

**Eduqas Physics GCSE**  
**Topic 5.2: Waves at material**  
**interfaces, applications in exploring**  
**Questions by topic**

1.

Sound from a loudspeaker is travelling in air towards a solid wall.

Fig. 7.1 shows compressions of the incident sound wave and the direction of travel of the wave.

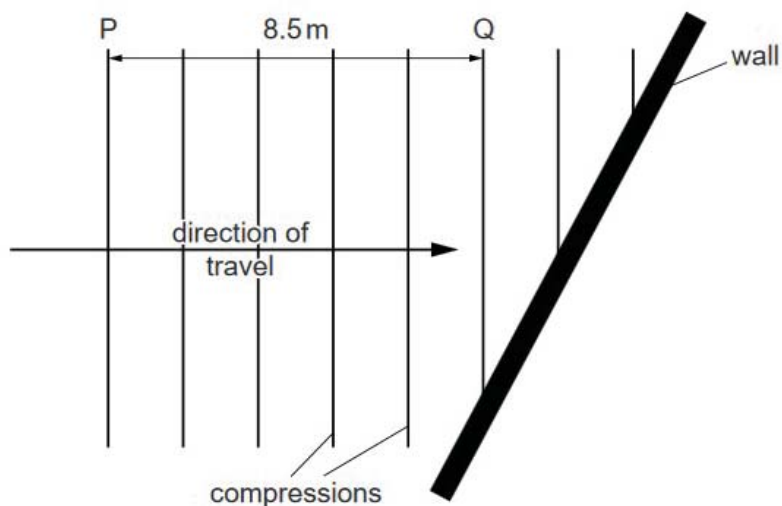


Fig. 7.1

(a) State what is meant by a *compression*.

.....  
.....[1]

(b) The distance from point P to point Q is 8.5m. It takes 25ms for the compression at P to reach Q.

For this sound wave, determine

(i) the wavelength,

wavelength = .....[1]

(ii) the frequency.

frequency = .....[2]

- (c) As it strikes the wall, the sound reflects.

Complete Fig. 7.1 to show the positions of three compressions of the reflected sound wave.  
[2]

- (d) The loudspeaker is immersed in water, where it continues to produce sound of the same frequency.

State and explain how the wavelength of the sound wave in water compares with the wavelength determined in (b)(i).

.....  
.....  
.....[2]

[Total: 8]

**2 (part (a) HIGHER).**

- (a)** Two types of seismic waves are produced by earthquakes. They are called P-waves and S-waves. P-waves are longitudinal and S-waves are transverse.

- (i)** Explain what is meant by the terms *longitudinal* and *transverse*.

longitudinal .....

.....

transverse .....

.....

[2]

- (ii)** State another example of

1. a longitudinal wave, .....

2. a transverse wave. ....

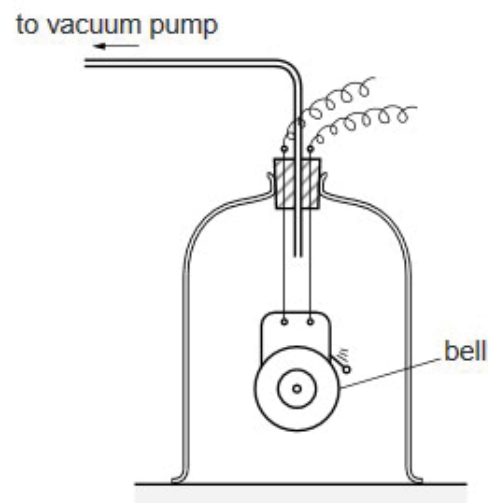
[2]

- (iii)** A seismic wave has a speed of 7.2 km/s and a frequency of 30 Hz.

Calculate its wavelength.

wavelength = .....[2]

(b) Fig. 5.1 shows an electric bell ringing in a sealed glass chamber containing air.



**Fig. 5.1**

A student hears the bell ringing. The air is then removed from the chamber.

State and explain any change in the sound heard by the student.

.....

.....

.....

.....[2]

[Total: 8]

### 3 (HIGHER).

(a) Seismic (earthquake) waves can be either P-waves or S-waves.

Which row of the table is correct for P-waves?

Put a cross (X) in the box next to your answer.

(1)

	type of wave	can they be refracted?
<input type="checkbox"/> A	longitudinal	yes
<input type="checkbox"/> B	transverse	no
<input type="checkbox"/> C	longitudinal	no
<input type="checkbox"/> D	transverse	yes

(b) Explain why it is difficult to predict when an earthquake will happen.

