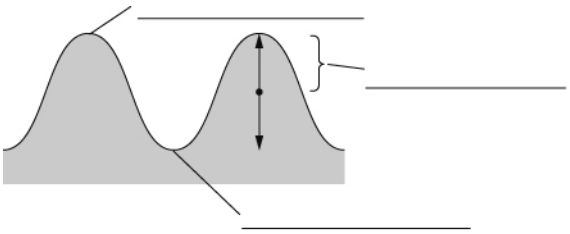
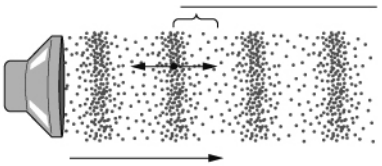
Name _____ **Class** _____ **Date** _____

1 The diagrams show two waves. Label the waves using words from the box. You may need some labels more than once.

amplitude	crest	longitudinal	transverse	trough



_____ wave



_____ wave

2 Fill in the gaps in these sentences using words from the box.

amplitude	at right angles	bigger	energy	longitudinal
no	same	spreading	transverse	water

Waves on the surface of water are _____ waves, because the particles are vibrating _____ to the direction the waves are travelling. Sound waves are _____ waves, because the particles vibrate in the _____ direction as the waves travel.

All waves transfer _____. Waves on a pond do not transfer _____ across the pond.

The _____ of waves gets less as they get further from the source. This is because the energy is _____ out.

When two waves meet their effects can add up to make a _____ wave, or they can cancel out to give _____ wave.

I can…

- describe longitudinal and transverse waves
- compare sound waves and waves on water
- describe what happens to the intensity of waves as they spread out
- describe what happens when two waves arrive in the same place.

Spot the mistakes

Name _____ **Class** _____ **Date** _____

Here are some revision notes made by a student.

1 Underline the mistakes in the passage.

> Sound is made by vibrating things. High notes have a high amplitude, and low notes have a low amplitude. The frequency is the number of waves per hour and is measured in hertz. The higher the frequency the more energy the wave is transferring.
>
> Sound waves travel fastest through gases and slowest through liquids. They do not travel at all in space, because space is very cold.
>
> We hear using our ears. Sound waves make the diaphragm vibrate, and these vibrations are passed on to the cochlea and then to the ear bones. Nerve impulses are sent to the brain.
>
> Loud noises can damage our ears. The best materials for sound proofing are hard, shiny materials.
>
> Sounds that are too high for humans to hear are called infrasound. Sounds that are too low for us to hear are called ultrasound. Dolphins and bats can hear infrasound, and they use this to find prey.
>
> We can use the energy transferred by infrasound in physiotherapy and for cleaning things. Sonar systems use echoes from the sea bed to work out the depth of the sea.

2 Write out a correct version below.

I can…

- describe sound waves
- recall the names and functions of the parts of the ear
- state what ultrasound is and describe how it can be used.

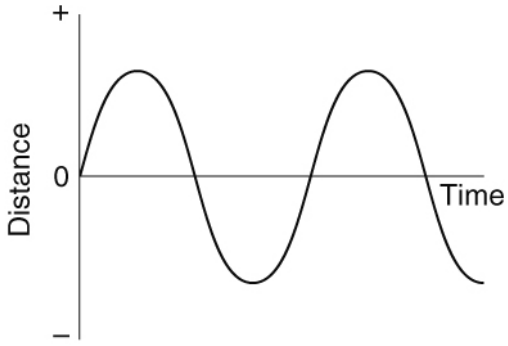
Graph A shows how far particles are displaced from their undisturbed positions as a wave passes.

1 Why are there plus and minus directions on the graph?

2 Explain why you cannot tell from this graph whether the wave is a transverse or longitudinal wave.

3 Copy the graph and draw another line on it to show how far the particles would move if the wave had a larger amplitude. Label the new line.

4 Make another copy of the graph, and show how the particles would move if the wave had a lower frequency.



Graph A

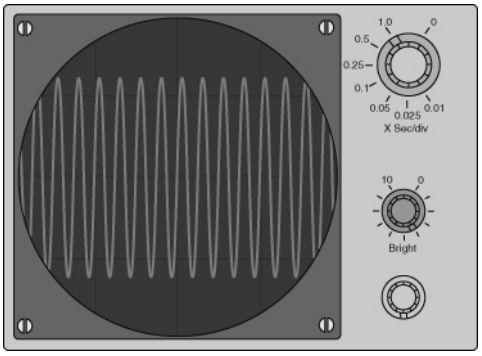
The drawing shows the trace produced on an oscilloscope when it is connected to a microphone. The oscilloscope shows how the pressure of the air changes with time.

