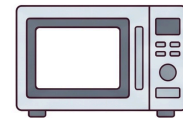
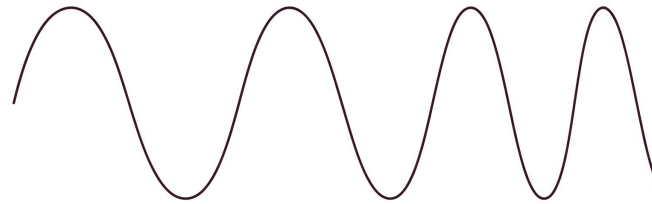
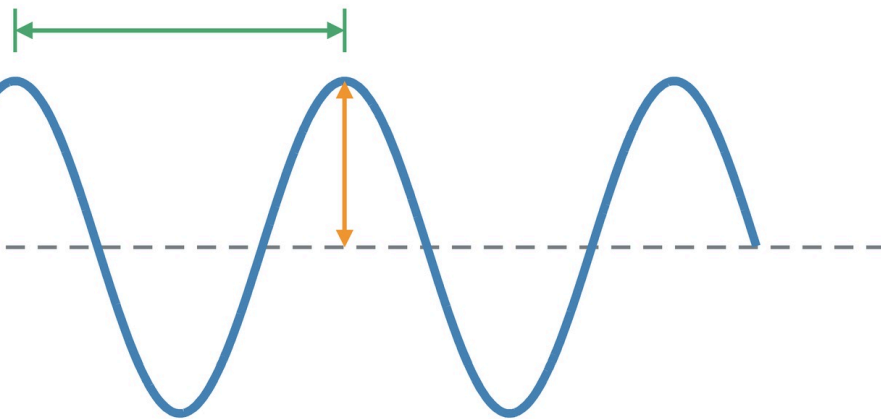


Waves and the Electromagnetic Spectrum

The parts of a wave and the seven kinds of electromagnetic waves



10

printable sheets

22

pages

All

answer keys included

Waves and the Electromagnetic Spectrum Teaching Pack

The parts of a wave and the seven kinds of electromagnetic waves

How to use this pack. The sheets are in a suggested teaching order: show the labeled diagrams, have students label the blank ones, then work through the practice sheets and finish with the quiz. Use them all over a week or pick the ones you need. The answer keys are together at the back.

What is inside

1. Teach

Parts of a Wave Diagram	3
Electromagnetic Spectrum Diagram	4

2. Label

Blank Parts of a Wave	5
Blank Electromagnetic Spectrum	6

3. Match

Parts of a Wave	7
Kinds of Electromagnetic Waves	8

4. Read

Waves All Around You	9
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5. Order

The Electromagnetic Spectrum in Order	11
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6. Review

Waves and Light Crossword	13
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7. Check

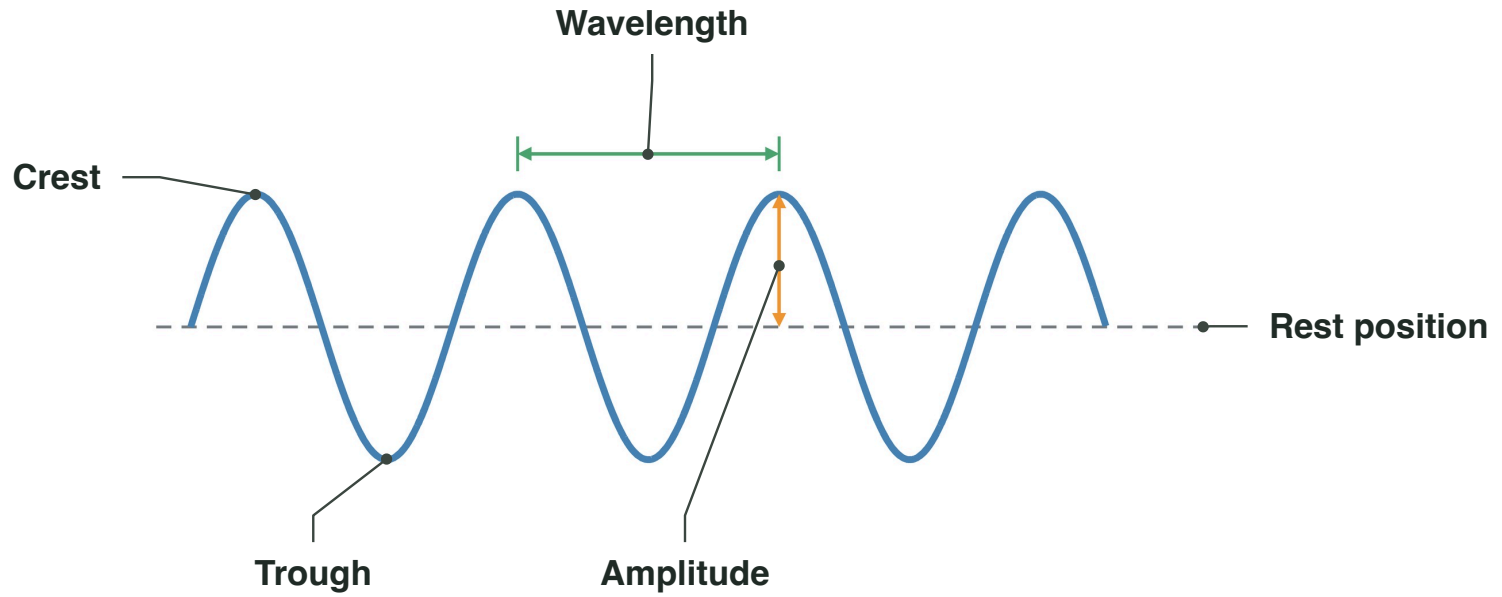
Waves and Light Quiz	14
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Answer keys