(2)

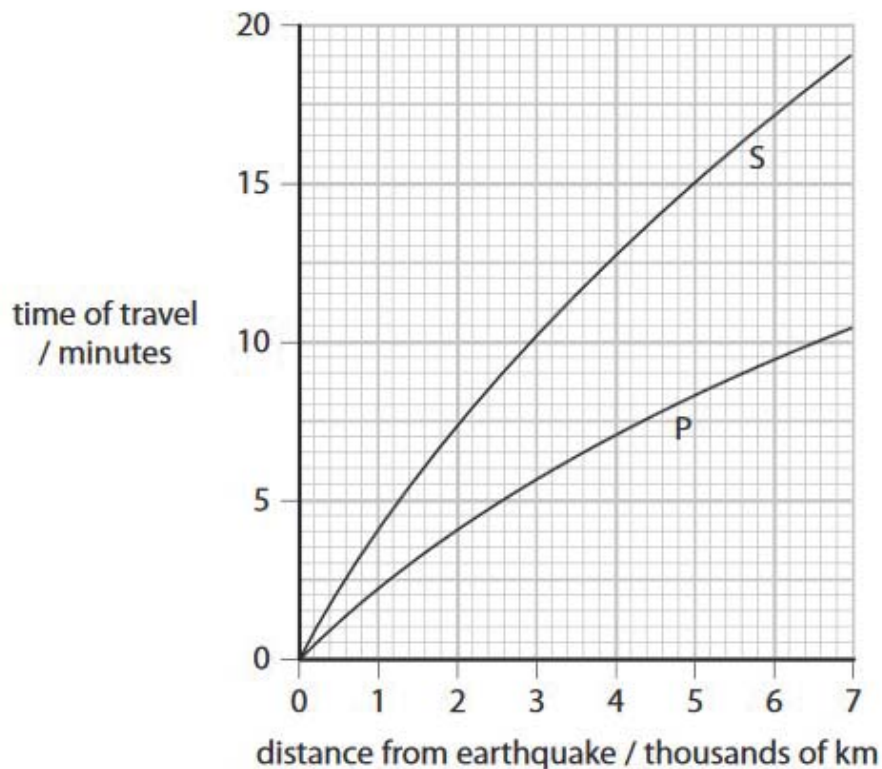
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- (c) The graph shows how long it takes the P-waves and the S-waves from an earthquake to travel different distances.



The time difference between these waves arriving at a place allows scientists to find out how far away the earthquake was.

Use the graph to find the time difference between the P- and S-waves when the distance is 4800 km.

(3)

time for P-wave = ..... minutes

time for S-wave = ..... minutes

time difference = ..... minutes

\*(d) The map below shows the positions of some seismic earthquake stations in the UK.



At the seismic stations, scientists record the arrival of earthquake waves. They use this data to locate where an earthquake happened.

Describe how they use the data to find out where an earthquake happened. You may add to the diagram above or draw your own diagram to help with your answer.

(6)

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings present.



**4 (HIGHER).**

- (a) A man uses a dog whistle to call his dog.  
The whistle uses ultrasound.

- (i) The dog can hear the whistle but the man cannot.  
Explain why the dog can hear the whistle but the man cannot hear the whistle.

(2)

.....

.....

.....

.....

- (ii) The dog is 140 m away from the man.  
The ultrasound takes 0.42 s to travel from the man to the dog.  
Calculate the speed of ultrasound.  
State the unit.

(3)

speed of ultrasound = ..... unit = .....

- (b) (i) An earthquake P-wave has a frequency of 15 Hz.

Complete the sentence by putting a cross (☒) in the box next to your answer.

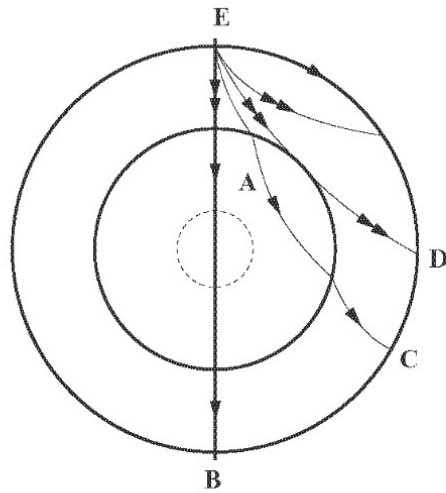
The earthquake P-wave is

(1)

- ☐ **A** an infrasound wave
- ☐ **B** an ultrasound wave
- ☐ **C** an electromagnetic wave
- ☐ **D** a transverse wave

### 5 (HIGHER).

The diagram shows how seismic waves from an earthquake at point **E** travel through the Earth. These waves travel through the Earth and are detected by scientists elsewhere.



