

**Science 8**  
**Unit 3: OPTICS**  
**Topic 2: The Nature Of Light**

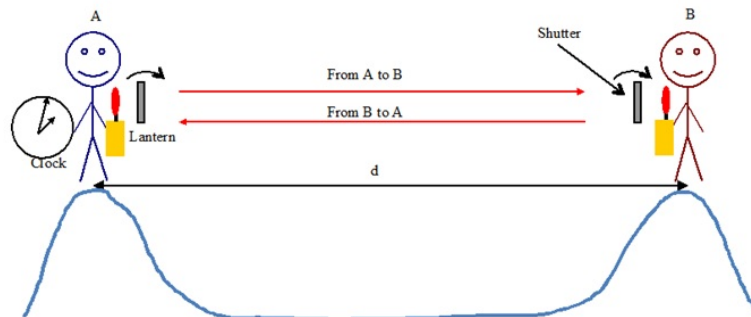


Student Name: \_\_\_\_\_

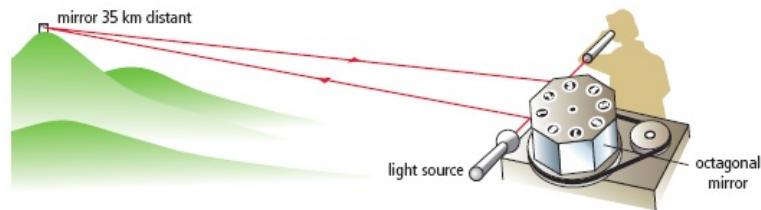
**The History of Light:**

Scientists believed that determining the speed of light would help them understand the nature of light.

**Galileo Galilei (1638):** is believed to be the first person to try to measure the speed of light. He was unsuccessful in determining the speed of light.



**Albert Michelson (1879)** First person to measure the speed of light ( $3 \times 10^8$  m/s)



**Speed: Light vs. Sound:**

- Light travels at 300 000 000 m/s
- Sound travels at 343 m/s
- A light-year is the distance light travels in one year
- It take 8 minutes for light to get to earth to from the sun!

**How Does Light Travel: Is it a particle or Wave?**

**Particle Model:**

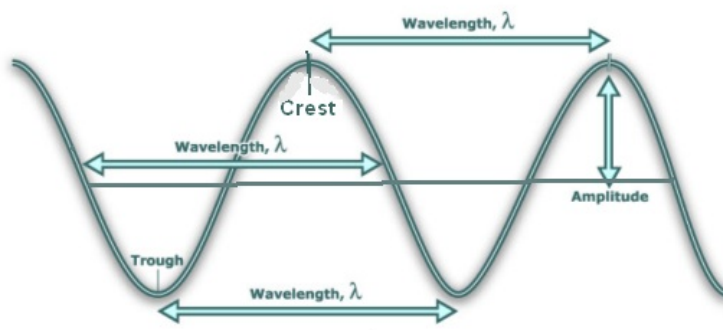
Pythagoras was a Greek philosopher who believed that beams of light were made of tiny particles. The eyes detected these particles and could see the object.



**Wave Model:**

If light was made of particles that travelled only in straight lines. However, light was observed to behave like a wave because of its ability to bend around corners or spread out as it passed through very narrow openings.

**The Wave Model of Light:** explains that light is a type of wave that travels through empty space and transfers energy from one place to another.



**Crest :** A high point of a wave.

**Trough:** A low point of a wave.

**Amplitude:** the height of a wave crest or depth of a wave trough as measured from the rest position. Amplitude of a light's wave tells you about the brightness of the colour.

