Sound

Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Waves
Topic	Sound
Booklet	Question Paper

Time Allowed: **41 minutes**

Score: **/34**

Percentage: **/100**

Grade Boundaries:

1 An intruder alarm is adjusted to give a quieter sound without affecting the pitch of the note.

How are the amplitude and the frequency of the sound affected?

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

2 In which situation do sound waves **not** travel?

A from a satellite in space to Earth

B from a ship to a submarine

C from an explosion underground to the surface

D through a balloon filled with helium gas

3 Two sound waves X and Y are compared.

X has the greater frequency.

Y has the greater amplitude.

How do the loudness and pitch of sound wave Y compare to those of X?

A Y is louder and higher pitch.

B Y is louder and lower pitch.

C Y is quieter and higher pitch.

D Y is quieter and lower pitch.

4 A musical note is produced by two sources.

The traces produced by each source on the screen of a cathode-ray oscilloscope (c.r.o.) are shown below.

What is the difference between the sounds?

A the amplitude

B the frequency

C the pitch

D the quality

5 An echo sounder produces ultrasound of frequency 24 kHz. The ultrasound travels in water at a speed of 1.5 km / s.

What is the wavelength in water of ultrasound of this frequency?

A 0.063 m **B** 16 m **C** 36 m **D** 63 m

6 A loudspeaker produces a sound wave of frequency 50 Hz.
The amplitude of the sound wave is increased.

What is heard?

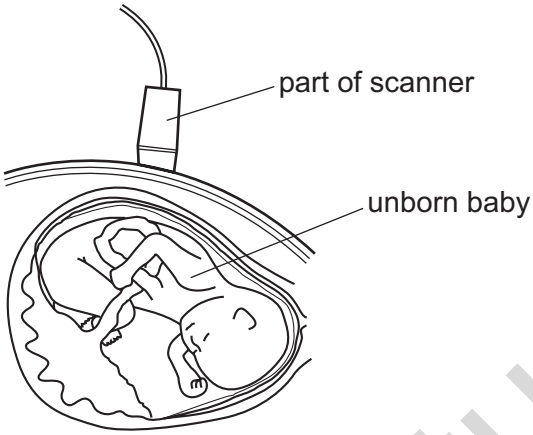
A a louder sound of a higher pitch

B a louder sound of the same pitch

C a sound of higher pitch but the same loudness

D a sound of the same pitch and loudness as before

7 An ultrasound scanner produces an image of an unborn baby.



How does the scanner form an image?

A from ultrasound absorbed by the baby

B from ultrasound emitted by the baby

C from ultrasound reflected by the baby

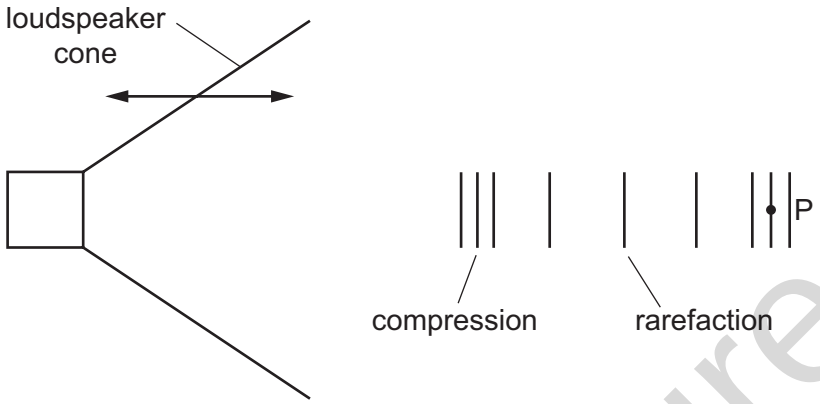
D from ultrasound refracted by the baby

8 The sound from the siren of a ship is reflected by a cliff. An echo is heard by a sailor on the deck of the ship, 4.0 s after the siren is sounded. The speed of sound in air is 320 m / s.

How far from the cliff is the ship?

