Sound – 2023 IGCSE 0625 Physics

1. Nov/2023/Paper_ 0625/11/No.23

Dogs can hear sounds in the range from 100 Hz to 45 kHz.

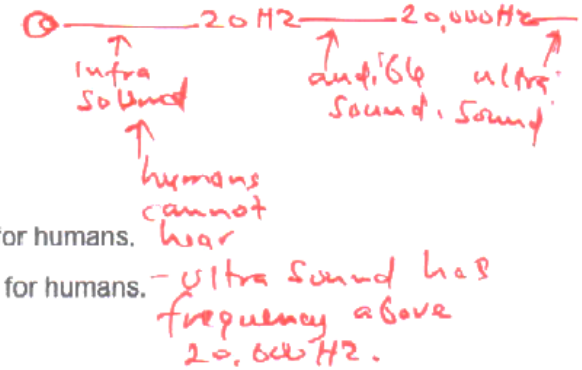
Which statement is correct?

A Any sound a dog can hear can also be heard by a human.

B Any sound a human can hear can also be heard by a dog.

C Dogs can hear some low frequency sounds that are silent for humans.

D ✓ Dogs can hear some high frequency sounds that are silent for humans.



2. Nov/2023/Paper_ 0625/12/No.23

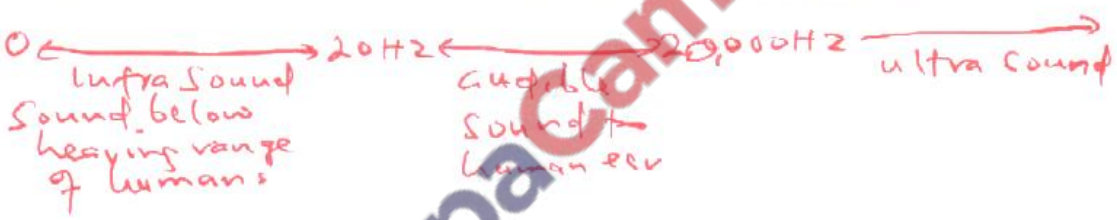
Which statement about a sound that can be heard by a person with normal hearing is correct?

A The sound is a longitudinal wave with a frequency between 2.0 Hz and 20 Hz.

B ✓ The sound is a longitudinal wave with a frequency between 20 Hz and 20 000 Hz.

C The sound is a transverse wave with a frequency between 2.0 Hz and 2000 Hz.

D The sound is a transverse wave with a frequency between 2.0 Hz and 20 MHz.



3. Nov/2023/Paper_ 0625/13/No.23

A sound is produced and an echo is heard after the sound reflects off a wall.

← reflected sound.

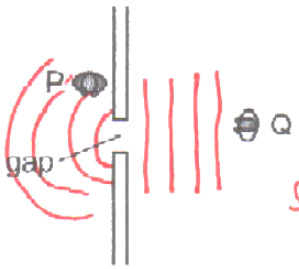
How do the properties of the echo compare to the original sound wave?

	amplitude	frequency	speed
A	lower	lower	lower
B ✓	lower	same	same
C	same	lower	lower
D	same	same	same

- Sound loses some energy after travelling through air.
- So amplitude will reduce, but frequency and speed remain same.

4. Nov/2023/Paper_ 0625/21/No.17

Two men, P and Q, stand close to a gap in a wall, as shown. Man P cannot see man Q but man P can hear man Q speaking.



Sound will diffract to P

Which statement explains this?

A Light waves do not diffract at all because they are electromagnetic waves.

B Light waves have a range of frequencies but sound has just one frequency.

C Sound waves are of a higher frequency than light waves.

D ✓ Sound waves diffract a lot because their wavelength is a similar size to the width of the gap.

5. Nov/2023/Paper_ 0625/22/No.23

Which row gives typical values for the speed of sound in a solid and in a gas?

	speed of sound in a solid m/s	speed of sound in a gas m/s
A	3	30
B	30	3
C	300	3000
D ✓	3000	300

In solid sound speed is faster than in gas.

6. Nov/2023/Paper_ 0625/23/No.23

Which row gives approximate values for the speed of sound in copper, water and air?

	speed of sound in copper m/s	speed of sound in water m/s	speed of sound in air m/s
A ✓	4500	1500	350
B	350	4500	1500
C	1500	4500	350
D	4500	350	1500

Speed of sound is fastest in solid and slowest in air.

7. Nov/2023/Paper_ 0625/32/No.7

A student can hear trains passing her house.

(a) Describe the motion that a sound wave gives to air particles.

