

- 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

- 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.

- 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.

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.

speed of sound in air m/s

speed of sound in water
[1]

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

statement

explanation
.....
[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.

Sound waves are made of vibrating which produce compressions and rarefactions. A compression is a region of and a rarefaction is a region of The sound waves travel to the direction of the vibrations.

[3]

[Total: 8]

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

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

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

- A** gamma rays
B infrared
C microwaves
D ultrasound

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