A 80 m **B** 160 m **C** 640 m **D** 1280 m

9 Compressions and rarefactions are sent out from a loudspeaker cone as it vibrates backwards and forwards. The frequency of vibration is 50 Hz.



A compression is at point P. How much time elapses before the next rarefaction arrives at P?

A 0.010 s **B** 0.020 s **C** 25 s **D** 50 s

10 Which statement about the speed of sound is correct?

A sound travels fastest in a vacuum

B sound travels fastest in gases

C sound travels fastest in liquids

D sound travels fastest in solids

11 Which frequency is in the ultrasound range?

A 35 Hz **B** 350 Hz **C** 3500 Hz **D** 35 000 Hz

12 In an experiment to determine the speed of sound in air, a student stands 200 m away from a cliff and claps two pieces of wood together.

His class-mates standing next to him start stopwatches when the two pieces of wood meet and stop the stopwatches when they hear the echo.

Their times are:

1.44 s 1.70 s 1.58 s 1.76 s

Which value for the speed of sound do they obtain?

A 62 m/s **B** 123 m/s **C** 247 m/s **D** 340 m/s

13 A student stands at a distance *d* from the base of a tall cliff.

He claps together two pieces of wood and measures the time that elapses before he hears the echo. He conducts the experiment five times and obtains these results.

0.72 s 0.80 s 0.7 s 0.8 s 0.7 s

The speed of sound is 320 m / s.

What is the distance *d*?

A 120 m **B** 240 m **C** 480 m **D** 600 m

14 Ultrasound has many uses.

For what are ultrasound waves used?

A killing cancerous cells

B pre-natal scanning

C sunbeds

D telephones

15 Which range is the approximate range of audible frequencies for a human?

A 0.2 Hz → 200 Hz

B 2 Hz → 2000 Hz

C 20 Hz → 20 000 Hz

D 200 Hz → 2 000 000 Hz

16 Which row correctly compares the speeds of sound in air, liquid and solid?

	highest→ lowest		
A	air	liquid	solid
B	air	solid	liquid
C	liquid	air	solid
D	solid	liquid	air

17 A guitar string is made to vibrate.

What makes the pitch of the note rise?

A a decrease in the amplitude of vibration

B a decrease in the frequency of vibration

C an increase in the amplitude of vibration

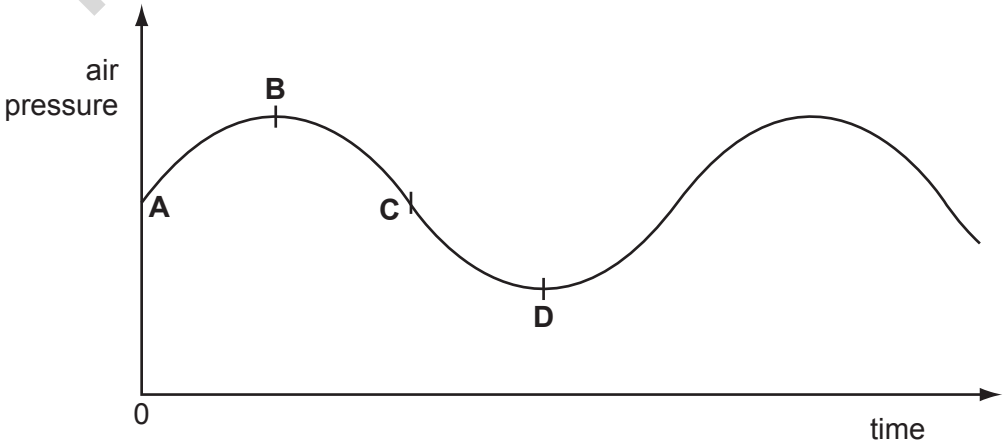
D an increase in the frequency of vibration