Vibrating backwards and forward. ..... [1]

(b) When the student is at her house, she can hear and see the trains, as shown in Fig. 7.1.

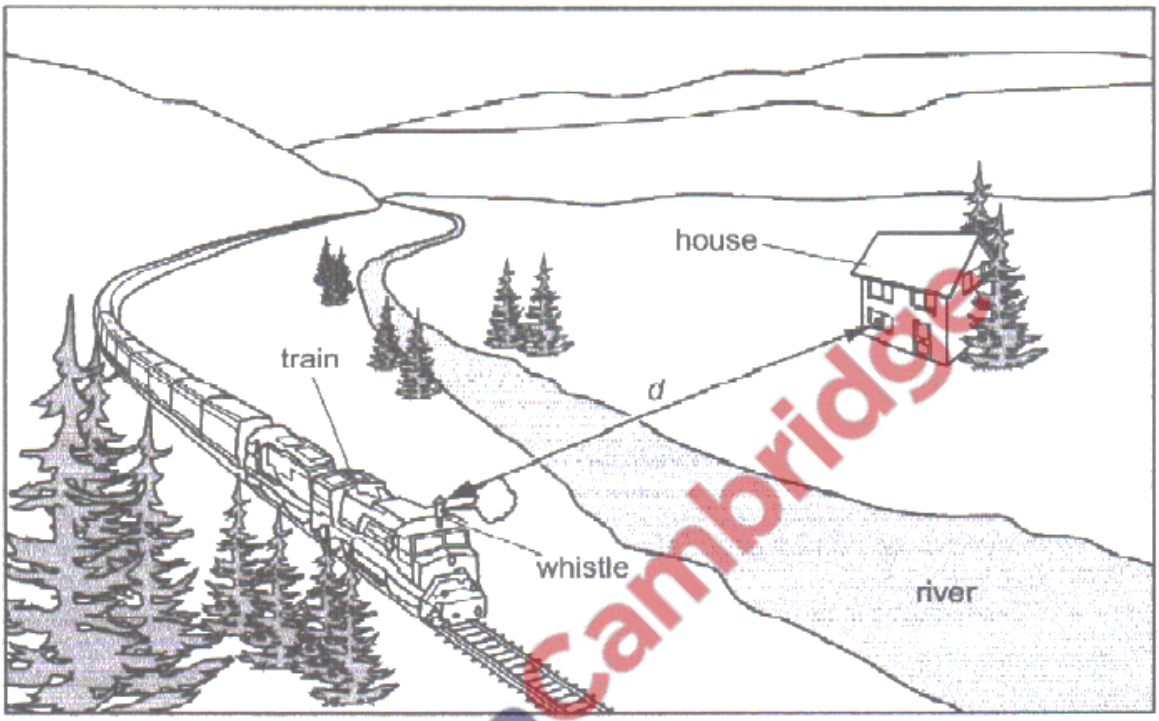


Fig. 7.1 (not to scale)

When a train whistle blows, steam comes out of the whistle.

The student measures the time interval between seeing the steam coming out of the whistle and hearing the whistle.

(i) Suggest a suitable device for measuring this time interval.

Stop watch ..... [1]

(ii) The time interval is 1.6 s between the steam coming out of the whistle and the student hearing the whistle.

The speed of sound in air is 340 m/s.

Calculate the distance d from the whistle to the student.

$d = s \times t$
$= 340 \times 1.6$
$= 544$ m

distance d = 544 ..... m [3]

(c) State the range of audible frequencies for a healthy human ear. Include the unit.

20 Hz – 20,000 Hz ..... [2]

8. June/2023/Paper_0625/11/No.22

Student X fires a starting pistol which produces smoke and sound. Student Y is standing 100 m away and sees the smoke the instant it is produced. The speed of sound in air is 340 m/s.

What is the time delay between student Y seeing the smoke and hearing the sound?

$t = \frac{d}{s}$
$= \frac{100\text{ m}}{340\text{ m/s}}$
$= 0.29$ s

A 0.29 s B 0.59 s C 1.7 s D 3.4 s

9. June/2023/Paper_0625/12/No.22

A boy shouts and hears the echo from a tall building 2.2 s later.

The speed of sound in air is 330 m/s.

How far away from the boy is the building?

$t = \frac{2.2}{2} = 1.1$ s

$d = s \times t$
$= 330\text{ m/s} \times 1.1$ s
$= 363$ m.

A 150 m B 300 m C 360 m D 730 m

10. June/2023/Paper_0625/13/No.22

A ship sounds its horn when it is 790 m from a cliff. A passenger on the ship hears the echo 4.8 s later.

