1 A ship is sinking in the dark as shown in Fig. 7.3.

Fig. 7.3

The sailors on the ship fire a distress flare into the air. It explodes with a bang and a bright flash of light.

A lifeboat crew hear the bang and see the flash, but not at the same time.
State which reaches the lifeboat first, the bang or the flash, and give a reason.

.....

.....

.....

MARKING SCHEME:

flash [1]

light travels faster than sound (accept figure) [1]

2 Fig. 6.1 shows the waveform of the note from a bell. A grid is given to help you take measurements.

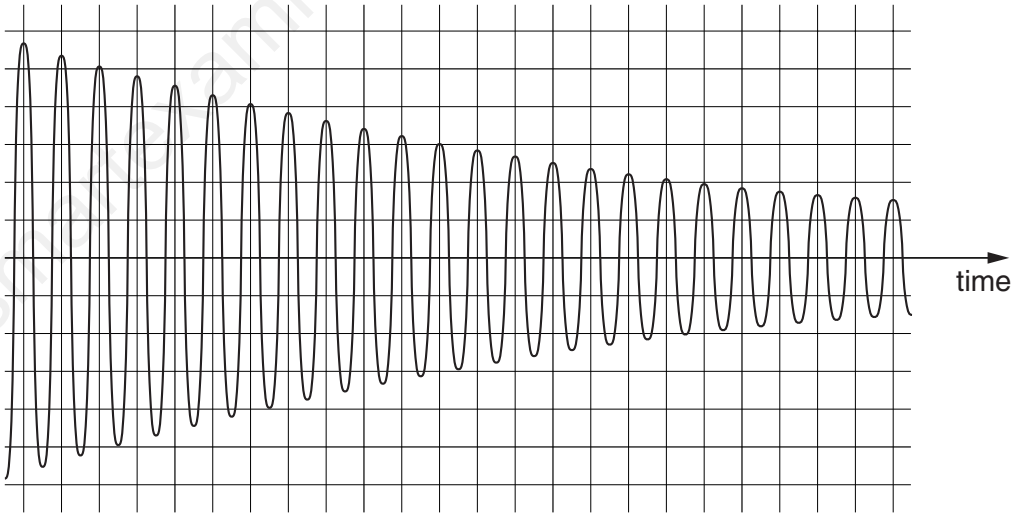

Fig. 6.1

(a) (i) State what, if anything, is happening to the loudness of the note.

..... [1]

(ii) State how you deduced your answer to **(a)(i)**.

..... [1]

(b) (i) State what, if anything, is happening to the frequency of the note.

..... [1]

(ii) State how you deduced your answer to **(b)(i)**.

..... [1]

(c) A student says that the sound waves, which travelled through the air from the bell, were longitudinal waves, and that the air molecules moved repeatedly closer together and then further apart.

(i) Is the student correct in saying that the sound waves are longitudinal? .....

(ii) Is the student correct about the movement of the air molecules? .....

(iii) The student gives light as another example of longitudinal waves.

Is this correct? .....

[2]

MARKING SCHEME:

(a)	**(i)**	decreasing OR getting lower/quieter/softer	M1
	(ii)	amplitude/length of wave decreased OR waves got smaller NOT wavelength decreased	A1
(b)	**(i)**	nothing OR constant	M1
	(ii)	waves equally spaced OR wavelength/period/T constant	A1
(c)	**(i)**	yes/✓)	
	(ii)	yes/✓) –1 e.e.o.o.	B2
	iii)	no/✓)	[11]

3 **(a)** A musical note is being produced by a loudspeaker connected to a signal generator.

A person is listening to the note, as shown in Fig. 4.1.

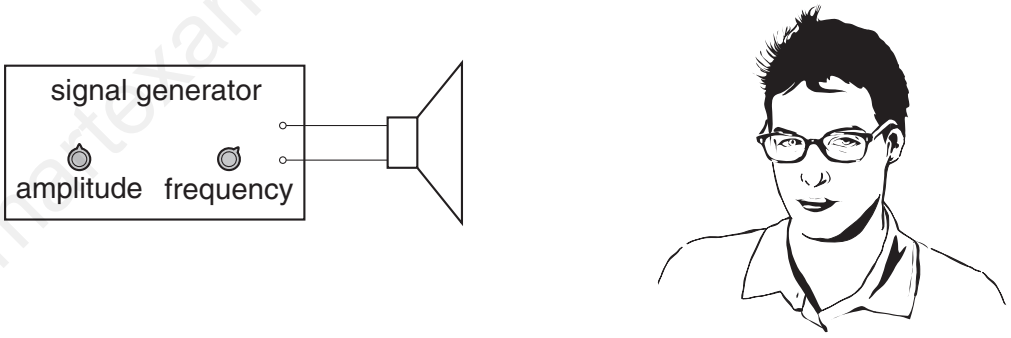

Fig. 4.1

By adjusting the controls on the signal generator, the amplitude and the frequency of the note from the loudspeaker can each be changed.