18 What is a possible frequency of an ultrasound wave?

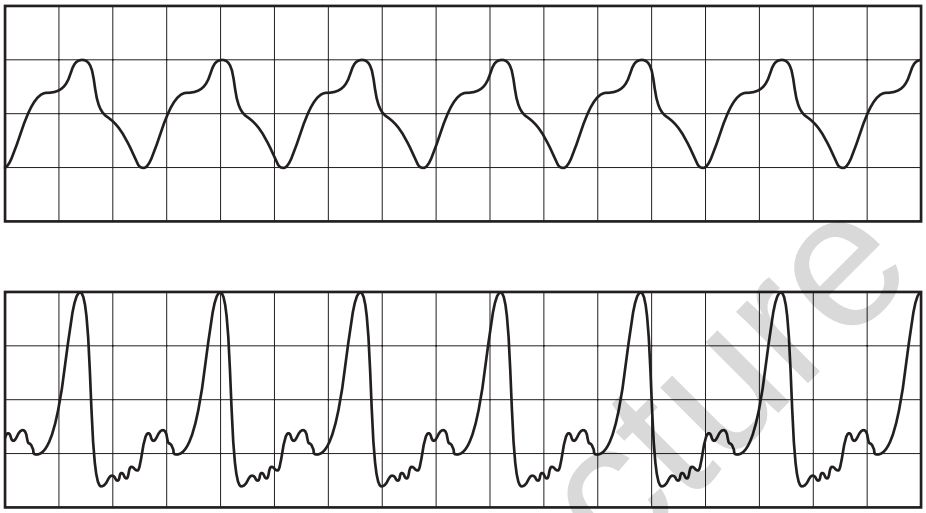
A 0.1 kHz **B** 3 kHz **C** 10 kHz **D** 30 kHz

19 The graph shows how the pressure varies as a sound wave passes through air.

Which point represents a compression?



20 The sounds produced by two musical instruments are directed towards a microphone connected to an oscilloscope (c.r.o.). The waveforms produced on the screen are shown.



The waveforms show that the sounds produced have a different property.

What is the property?

A frequency

B speed

C timbre (quality)

D wavelength

21 Two campers are woken up in the middle of the night by a thunderstorm. Their tent is lit up by a flash of lightning and they hear the thunderclap 5.0 s later. The speed of sound is 340 m / s.

How far away from the tent is the lightning?

A 68 m **B** 850 m **C** 1700 m **D** 3400 m

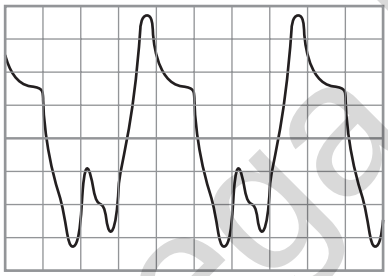
22 Sound travels at different speeds in air, water and steel.

For these materials, which row is correct?

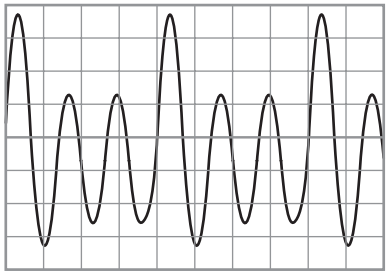
	sound travels slowest in	sound travels fastest in
A	air	steel
B	air	water
C	steel	air
D	water	air

23 Waveforms are shown on a cathode-ray oscilloscope for a flute and for a guitar, each playing the same note. The oscilloscope settings are the same for both waveforms.

flute



guitar



What is the difference between the two sounds?

A the amplitude

B the frequency

C the quality (timbre)

D the wavelength

24 A flash of lightning and the corresponding sound of the thunder are detected 6 s apart. A student calculates that the lightning struck about 1800 m away.

On which assumption is the calculation based?

A Light reaches us almost instantaneously, but sound travels at 300 m / s.

B Light travels 300 m / s faster than sound.

C Light travels 300 times faster than sound.

D The sound of the thunder was emitted 6 s after the flash.

25 During a thunderstorm, there is an interval of 1.70 s between an observer seeing the lightning and hearing the thunder. The speed of sound is 340 m / s.

What is the distance between the observer and the storm?

A 100 m **B** 200 m **C** 578 m **D** 1160 m

26 An ultrasonic tape-measure is used to find the distance to a wall. It sends out an ultrasonic pulse and times how long it takes for the reflected pulse to return from the wall.

