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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Sound

Paper 1 — Multiple-Choice Questions (topical compilation)

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3.4 Sound

PAPER 1

- 1 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

5054/11/M/J/11/Q25

- 2 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

5054/11/M/J/13/Q23

- 3 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

5054/11/M/J/13/Q24

- 4 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

5054/11/M/J/13/Q25

5 What is a possible frequency of an ultrasound wave?

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

5054/12/M/J/13/Q27

6 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

5054/11/M/J/14/Q28

7 Which frequency is in the ultrasound range?

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

5054/12/M/J/14/Q28

8 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

5054/12/M/J/14/Q29

- 9 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

5054/11/M/J/15/Q20

- 10 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.

5054/12/M/J/15/Q30

- 11 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

5054/11/M/J/16/Q26

- 12** A ship that is stationary on the surface of the sea sends pulses of sound vertically downwards towards the sea bed.

Each pulse that reflects from the sea bed is received 1.0 s after it is sent out.

A whale swims under the boat and a pulse is received 0.60 s after it is sent out.

The speed of sound in sea water is 1500 m/s.

What is the distance of the whale above the sea bed?

- A** 300 m **B** 450 m **C** 600 m **D** 750 m

5054/11/M/J/17/Q31

- 13** A young person with healthy ears can hear a range of frequencies.

What is the approximate range of frequencies?

- A** 2 Hz to 2000 Hz only
B 2 Hz to 20 000 Hz only
C 20 Hz to 2000 Hz only
D 20 Hz to 20 000 Hz only

5054/11/M/J/18/Q25

- 14** Which frequency is in the range heard by a healthy human ear?

- A** 12 mHz **B** 12 Hz **C** 12 kHz **D** 12 MHz

5054/12/M/J/18/Q32

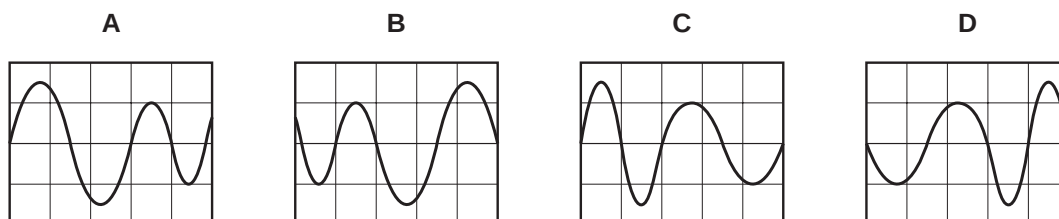
- 15** What is one of the uses of ultrasound?

- A** cleaning jewellery
B satellite communication
C fluorescent tubes
D optical fibres

5054/12/M/J/18/Q33

- 16 Four sound waves are displayed on the screen of a cathode-ray oscilloscope.

Which sound wave gets louder and has a pitch that decreases?



5054/11/M/J/19/Q27

- 17 What is the approximate range of audible frequencies for a healthy human ear?

- A 2.0 Hz to 2.0 kHz
- B 20 Hz to 2.0 kHz
- C 20 Hz to 20 kHz
- D 200 Hz to 200 kHz

5054/12/M/J/19/Q29

- 18 The speed of sound in air is c_a , the speed of sound in water is c_w and the speed of sound in ice is c_i .

Which relationship is correct?

- A $c_a > c_i$
- B $c_a > c_w$
- C $c_i > c_w$
- D $c_w = c_a$

5054/12/M/J/19/Q30

- 19 What is the ratio of the longest sound wavelength audible to a healthy human ear to the shortest?

- A 20 : 1
- B 1000 : 1
- C 10 000 : 1
- D 20 000 : 1

5054/11/M/J/20/Q30

- 20** Ultrasound is used to clean jewellery in a liquid.

What is another use of ultrasound?

