Solutions

Each answer shows the steps, then the **result**.

2.1

- sound needs a medium (particles) to travel through, and a vacuum has none

2.2

- about 20 Hz to 20 000 Hz

2.3

- speed = distance ÷ time, $v = d/t$

$$v = \frac{d}{t} = \frac{1700\ \text{m}}{5.0\ \text{s}} = \mathbf{340}\ \text{m/s}$$

2.4

- compressions (higher pressure) and rarefactions (lower pressure)

2.5

- sound with a frequency above 20 kHz, too high for humans to hear

3.1 B

- sound is a longitudinal wave that needs a medium

3.2

(a) distance there and back = $2 \times 660\ \text{m} = 1320\ \text{m}$

- $v = s/t$

$$v = \frac{d}{t} = \frac{1320\ \text{m}}{4.0\ \text{s}} = \mathbf{330}\ \frac{\text{m}}{\text{s}}$$

(b) faster in water

3.3

- light travels much faster than sound
- so the light from the lightning reaches you almost at once, while the sound takes longer to arrive

3.4

- distance travelled = vt

$$d = vt = (1500\ \text{m/s})(0.80\ \text{s}) = 1200\ \text{m}$$

- the sound travels down and back up, so halve it

$$\text{depth} = \frac{1200\ \text{m}}{2} = \mathbf{600}\ \text{m}$$

3.5

- louder: X has a larger **amplitude**
- higher pitch: X has a higher **frequency**