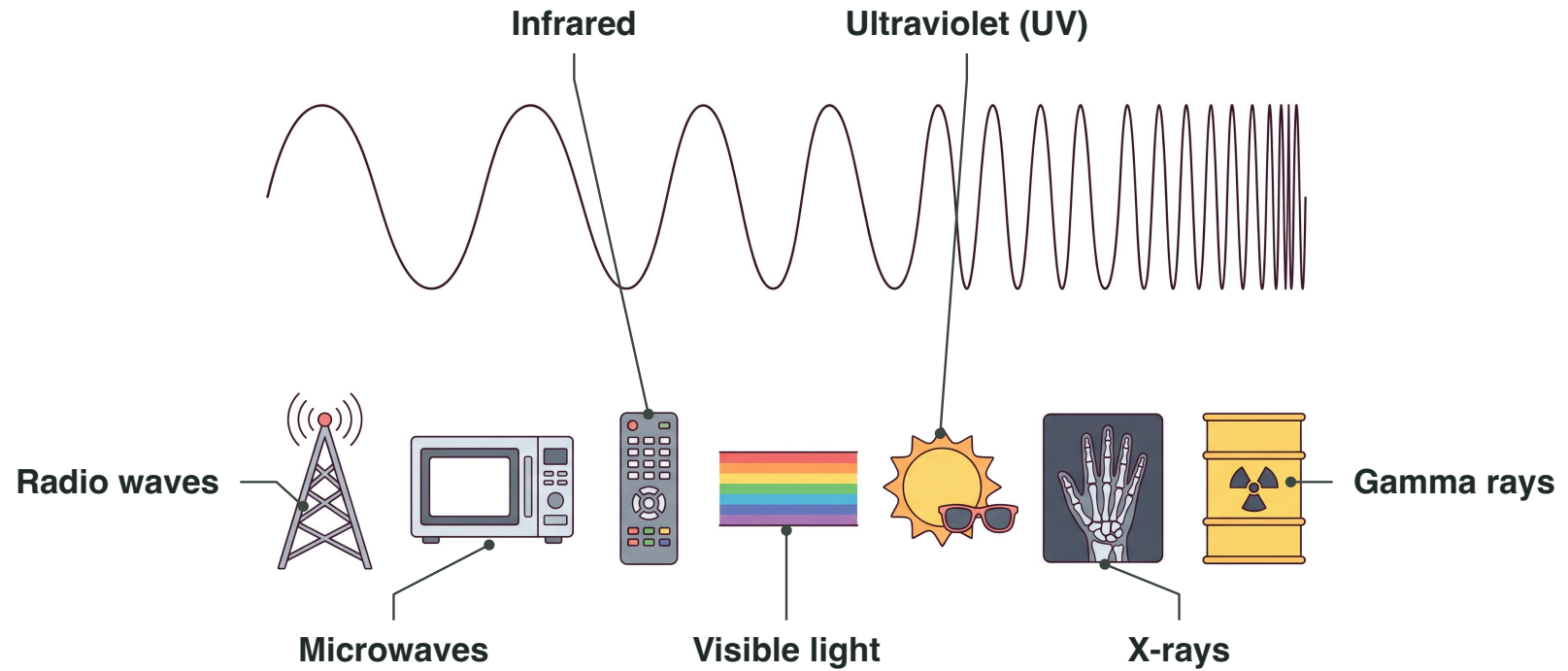
Every answer key, in the same order	16
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More free teaching packs. Parts of an Atom, States of Matter, Forms of Energy, Magnets and Magnetic Fields, Acids, Bases and the pH Scale and more at printablescholar.com/teaching-packs/