- A** optical fibre communication
- B** pre-natal scanning
- C** sunbeds
- D** telephone communications

5054/11/M/J/20/Q31

- 21** The sound from a ship is reflected by a cliff. An echo is heard by a sailor on the ship 4.0 s after the sound is made. The speed of sound in air is 320 m/s.

How far from the cliff is the ship?

- A** 160 m
- B** 640 m
- C** 1280 m
- D** 2560 m

5054/11/M/J/21/Q25

- 22** Students are asked for the uses of ultrasound.

Three suggested uses for ultrasound are:

- P** cleaning jewellery
- Q** tanning on a sunbed
- R** obtaining an image of an unborn baby.

Which suggestions are correct?

- A** P and Q only
- B** P and R only
- C** Q and R only
- D** P, Q and R

5054/12/M/J/21/Q29

- 23** A sound wave refracts as it passes from air to water.

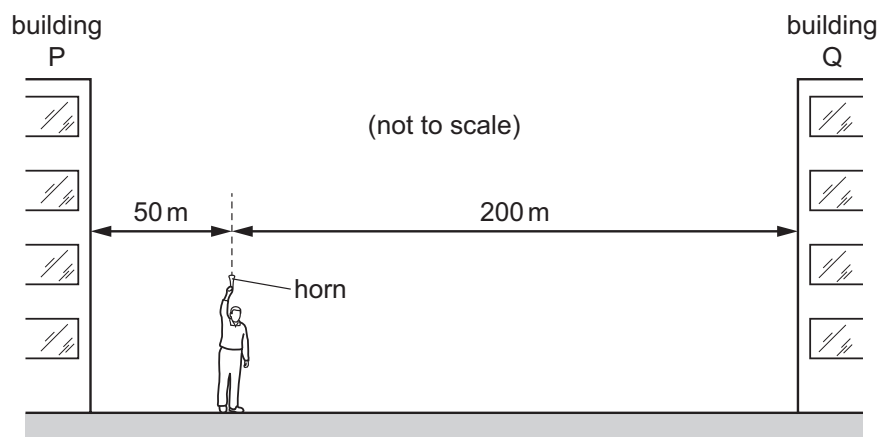
Which quantities change?

- A** speed and frequency only
- B** speed and wavelength only
- C** wavelength and frequency only
- D** speed, frequency and wavelength

5054/11/M/J/22/Q20

- 24 A man stands between two tall buildings, P and Q.

He is 50 m from P and 200 m from Q.



He sounds a horn.

He hears the first echo from building P and 1.0 s later he hears the first echo from building Q.

What is the speed of sound calculated using this information?

- A** 250 m/s **B** 300 m/s **C** 330 m/s **D** 500 m/s

5054/11/M/J/22/Q24

- 25 Sound travels at different speeds in each of the three states of matter, solid, liquid and gas.

Which row shows where sound travels fastest and where sound travels slowest?

	state where sound travels fastest	state where sound travels slowest
A	gas	liquid
B	gas	solid
C	liquid	gas
D	solid	gas

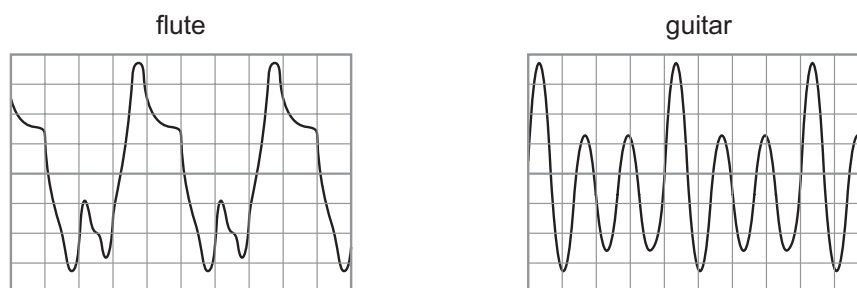
5054/11/M/J/22/Q25

26 What is one of the uses of ultrasound?

- A cleaning jewellery
- B fluorescent tubes
- C optical fibres
- D sunbeds

5054/11/M/J/22/Q26

27 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.



