Year 10 Science: Transverse and longitudinal waves, sound and the EM spectrum

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Say whether each is transverse or longitudinal: a ripple on a pond, a sound wave, a light wave, a slinky pushed in and out.

2. A dog whistle makes sound at 34,300 Hz in air at 343 m/s. Find the wavelength, and explain why people cannot hear it.

3. A whale call in seawater (1,500 m/s) has a wavelength of 3.0 m. What is its frequency?

4. Explain why you can hear a train coming through the rail before you hear it through the air.

5. Put these in order from longest to shortest wavelength: X-rays, radio, visible light, microwaves.

Fix the mistake

6. Correct this statement: "Sound travels fastest in air, because there is less stuff in the way."

7. Correct this statement: "The echo returns after 0.80 s at 1,500 m/s, so the sea is 1,200 m deep."

8. Correct this statement: "A higher note travels faster than a low one."

9. Correct this statement: "A high-pitched sound is a loud sound."

Answer key (for parents and tutors)

1. Say whether each is transverse or longitudinal: a ripple on a pond, a sound wave, a light wave, a slinky pushed in and out.
   Transverse, longitudinal, transverse, longitudinal.
2. A dog whistle makes sound at 34,300 Hz in air at 343 m/s. Find the wavelength, and explain why people cannot hear it.
   λ = 343 ÷ 34,300 = 0.01 m (1 cm); 34,300 Hz is above the 20,000 Hz limit of human hearing.
3. A whale call in seawater (1,500 m/s) has a wavelength of 3.0 m. What is its frequency?
   f = 1,500 ÷ 3.0 = 500 Hz.
4. Explain why you can hear a train coming through the rail before you hear it through the air.
   Steel is stiff, so sound travels in it about 17 times faster than in air.
5. Put these in order from longest to shortest wavelength: X-rays, radio, visible light, microwaves.
   Radio, microwaves, visible light, X-rays.
6. Correct this statement: "Sound travels fastest in air, because there is less stuff in the way."
   Sound is fastest in solids, because tightly bonded particles pass each push on to their neighbours much faster than far-apart gas particles.
7. Correct this statement: "The echo returns after 0.80 s at 1,500 m/s, so the sea is 1,200 m deep."
   The sound went down and back up, so halve the distance: the sea is 600 m deep.
8. Correct this statement: "A higher note travels faster than a low one."
   In one medium every sound has the same speed; a higher frequency just means a shorter wavelength, since v = fλ.
9. Correct this statement: "A high-pitched sound is a loud sound."
   Frequency sets the pitch and amplitude sets the loudness, so a high note can be quiet and a low note can be loud.