Parts of a Wave



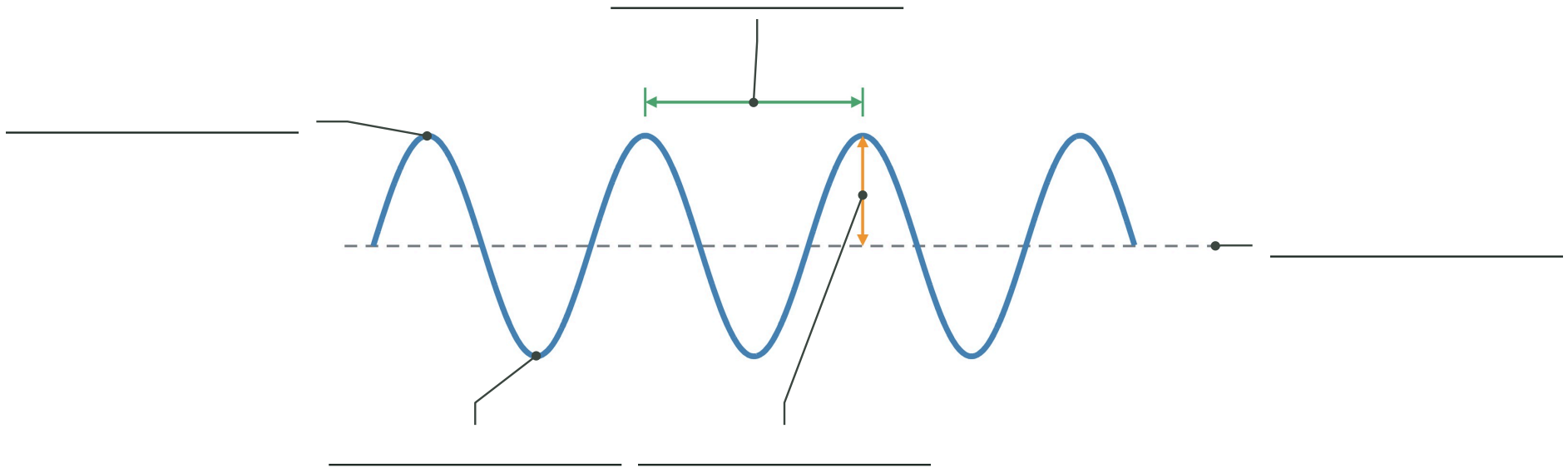
The Electromagnetic Spectrum



Parts of a Wave

Name: _____

Write the name of each part on its line. Use the word bank.



Word bank

Amplitude

Crest

Rest position

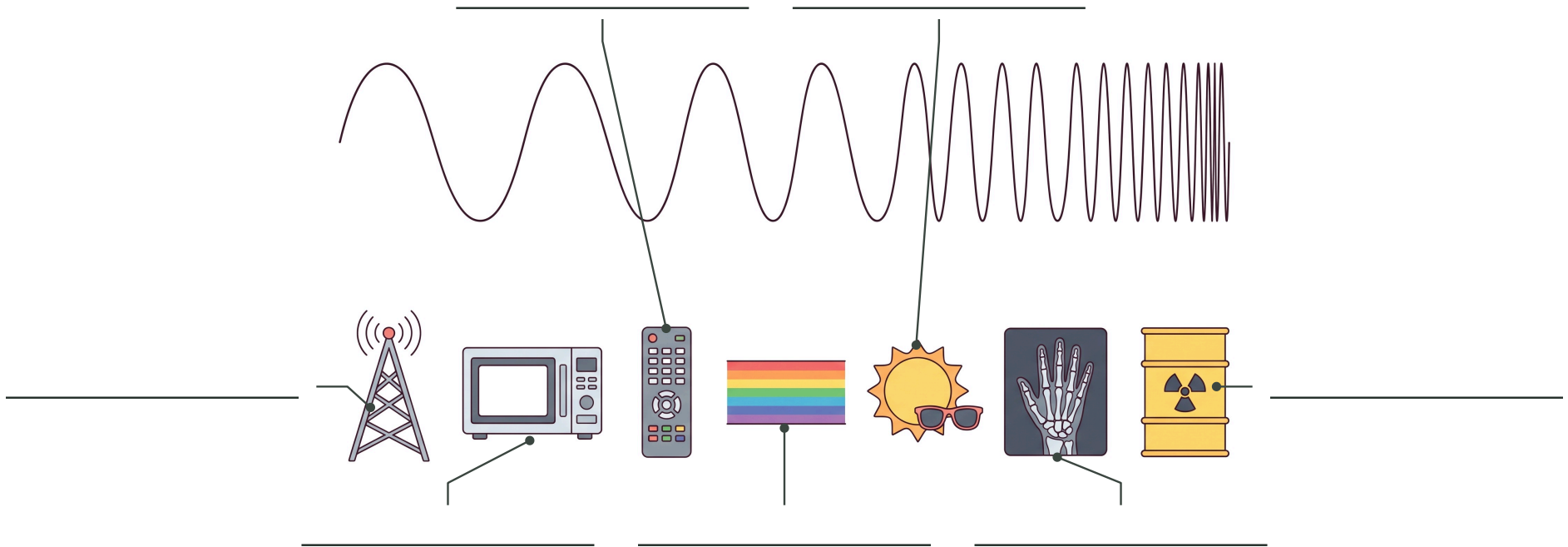
Trough

Wavelength

The Electromagnetic Spectrum

Name: _____

Write the name of each part on its line. Use the word bank.



Word bank

Gamma rays

Infrared

Microwaves

Radio waves

Ultraviolet (UV)

Visible light

X-rays

Parts of a Wave

Use the labeled parts of a wave diagram to help you.

Part A. Write the word that fits each description.

Word bank

Amplitude

Crest

Energy

Frequency

Medium

Rest position

Trough

Wavelength

1. The lowest point of a wave. _____
2. The distance from one crest to the next crest. _____
3. How many waves pass a point each second. _____
4. The highest point of a wave. _____
5. The level line the wave moves up and down from. _____
6. What every wave carries from one place to another. _____
7. The height of the wave from the rest position up to a crest. _____
8. The matter a wave travels through, such as water, air or a rope. _____

Part B. Answer the questions.

1. Wavelength can be measured from crest to crest. Name another pair of points that gives the same distance.

2. A student measures from the bottom of a trough to the top of a crest and calls it the amplitude. What is wrong?

3. Two waves travel at the same speed. Wave A has a shorter wavelength than wave B. Which wave has the higher frequency?

Kinds of Electromagnetic Waves

Use the labeled electromagnetic spectrum diagram to help you.

Part A. Write the kind of wave that fits each description.

Word bank

Gamma rays

Infrared

Microwaves

Radio waves

Ultraviolet (UV)

Visible light

X-rays

1. We feel these waves as heat. A TV remote control sends its signal with them. _____
2. The shortest waves, with the highest energy. Radioactive material gives them off. _____
3. The only waves our eyes can see. They make all the colors of the rainbow. _____
4. The longest waves, with the lowest energy. They carry music, talk and television signals from broadcast towers. _____
5. They come from the sun and can cause sunburn. _____
6. They heat food in a kitchen oven that works in minutes. They are also used for radar. _____
7. They pass through soft parts of the body, so doctors use them to take pictures of bones. _____

Part B. Answer the questions.

