1. A wave carries matter along with it from place to place.

   ☐ True ☐ False

2. A ray hits a plane mirror at 30° to the normal. At what angle to the normal does it reflect?

   ☐ 30°

   ☐ 0°

   ☐ 60°

   ☐ 90°

3. A converging lens makes parallel rays of light:

   ☐ stop completely

   ☐ carry straight on unchanged

   ☐ meet at the principal focus

   ☐ spread out as if from a point

4. In a vacuum, how do the speeds of radio waves, light and gamma rays compare?

   ☐ radio waves are fastest

   ☐ gamma rays are fastest

   ☐ visible light is fastest

   ☐ they all travel at the same speed

5. Sound travels as a series of:

   ☐ electromagnetic waves

   ☐ crests and troughs at right angles to travel

   ☐ compressions and rarefactions (a longitudinal wave)

   ☐ still particles

6. A wave has frequency 5.0 Hz and wavelength 2.0 m. What is its speed, in m/s?

   _____ m/s

7. An image in a plane mirror is:

   ☐ real, the same size, and can be shown on a screen

   ☐ virtual, the same size, and as far behind the mirror as the object is in front

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   ☐ virtual, smaller than the object, and closer to the mirror

8. The distance from the lens to its principal focus is called the _____ length.

   _____

9. Sound can travel through a vacuum (empty space).

   ☐ True ☐ False

10. A sound wave travels at 330 m/s with a frequency of 110 Hz. What is its wavelength, in m?

    _____ m

1. **False**

   A wave carries energy, not matter. A floating cork bobs up and down but does not travel with the wave.

2. **30°**

   The law of reflection: the angle of reflection equals the angle of incidence, both measured from the normal.

3. **meet at the principal focus**

   A converging (convex) lens bends parallel rays inward so they meet at the principal focus.

4. **they all travel at the same speed**

   All electromagnetic waves travel at the same speed in a vacuum, 3.0×10^8 m/s.

5. **compressions and rarefactions (a longitudinal wave)**

   A vibrating source squeezes and stretches the air into compressions and rarefactions – a longitudinal wave.

6. **10 m/s**

   $v = f\lambda = 5.0 \times 2.0 = 10$ m/s.

7. **virtual, the same size, and as far behind the mirror as the object is in front**

   A plane mirror gives a virtual image, the same size, the same distance behind the mirror – it cannot be caught on a screen.

8. **focal**

   The focal length is the distance from the centre of the lens to the principal focus.

9. **False**

   Sound needs particles to pass the vibration along, so it cannot travel through a vacuum.

10. **3 m**

    Rearrange $v = f\lambda$: $\lambda = \dfrac{v}{f} = \dfrac{330}{110} = 3.0$ m.

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