Eduqas Physics GCSE
Topic 5.1: Waves in air, fluids and solids
Questions by topic

1.

(a) State how a longitudinal wave differs from a transverse wave.

....

....

.... [2]

(b) A sound wave of frequency 7.5 kHz travels through a steel beam at a speed of 6100 m/s.

wavelength = ... [2]

(ii) The sound wave passes from the end of the beam into air.

State

    1.   the effect on the speed of the sound,

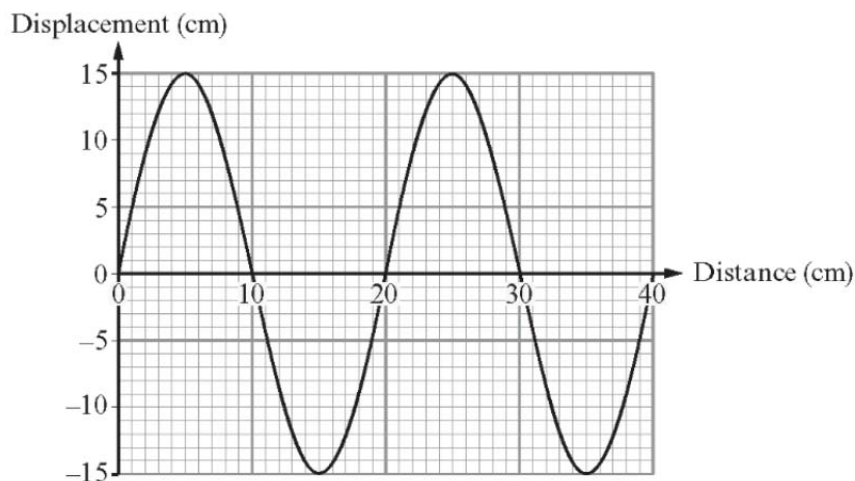   .... [1]

    2.   the effect on the wavelength of the sound.

    .... [1]

[Total: 6]

2.

Waves are shown on the grid below.

Displacement (cm)

(a)   Write down the amplitude of the waves. .... cm [1]

(b)   Write down the wavelength of the waves. .... cm [1]

(c)   If 10 waves are produced in 5 seconds, calculate their frequency.   [2]

frequency = ... Hz

(d)   Use the equation:

wave speed = wavelength × frequency

to calculate the speed of the waves and state the unit.   [3]

wave speed = ...

unit = ...

(e)   **Underline** the correct statement in the bracket below.