5 Does this trace represent a transverse or longitudinal wave? Explain your answer.

6 Describe how the trace would look different if the sound:

a were quieter

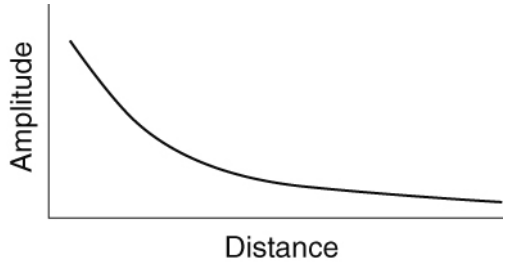
b were at a lower pitch



Graph B shows how the height of waves on water changes as the waves get further from their source.

7 Describe what the graph is showing.

8 Explain why this happens.



Graph B

I can…

- use graphs to help to describe longitudinal and transverse waves
- explain why the amplitude of a wave decreases as it gets further from its source.

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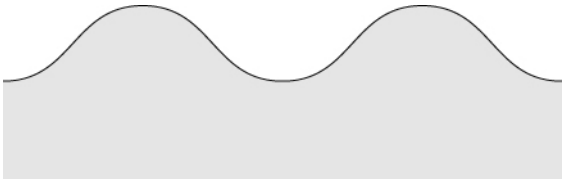
1 The table shows some characteristics of waves. Tick the boxes to show which waves each statement is describing. Each row could have one tick, two ticks, or no ticks at all.

Statement	Applies to sound waves	Applies to waves on water
a particles move at right angles to the way the wave is moving		
b can be reflected		
c particles move in the same direction as the wave is moving		
d can involve solids, liquids or gases		
e transverse wave		
f spreads out from source in all directions		
g transfers energy		
h transfers matter		
i longitudinal wave		

2 Sam dropped a small stone into a pond. It made some waves. The drawing shows part of the wave travelling across the pond.



a Draw another line on the drawing to show how big the waves would be if Sam had dropped a much bigger stone into the water.

b What happens to the amplitude of the waves as they move further from the place the stone landed?

_____

3 The effects of waves can add up or cancel out.

a What happens if the peaks of two waves arrive at one point together?

_____

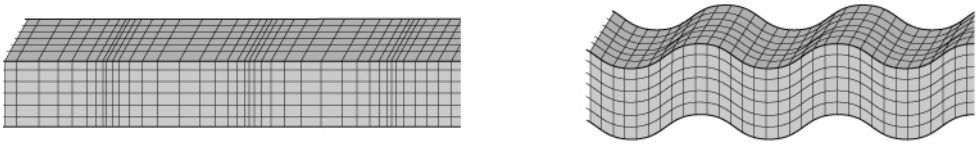
b What happens if a peak from one wave arrives with the trough of another wave?

_____

I can…

- describe sound waves and waves on water
- use the term ‘amplitude’ to describe waves
- describe what happens if two waves arrive at the same place.

Earthquakes happen when forces within the Earth push rocks and they move with a sudden jerk. Energy from the earthquake spreads out in all directions from the location of the earthquake. There are two types of earthquake waves, called P-waves and S-waves, shown in the diagram below. P-waves travel faster than S-waves.



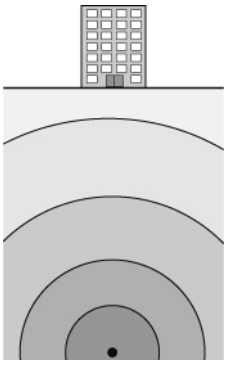
P-wave S-wave

1 Which of these waves is a sound wave? Explain your answer.

2 **a** Which of these waves is most like the waves on the surface of water?

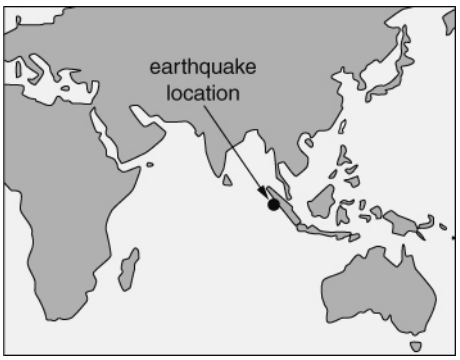
b In what ways is this wave *not* like waves on the surface of water?

3 The drawing shows waves from an earthquake spreading out towards a building on the surface. Will the building first start shaking up and down or side to side? Explain your answer.



4 Earthquakes can also be caused by explosions. Explain why you would feel the earth shaking before you heard the sound of an explosion.

