1 Two students are asked to determine the speed of sound in air on the school playing fields.

(a) List the apparatus they need.

.....

.....

..... [1]

(b) List the readings that the students need to take.

.....

.....

..... [1]

(c) State how the speed of sound is calculated from the readings.

..... [1]

(d) State one precaution that could be taken to improve the accuracy of the value obtained.

.....

..... [1]

(e) The table gives some speeds.

speed/ m/s	speed of sound in air	speed of sound in water
10		
100		
1000		
10 000		

Place a tick in the table to show the speed which is closest to

(i) the speed of sound in air,

(ii) the speed of sound in water.

[2]

[Total: 6]

2 **(a)** In the space below, draw a diagram to represent a sound wave.

On your diagram, mark and label

(i) **two** consecutive compressions and **two** consecutive rarefactions,

(ii) the wavelength of the wave.

[3]

(b) Fig. 7.1 shows part of the electromagnetic spectrum.

Fig. 7.1

(i) On Fig. 7.1, label the positions of γ-rays, visible light waves and radio waves. [1]

(ii) State which of the three types of wave in **(i)** has the lowest frequency.

..... [1]

(iii) State the approximate value of the speed in air of radio waves.

..... [1]

[Total: 6]

3 Fig. 7.1 shows how the air pressure at one instant varies with distance along the path of a continuous sound wave.

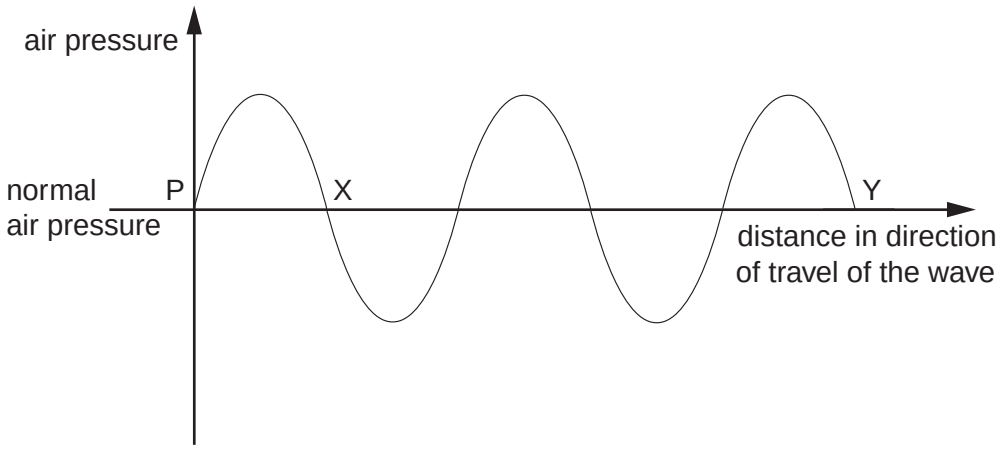

Fig. 7.1

(a) What type of waves are sound waves?

.....[1]

(b) On Fig. 7.1, mark on the axis PY

(i) one point C where there is a compression in the wave, [1]

(ii) one point R where there is a rarefaction in the wave. [1]

(c) Describe the motion of a group of air particles situated on the path of the wave shown in Fig. 7.1.

.....

.....

.....[2]

(d) The sound wave shown has speed of 340 m / s and a frequency of 200 Hz.
Calculate the distance represented by PX on Fig. 7.1.

distance = ...[2]

[Total : 7]

4 Fig. 6.1 shows the path of a sound wave from a source X.

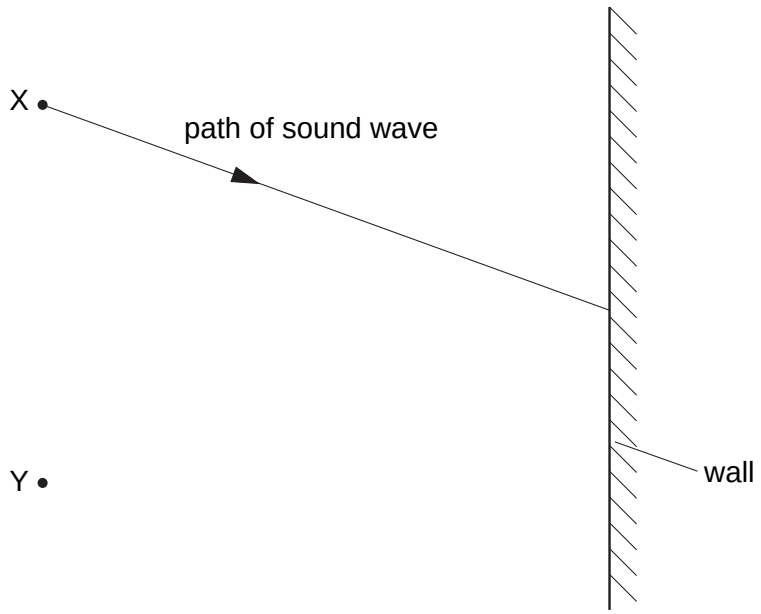

Fig. 6.1

(a) State why a person standing at point Y hears an echo.

..... [1]

(b) The frequency of the sound wave leaving X is 400 Hz. State the frequency of the sound wave reaching Y.

frequency = …….. [1]

(c) The speed of the sound wave leaving X is 330 m/s. Calculate the wavelength of these sound waves.

wavelength = …… [2]

(d) Sound waves are longitudinal waves.