If the wave amplitude was doubled the speed of the waves would
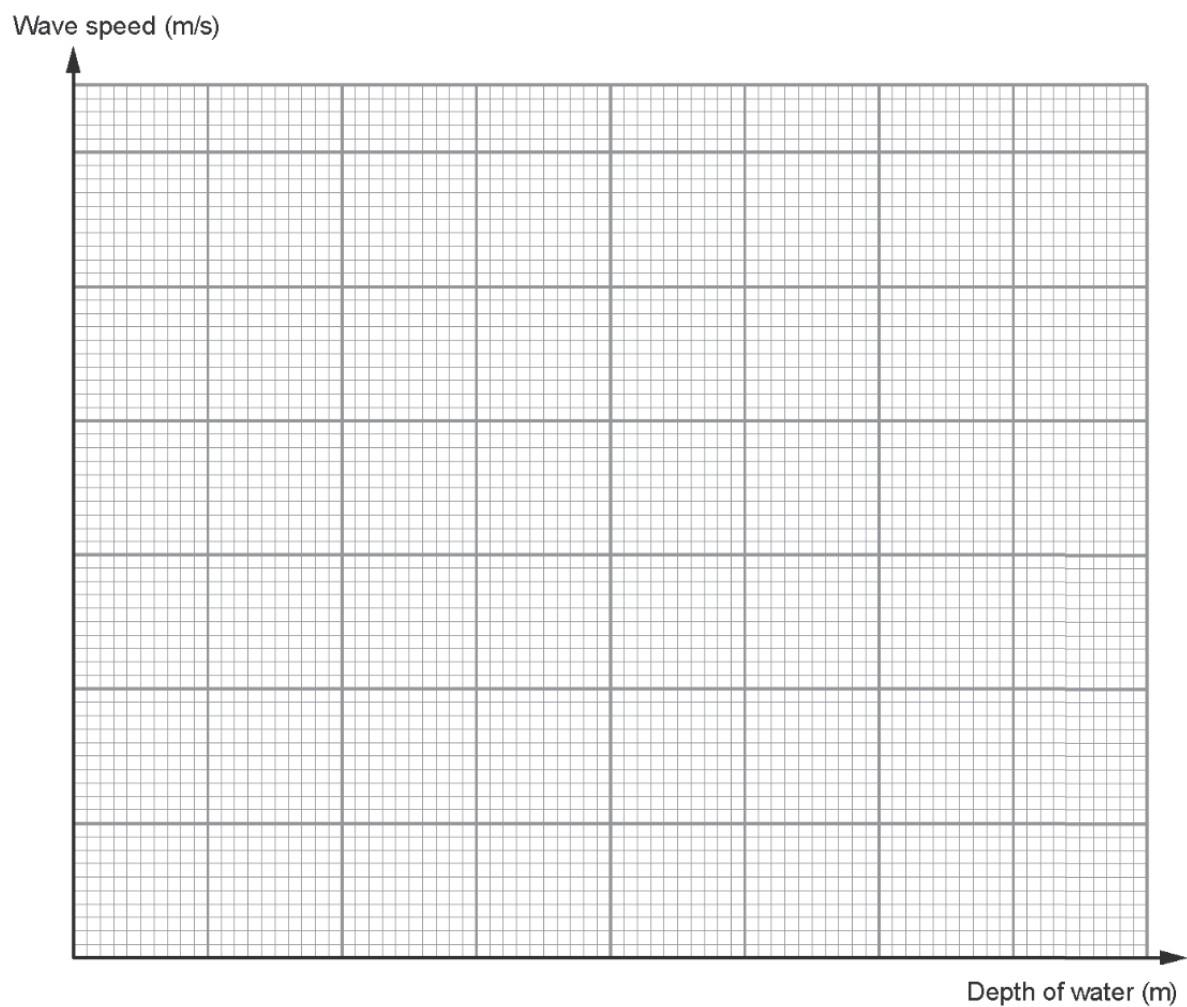(double / stay the same / halve).   [1]

8

3.   The data below shows how the speed of water waves changes with the depth of water.

   (a)   (i)   Use the data in the table below to plot a graph on the grid below.   [3]

Depth of water (m)	Wave speed (m/s)
0.0	0.0
0.5	1.8
1.5	3.8
2.5	4.9
3.5	5.7
4.0	6.0

Wave speed (m/s)

Depth of water (m)

(ii)   Describe how the wave speed changes with the depth of water.   [2]

....

....

(b)   Use the graph to answer the following question.
Water waves produced by a wave machine in a swimming pool have a wavelength of
8.1 m where the depth of water is 3.0 m.

(i)   Use an equation from page 2 to calculate the frequency of these waves in the
pool.   [3]

frequency = ... Hz

(ii)   As the waves travel from **A** to **B** in the pool, their frequency remains constant.
Explain what happens to their wavelength.   [2]

....

....

....

10
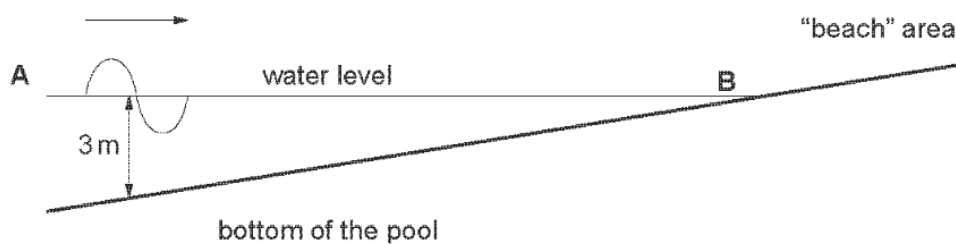
4.

