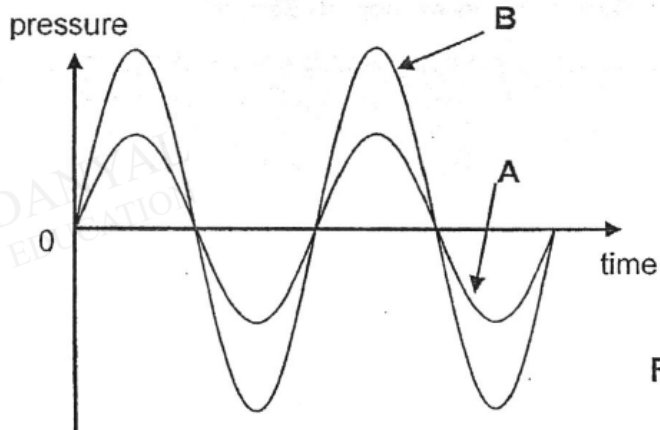**O Level Combined Physics Structured**

Sound Test 2.0

Q1

b) The pressure variations in two sound waves, labelled **A** and **B** are as shown in Fig. **11.2**.

Fig. 11.2

What can you say about the loudness and the pitch of the sound wave labelled **B** as compared to the sound wave labelled **A**?   [2]

Q2

Fig. 6.1 shows a man **P** standing a certain distance from a vertical wall. A second man **Q** is located 200 m behind **P**.
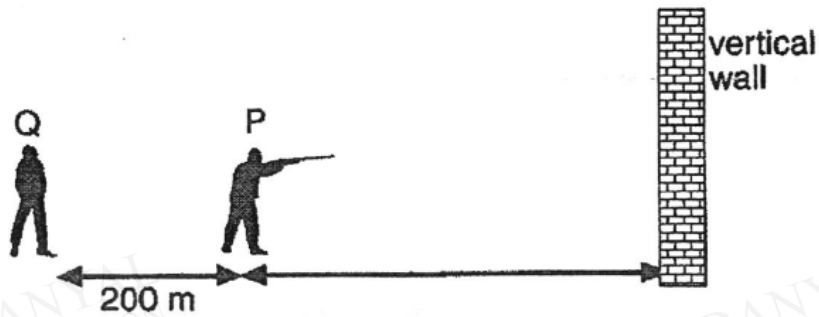

Fig. 6.1

When **P** fires a gun, one sound will travel directly to **Q** and another sound will travel forward to the vertical wall and reflects from it before reaching **Q**.

(a) If **Q** hears the first sound 0.625 s after **P** fires the gun, calculate the speed of sound in air.

                          speed of sound   = ... m/s [1]

(b) If **Q** hears a second sound 3.125 s after hearing the first sound, calculate how far **P** is standing from the wall.

                          distance from wall   = ... m [2]

Q3

(a) State two differences between sound waves and light waves.

....

....

....

....

...[2]

(b) Bats use echolocation to determine their surroundings in the dark. They send out a pulse of ultrasound, which will be reflected when it hits an object. They listen for the echo of this pulse, and are able to deduce the distance of the object from where they are located

Fig 8.1 shows a bat in a cave. It lets out a pulse of ultrasound of 5 kHz towards the back of the cave.

Fig. 8.1
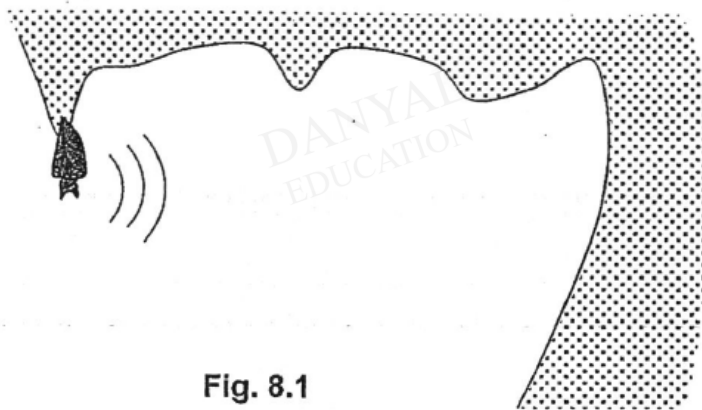
(i) Calculate the wavelength of the ultrasound pulse if sound travels at 330 m/s

wavelength = ... m [2]

(ii) The pulse the bat sends out is reflected back 12 seconds after the pulse was sent out. Calculate the distance from the bat to the back of the cave.

distance to back of the cave = ... m [2]