1. Which kind of electromagnetic wave has the longest wavelength? Which has the shortest?

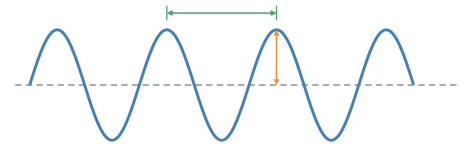
2. Infrared and ultraviolet sit on either side of visible light in the spectrum. Which of the two has more energy?

3. Why is it a good idea to wear sunscreen on a sunny day? Use the name of a kind of wave in your answer.

Waves All Around You

Read the text. Then answer the questions on the next page.

- 1 Drop a pebble into a pond and ripples spread out across the water. Each ripple is a **wave**. A wave carries **energy** from one place to another. It does not carry the water along with it. A leaf floating on the pond bobs up and down as the ripples pass, but it stays in about the same place.
- 2 Scientists describe a wave by its parts. The highest point is the **crest**, and the lowest point is the **trough**. The level line the wave moves up and down from is the **rest position**. The **wavelength** is the distance from one crest to the next crest. The **amplitude** is the height from the rest position up to a crest. The **frequency** is how many waves pass a point each second.
- 3 Water waves and sound waves need matter to travel through. That matter is called a **medium**. Sound cannot cross empty space, because there is no matter there to carry it. Light can. Light is an **electromagnetic wave**, and electromagnetic waves need no medium. That is how sunlight reaches Earth.
- 4 The light you see is only one kind of electromagnetic wave. The whole range is called the **electromagnetic spectrum**. From the longest wavelength to the shortest, its seven kinds are radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays. In empty space they all travel at the same speed. The shorter the wavelength, the higher the frequency and the more energy the wave carries.
- 5 People use every part of the spectrum. Radio waves carry music to a radio. Microwaves heat food. A TV remote sends its signal with infrared. Ultraviolet from the sun can cause sunburn. X-rays let doctors take pictures of bones. Gamma rays carry the most energy of all. They come from radioactive material.



A wave. Green marks one wavelength.
Orange marks the amplitude.



The electromagnetic spectrum, from long radio waves on the left to short gamma rays on the right.

Waves All Around You: Questions

Go back to the text to find each answer. The paragraphs are numbered to help you.

1. What is this text mostly about?

- ☐ How to skip a pebble across a pond
- ☐ What waves are and the kinds of electromagnetic waves
- ☐ How a radio is built
- ☐ Why the sun is hot

2. What does a wave carry from one place to another?

- ☐ Water
- ☐ Leaves
- ☐ Energy
- ☐ Air

3. What happens to a leaf floating on the pond as the ripples pass?

4. What is the amplitude of a wave?

- ☐ The distance from one crest to the next crest
- ☐ The height from the rest position up to a crest
- ☐ The number of waves that pass a point each second
- ☐ The lowest point of the wave

5. Why can light cross empty space when sound cannot?

6. Number these waves 1, 2 and 3 from the longest wavelength to the shortest (paragraph 4).

- ☐ Visible light
- ☐ Gamma rays
- ☐ Radio waves

7. What is the same for all electromagnetic waves in empty space?

- ☐ Their wavelength
- ☐ Their frequency
- ☐ Their speed
- ☐ Their energy

8. Which kind of electromagnetic wave carries the most energy? Where does it come from?

The Electromagnetic Spectrum in Order

Each sentence names one kind of electromagnetic wave. Put them in order by wavelength. Give the longest wavelength number 1 and the shortest number 7.

Part A. Number the steps from 1 to 7.

- ☐ Radio waves carry music and news to a car radio.
- ☐ Gamma rays come from radioactive material.
- ☐ Ultraviolet from the sun causes a sunburn.
- ☐ X-rays make a picture of the bones in a hand.
- ☐ Microwaves heat a bowl of soup.
- ☐ Visible light shows the colors of a rainbow.
- ☐ Infrared carries a signal from a TV remote to the TV.

Part B. Answer the questions.

1. Which of the seven kinds of waves has the highest frequency? How do you know?

2. Which carries more energy, a microwave or an X-ray? Explain.

3. Name two things that are the same for all seven kinds of waves.

The Electromagnetic Spectrum in Order: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. Number the steps from 1 to 7.

- 1** Radio waves carry music and news to a car radio.
- 7** Gamma rays come from radioactive material.
- 5** Ultraviolet from the sun causes a sunburn.
- 6** X-rays make a picture of the bones in a hand.
- 2** Microwaves heat a bowl of soup.
- 4** Visible light shows the colors of a rainbow.
- 3** Infrared carries a signal from a TV remote to the TV.

Part B. Answer the questions.

1. Which of the seven kinds of waves has the highest frequency? How do you know?

Gamma rays. They have the shortest wavelength, and a shorter wavelength means a higher frequency.

