Past-paper walk-through

Sound ▪ 3.4

eXercise

Questions in this set

- 0625/21 N25 Q23 ▪ 1 mark
- 0625/22 N25 Q23 ▪ 1 mark
- 0625/23 N25 Q23 ▪ 1 mark
- 0625/41 N25 Q5 ▪ 8 marks
- 0625/21 J25 Q23 ▪ 1 mark
- 0625/21 J24 Q22 ▪ 1 mark
- 0625/21 J24 Q23 ▪ 1 mark
- 0625/21 J23 Q22 ▪ 1 mark

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 23

0625/21 N25 ▪ Q23 ▪ 1 mark

23 A police car with its siren sounding is stationary in heavy traffic. A pedestrian notices that, although the loudness of the sound produced does **not** change, the pitch varies.

Which row describes the amplitude and the frequency of the sound?

	amplitude	frequency
A	constant	constant
B	constant	varying
C	varying	constant
D	varying	varying

Solution 23

Answer: **B**

Why

- Loudness is set by the amplitude and pitch by the frequency.
- The loudness does not change, so the amplitude is constant.
- The pitch varies, so it is the frequency that is changing.

Question 23

0625/22 N25 ▪ Q23 ▪ 1 mark

23 Sound travels through air as a series of compressions and rarefactions.

Which statement correctly compares a compression with a rarefaction?

A In a compression, the wavelength is longer than in a rarefaction.

B In a compression, the wavelength is shorter than in a rarefaction.

C In a compression, the density of the air is greater than in a rarefaction.

D In a compression, the density of the air is lower than in a rarefaction.

Solution 23

Answer: **C**

Why

- Sound is longitudinal, so the particles bunch up and spread out along the direction of travel.
- In a compression the particles are closer together, so the pressure is higher.
- In a rarefaction they are further apart, so the pressure is lower – the wavelength is the same throughout.

Question 23

0625/23 N25 ▪ Q23 ▪ 1 mark

23 Both the amplitude and the frequency of a sound wave decrease.

What happens to the sound that is heard?

A The sound is louder and has a higher pitch.

B The sound is louder and has a lower pitch.

C The sound is quieter and has a higher pitch.

D The sound is quieter and has a lower pitch.

Solution 23

Answer: **D**

Why

- Amplitude controls loudness, so a smaller amplitude makes the sound quieter.
- Frequency controls pitch, so a lower frequency makes the pitch lower.
- Both decrease here, so the sound is quieter *and* lower.

Question 5

0625/41 N25 ▪ Q5 ▪ 8 marks

5 A dolphin communicates with other dolphins underwater by emitting sounds in the range 7–15 kHz.

(a) State the value of the speed of sound in air and state how the speed of sound in water differs from the speed of sound in air.

Question 5

[1]

(b) State and explain if humans with normal hearing can hear all the sounds emitted by the dolphin.

Question 5

[2]

(c) Complete Table 5.1 to describe differences in loudness and pitch of two different dolphin sounds.

Table 5.1

Frequency /kHz	amplitude	loudness	pitch
14	large		
8	small		

[2]

(d) Complete the sentences to describe how sound is transmitted through water.

Question 5

[3]

[Total: 8]

Solution 5

(a)

Mark scheme

- (speed of sound in air =) 330 m / s value 350 m / s
- AND
- (speed of sound in water) is faster

Solution 5

(b)

Mark scheme

- Yes AND (normal) human hearing range is 20 Hz to 20 kHz (and all dolphin sounds lie in this range)
- Yes AND all the dolphin sounds are in the range of human hearing
- 0625/41
- October/November 2025

Solution 5

(c) Mark scheme

- Frequency kHz amplitude
- loudness
- pitch
- 14
- Large
- loud
- high
- 8

Solution 5

- small
- soft / quiet
- low
- one mark for each column correct

Solution 5

(d)

Mark scheme

- Particles
- high pressure
- AND
- low pressure
- Parallel

Question 23

0625/21 J25 ▪ Q23 ▪ 1 mark

23 A sound wave travels through the air and strikes a solid block of steel.

Some of the sound is reflected from the steel, and some is transmitted through the steel.

How does the speed and the wavelength of the sound in steel compare to the speed and the wavelength of the sound in air?

	speed in steel	wavelength in steel
A	less than in air	less than in air
B	less than in air	greater than in air
C	greater than in air	less than in air
D	greater than in air	greater than in air

Solution 23

Answer: **D**

Why

- The frequency is fixed by the source, so it does not change when the wave enters the steel.
- Sound travels much faster in a solid than in air.
- Since $v = f\lambda$ with f unchanged, a higher speed means a longer wavelength.

Question 22

0625/21 J24 ▪ Q22 ▪ 1 mark

22 A sound wave travels at 330 m/s. The distance between the centre of a compression and the centre of the nearest rarefaction in the sound wave is 2.5 cm.

What is the frequency of the sound wave?

A 66 Hz **B** 130 Hz **C** 6600 Hz **D** 13 000 Hz

Solution 22

Answer: **C**

Why

- A compression and the nearest rarefaction are *half* a wavelength apart.
- So $\lambda = 2 \times 2.5 = 5.0$ cm $= 0.050$ m.
- $f = v/\lambda = 330/0.050 = 6600$ Hz.

Question 23

0625/21 J24 ▪ Q23 ▪ 1 mark

23 Which waves are used in the medical scanning of soft tissue?

A gamma rays

B infrared

C microwaves

D ultrasound

Solution 23

Answer: **D**

Why

- Medical scanning of soft tissue uses ultrasound.
- It reflects at boundaries between tissues, and unlike X-rays it does not ionise.
- That makes it safe for scanning a fetus.

Question 22

0625/21 J23 ▪ Q22 ▪ 1 mark

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

Solution 22

Answer: **A**

Why

- Light reaches Y effectively instantly, so the delay is entirely the sound's travel time.
- $t = d/v = 100/340$.
- $= 0.29$ s.