

Waves at Work

Connect each electromagnetic region to its characteristics and uses.

PS.7.b "regions of the electromagnetic spectrum have specific characteristics and uses."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Circle each electromagnetic spectrum region, underline a characteristic of that region, and number each use that is described so you can match waves to what they do.

Energy Beyond What We See

- ① Electromagnetic waves carry energy as they travel through space or through some materials. They do not need a medium, so sunlight can cross space from the Sun to Earth. Scientists arrange these waves in the electromagnetic spectrum. Radio waves have the longest wavelengths and lowest frequencies. Moving across the spectrum, wavelengths become shorter while frequencies and energy increase. The main regions are radio, microwave, infrared, visible light, ultraviolet, X-ray, and gamma ray. Each region interacts with matter in useful ways.
- ② Radio waves can carry signals over long distances, which makes them useful for broadcasting and some wireless communication. Microwaves have shorter wavelengths than radio waves. They carry signals between satellites and Earth, and they can heat water-rich food in microwave ovens. Infrared radiation is often felt as heat because warm objects emit it. Thermal cameras detect infrared radiation to show temperature patterns, even when visible light is limited. Visible light is the narrow region human eyes detect, allowing people to see colors and objects.
- ③ Ultraviolet radiation has more energy than visible light. Too much ultraviolet exposure can damage skin, but controlled ultraviolet light can disinfect some surfaces and water. X-rays have still higher energy and can pass through soft tissue more easily than through bone. This difference helps doctors view broken bones, and security workers scan luggage. Gamma rays have the shortest wavelengths and greatest energy. Doctors may aim controlled gamma rays at certain cancers, while industries use them to sterilize some medical equipment.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Why can a thermal camera help someone see temperature patterns when visible light is limited?

2 Give one communication use of microwaves and one heating use of microwaves.

3 How does the way X-rays pass through soft tissue and bone help doctors view broken bones?

4 Which electromagnetic region has the shortest wavelengths and greatest energy? Give one use named in the passage.

3 YOUR TURN _____ Your own words

Create a four-sentence plan for a field team that must complete two jobs. Name two spectrum regions, describe a characteristic of each, and explain how a tool using each region helps complete a job.

PART 1 • READ AND MARK

Circle each electromagnetic spectrum region, underline a characteristic of that region, and number each use that is described so you can match waves to what they do. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Why can a thermal camera help someone see temperature patterns when visible light is limited?	Warm objects emit infrared radiation, and thermal cameras detect infrared radiation to show temperature patterns.
2	Give one communication use of microwaves and one heating use of microwaves.	Microwaves carry signals between satellites and Earth. They heat water-rich food in microwave ovens.
3	How does the way X-rays pass through soft tissue and bone help doctors view broken bones?	X-rays pass through soft tissue more easily than bone, creating a difference that lets doctors see bones and breaks.
4	Which electromagnetic region has the shortest wavelengths and greatest energy? Give one use named in the passage.	Gamma rays. They can be aimed at certain cancers or used to sterilize some medical equipment.

PART 3 • YOUR TURN (SAMPLE ANSWER)

At night, a rescue team uses infrared radiation in a thermal camera to locate a lost hiker, because warm bodies emit infrared radiation. The camera shows temperature patterns when visible light is scarce. The team then uses radio waves to send the hiker's location to the base station. Radio waves can carry signals over long distances, so the message reaches the team quickly.

Accept accurate region, characteristic, and use connections stated in the passage. For the open response, accept any scientifically accurate two-region plan with a characteristic and a matching tool or use for each region.