2. Which carries more energy, a microwave or an X-ray? Explain.

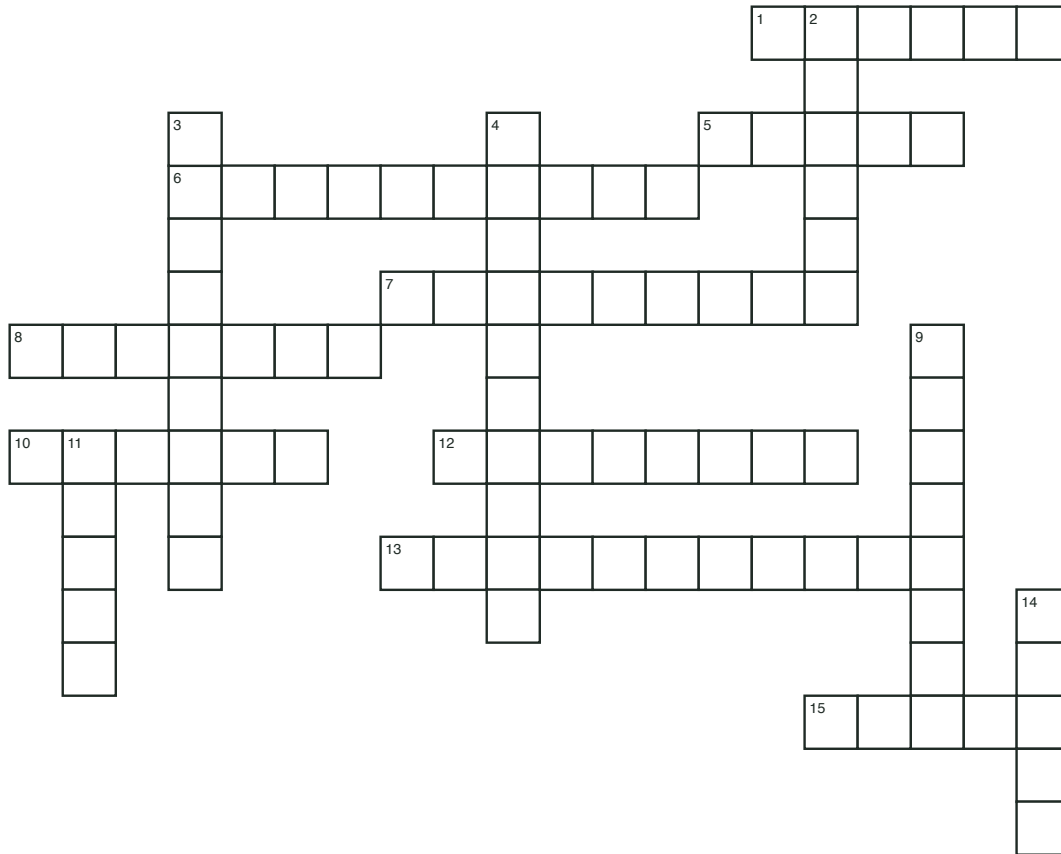
An X-ray. It has a shorter wavelength, so it carries more energy.

3. Name two things that are the same for all seven kinds of waves.

Any two: they are all electromagnetic waves. They all travel at the same speed in empty space. They need no medium.

Waves and Light Crossword

Read each clue. Write the answer in the puzzle, one letter in each box. Use the word bank if you get stuck.



ACROSS

1. The matter that a sound wave or a water wave travels through.
5. The highest point of a wave.
6. They are used for radar and in an oven that heats food in minutes.
7. How many waves pass a point each second.
8. ____ light is the only part of the spectrum our eyes can see.
10. The lowest point of a wave.
12. A TV remote sends its signal with this kind of wave. We feel it as heat.
13. Waves from the sun that can cause sunburn.
15. ____ rays have the shortest wavelength and the highest energy.

DOWN

2. What a wave carries from place to place.
3. The height from the rest position up to a crest.
4. The distance from one crest to the next crest.
9. The electromagnetic ____ is the whole range of electromagnetic waves.
11. ____ waves have the longest wavelength in the electromagnetic spectrum.
14. Doctors use these to take pictures of bones.

Word bank

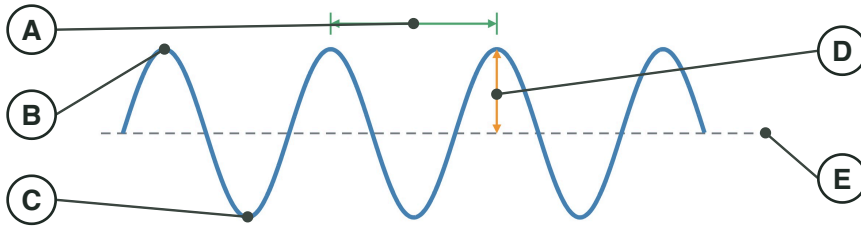
amplitude crest energy frequency gamma infrared medium microwaves
radio spectrum trough ultraviolet visible wavelength X-rays

Waves and Light Quiz

Score _____ / 13

Show what you know about waves and the electromagnetic spectrum.

Part A. This is a wave. Write the name of each part.



- A _____
B _____
C _____
D _____
E _____

Amplitude · Crest · Rest position · Trough ·
Wavelength

Part B. Choose the best answer.

- Which electromagnetic waves have the longest wavelength?
☐ Gamma rays
☐ Visible light
☐ Radio waves
☐ X-rays
- Which kind of electromagnetic wave can our eyes see?
☐ Infrared
☐ Ultraviolet
☐ Visible light
☐ Microwaves
- Which waves from the sun can cause sunburn?
☐ Radio waves
☐ Ultraviolet
☐ Microwaves
☐ Gamma rays
- What is the frequency of a wave?
☐ The height of the wave
☐ The distance between two crests
☐ The lowest point of the wave
☐ How many waves pass a point each second
- Which of these is NOT an electromagnetic wave?
☐ X-rays
☐ Sound
☐ Microwaves
☐ Visible light
- In empty space, what is the same for radio waves and gamma rays?
☐ Their speed
☐ Their wavelength
☐ Their frequency
☐ Their energy

Part C. Write your answer.