crest height = trough depth

**Wavelength:** is the distance over which the wave repeats . Wavelength is measured in meters.

**Frequency:** the number of repetitive motions that occur during a given time. The number of wavelengths that pass a point in 1 second. Measured in Hertz

$$f = \frac{\text{\# cycles}}{\text{total time}}$$

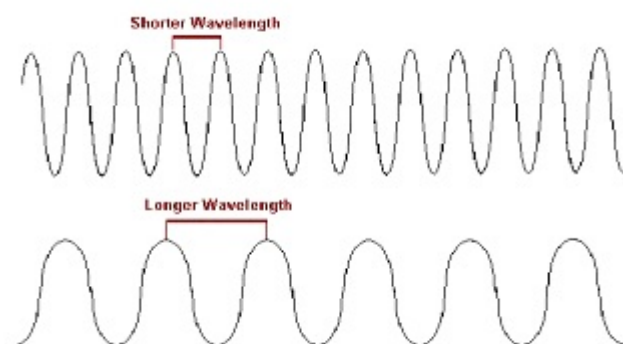
Example 1: A person standing on a wharf counts 12 waves passing by in 6 seconds. What is the frequency?

Example 2: A buoy bobs up and down on the ocean a total of 24 times in 8.0 seconds. What is the frequency of the motion?

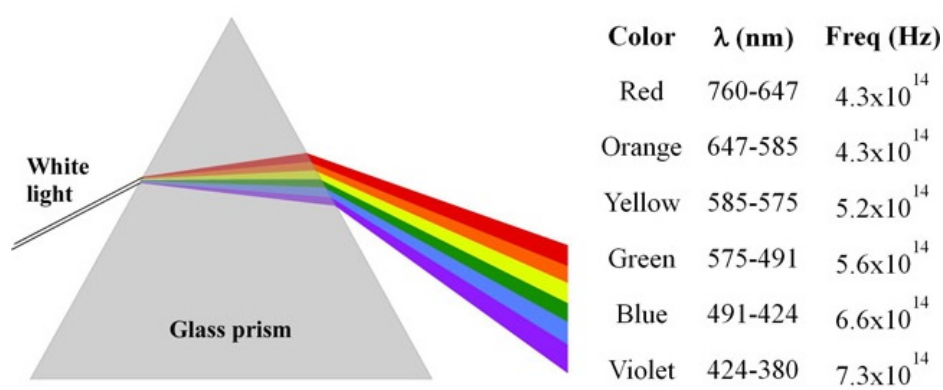
Relationship between Frequency and Wavelength:

High frequency waves have shorter wavelengths

Low frequency waves have longer wavelengths



Visible Light has range of wavelengths and frequencies. Red light has the lowest frequency (longest wavelength) and violet light has the highest frequency (shortest wavelength) of visible light.



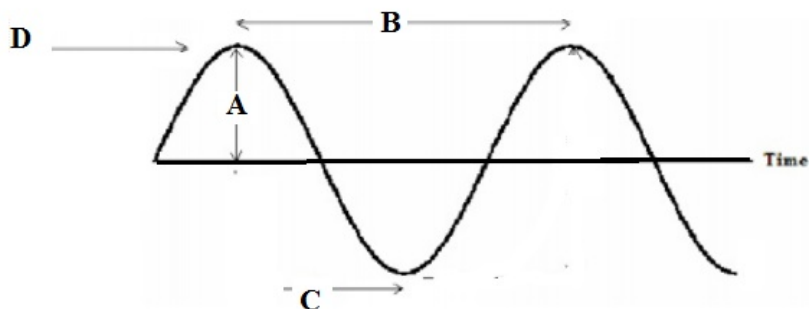
### PART A: MULTIPLE CHOICE.

Instruction: Circle the correct answer below each question. Also, transfer your answers to the bubble sheet provided.

- Who was the first scientist to make an attempt at determining the speed of light?
  - Albert Michelson
  - Blaise Pascal
  - Galileo Galilei
  - Pythagoras
- Which of the following scientists determined the speed of light?
  - Albert Michelson
  - Blaise Pascal
  - Galileo Galilei
  - Pythagoras
- What is the speed of light?
  - 300 m/s
  - 360 m/s
  - 300 000 000 m/s
  - 360 000 000 m/s

4. How long does it approximately take light from the sun to reach earth?
- (A) 1 min  
 (B) 5 min  
 (C) 8 min  
 (D) 10 min
5. Which of the following is true for thunder and lightning?
- (A) You see lightning first because it travels faster than thunder  
 (B) You hear thunder first because it travels faster than lightning  
 (C) Thunder and lightning occurs at different times  
 (D) A smaller time interval between thunder lightning, indicates the storm is receding
6. What does light behave like?
- (A) Particle  
 (B) Wave  
 (C) Wave and a particle  
 (D) None are correct

