

# Light: Wave or Particle?

## 9.4

### Vocabulary

Huygens' principle

rectilinear propagation

Textbook pp. 470–476

**MAIN IDEA:** Newton proposed the particle theory of light to explain reflection, refraction, and the rectilinear propagation of light. However, Newton's theory could not adequately explain diffraction.

1. A major supporter of the wave theory of light was
  - (a) Grimaldi
  - (b) Hooke
  - (c) Huygens
  - (d) all of the above
2. Newton concluded that the particles that make up light
  - (a) move at very high speeds
  - (b) each have a large mass
  - (c) produce a noticeable pressure
  - (d) all of the above
3. Did Young's double-slit experiment provide support for the particle theory of light or the wave theory of light? Explain your answer.
4. Newton explained refraction as a result of particles speeding up when moving from air to glass, and, hence, bending towards the normal. In fact, light slows down when moving from air to glass. Why did Newton not correct his error?

**MAIN IDEA:** Huygens' principle states that every point on a wave front acts as a point source for secondary wavelets, which then spread out in front of the initial wave at the same speed. The new wave front appears as a line tangent to all the wavelets. The wave theory proposed by Huygens and embodied in Huygens' principle explains reflection, refraction, and diffraction.

5. According to Huygens' wave theory of light, what statement is true about light crossing from air into water?
  - (a) The speed decreases.
  - (b) The wavelength increases.
  - (c) The frequency increases.
  - (d) all of the above
6. Is the following statement true or false? If you think the statement is false, rewrite it to make it true: Huygens' principle applies only to straight wave fronts.

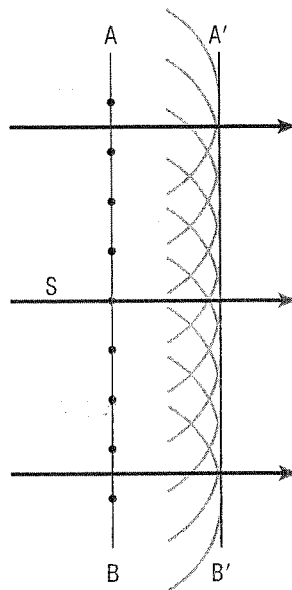
### STUDY TIP

#### Understanding New Vocabulary

Sometime long words can be intimidating. However, if you view the word in familiar parts, you can most often determine the meaning of the word. For example, rectilinear = recti + linear  
recti = straight and linear = line  
So, rectilinear means straight lines.

7. Suleiman is standing near the corner of a building. He can hear Indira and Polina talking around the corner, but he cannot see them. Explain why this happens. Illustrate your answer with a diagram. [3] [3] [3]

8. Write the labels listed below on **Figure 1**. [2] [2] [2]  
direction of propagation  
virtual sources  
wave front



**Figure 1**