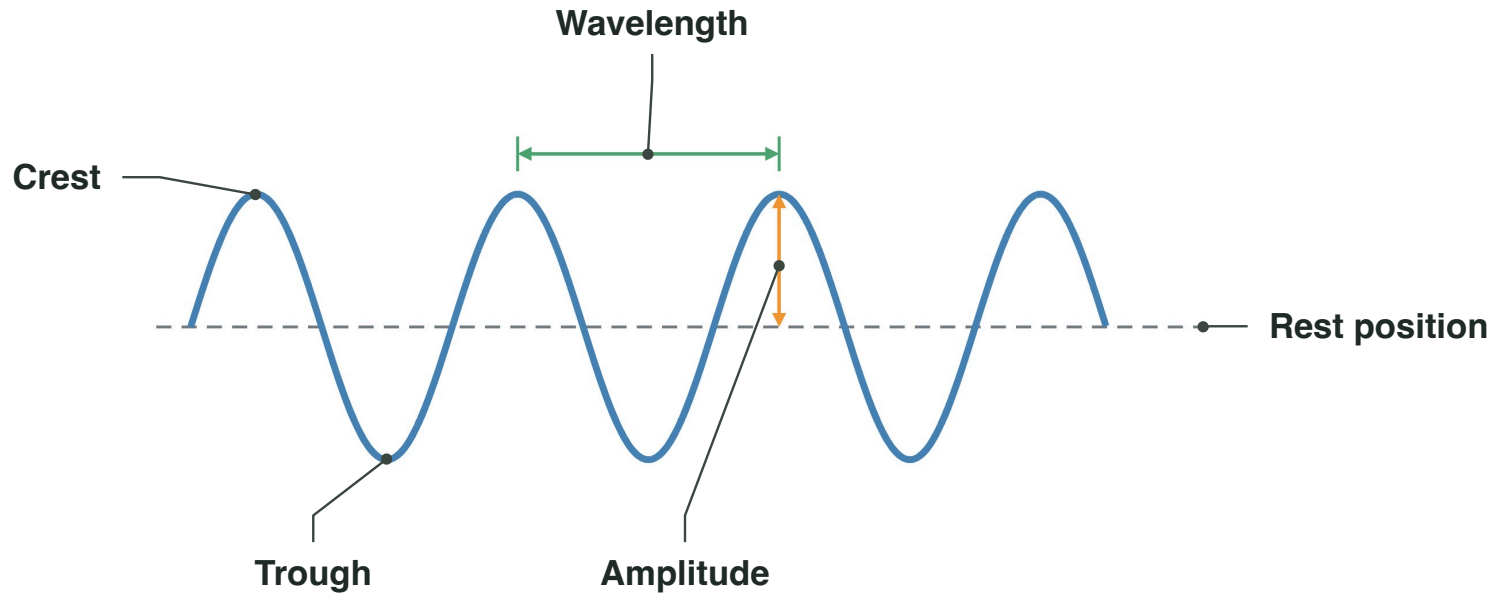
7. What is the difference between wavelength and amplitude?