Use the diagram below to answer questions



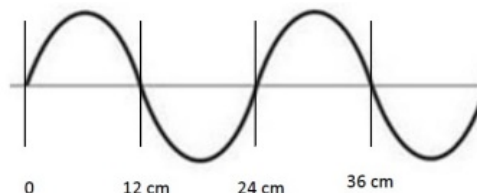
7. Which represents a crest in the diagram shown?
- (A) A  
 (B) B  
 (C) C  
 (D) D
8. Which represents a trough in the diagram shown?
- (A) A  
 (B) B  
 (C) C  
 (D) D
9. Which represents a wavelength in the diagram shown?
- (A) A  
 (B) B  
 (C) C  
 (D) D
10. Which represents the amplitude in the diagram shown?
- (A) A  
 (B) B  
 (C) C  
 (D) D

11. Which of the following refers to the number of cycles in a certain time ?

- (A) Amplitude
- (B) Frequency
- (C) Period
- (D) Wavelength

12. What is the wavelength of the wave shown below?

- (A) 6.0 cm
- (B) 12 cm
- (C) 24 cm
- (D) 36 cm



13. What is the unit for frequency?

- (A) Hertz
- (B) Meter
- (C) Newton
- (D) Wavelength

14. A swimmer on an inner tube bobs over waves in the water after a large ship passes by. If 2 seconds elapse between each bob of the swimmer upward, what is the frequency of the water waves?

- (A) 0.5 Hz
- (B) 1 Hz
- (C) 1.5 Hz
- (D) 2 Hz

15. Assuming that the speed of a wave stays the same, what must happen for the frequency of the wave to decrease?

- (A) The amplitude must decrease
- (B) The amplitude must increase
- (C) The wavelength must increase
- (D) The wavelength must decrease

16. Which of the following colours has the longest wavelength?

- (A) Blue
- (B) Green
- (C) Orange
- (D) Red

17. Which of the following colours has the highest frequency?

- (A) Blue
- (B) Green
- (C) Orange
- (D) Red

**PART B: WRITTEN RESPONSE**

1. What made scientists think that light behaved like a wave, rather than a stream of particles?

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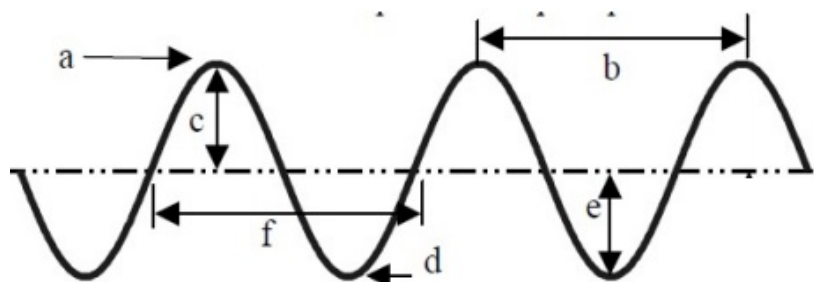


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2. The illustration below shows a wave. Label each part in the space provide



- |          |          |
|----------|----------|
| a) _____ | d) _____ |
| b) _____ | e) _____ |
| c) _____ | f) _____ |

3. Suppose a series of waves passes under a dock.

- (a) What is the frequency of the waves if 14 crests pass the dock in 7 s?
- (b) What is the frequency of the waves if 30 crests pass the dock in 5 s?

4. Do lightning and thunder occur at the same time? Are they detected by your senses at the same time? Explain

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**PART C: FILL IN THE BLANKS**

The Wave Model of Light Explains

- that light is a type of \_\_\_\_\_ that travels through empty space and transfers energy from one place to another.
- Frequency is the number of \_\_\_\_\_ that pass a point in \_\_\_\_\_ second.

It is measured in \_\_\_\_\_ (\_\_\_\_)

High frequency waves have \_\_\_\_\_ wavelengths.

Low frequency waves have \_\_\_\_\_ wavelengths.