The person moves to a position further away from the loudspeaker.

(i) State what, if anything, happens to

1. the pitch of the sound heard,

.....

2. the loudness of the sound heard.

..... [2]

(ii) What adjustment, if any, should be made to the two controls so that the sound heard in the new position is the same as in the original position?

frequency control .....

amplitude control ..... [2]

(b) Fig. 4.2 shows a girl standing some distance from a rock face. She has a bell in her hand.

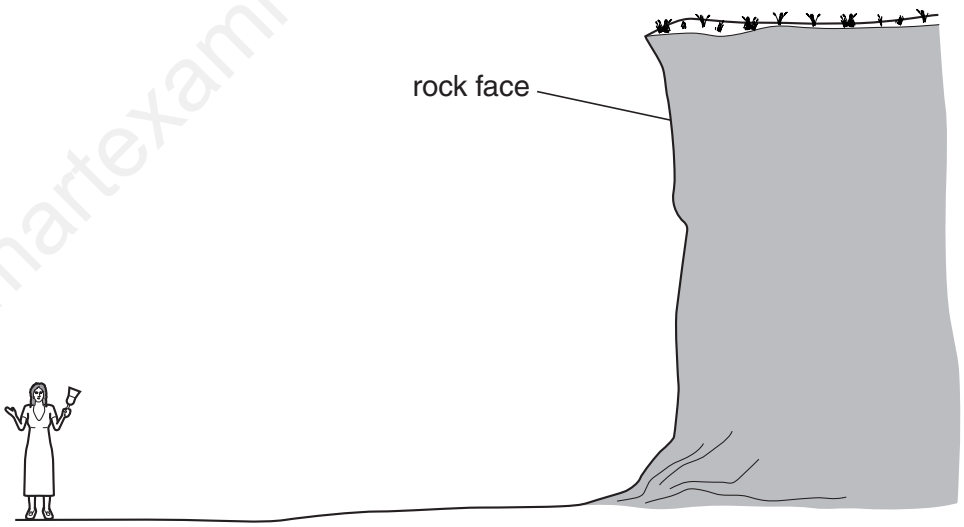

Fig. 4.2

The girl rings the bell once. After a short time the sound of the bell reaches her again.

(i) Why did the sound return to her?

..... [1]

(ii) Why was there a short time delay before the girl heard the second sound?

..... [1]

[Total: 6]

MARKING SCHEME:

(a)	**(i)**	1 nothing OR no change		B1
		2 quieter/softer OR loudness less/decreases		B1
	(ii)	frequency control: none OR no adjustment	**no e.c.f.**	B1
		amplitude control: increase (amplitude)	**no e.c.f.**	
		allow turn clockwise/to right		B1
(b)	**(i)**	echo OR reflection (of sound) OR bounced (back)		B1
	(ii)	idea of sound taking a finite time to travel OR idea of sound doesn't travel infinitely fast IGNORE sound has to travel to rock face and back		B1
				[6]

4 A laboratory worker hears the sound from a loudspeaker, as illustrated in Fig. 6.1.

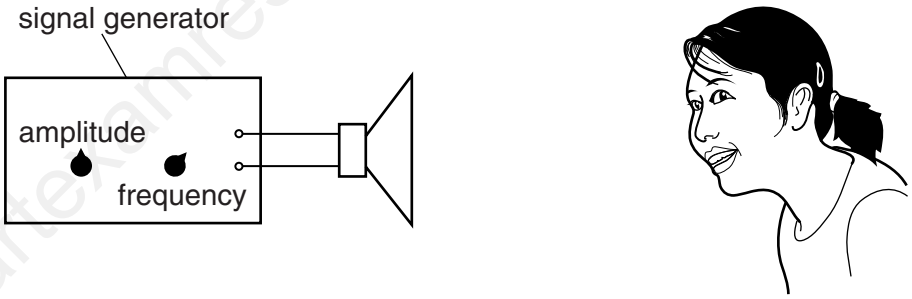

Fig. 6.1

The amplitude control knob and the frequency control knob on the signal generator are set so that the worker hears a particular note from the loudspeaker.

(a) The two control knobs are left untouched but the worker stands further away from the loudspeaker.

What difference, if any, does this make to the sound heard by the worker?

.....[1]

(b) What difference, if any, does it make to the note heard by the worker if

(i) the amplitude of the sound wave is increased,

.....