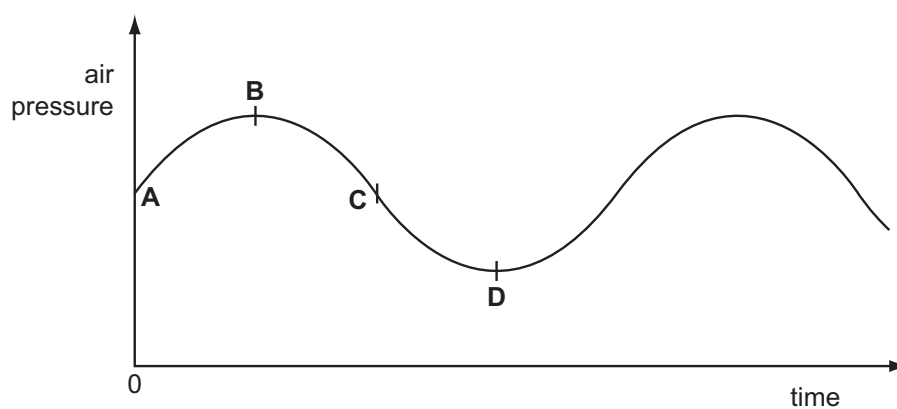
What is the difference between the two sounds?

- A the amplitude
- B the frequency
- C the quality (timbre)
- D the wavelength

5054/11/O/N/11/Q26

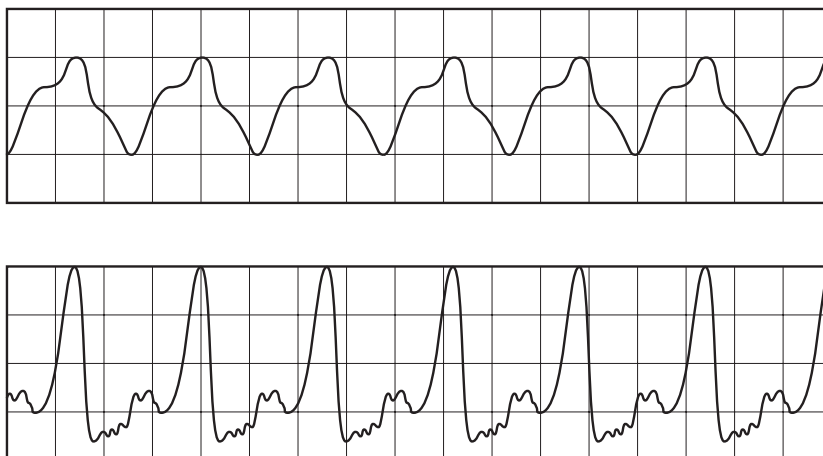
28 The graph shows how the pressure varies as a sound wave passes through air.

Which point represents a compression?



5054/11/O/N/13/Q23

- 29 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

5054/11/O/N/13/Q24

- 30 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

5054/12/O/N/13/Q25

- 31 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 0.71 s 0.81 s 0.71 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

5054/12/O/N/14/Q18

- 32** Ultrasound has many uses.

For what are ultrasound waves used?

- A** killing cancerous cells
- B** pre-natal scanning
- C** sunbeds
- D** telephones

5054/12/O/N/14/Q19

- 33** 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

5054/11/O/N/15/Q22

- 34** 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

5054/12/O/N/15/Q21

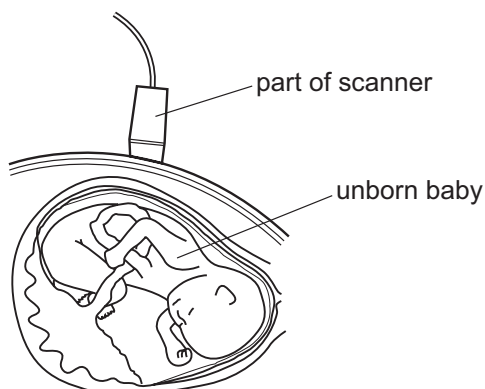
- 35** A loudspeaker produces a sound wave of frequency 50 Hz. The amplitude of the sound wave is increased.