(a) A sound wave in air consists of alternate compressions and rarefactions along its path.

    (i) Explain how a compression differs from a rarefaction.

        ....

        ....[1]

    (ii) Explain, in terms of compressions, what is meant by

        1. the wavelength of the sound,

            ....

            ....[1]

        2. the frequency of the sound.

            ....

            ....[1]

(b) At night, bats emit pulses of sound to detect obstacles and prey. The speed of sound in air is 340 m / s.

    (i) A bat emits a pulse of sound of wavelength 0.0085 m.

    Calculate the frequency of the sound.

frequency = ...[2]

(ii) State why this sound cannot be heard by human beings.

....

....[1]

(iii) The pulse of sound hits a stationary object and is reflected back to the bat. The pulse is received by the bat 0.12 s after it was emitted.

Calculate the distance travelled by the pulse of sound during this time.

distance = ...[2]

5.

(a) Draw a straight line from each quantity on the left-hand side to a speed on the right-hand side which is typical for that quantity.

	30 m/s
speed of sound in gas	300 m/s
	3000 m/s
speed of sound in solid	30 000 m/s
	300 000 m/s

[2]

(b) Explain why sound waves are described as *longitudinal*.

....

.... [2]

(c) Fig. 8.1 shows how the displacement of air molecules, at an instant of time, varies with distance along the path of a sound wave.

displacement

distance along path of sound wave
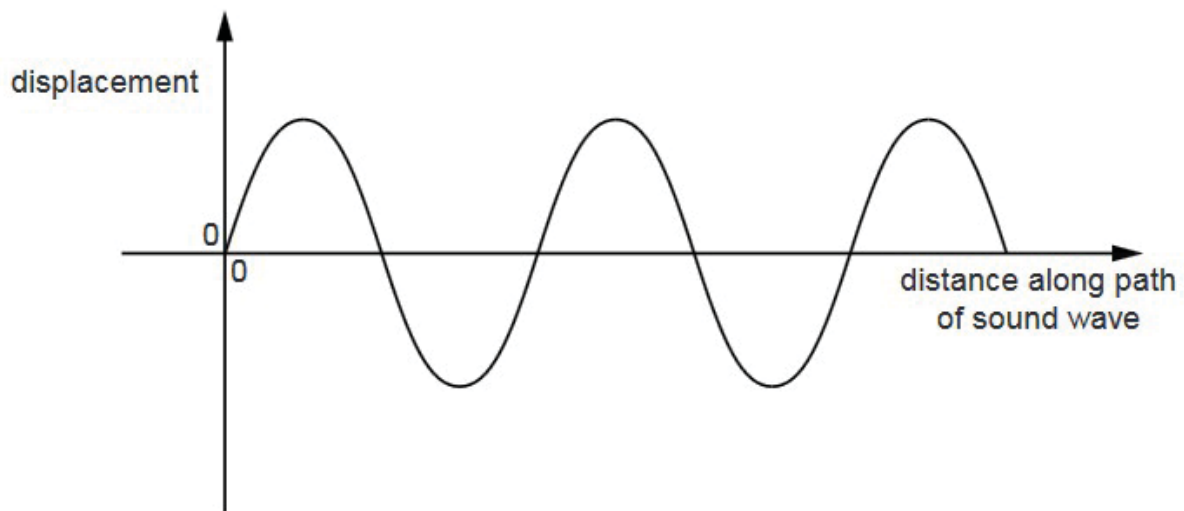
Fig. 8.1

(i) On Fig. 8.1, sketch two cycles of a sound wave that has a shorter wavelength **and** a greater amplitude. [2]