The ultrasound has a frequency, a wavelength and a speed.

Which pair of values is needed to find the distance to the wall?

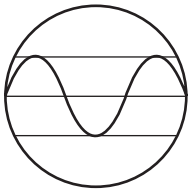
A frequency and wavelength

B frequency and time taken for the pulse to return

C speed and time taken for the pulse to return

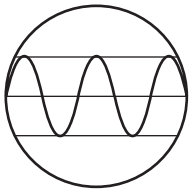
D wavelength and time taken for the pulse to return

27 The diagram shows the trace produced on a cathode-ray oscilloscope (c.r.o.) by a sound.

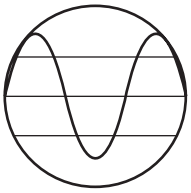


Which trace is produced when both the loudness and the pitch of the sound are increased?

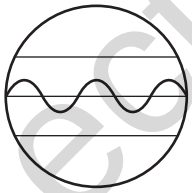
A



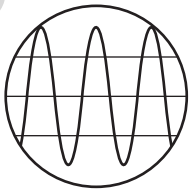
B



C



D



28 Delicate instruments are often placed in a 'box' to protect them from stray magnetic fields.

What is the material used for the box and why is it chosen?

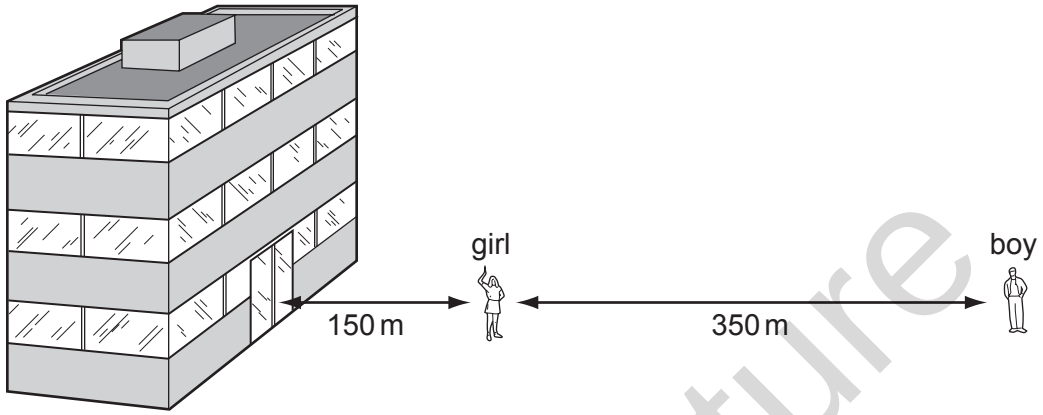
A Aluminium is used because it is a non-magnetic material.

B Copper is used because it has a low electrical resistance.

C Polythene is used because it is a good electrical insulator.

D Soft iron is used because it is a magnetic material.

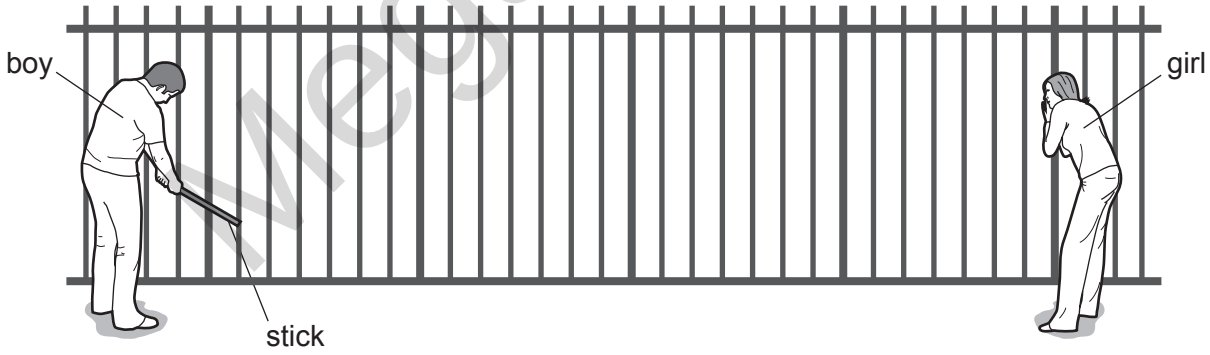
29 A girl, standing 150 m in front of a tall building, fires a shot using a starting pistol. A boy, standing 350 m from the girl, hears two bangs 1 s apart.