A tsunami is a large wave, or series of waves, that is caused by an earthquake on the sea bed, or by a large landslide falling into the sea. In 2004 a tsunami just off the coast of Sumatra in the Indian Ocean killed over 200 000 people. In some places the wave reached a height of nearly 30 metres. The wave was 1.5 m high in South Africa, and only 1 m high in Antarctica.



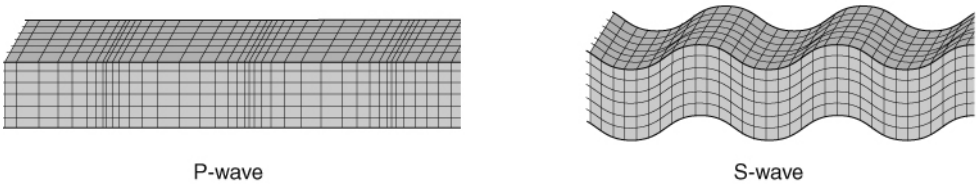
5 Where do you think the 30 m high waves were experienced? Explain your answer.

6 Explain why the waves were different heights in different places.

I can…

- describe longitudinal and transverse waves
- apply my knowledge of waves to new situations.

Earthquakes happen when forces within the Earth push rocks and they move with a sudden jerk. Energy from the earthquake spreads out in all directions from the location of the earthquake. There are two types of earthquake waves, called P-waves and S-waves, shown in the diagram below.



1 Which of these waves is a sound wave? Explain your answer.

2 **a** Which of these waves is most like the waves on the surface of water?

b In what ways is this wave *not* like waves on the surface of water?

3 Mrs Jones was sitting at home when there was a small earthquake 10 miles away.

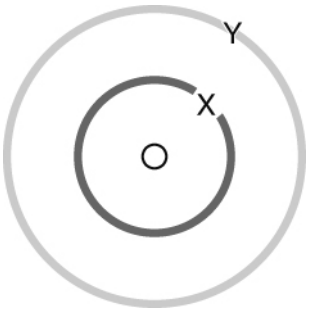
> I felt the house shake, and there was a loud bang. Nothing was damaged, but it was a little frightening.

Mrs Jones heard a bang because the air was vibrating.

a Explain why these vibrations could not have travelled through the air from the site of the earthquake.

b Describe how the vibrations reached the air in Mrs Jones' house.

When a stone is dropped into water, the energy transferred to the water spreads out as waves. The diagram shows that wave Y is twice as far from the original splash as wave X. The total length of the ripple is twice as long, so the energy per metre of wave Y is only half as much as wave X.

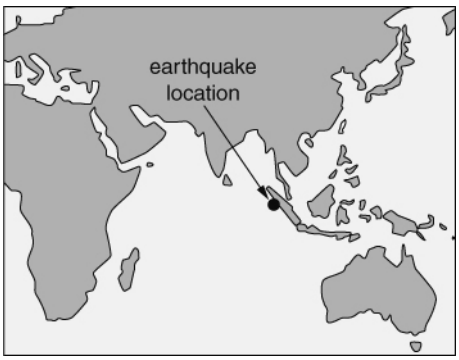


4 Wave X is transferring 300 J of energy per metre of wave.

a How much energy is being transferred per metre of wave by wave Y?

b Wave Z is three times as far from the original splash as wave X. How much energy is it transferring per metre of wave?

A tsunami is a large wave, or series of waves, that is caused by an earthquake on the sea bed, or by a large landslide falling into the sea. In 2004 a tsunami just off the coast of Sumatra in the Indian Ocean killed over 200 000 people. In some places the wave reached a height of nearly 30 metres. The wave was 1.5 m high in South Africa, and only 1 m high in Antarctica.



5 Where do you think the 30 m high waves were experienced? Explain your answer.

6 Explain why the waves were different heights in different places.

7 If you could calculate the distance from the earthquake location to the places mentioned above and work out what the wave heights should be, you would find that they did not exactly follow the rule explained before question 4. Suggest why the rule does not work for tsunami waves.

When a wave spreads out on the surface, the total length of the wave halves when the distance from the source is doubled. When a wave spreads out in three dimensions, such as from an underground earthquake, the energy transferred by each part of the wave decreases faster. For double the distance the energy is $^1/_4$ of the original, and for 3 times the distance the energy is only $^1/_9$ of the original.

8 Earthquake waves 5 km below the surface are 1 km from the location of the earthquake. They are transferring 5000 MJ of energy per square metre of the wave.

a How much energy per square meter will there be when the waves are 2 km from the earthquake location?

b How much energy per square meter will there be when the waves are 3 km away?

9 Why is damage to buildings much worse close to the location of an earthquake than it is further away?

I can…

- apply my knowledge of waves to new situations
- explain why the intensity of waves decreases with distance from the source.