

Light in Motion

Read for evidence of how electromagnetic waves behave.

PS.7.a "electromagnetic radiation, including visible light, has wave characteristics and behavior; and"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each sentence that describes a wave property or a behavior of visible light. In the margin, number the underlined sentences in the order you find them.

Waves at Work

- ① At a concert, colored stage lights send visible light across the arena. Electromagnetic radiation travels as waves, even though it needs no material medium. Visible light is one small part of this radiation. A wave has repeating patterns. The distance from one crest to the next is its wavelength, and the number of waves passing a point each second is its frequency. In a vacuum, all electromagnetic waves move at the same speed. A shorter wavelength therefore has a higher frequency, while a longer wavelength has a lower frequency.
- ② When light waves meet matter, several behaviors are possible. A smooth mirror reflects much of the incoming light, so a viewer can see an image. Clear window glass transmits much light, allowing it to pass through. Light changes direction when it enters the glass from air because its speed changes in the new material. This bending is refraction. Dark pavement absorbs more visible light than a white sidewalk, which reflects more light. Absorbed light energy can warm the pavement.
- ③ Wave behavior can also explain patterns made when light passes through a narrow opening or around an edge. The waves spread into the region beyond the opening, a behavior called diffraction. When waves from nearby openings overlap, they can combine. In some places, their electric fields reinforce, producing brighter light. In other places, they reduce one another, producing darker bands. This interference pattern is evidence that visible light behaves as a wave. Similar wave behaviors occur across the electromagnetic spectrum.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 How are wavelength and frequency related when electromagnetic waves travel in a vacuum?

2 Why does visible light change direction when it enters window glass from air?

3 Compare what happens to visible light at dark pavement and at a white sidewalk.

4 How do brighter and darker bands form when waves from nearby openings overlap?

3 YOUR TURN _____ Your own words

Choose a new situation in which visible light meets a material. In two panels, sketch labeled light waves before and after the interaction, showing reflection, transmission, refraction, absorption, or diffraction. Write two sentences explaining what the waves do and why.

	
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PART 1 • READ AND MARK

Underline each sentence that describes a wave property or a behavior of visible light. In the margin, number the underlined sentences in the order you find them. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How are wavelength and frequency related when electromagnetic waves travel in a vacuum?	A shorter wavelength has a higher frequency, and a longer wavelength has a lower frequency.
2	Why does visible light change direction when it enters window glass from air?	Its speed changes when it enters the glass, causing refraction.
3	Compare what happens to visible light at dark pavement and at a white sidewalk.	Dark pavement absorbs more visible light and can warm up. A white sidewalk reflects more light.
4	How do brighter and darker bands form when waves from nearby openings overlap?	Brighter bands form where electric fields reinforce. Darker bands form where the fields reduce one another.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Panel 1 shows labeled light waves traveling through air toward a glass prism. Panel 2 shows the labeled waves bending as they enter the glass because their speed changes in the new material.

Accept any accurate, clearly labeled two-panel model of one listed wave behavior. The two sentences should correctly explain the selected behavior using wave movement or an interaction with matter.