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

5054/12/O/N/15/Q25

- 36 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

5054/12/O/N/15/Q26

- 37 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

5054/12/O/N/15/Q27

- 38 Which property of a sound wave increases as the loudness of the sound increases?

- A amplitude
- B frequency
- C speed
- D wavelength

5054/11/O/N/16/Q29

39 Sound travels at different speeds in solids, liquids and gases.

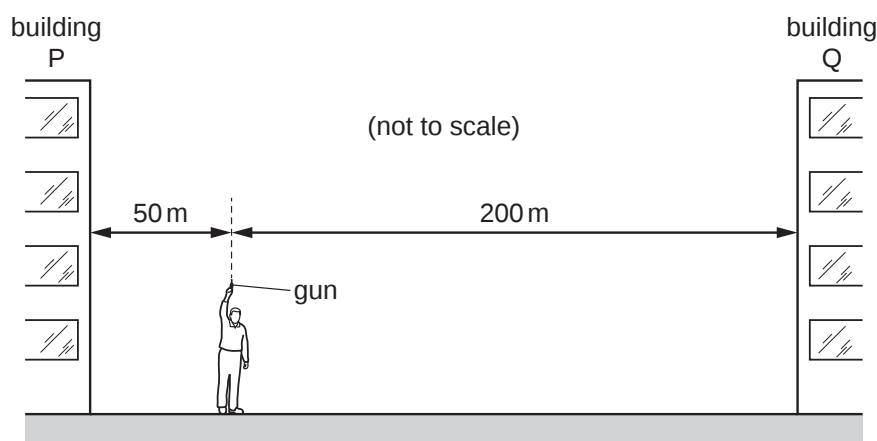
Which list shows these states of matter in order of increasing speed of sound (slowest to fastest)?

- A gas → liquid → solid
- B gas → solid → liquid
- C liquid → solid → gas
- D solid → liquid → gas

5054/12/O/N/16/Q29

40 A man stands between two tall buildings, P and Q. The diagram is not drawn to scale.

He is 50 m from P and 200 m from Q.



He fires a gun and the first two echoes he hears are 1.0 second apart.

What is the speed of sound calculated from this observation?

- A 250 m/s
- B 300 m/s
- C 330 m/s
- D 500 m/s

5054/12/O/N/16/Q30

41 Which row gives the speed of sound in air, in water and in steel?

	<u>speed in air</u> m/s	<u>speed in water</u> m/s	<u>speed in steel</u> m/s
A	330	1500	6000
B	330	6000	1500
C	6000	330	1500
D	6000	1500	330

5054/11/O/N/17/Q24

- 42 As a sound wave travels from one medium to another, its wavelength increases.

What happens to the frequency and to the speed of the sound?

	frequency	speed
A	decreases	decreases
B	decreases	increases
C	stays constant	decreases
D	stays constant	increases

5054/11/O/N/17/Q25

- 43 What is the approximate value for

$$\frac{\text{speed of light in air}}{\text{speed of sound in air}} ?$$

- A** 10^2 **B** 10^4 **C** 10^6 **D** 10^8

5054/11/O/N/18/Q21

- 44 What are the lowest frequency and the highest frequency of the sound that a human being with normal hearing can hear?

	lowest frequency	highest frequency
A	2.0 Hz	2.0 kHz
B	2.0 Hz	20 000 Hz
C	20 Hz	20 kHz
D	20 kHz	20 000 kHz

5054/11/O/N/18/Q22

- 45 Ultrasound has a number of uses in engineering and medicine.

What is ultrasound **not** used for?