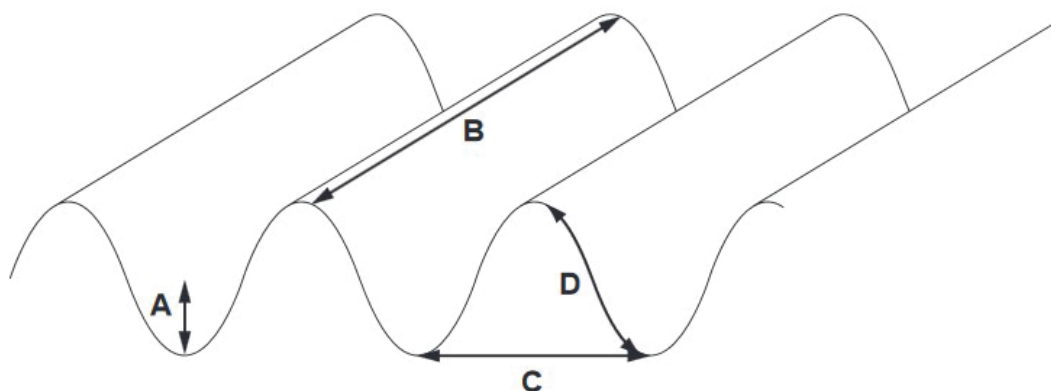**(ii)** State **two** changes in the sound heard from this wave compared with the original wave.

1. ....

2. ....
[2]

[Total: 8]

6.

The diagram shows a water wave in a ripple tank.

Which line represents a wavefront?

7.

The diagram shows a side view of a water wave at a particular time. The diagram is drawn full size.

direction of travel of wave

Which statement about the wave is correct?

A   The wave is longitudinal and the frequency can be measured from the diagram.

B   The wave is longitudinal and the wavelength can be measured from the diagram.

C   The wave is transverse and the frequency can be measured from the diagram.

D   The wave is transverse and the wavelength can be measured from the diagram.

8.

A boy throws a small stone into a pond. Waves spread out from where the stone hits the water and travel to the side of the pond.

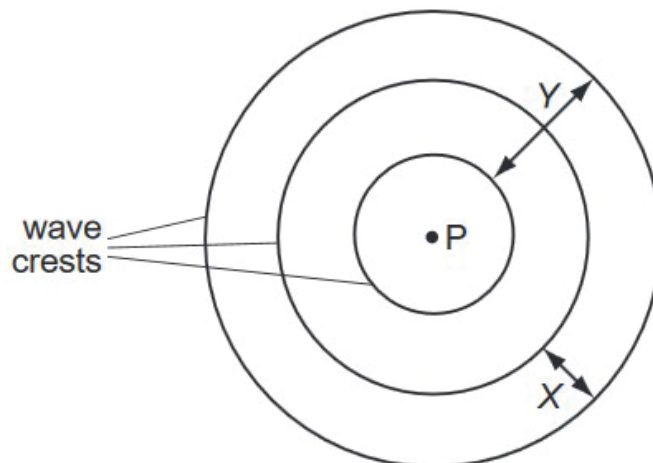The boy notices that eight waves reach the side of the pond in a time of 5.0 s.

What is the frequency of the waves?

A 0.20 Hz **B** 0.63 Hz **C** 1.6 Hz **D** 40 Hz

9.

A vertical stick is dipped up and down in water at P.

In two seconds, three wave crests are produced on the surface of the water.

Which statement is correct?

A Distance X is the amplitude of the waves.

B Distance Y is the wavelength of the waves.

C Each circle represents a wavefront.

D The frequency of the waves is 3 Hz.

10.

Sound waves of frequency 2.0 kHz travel through a substance at a speed of 800 m/s.

What is the wavelength of the waves?

A   0.40 m   **B**   2.5 m   **C**   400 m   **D**   1600 m

11.

The frequency of a wave is doubled. The speed of the wave does not change.

What happens to the wavelength of the wave?

A   It becomes four times as large.

B   It does not change.

C   It doubles.

D   It halves.