(ii) the frequency of the sound wave is increased?

.....
[2]

(c) Describe what happens to the air in order for the sound from the loudspeaker to reach the laboratory worker's ear.

.....

.....

.....[2]

(d) The human ear cannot detect all frequencies.

State the approximate range of frequencies for a healthy human ear.

lower frequency limit = ... Hz

upper frequency limit = ... Hz
[2]

[Total: 7]

MARKING SCHEME:

(a)	less loud / quieter / lower volume / not as loud	B1
(b)	**(i)** louder / greater volume	B1
	(ii) higher pitch	B1
(c)	any two from: compressions and / or rarefactions waves / vibrations / it vibrates longitudinal energy passed from particle to particle / particles vibrate	B2
(d)	any value between 10–25 (Hz)	B1
	any value between 15 000–25 000 (Hz) or 15–25 k(Hz)	B1

[Total: 7]

5 **(a)** Fig. 5.1 shows four traces produced by an oscilloscope for different sounds. For each trace the same settings of the oscilloscope were used.

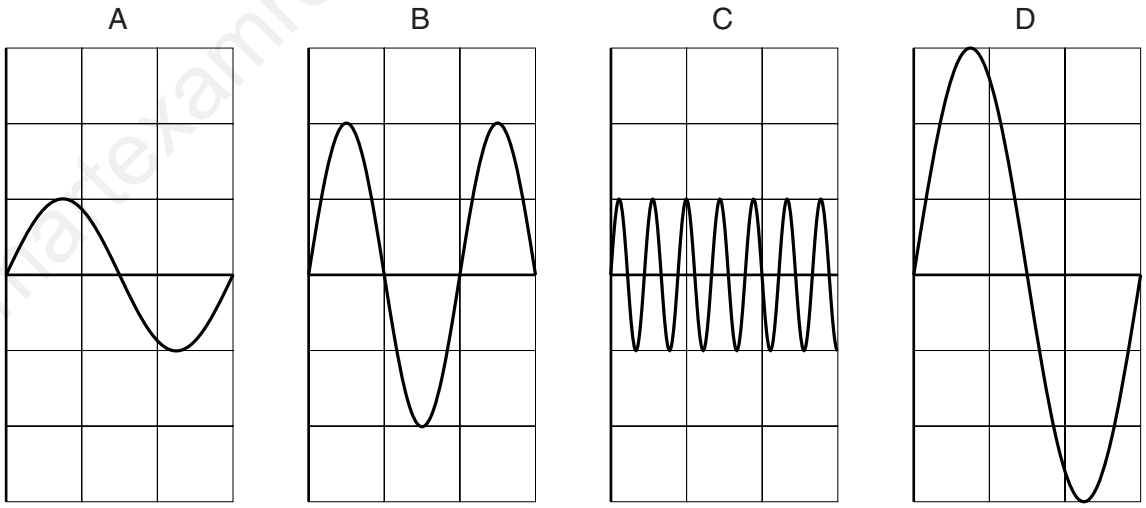

Fig. 5.1

(i) In the box, write the letter A, B, C or D of the trace showing the sound with the highest pitch.

[1]

(ii) Complete the statement using the letters of the traces.

The two traces that have the same amplitude are ..... and ..... . [1]

(b) Students are provided with a 100 m tape measure and stopwatches. The teacher has a starting pistol.

Describe an experiment that they can carry out to determine the speed of sound in air.

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 7]

MARKING SCHEME:

(a) (i) C in box B1

(ii) A **AND** C in any order B1

(b) any 5 points in any order from: B5

- starting pistol fired
- stopwatch started on seeing smoke/signal
- stopwatch stopped on hearing bang
- time taken (between flash and bang) calculated/recorded
- distance measured **OR** at least 100 m apart, IGNORE distances less than 100 m
- speed = distance ÷ time

[Total: 7]

6 A man is using an axe to chop down a tree, as shown in Fig. 7.1.

Fig. 7.1

(a) A short time after the axe hits the tree, the man hears a clear echo.

He estimates that the echo is heard 3 seconds after the axe hits the tree.

(i) Suggest what type of obstacle might have caused such a clear echo.

.....

MARKING SCHEME:

(i)	large, OR accept any large example e.g. cliff	B1

7 alternatives. An example has been given to help you.

(a) Make the following sentences about sound echoes correct by crossing out the incorrect alternatives.

(example) An echo is caused when a sound wave hits a ~~small~~ ~~thin~~ large obstacle.

(i) An echo is a sound wave which is ~~reflected~~ ~~refracted~~ ~~dispersed~~ by an obstacle. [1]

MARKING SCHEME:

(a)	**(i)**	reflected	B1