Q4

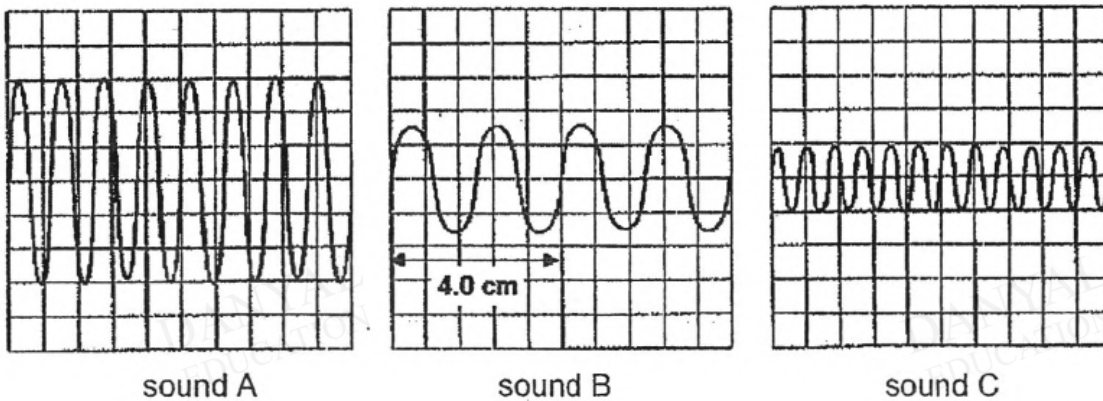A cathode-ray oscilloscope displays three waveforms detected from a submarine under the sea shown in Fig. 7.1.

sound A   sound B   sound C

Fig. 7.1

(a) State and explain the difference between a sound wave and visible light.

_____

_____

_____

_____ [2]

(b) State two differences in sounds A and B as shown in Fig. 7.1.

_____

_____ [2]

(c) If sound B has a frequency of 75 kHz, what is its speed?

speed = _____m/s [2]

(d) State and explain how the speed of sound in air will differ from what you have calculated in (c).

_____

_____

_____ [2]

Q5

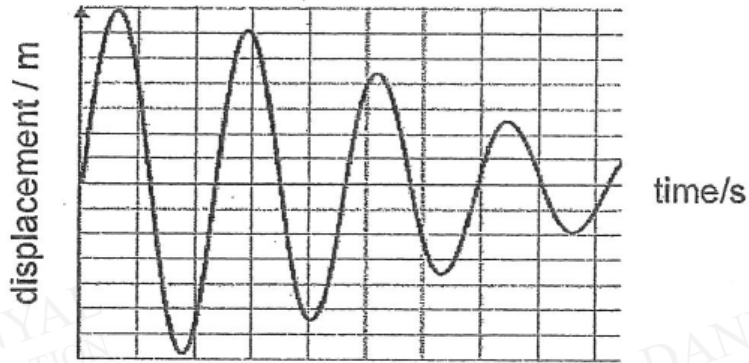The following figure shows the variations of a sound wave over time.

Fig 5.1

a) Comment on the volume of the sound and explain your answer.

....

....

....

.... [2]

b) The frequency of the sound is 60 Hz.
What is the wavelength of the sound if its speed is 330 m/s?

wavelength = ... m [2]

Answers

Sound Test 2.0

Q1

b) Sound is louder than sound A since the amplitude is higher [1].
Sound A and B has the same pitch since the frequency is the same as the period is the same [1]

Q2

(a) speed = distance travelled/time taken $\qquad$ = 200 m/0.625s $\qquad$ = 320 m/s	1
(b) distance travelled = speed x time $\qquad$ = 320 x 3.125 $\qquad$ = 1000 m Distance to the wall = 1000 / 2 $\qquad$ = 500 m	1 1

Q3

(a)	Light travels at 3 x 10⁸ m/s while sound travels at 300 m/s **in air.** OR	B1
	Sound waves are longitudinal while light waves are transverse. OR Sound needs a medium but light does not	B1
(b)(i)	$v = f\lambda$ $\lambda = \frac{330}{5000} = 0.066\ m$	[M1] [A1]
(b)(ii)	$v = \frac{2d}{t}$ where distance between bat and back of cave $d = (v \times t)/2$ $\quad = 330 \times 6$ $\quad = 1980\ m$	[M1] [A1]

Q4

(a)	Sound wave is a longitudinal wave and the particles on the sound wave vibrate parallel to the direction of wave motion. Visible light is a transverse wave and the particles vibrate perpendicular to direction of wave motion.	[1] [1]
(b)	Sound B is <u>softer</u> and at <u>lower pitch</u> as compared to sound A.	[2]
(c)	$V = (75000)(0.02)$ $= 1500$ m/s	[1] [1]
(d)	Speed of sound in air is <u>slower</u> as the air molecules are <u>spaced further apart</u> as compared to those in water.	[1] [1]

Q5

a	The volume is getting softer over time. The amplitude of the wave is decreasing over time.	A1 A1
b	$v = f \lambda$ $\lambda = 330 / 60$ $\lambda = 5.5$ m	M1 A1