(a) State which seismic waves (if any) are detected:

(i) between points **B** and **C**

[1]

.....

(ii) between points **C** and **D**.

[1]

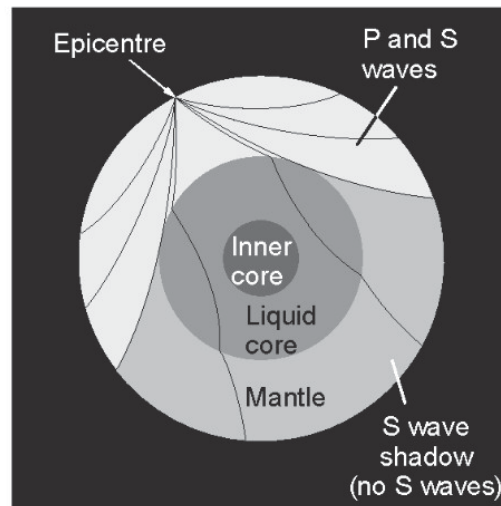
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(b) Explain how the Earth's structure affects the path of the seismic wave that passes from **E** to **A** on the diagram. [4]

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

**6 (HIGHER).**

- (a) Use the diagram below and your knowledge to compare the properties of seismic P waves, S waves and surface waves. [6 QWC]

[illegible]

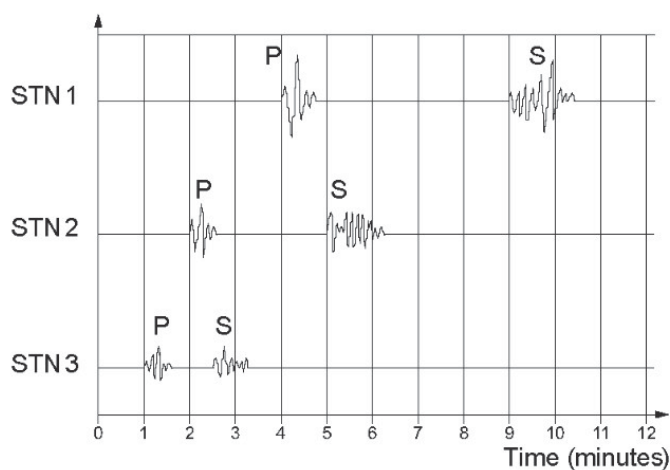
(b) By looking at the seismograms from different monitoring stations we can find out their distances from the epicentre of the earthquake. The signals arriving at 3 stations named as STN 1, STN 2 and STN 3 are shown below. (STN = station.)

- (i) Use the information in the diagram and graph below to find the distance from the STN2 monitoring station to the epicentre of the earthquake, describing how you arrive at your answer. [2]

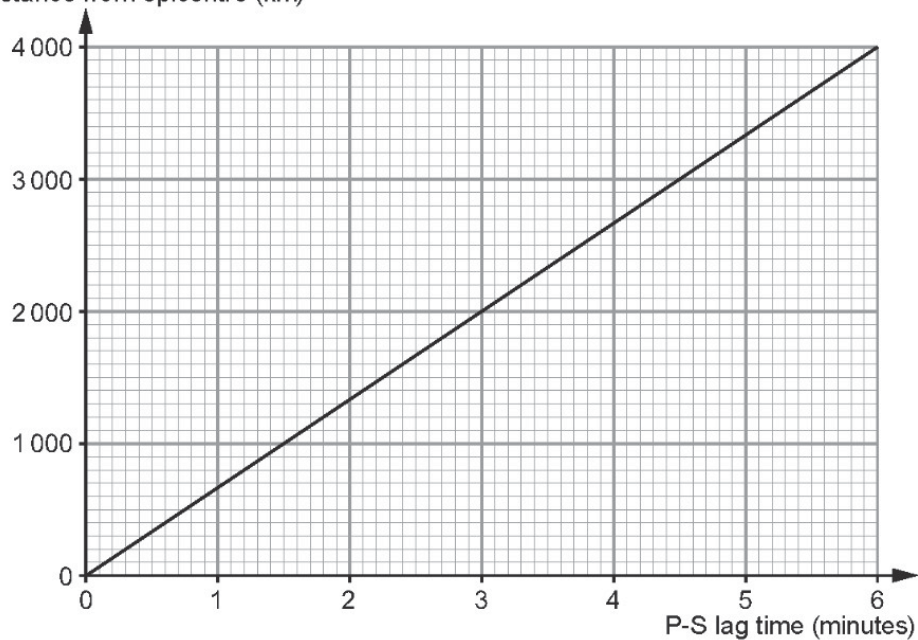
.....  
 .....