$s = \frac{d}{t}$

$t = \frac{4.8}{2} = 2.4$ s

$s = \frac{790\text{ m}}{2.4\text{ s}}$
$= 329$ m/s
≈ 330 m/s

What is the speed of the sound?

A 165 m/s B 330 m/s C 340 m/s D 1896 m/s

11. June/2023/Paper_0625/21/No.22

Student X fires a starting pistol which produces smoke and sound. Student Y is standing 100 m away and sees the smoke the instant it is produced. The speed of sound in air is 340 m/s.

What is the time delay between student Y seeing the smoke and hearing the sound?

A ✓ 0.29 s B 0.59 s C 1.7 s D 3.4 s

$t = \frac{d}{s}$

$= \frac{100\,m}{340\,m/s}$

$= 0.29\,s$

time delay is the time it takes the sound to travel the 100m distance to reach student Y, after seeing the smoke.

12. June/2023/Paper_0625/22/No.22

A boy shouts and hears the echo from a tall building 2.2 s later.

The speed of sound in air is 330 m/s.

How far away from the boy is the building?

A 150 m B 300 m C ✓ 360 m D 730 m

$t = \frac{2.2}{2}$

$= 1.1\,s$

$d = s \times t$

$= 330\,\frac{m}{s} \times 1.1\,s$

$= 363\,m$

$\approx 360\,m$ (2 s.f)

$\approx 3.4\,m$.

13. June/2023/Paper_0625/23/No.22

A ship sounds its horn when it is 790 m from a cliff. A passenger on the ship hears the echo 4.8 s later.

What is the speed of the sound?

A 165 m/s B ✓ 330 m/s C 340 m/s D 1896 m/s

$t = \frac{4.8}{2}$

$= 2.4\,s$

$s = \frac{d}{t} = \frac{790\,m}{2.4\,s}$

$= 329\,m/s$

$\approx 330\,m/s$

14. June/2023/Paper_0625/32/No.5

An observer stands at P and looks into a rock quarry. A small explosion takes place at X in the quarry.

Fig. 5.1 shows the situation.

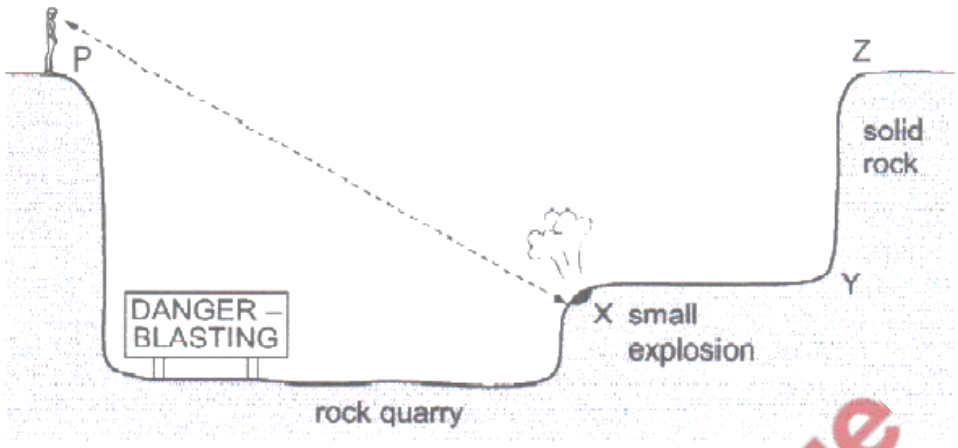


Fig. 5.1 (not to scale)

(a) The observer first hears the sound from the explosion 1.8 s after the explosion occurs. The speed of the sound is 340 m/s.

(i) Calculate the distance XP from the explosion at X to the observer at P.

$d = s \times t$

$= 340 \frac{m}{s} \times 1.8 s$

$= 612 m$

distance XP = 612 m [3]

(ii) The observer then hears a quieter sound from the explosion.

Suggest how the quieter sound waves reach the observer.

- Sound wave reflecting from the solid rock YZ travel to the observer. [2]

(b) Before the explosion, a warning siren produces a sound. The wavelength of the sound is 0.28 m.

The speed of the sound is 340 m/s.

Calculate the frequency of the sound.

$f = \frac{v}{\lambda}$

$= \frac{340 \text{ m/s}}{0.28 \text{ m}}$

$= 1214 \text{ Hz}$

$\simeq 1200 \text{ Hz}$ (2 s.f).

frequency = 1200 Hz [3]

[Total: 8]