State what is meant by the term *longitudinal*.

.....

..... [1]

[Total : 5]

5 Fig. 7.1 shows the cone of a loudspeaker that is producing sound waves in air.
At any given moment, a series of compressions and rarefactions exist along the line XY.

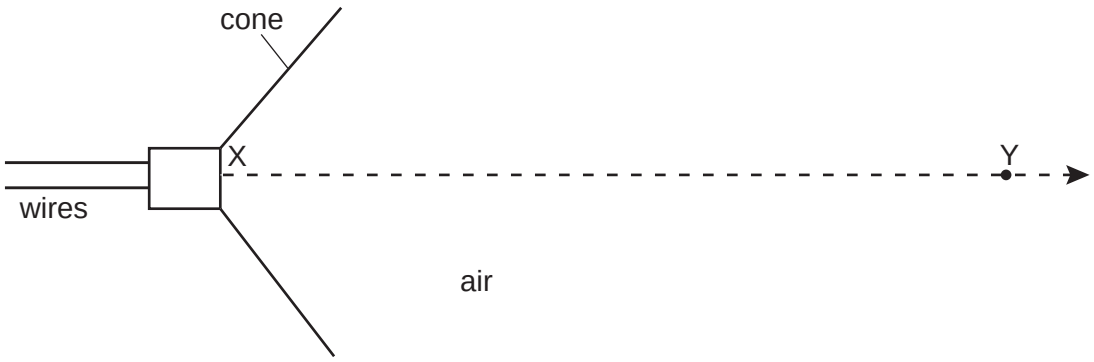

Fig. 7.1

(a) On Fig. 7.1, use the letter C to mark **three** compressions and the letter R to mark **three** rarefactions along XY. [1]

(b) Explain what is meant by

(i) a *compression*,

.....

.....

(ii) a *rarefaction*.

.....

.....
[2]

(c) A sound wave is a longitudinal wave. With reference to the sound wave travelling along XY in Fig. 7.1, explain what is meant by a *longitudinal* wave.

.....

.....[2]

(d) There is a large vertical wall 50 m in front of the loudspeaker. The wall reflects the sound waves.
The speed of sound in air is 340 m/s.
Calculate the time taken for the sound waves to travel from X to the wall and to return to X.

time = ……[2]

6 Fig. 8.1 shows plane waves passing through a gap in a barrier that is approximately equal to the wavelength of the waves.

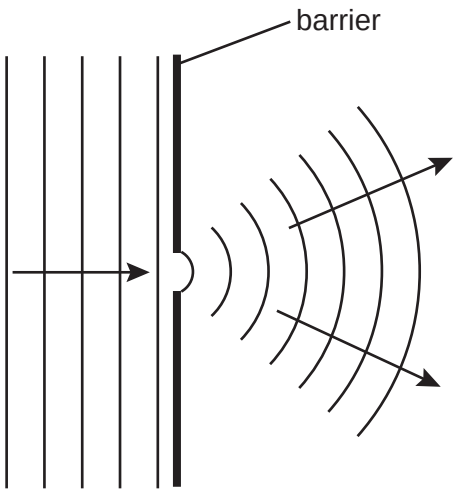

Fig. 8.1

(a) What is the name given to the wave property shown in Fig. 8.1?

.....[1]

(b) In the space below, carefully draw the pattern that would be obtained if the gap were increased to six times the wavelength of the waves. [4]

(c) The effect in Fig. 8.1 is often shown using water waves on the surface of a tank of water. These are transverse waves. Explain what is meant by a *transverse* wave.

.....

.....

.....[2]

[Total : 7]

7 **(a)** Fig. 5.1 shows the air pressure variation along a sound wave.

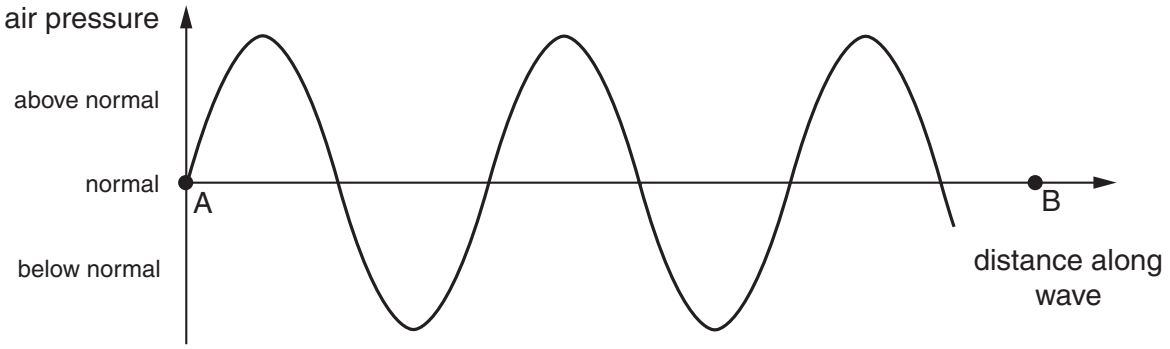

Fig. 5.1

(i) On AB in Fig. 5.1, mark one point of compression with a dot and the letter C and the next point of rarefaction with a dot and the letter R.

(ii) In terms of the wavelength, what is the distance along the wave between a compression and the next rarefaction?

.....

[3]

(b) A sound wave travels through air at a speed of 340 m/s. Calculate the frequency of a sound wave of wavelength 1.3 m.

frequency = ... [2]

[Total : 5]