

4. CRO Traces:
 - Loud, low pitch: Large amplitude, long wavelength.
 - Soft, high pitch: Small amplitude, short wavelength.
 - Loud, high pitch fading: Large amplitude, short wavelength decreasing over time.
 5. Sound cannot travel in a vacuum because it needs **particles** to transmit energy.
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Page 15: Questions on the Ear

- Ear canal: Sound waves pass down this tube.
 - Ear drum: A tight sheet of skin; sound waves make it vibrate.
 - Ear bone: The 3 small bones pass on the vibrations from the ear drum.
 - Cochlea: Coiled tube that picks up vibrations and sends signals along the nerve.
 - Nerve: Carries signals to the brain.
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Page 17: Questions on Echoes

1. Good absorbers of sound: **duvet, cushions, curtains, carpet.**
 2. Soft materials absorb sound waves, reducing echoes and improving sound quality in a cinema by preventing sound from bouncing off hard surfaces.
 3. In a sports hall, sound reflects off hard surfaces, creating multiple overlapping echoes, making it difficult to hear clearly.
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Page 21: Ultrasound and Sonar

1. Distance of seabed = Speed \times Time \div 2 = 1500 m/s \times 0.8 s \div 2 = **600 m.**
2. Matching:
 - Echolocation: Measure distances.
 - Dolphins and whales use ultrasound to: Communicate.
 - Ultrasound is: Sound beyond a human's audible range.
 - Medical use: Scanning unborn babies.
 - Echoes: Reflected sound waves.
 - Soft materials: Reduce echoes.

Page 23: Sound Waves on Oscilloscope

1. (i) A loud sound with a low pitch: P
(ii) A quiet sound with a high pitch: S
(iii) A loud sound with a high pitch: R

Page 24: Higher Pitch and More Quietly

2. Correct diagram: B
 - Higher pitch: Waves closer together.
 - More quiet: Smaller amplitude.
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Page 25: Longitudinal Wave and Speed of Sound

3. (a) (i) Arrow at A pointing right (direction of energy flow).
(ii) Particles at X oscillate parallel to the direction of wave energy transfer.
 - (b) Trend: As temperature increases, the speed of sound increases.
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Page 26: Sound Levels and Reflection

- (c) Recommended maximum time for 100 dB: 0.25 hours (15 minutes).

- (d) (i) Material with the biggest difference in sound reflection: Carpet (76% at 250 Hz to 29% at 2 kHz).
(ii) Worst absorber of sound: Brick (consistently reflects >90%).
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Page 27: Transverse Wave

- (e) (i) Amplitude of the wave: 1.5 m.
(ii) Wave speed = frequency \times wavelength
Wave speed = 30 Hz \times 1.5 m = 45 m/s.
Answer: 45 m/s
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Page 28: Wave Diagram

4. (i) Amplitude: d
(ii) Wavelength: b
5. (a) (i) Sound above 20 kHz: Ultrasound
(ii) Method of detection: Echolocation
(iii) In a longitudinal wave, particles oscillate parallel to the direction of wave travel.
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Page 29: Calculating Speed of Sound

- (b) Wave speed = frequency \times wavelength
Wave speed = 1,000 Hz \times 1.5 m = 1,500 m/s.
Answer: 1,500 m/s
(c) Mistake: The student did not divide the time by 2 to account for the round trip of the sound wave.
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Page 30: Sound Wave Graph

6. (i) Amplitude: 6 cm
(ii) Wavelength: 12 cm
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Page 31: Dolphin Ultrasound

7. Distance = speed \times time \div 2
Distance = 1,500 m/s \times 0.04 s \div 2 = 30 m
Answer: 30 m