

Wave Detective Notes

Use comparison questions to explain how waves travel and transfer energy.

S8P4.a "Ask questions to develop explanations about the similarities and differences between electromagnetic and mechanical waves."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline facts that show a similarity between electromagnetic and mechanical waves. Circle facts that show a difference, then number two sentences that explain how a question could help investigate waves.

Signals, Sound, and Space

- ① At a school concert, a speaker cone vibrates and makes nearby air particles vibrate. This disturbance moves outward as sound, a mechanical wave. Mechanical waves transfer energy through matter, called a medium. A medium may be a solid, liquid, or gas. Sound can travel through air, water, and metal, although its speed changes in different materials. In the near-empty space between planets, sound cannot travel because there are too few particles to pass the disturbance along.
- ② Sunlight reaches Earth after crossing space, so it is not a mechanical wave. Light is an electromagnetic wave, made of changing electric and magnetic fields. Electromagnetic waves can transfer energy through a vacuum and can also travel through materials. Radio waves, microwaves, visible light, and X-rays are electromagnetic waves. Like mechanical waves, electromagnetic waves can have wavelength, frequency, and amplitude. Both types can transfer energy and may be reflected or absorbed when they meet a material.
- ③ Scientists build explanations by asking questions that compare conditions and evidence. A useful question focuses on one feature and names what will be compared. Another question can ask how a wave changes after entering a new material. Answers should connect observations to wave properties, not just name a type. Evidence from repeated tests can show whether a pattern is reliable. Questions about a shared property can reveal similarities, while questions about conditions that permit travel can reveal differences.

2 ANSWER WITH EVIDENCE _____ Use the passage

- 1** A spacecraft receives a radio signal in space but cannot receive sound from a speaker in the same vacuum. Write one comparison question that could help explain this difference.

- 2** Use the passage to explain why a sound wave and a radio wave would behave differently in a vacuum.

- 3** Write one question that investigates a similarity between a sound wave and visible light. Then state the similarity your question investigates.

- 4** Which question is more useful for comparing electromagnetic and mechanical waves: "What color is the light?" or "Can each wave transfer energy?" Explain your choice using the passage.

3 YOUR TURN _____ Your own words

Compare a water ripple and visible light. Write two testable comparison questions, one about travel through a vacuum and one about a shared property. Then write exactly three sentences that use wave evidence to predict the answers.

PART 1 • READ AND MARK

Underline facts that show a similarity between electromagnetic and mechanical waves. Circle facts that show a difference, then number two sentences that explain how a question could help investigate waves. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	A spacecraft receives a radio signal in space but cannot receive sound from a speaker in the same vacuum. Write one comparison question that could help explain this difference.	Sample answer: Does a sound wave need a material medium to travel, while a radio wave can travel through a vacuum?
2	Use the passage to explain why a sound wave and a radio wave would behave differently in a vacuum.	Sound is a mechanical wave and needs matter in a medium to transfer energy. A radio wave is electromagnetic and can transfer energy through a vacuum.
3	Write one question that investigates a similarity between a sound wave and visible light. Then state the similarity your question investigates.	Sample answer: Do sound waves and visible light both have wavelength? Both can have wavelength.
4	Which question is more useful for comparing electromagnetic and mechanical waves: "What color is the light?" or "Can each wave transfer energy?" Explain your choice using the passage.	"Can each wave transfer energy?" is more useful because both electromagnetic and mechanical waves transfer energy, so it compares a shared wave property.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Question 1: Can a water ripple and visible light each travel through a vacuum? Question 2: Do a water ripple and visible light both have amplitude? A water ripple is a mechanical wave, so it needs water or another medium. Visible light is an electromagnetic wave, so it can transfer energy through a vacuum. Both waves transfer energy and can have amplitude.

Accept varied testable comparison questions when they clearly compare the two waves and address the required topic. In explanations, require the distinction that mechanical waves need a medium and electromagnetic waves can travel through a vacuum, plus an accurate shared property.