Kirkcaldy High School

BGE Science

Medical Science

Sound

Name:_____

Class:_____

Teacher:_____

Expectations and Outcomes Learner Evaluation

Topic: Chemical Changes

Experience and Outcomes	Date Completed (dd/mm/yy)	Evaluation How happy are you with it? (☺ ? ☹)
I can explain how sound is made		
I can explain how sound travels		
I can describe how sound travels through a solid, liquid and gas		
I can state what happens when the frequency of a sound wave is changed.		
I can state what happens when the amplitude of a sound wave is changed.		
I can draw and analyse sound waveforms.		
I can state the frequency range of human hearing.		
I can explain the terms ultrasound and infrasound.		
I can state that animals can hear different frequencies		
I can describe the term echolocation.		
I can describe how ultrasound is used in medicine.		
I can describe how ultrasound is used in industry.		
I can describe how our ear works		
I can describe how echolocation can be used to help you ‘see’.		
I can describe how our ear works		

Experience and Outcomes	Date Completed (dd/mm/yy)	Evaluation How happy are you with it? (☺ ? ☹)
I can describe how echolocation can be used to help you ‘see’.		
I can measure the sound level of different areas.		
I can draw a bar chart		
I can give typical examples of readings on the decibel scale.		
I can list ways to prevent damage to your ear through noise pollution.		
I can describe how sound is amplified in medicine.		
I understand how noise cancellation works		
I have an awareness of sound reproduction technologies.		

Date: _____

Introduction to Sound

Starter

Explain how these musical instrument produce sound.:

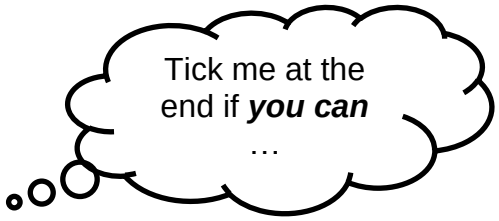
_____

_____

Learning Intentions

To explain how sound is made.
To explain how sound travels.

Success Criteria



☐ I can explain how sound is made

☐ I can explain how sound travels

Investigating Sound

Sound is a _____ which transfers _____ from one place to another.

Sound is produced by the _____ of particles through solids, liquids and gases.

Activity 1: Tuning fork in water
What do you notice about the tuning fork when it hits the wooden block?

_____

_____

What happens to the water on the surface?

_____

_____

Activity 2: Ruler on desk
What do you see happening to the ruler?

_____

_____

What do you hear?

_____

_____

Activity 3: Tuning fork and ping pong ball
What happens to the ping pong ball when the tuning fork is moved towards it without striking it first?

_____

_____

What happens to the ping pong ball when the tuning fork is moved towards it after striking it?

_____

_____

Extension
Write down as many musical instruments that you can think of.

_____

_____

How does each one change the pitch (high/low) of the sound?

Date: _____

Travelling Sound

Starter

Group these objects into solids, liquids and gases

Solids	Liquids	Gases

Learning Intentions

- To describe how sound travels through a solid, liquid and gas.

Success Criteria

☐ I can describe how sound travels through a solid, liquid and gas

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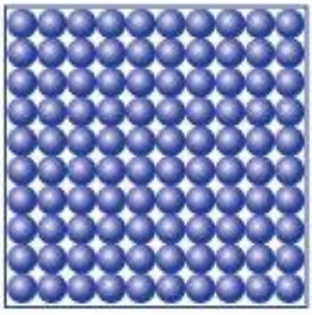
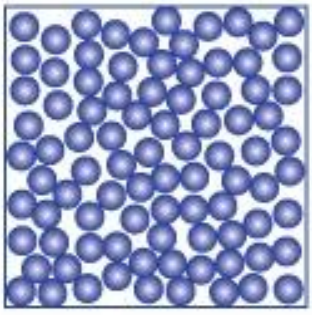
Particles

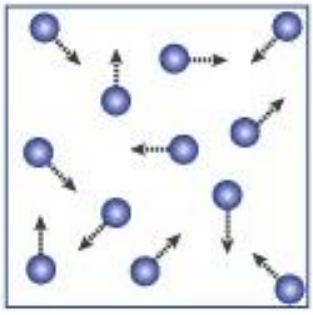
All matter is made up of particles.