8. Write these in order from the longest wavelength to the shortest: X-rays, microwaves, visible light.

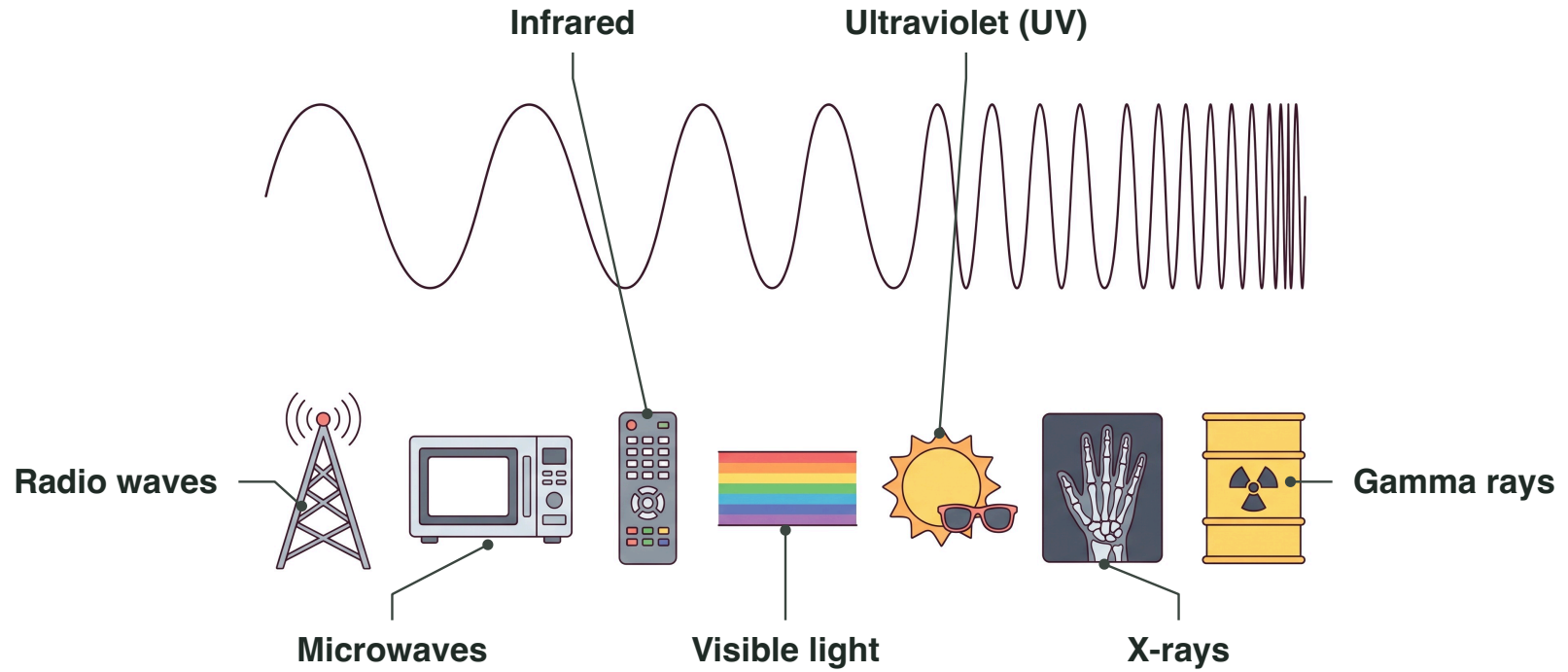
Answer Keys

In the same order as the sheets.

Parts of a Wave: Answer Key



The Electromagnetic Spectrum: Answer Key



Parts of a Wave: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. Write the word that fits each description.

Word bank

Amplitude

Crest

Energy

Frequency

Medium

Rest position

Trough

Wavelength

1. The lowest point of a wave.	Trough
2. The distance from one crest to the next crest.	Wavelength
3. How many waves pass a point each second.	Frequency
4. The highest point of a wave.	Crest
5. The level line the wave moves up and down from.	Rest position
6. What every wave carries from one place to another.	Energy
7. The height of the wave from the rest position up to a crest.	Amplitude
8. The matter a wave travels through, such as water, air or a rope.	Medium

Part B. Answer the questions.

1. Wavelength can be measured from crest to crest. Name another pair of points that gives the same distance.

From one trough to the next trough.

2. A student measures from the bottom of a trough to the top of a crest and calls it the amplitude. What is wrong?

Amplitude is measured from the rest position up to a crest. The student measured twice that distance.

3. Two waves travel at the same speed. Wave A has a shorter wavelength than wave B. Which wave has the higher frequency?

Wave A. More of the shorter waves pass a point each second.

Kinds of Electromagnetic Waves: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. Write the kind of wave that fits each description.

Word bank

Gamma rays

Infrared

Microwaves

Radio waves

Ultraviolet (UV)

Visible light

X-rays

1. We feel these waves as heat. A TV remote control sends its signal with them.

Infrared

2. The shortest waves, with the highest energy. Radioactive material gives them off.

Gamma rays

3. The only waves our eyes can see. They make all the colors of the rainbow.

Visible light

4. The longest waves, with the lowest energy. They carry music, talk and television signals from broadcast towers.

Radio waves

5. They come from the sun and can cause sunburn.

Ultraviolet (UV)

6. They heat food in a kitchen oven that works in minutes. They are also used for radar.

Microwaves

7. They pass through soft parts of the body, so doctors use them to take pictures of bones.

X-rays

Part B. Answer the questions.

1. Which kind of electromagnetic wave has the longest wavelength? Which has the shortest?

Radio waves have the longest wavelength. Gamma rays have the shortest.

2. Infrared and ultraviolet sit on either side of visible light in the spectrum. Which of the two has more energy?

Ultraviolet. It has a shorter wavelength than infrared, so it has more energy.

3. Why is it a good idea to wear sunscreen on a sunny day? Use the name of a kind of wave in your answer.

The sun gives off ultraviolet (UV) waves. They can cause sunburn. Sunscreen helps block them.

Waves All Around You: Answer Key

Answers are in green. Written answers will vary; these are examples.

1. What is this text mostly about?

- ☐ How to skip a pebble across a pond
- ☒ **What waves are and the kinds of electromagnetic waves**
- ☐ How a radio is built
- ☐ Why the sun is hot

2. What does a wave carry from one place to another?

- ☐ Water
- ☐ Leaves
- ☒ **Energy**
- ☐ Air

3. What happens to a leaf floating on the pond as the ripples pass?

It bobs up and down but stays in about the same place.

4. What is the amplitude of a wave?

- ☐ The distance from one crest to the next crest
- ☒ **The height from the rest position up to a crest**
- ☐ The number of waves that pass a point each second
- ☐ The lowest point of the wave

5. Why can light cross empty space when sound cannot?

Sound needs a medium to travel through. Light is an electromagnetic wave and needs no medium.