From this information, what is the speed of sound in air?

A 300 m / s **B** 350 m / s **C** 500 m / s **D** 650 m / s

30 A boy strikes a rigid metal fence with a stick to create a sound along the fence. A girl listens with her ear against the fence. One second after the fence is struck, the girl hears a sound through the air.



How long will it take for the sound to reach the girl through the fence?

A 0 second

B less than 1 second

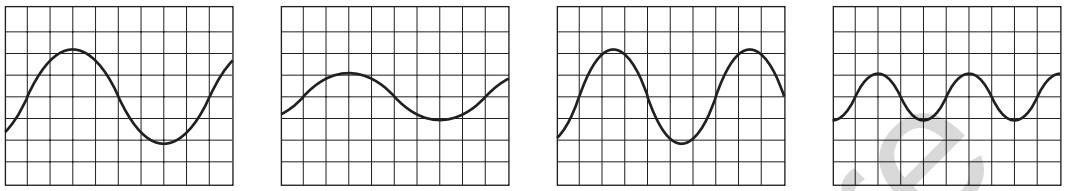
C 1 second

D more than 1 second

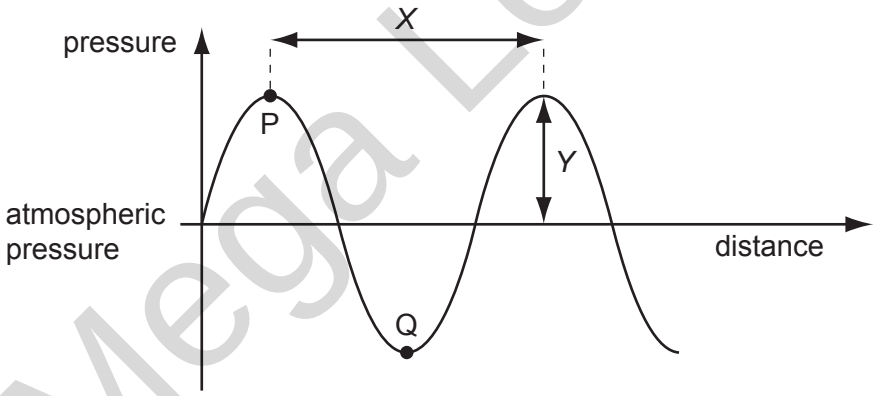
31 The diagrams show oscilloscope traces of sounds picked up by microphones. The oscilloscope controls are set in the same position for all the traces.

Which trace shows the sound that is both loud and low-pitched?

A **B** **C** **D**



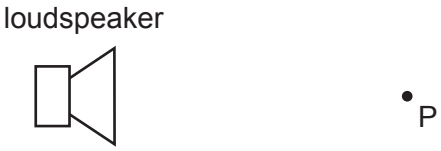
32 The graph shows, at one instant, the pressure variation along a sound wave.



Which point on the diagram represents a rarefaction and what is the wavelength of the sound wave?

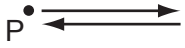
	rarefaction at	wavelength is
A	P	*X*
B	P	*Y*
C	Q	*X*
D	Q	*Y*

33 The diagram shows a loudspeaker that is producing a continuous sound wave of frequency 200 Hz in air.



Which diagram best shows how the sound causes a molecule at P to move during $\frac{1}{200}$ s ?

A



B

C

D

34 Which of the following does **not** produce a sound wave?

A a bell ringing under water

B a gun fired in a room with no echoes

C a hammer hitting a block of rubber

D an explosion in outer space