The way particles behave depends on the state of matter. The three states of matter are _____, _____ and _____.

Label the diagrams below.







String Telephone

Aim: To investigate how sound travels through a solid.

Method:

Draw your method below

Results:

_____

_____

_____

Conclusion:

_____

_____

_____

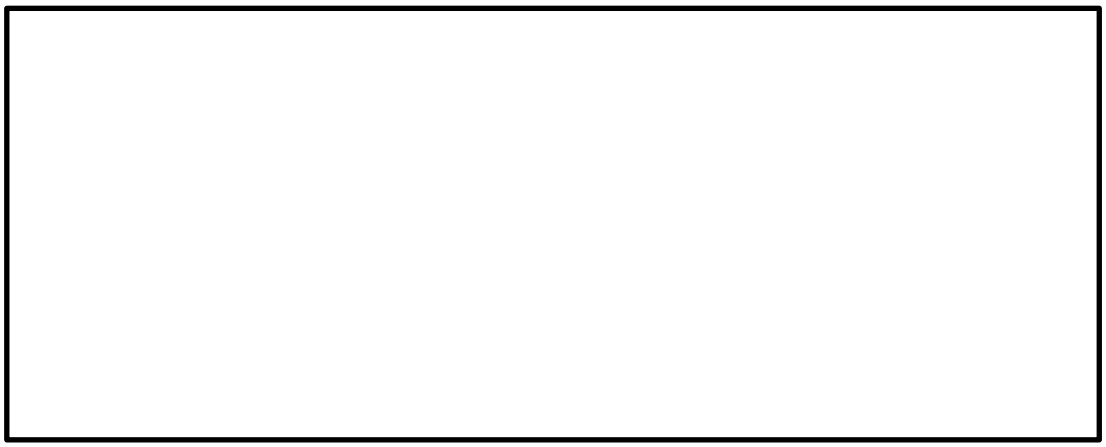
_____

The Bell Jar Experiment

Aim: To investigate if sound can travel through a vacuum.

Method:

Draw your method below



Results:

_____

_____

_____

Conclusion:

_____

_____

_____

_____

Summary

Sound waves can travel through _____, liquid and gas.

Sound travels _____ through solids and _____ through gases such as air.

Sound waves cannot travel through a _____. A _____ is empty space (no particles).

Extension

When the film “Alien” was released, the slogan was “In Space No One Can Hear You Scream".
What do you think of this statement?

_____

_____

_____

Date: _____

Sound Patterns

Starter

State which of the following statement is true.

A. Sound can travel through solids, liquids, gases and a vacuum.
B. Sound can only travel through a vacuum.
C. Sound can travel through solids, liquids and gases.
D. Sound can only travel through gases.

I think statement _____ is true because _____.

Learning Intentions

- Investigate what happens when the frequency of a sound wave is changed.
- Investigate what happens when the amplitude of a sound wave is changed.
- Draw and analyse sound waveforms.

Success Criteria

☐ I can state what happens when the frequency of a sound wave is changed.

☐ I can state what happens when the amplitude of a sound wave is changed.

☐ I can draw and analyse sound waveforms.

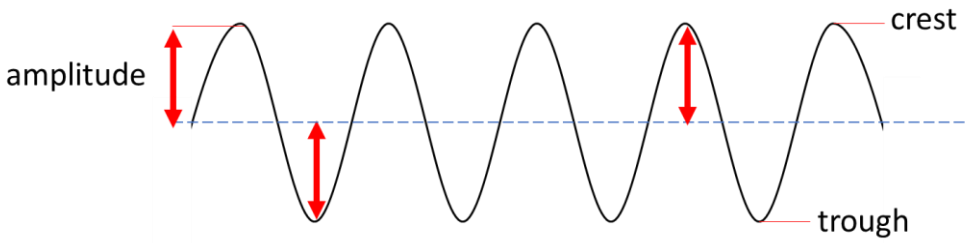
Sound Waves

Sound waves have two separate properties which affect what we hear.