STN 2 distance from epicentre = ..... km

Plot of arrival of P and S waves at the three different monitoring stations



Distance from epicentre (km)



- (ii) **Describe** how you would determine the position of the epicentre of the earthquake using your answer in (b)(i) and the information below. **Show** its position on the diagram below. [3]

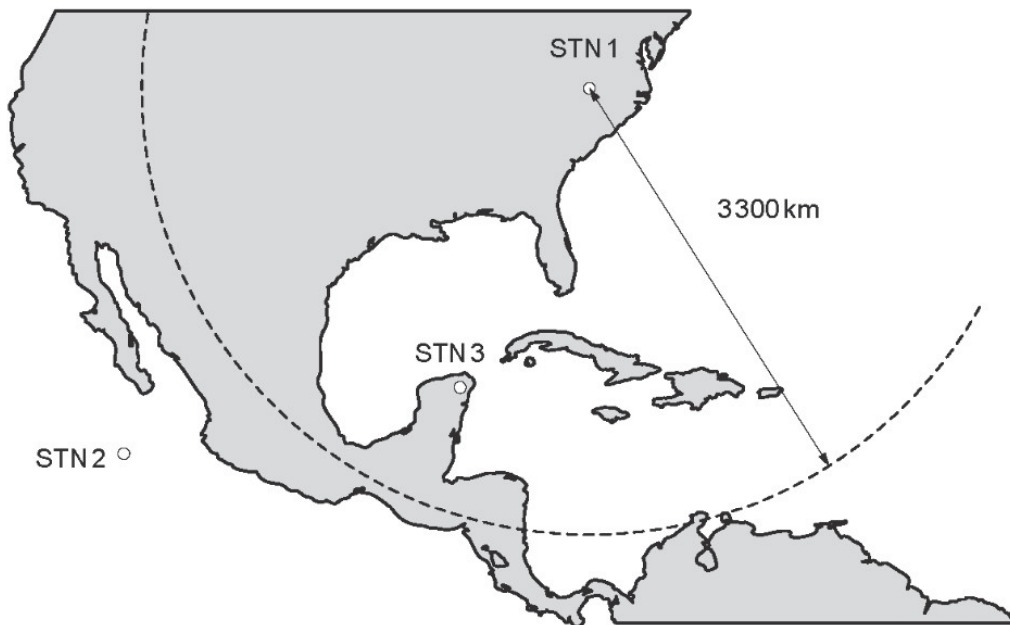
STN 1 distance from epicentre = 3300 km

STN 3 distance from epicentre = 900 km

.....

.....

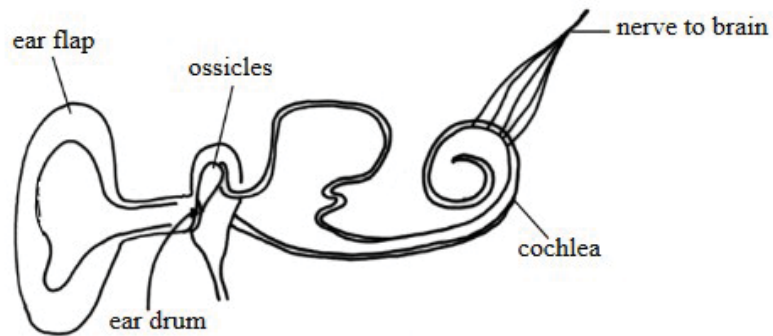
.....



Scale: 1 cm to 500 km

## 7 (HIGHER).

(a) Explain the part played by each of the following in detecting sound.



(i) the eardrum

.....  
..... [2]

(ii) the cochlea

.....  
..... [2]

(b) What is the function of the semi-circular canals?

.....  
..... [2]

(c) Why do we not hear our own voice as others hear us?

.....  
..... [2]

(d) How does a hearing aid pass sounds to the cochlea?

..... [1]