6. Number these waves 1, 2 and 3 from the longest wavelength to the shortest (paragraph 4).

- 2** Visible light
- 3** Gamma rays
- 1** Radio waves

7. What is the same for all electromagnetic waves in empty space?

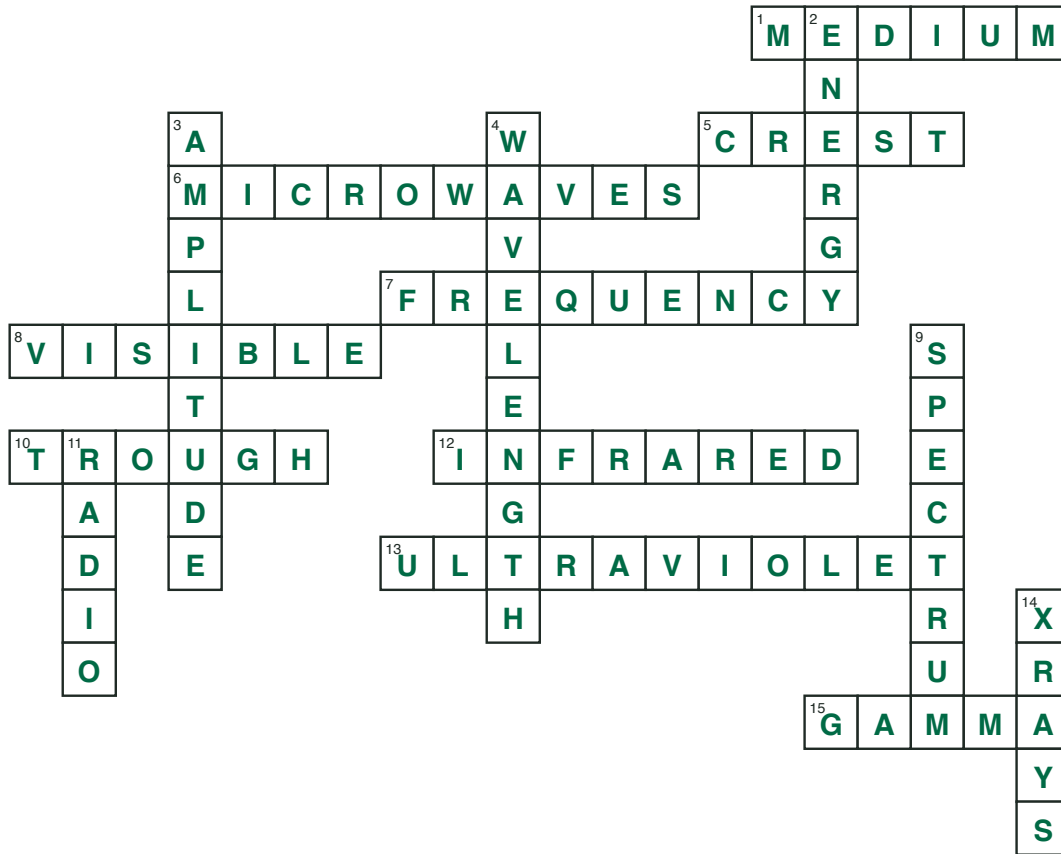
- ☐ Their wavelength
- ☐ Their frequency
- ☒ **Their speed**
- ☐ Their energy

8. Which kind of electromagnetic wave carries the most energy? Where does it come from?

Gamma rays. They come from radioactive material.

Waves and Light Crossword: Answer Key

Answers are in green.



ACROSS

- The matter that a sound wave or a water wave travels through.
- The highest point of a wave.
- They are used for radar and in an oven that heats food in minutes.
- How many waves pass a point each second.
- ____ light is the only part of the spectrum our eyes can see.
- The lowest point of a wave.
- A TV remote sends its signal with this kind of wave. We feel it as heat.
- Waves from the sun that can cause sunburn.
- ____ rays have the shortest wavelength and the highest energy.

DOWN

- What a wave carries from place to place.
- The height from the rest position up to a crest.
- The distance from one crest to the next crest.
- The electromagnetic ____ is the whole range of electromagnetic waves.
- ____ waves have the longest wavelength in the electromagnetic spectrum.
- Doctors use these to take pictures of bones.

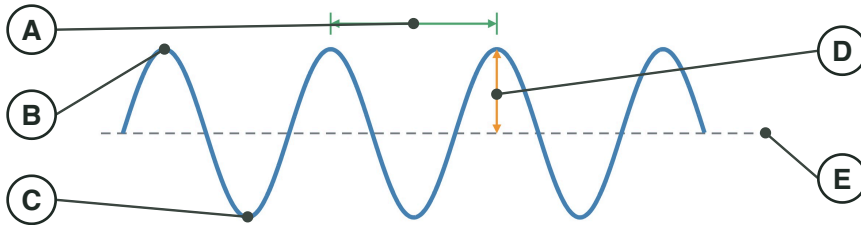
Word bank

amplitude crest energy frequency gamma infrared medium microwaves
radio spectrum trough ultraviolet visible wavelength X-rays

Waves and Light Quiz: Answer Key

Answers are in green. Written answers will vary; these are examples.

Part A. This is a wave. Write the name of each part.



A **Wavelength**

B **Crest**

C **Trough**

D **Amplitude**

E **Rest position**

Amplitude · Crest · Rest position · Trough · Wavelength

Part B. Choose the best answer.

- Which electromagnetic waves have the longest wavelength?
☐ Gamma rays
☐ Visible light
☒ **Radio waves**
☐ X-rays
- Which kind of electromagnetic wave can our eyes see?
☐ Infrared
☐ Ultraviolet
☒ **Visible light**
☐ Microwaves
- Which waves from the sun can cause sunburn?
☐ Radio waves
☒ **Ultraviolet**
☐ Microwaves
☐ Gamma rays
- What is the frequency of a wave?
☐ The height of the wave
☐ The distance between two crests
☐ The lowest point of the wave
☒ **How many waves pass a point each second**
- Which of these is NOT an electromagnetic wave?
☐ X-rays
☒ **Sound**
☐ Microwaves
☐ Visible light
- In empty space, what is the same for radio waves and gamma rays?
☒ **Their speed**
☐ Their wavelength
☐ Their frequency
☐ Their energy

Part C. Write your answer.

7. What is the difference between wavelength and amplitude?

Wavelength is the distance from crest to crest. Amplitude is the height from the rest position to a crest.

8. Write these in order from the longest wavelength to the shortest: X-rays, microwaves, visible light.

Microwaves, visible light, X-rays.