**
- b) X-rays
- c) Microwaves
- d) Radio waves

3. What is the primary use of microwaves in communication?

- a) Cooking food
- b) **Cell phone signals**
- c) MRI scanning
- d) Television broadcasting

4. Which of the following is an example of a practical application

of infrared radiation?

- a) X-ray imaging
- b) **Night vision goggles**
- c) Radio broadcasting
- d) UV sterilization

5. Which region of the electromagnetic spectrum is most commonly used for sterilizing medical equipment?

- a) Visible light
- b) Microwaves
- c) **Ultraviolet (UV) rays**
- d) Radio waves

Explanation: Ultraviolet (UV) rays are used for sterilization because they can kill bacteria and viruses by damaging their DNA.

Explanation: Infrared radiation is used in night vision technology to detect heat emitted by objects, allowing the user to see in the dark.

Explanation: Microwaves are widely used for wireless communication, including cell phone signals, satellite communications, and Wi-Fi.

Explanation: Gamma rays have the shortest wavelength in the electromagnetic spectrum and the highest frequency.

Explanation: Electric fields are not a region of the electromagnetic spectrum. The electromagnetic spectrum includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays.

6. The visible light spectrum is part of which region of the

electromagnetic spectrum?

- a) Radio waves
- b) Microwaves
- c) Infrared
- d) Optical

7. What is one practical application of radio waves?

a) Heating food in a microwave oven

b) Broadcasting radio and TV signals

c) Taking X-ray images

d) Medical treatments like radiotherapy

8. Which region of the electromagnetic spectrum is commonly

used for medical imaging?

a) Microwaves

b) X-rays

c) Infrared

d) Gamma rays

9. What type of electromagnetic radiation is used in cooking food

in a microwave oven?

a) Microwaves

b) Radio waves

c) Gamma rays

d) Infrared radiation

10. Which region of the electromagnetic spectrum is used for

cancer treatment?

a) Gamma rays

b) Visible light

c) Infrared radiation

d) Microwaves

Explanation: Gamma rays are used in radiation therapy for cancer treatment because they have high energy and can penetrate tissues to kill cancer cells.

Explanation: Microwaves are used in microwave ovens because they can penetrate food and cause water molecules to vibrate, which heats the food.

Explanation: X-rays are commonly used in medical imaging, such as X-ray films and CT scans, to view the internal structures of the body.

Explanation: Radio waves are commonly used for broadcasting television and radio signals, as well as for radar and communication.

Explanation: The visible light spectrum is a part of the electromagnetic spectrum that is visible to the human eye and falls under the optical region.

Motivational Activity

Spot the Wave!

Directions: Identify objects in a room that correspond to different types of electromagnetic waves (radio waves, microwaves, visible light, etc.) by simply encircling the object.



Post-test

1. Which of the following is a region of the electromagnetic spectrum?

- a) **Radio waves**
- b) Electric fields
- c) Sound waves
- d) Magnetic fields

Explanation: Radio waves are one of the regions of the electromagnetic spectrum. The electromagnetic spectrum includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays.

2. Which region of the electromagnetic spectrum has the longest wavelength?

- a) Gamma rays
- b) X-rays
- c) **Radio waves**
- d) Microwaves

Explanation: Radio waves have the longest wavelengths in the electromagnetic spectrum. Gamma rays have the shortest wavelength..

3. What is the primary use of microwaves in medical applications?

- a) **To treat cancer**
- b) To take X-ray images
- c) For MRI scanning
- d) For sterilization

Explanation: Microwaves are used in some cancer treatments, particularly in hyperthermia therapy, which uses microwave radiation to heat and destroy cancer cells. MRI scanning uses radio waves, not microwaves.

4. Which of the following is a practical application of ultraviolet (UV) radiation?

- a) Night vision goggles
- b) **Sunburns**
- c) Radio communication
- d) Cooking food in a microwave oven

Explanation: Ultraviolet (UV) radiation from the sun is the primary cause of sunburns. It can also be used for sterilization but not for night vision or microwave cooking.

5. Which region of the electromagnetic spectrum is most commonly used in satellite communication?

- a) X-rays
- b) **Microwaves**
- c) Infrared
- d) Radio waves

Explanation: Microwaves are commonly used for satellite communication due to their ability to pass through the Earth's atmosphere effectively, allowing for high-frequency, long-range communication.

Compare your answers with the pre-test to see how much you've learned and retained.

6. The visible light spectrum is part of which region of the electromagnetic spectrum?

- a) Optical
- b) Ultraviolet
- c) Infrared
- d) Gamma rays

Explanation: The visible light spectrum is part of the optical region of the electromagnetic spectrum. It is the range of light that can be seen by the human eye.

7. What is one practical application of X-rays in the medical field?

- a) Detecting heat emissions in buildings
- b) Visualizing internal organs in the body
- c) Sterilizing medical equipment
- d) Sending signals to space

Explanation: X-rays are widely used in the medical field to visualize bones and internal organs. They are not used for detecting heat, sterilizing medical equipment, or sending signals to space.

8. Which region of the electromagnetic spectrum is most commonly used for the detection of heat from objects?

- a) Microwaves
- b) Infrared radiation
- c) Gamma rays
- d) Ultraviolet radiation

Explanation: Infrared radiation is used to detect heat. It is used in thermal imaging and night-vision technologies to detect the heat emitted by objects.

9. What type of electromagnetic radiation is used to kill bacteria and viruses?

- a) Infrared radiation
- b) X-rays
- c) Ultraviolet (UV) rays
- d) Radio waves

Explanation: Ultraviolet (UV) rays have germicidal properties and are commonly used for sterilization, as they can kill bacteria and viruses by damaging their DNA.

10. Which region of the electromagnetic spectrum is used in cancer treatment?

- a) Microwaves
- b) Gamma rays
- c) Visible light
- d) Radio waves

Explanation: Gamma rays are used in radiation therapy to treat cancer, as they can penetrate tissues and kill cancer cells. Microwaves and radio waves are not used in cancer treatment.

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