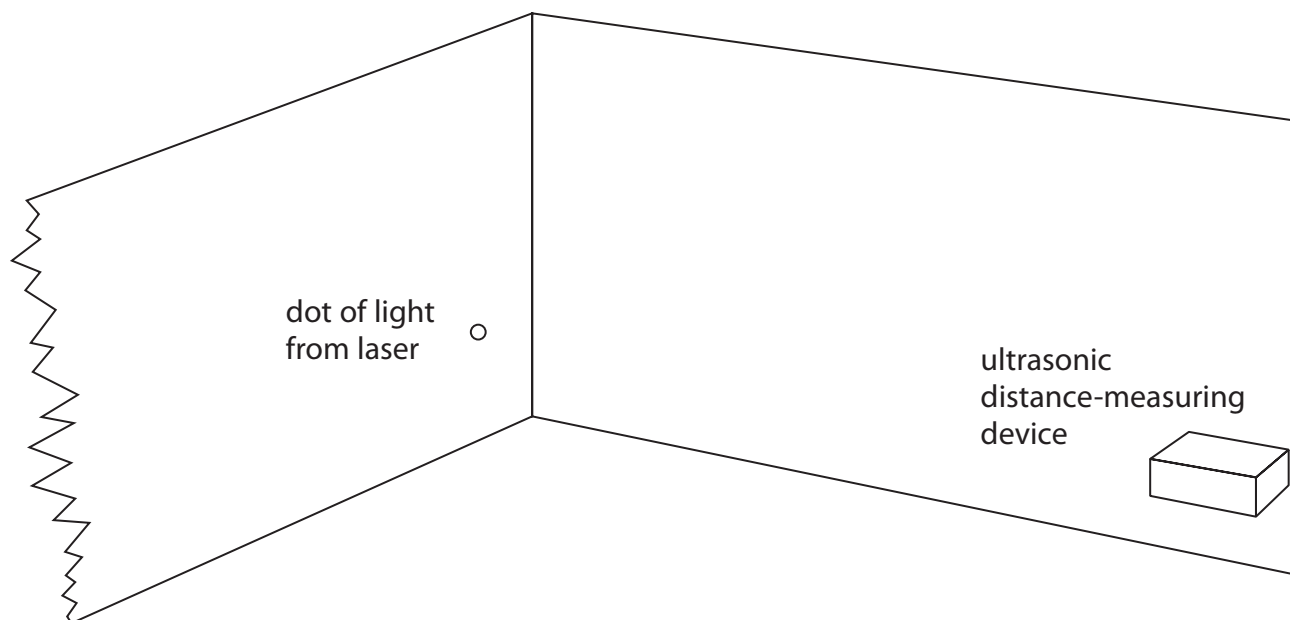**3** An ultrasonic distance-measuring device can be used to measure the length of a room.

The device emits a pulse of sound with a frequency of 40 kHz.

The device also emits a bright beam of red visible light.

(a) Explain what is meant by a frequency of 40 kHz.

(2)

....

....

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....

(b) A sound wave from the device travels at 345 m / s.

(i) State the formula linking wave speed, frequency and wavelength.

(1)

(ii) Calculate the wavelength of the sound wave.

(3)

wavelength = ... m

(iii) The device emits a sound wave.

The sound wave travels to the wall, reflects back to the device and is received by the device.

The distance from the device to the wall is 2.35 m.

Calculate the time between the sound wave being emitted and received by the device.

(4)

time = ... s

(c) Suggest why the device emits visible light.

(1)

....

....

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(d) Sound waves and light waves can have different frequencies and wavelengths.

Describe three other differences between sound waves and light waves.

You may draw diagrams to support your answer.

(3)

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(Total for Question 3 = 14 marks)

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