

Speed of sound

Physics - Key Stage 3

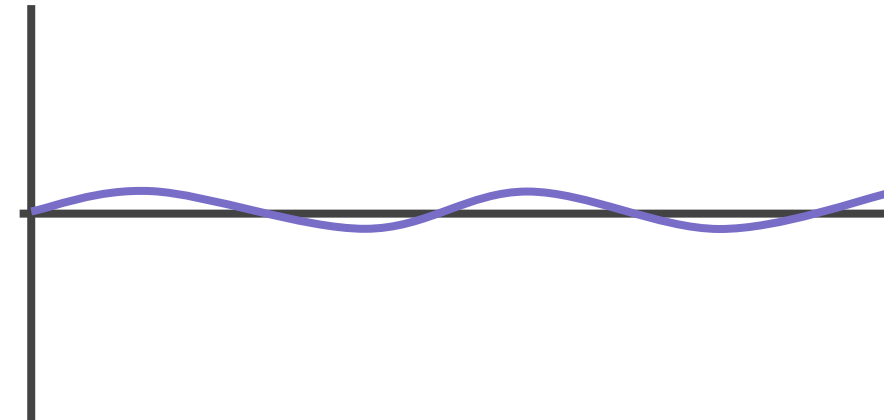
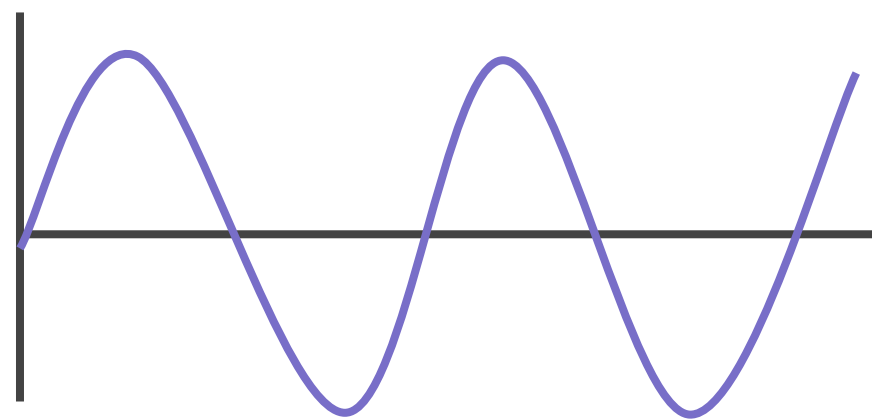
Sound waves - Lesson 5

Miss Mason



Recap

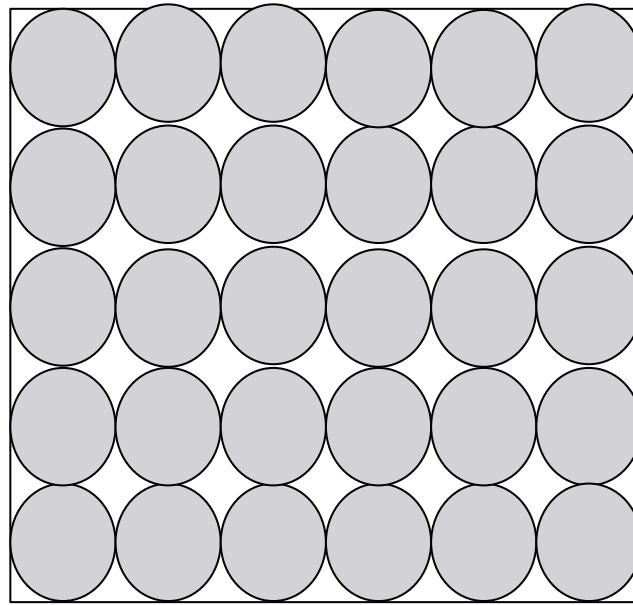
1. What is the volume of a sound determined by? ***The a_____ (d_____ of the particles)***
2. What is the pitch of a sound determined by? ***The f_____ of waves (how _____ pass a certain point every s_____)***
3. What equation has to be used in echolocation to find out how far away an object is?
4. Describe what these 2 oscilloscope traces show.
(Make sure you mention frequency, pitch, wavelength, amplitude and volume).



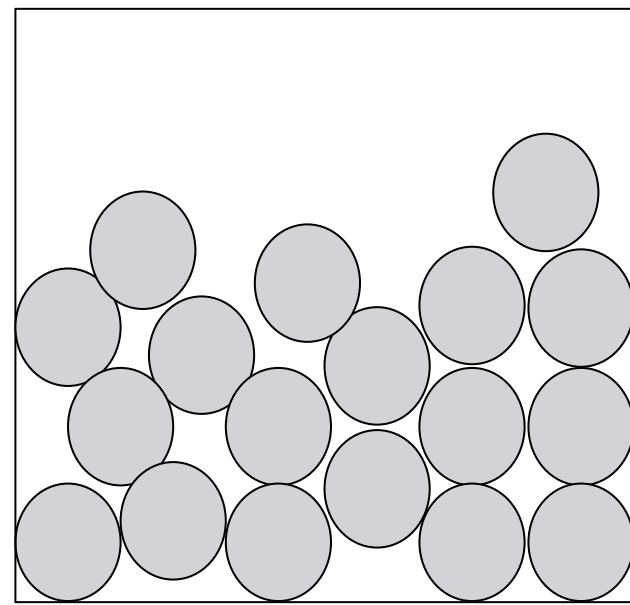
Reminder: sound waves need a medium to travel through

1. Sounds cannot travel through a _____ because...
2. Through which state of matter do you think sound will travel fastest?

