Waves at Work

Trace how wave properties make technologies useful.

8.8.B "explain the use of electromagnetic waves in applications such as radiation therapy, wireless technologies, fiber optics, microwaves, ultraviolet sterilization, astronomical observations, and X-rays."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each electromagnetic-wave application in the passage. Circle the words that explain what the wave does or why it is useful in that application.

Energy on the Move

1. Electromagnetic waves carry energy without needing matter to travel through. Doctors use carefully aimed high-energy radiation therapy to damage cancer cells and slow their growth. Nearby healthy tissue is protected as much as possible by planning the beam path. X-rays pass through soft body tissues more easily than through bone, so detectors can create images of broken bones. Ultraviolet light can damage the genetic material of bacteria and viruses. Hospitals and water-treatment systems use controlled ultraviolet light to reduce harmful microbes.

2. Wireless technologies send information by changing electromagnetic waves into signals that receivers decode. Cell phones, Wi-Fi routers, and satellites use radio waves or microwaves because these waves can travel through air and across long distances. Microwave ovens use a different application: microwaves transfer energy to water molecules in food, warming the food. Fiber-optic cables guide pulses of visible or infrared light through thin glass strands. The light remains inside because it reflects from the boundary, allowing fast communication with little signal loss.

3. Astronomers study electromagnetic waves from space because objects emit or reflect different parts of the spectrum. Radio telescopes detect radio waves from distant clouds and galaxies, while infrared observations can reveal cooler dust regions. Visible-light telescopes show stars and planets, and X-ray telescopes investigate extremely hot events, such as matter falling toward a black hole. Earth's atmosphere blocks some waves, so certain observatories operate above it. Across all these applications, choosing a wave depends on how its energy, wavelength, and interactions fit the job.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why do doctors carefully plan the path of a radiation therapy beam?

2. How do microwave ovens and wireless technologies use microwaves differently?

3. How does a fiber-optic cable keep light moving through its glass strand, and what communication benefit does this provide?

4. How do radio, infrared, and X-ray astronomical observations help scientists study different objects or events in space?

3 YOUR TURN

Your own words

A wildlife research team must send measurements from a remote weather station to a laboratory 20 kilometers away. In 3 or 4 sentences, propose an electromagnetic-wave technology for the job and explain how it would carry the information and why it fits the situation.

ANSWER KEY

Waves at Work

GRADE 8 · TEKS 8.8.B

PART 1 · READ AND MARK

Underline each electromagnetic-wave application in the passage. Circle the words that explain what the wave does or why it is useful in that application. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why do doctors carefully plan the path of a radiation therapy beam?	**They plan the beam path to damage cancer cells while protecting nearby healthy tissue as much as possible.**
2	How do microwave ovens and wireless technologies use microwaves differently?	**Microwave ovens transfer energy to water molecules in food to warm it. Wireless technologies use microwaves to carry information as signals that receivers decode.**
3	How does a fiber-optic cable keep light moving through its glass strand, and what communication benefit does this provide?	**The light reflects from the boundary of the glass strand and remains inside. This allows fast communication with little signal loss.**
4	How do radio, infrared, and X-ray astronomical observations help scientists study different objects or events in space?	**Radio telescopes detect distant clouds and galaxies. Infrared observations can reveal cooler dust regions. X-ray telescopes investigate extremely hot events, such as matter falling toward a black hole.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The team could use radio waves to send the station's measurements to a receiver at the laboratory. The station would change the data into signals, and the receiver would decode them. Radio waves fit because wireless technologies can carry information through air over long distances.

Accept equivalent explanations that correctly connect a wave's behavior or interaction with its application. For Part 3, accept radio waves or microwaves if the student explains signal transmission through air and decoding at the receiver.