- A cleaning
- B pre-natal scanning
- C quality control
- D sterilising medical equipment

5054/11/O/N/18/Q23

- 46 Ultrasound is used to map the ocean floor.

During one survey, the depth of water is 1200 m. An ultrasound pulse is sent from the surface and when it returns to the ship, another pulse is sent immediately. In any period of 8.0 s, five pulses are sent down from the surface.

What is the speed of the ultrasound in water?

- A 150 m/s B 300 m/s C 750 m/s D 1500 m/s

5054/12/O/N/18/Q27

- 47 A person hears an echo after a sound hits a solid cliff face.

What causes the echo?

- A absorption
- B dispersion
- C reflection
- D refraction

5054/11/O/N/19/Q28

- 48 What is a typical value for the speed of sound in air?

- A 3.3×10^4 cm/s
- B 3.3×10^4 m/s
- C 3.3×10^2 km/s
- D 3.3×10^8 m/s

5054/11/O/N/19/Q29

- 49 Which row shows the speed of sound in air (c_a), liquid (c_L) and solid (c_s) in order from slowest to fastest?

	slowest	→	fastest
A	c_L		c_s
B	c_L		c_a
C	c_a		c_s
D	c_s		c_L

5054/12/O/N/19/Q27

- 50 A man stands 80 m in front of a cliff face. He makes a loud bang and listens for the echo.

He makes a loud bang once every second. He hears an echo exactly halfway between the bang that caused it and the next bang.

What is the speed of sound?

- A** 40 m/s **B** 80 m/s **C** 160 m/s **D** 320 m/s

5054/12/O/N/19/Q28

- 51 Where does sound travel the fastest?

- A** in a vacuum
B in gases
C in liquids
D in solids

5054/11/O/N/20/Q31

- 52 A scientific research boat uses pulses of ultrasound to detect fish underneath it.

A pulse of ultrasound is bounced from a group of fish 6000 m directly below the boat.

The next pulse is sent out 2.0 s after the echo from the previous pulse has been received.

The speed of ultrasound in water is 1500 m/s.

What is the interval between the two pulses?

- A** 4.0 s **B** 6.0 s **C** 8.0 s **D** 10 s

5054/12/O/N/20/Q27

53 Which row correctly describes ultrasound?

	type of wave	frequency
A	longitudinal	less than 20 kHz
B	longitudinal	greater than 20 kHz
C	transverse	less than 20 kHz
D	transverse	greater than 20 kHz

5054/12/O/N/20/Q28

54 A student stands a distance x in front of a large wall.

He claps his hands at a regular rate so that each clap coincides with the echo from the previous clap.

In a time t , he claps his hands N times.

Which expression is used to calculate the speed of sound in air?

A $\frac{x}{Nt}$

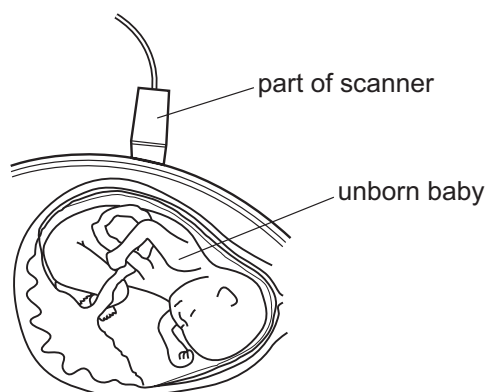
B $\frac{2x}{Nt}$

C $\frac{Nx}{t}$

D $\frac{2Nx}{t}$

5054/11/O/N/21/Q25

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



What does the scanner use to form an image of the baby?

- A** ultrasound absorbed by the baby
- B** ultrasound emitted by the baby
- C** ultrasound reflected by the baby
- D** ultrasound refracted by the baby

5054/11/O/N/21/Q26

56 Which of the following is most closely associated with echoes?

- A** focussing
- B** reflection
- C** refraction
- D** total internal reflection

5054/12/O/N/21/Q28