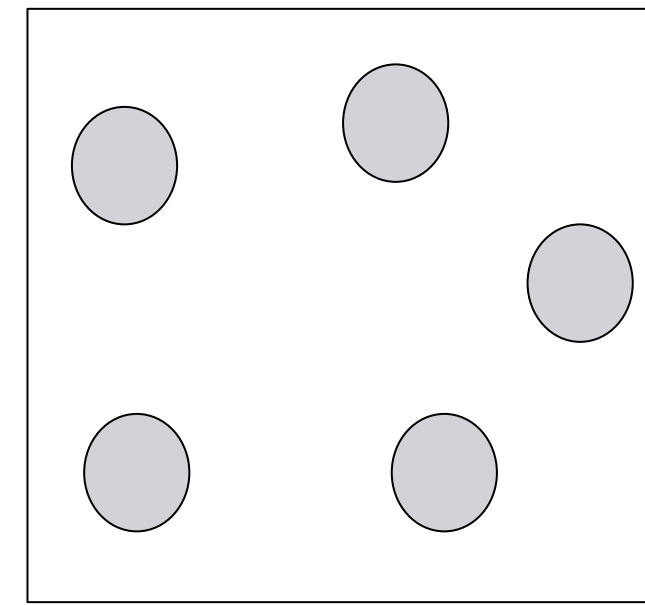
Solid



Liquid



Gas



Using no more than 10 words, explain why sound travels the slowest in a gas.



Calculating the speed of a sound wave

A football pitch is 100m metres long.

Susie bangs some cymbals from one end and the sound is heard 0.3s later from the other end.

How fast was the sound wave travelling through the air.

V(alues)	
E(quation)	
S(ubstite)	
R(earrange)	
A(nswer)	
U(nit)	



Calculating the speed of a sound wave

Two people stand 0.6km away from each other.

One of them blasts an airhorn and the other records the time it takes for them to hear it.

It takes 2s.

What was the speed of the sound?

V(alues)	
E(quation)	
S(ubstite)	
R(earrange)	
A(nswer)	
U(nit)	





Pause the video to complete your task

1. What is the speed of a sound wave that takes 0.03s to travel through a 10m long cylinder of air?
2. What is the speed of a sound wave that takes 1 minute to travel through 50km of a liquid?
3. Look at the answers you have got - are they what you would expect?
4. What would you have expected your answer to be like if you were asked about the speed of sound through a solid?



Echolocation recap

1. Identify 3 organisms/vehicles that rely on echolocation.
2. How does echolocation work?
3. Which equation is used for echolocation calculations?



Calculating how far away an object is

A submarine sends out a sound wave to try and detect surrounding objects.

The sound wave takes 4s to return to the submarine and sound travels through water at 1400m/s.

Work out how far away the object is from the submarine.

V(alues)	
E(quation)	
S(ubstite)	
R(earrange)	
A(nswer)	
U(nit)	



Calculating how far away an object is

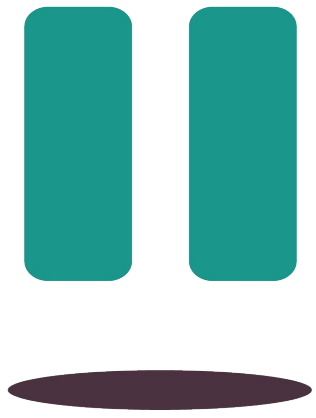
A dolphin sends out a sound wave to try and track down some fish to eat.

The sound wave takes 1 minute to return to the dolphin and sound travels through water at 1400m/s.

Work out how far away the fish are from the dolphin.

V(alues)	
E(quation)	
S(ubstite)	
R(earrange)	
A(nswer)	
U(nit)	





Pause the video to complete your task

(Use your knowledge of speed of sound in different states of matter to help you with these)

1. How far away is a bat's prey if it had a sound wave returned to it in 3s in air?
2. A baby dolphin has been separated from its family and needs to find them. It sends out a sound wave which is returned within 1.5s. How far away is the dolphin's family?
3. A submarine is on the lookout for an abandoned shipwreck and sends out a sound wave which is returned within 2 minutes. How far away must the shipwreck be from the submarine?



Calculating how long it will take for a sound wave to get somewhere

A cricket pitch is 0.2km long and sound travels through air at 330m/s.

If someone on the far end of the pitch shouts to someone at the other end, how long would it take for that person to hear their shout?

V(alues)	
E(quation)	
S(ubstite)	
R(earrange)	
A(nswer)	
U(nit)	



Calculating how long it will take for a sound wave to get somewhere

An ice rink is 150m long and a maximum speed a skater can reach is 10m/s.

How long would it take for an ice skater to get from one side of the rink to the other if they could travel at full speed the whole way?

V(alues)	
E(quation)	
S(ubstite)	
R(earrange)	
A(nswer)	
U(nit)	





Pause the video to complete your task

1. How long would it take for a car to travel a distance of 1km at a speed of 20m/s?
2. Jane want to cycle to her friend's house which is 3km away. She knows she will be able to cycle at an average speed of 7m/s. How long should it take her to get there?
3. Jack wants to get a new record for running 5km. If his average speed throughout the run is 4m/s, how long should the run take him? *Give your answer in minutes.*



Jeff wants to know how quickly he could run a marathon if he trained really hard. A marathon is approximately 42km and he thinks he could manage an average speed of 3m/s. How long would it take him to run the marathon if he was able to maintain this speed? Give your answer in minutes.