_____ is a measure of the pitch of a sound. The frequency is the number of sound waves that pass a fixed point per second.

_____ is a measure of the loudness, or volume of the sound.

Sound waves can be represented by a wave diagram



The _____ is the highest point of the wave.

The _____ is the lowest point of the wave.

The _____ is the distance from the middle of the wave to a crest or trough. It is half the total height of the wave

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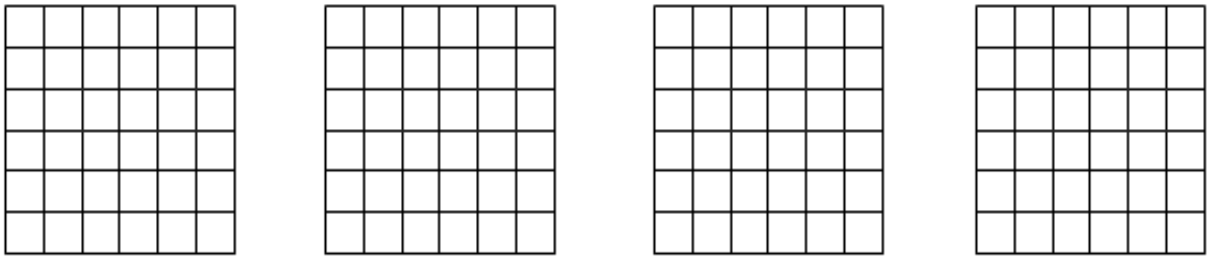
Amplitude and Frequency of Sound Waves – Experiment 1

Aim: What happens when we change the volume of the sound produced?

Method:
Draw your method below

Results:



Conclusion:

When the **volume** of a sound increases, the **amplitude** (height) of the wave _____.

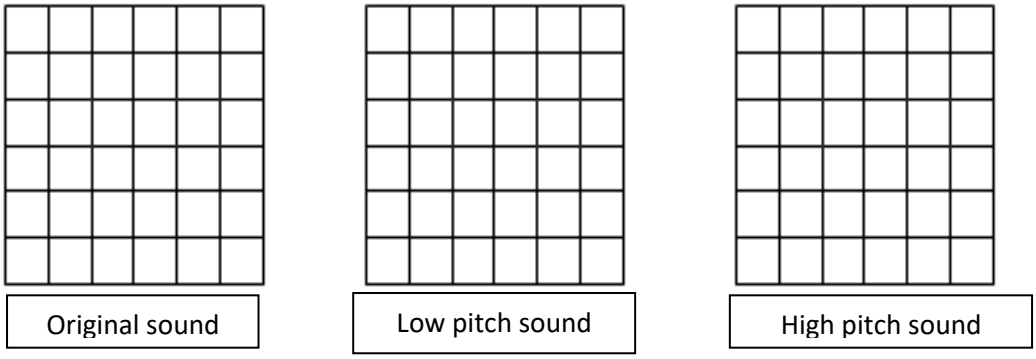
There is _____ to the frequency (pitch).

Amplitude and Frequency of Sound Waves – Experiment 2

Aim: What happens when we change the pitch of the sound produced?

Method:
Draw your method below

Results:



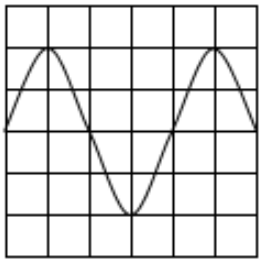
Conclusion:

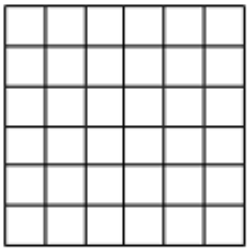
When the **pitch** of a sound increases, the **frequency** of the wave _____.

There is _____ to the volume (amplitude).

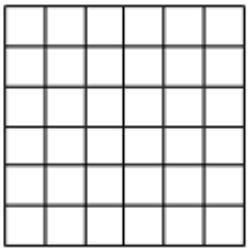
Sound Pattern Worksheet

Original Pattern

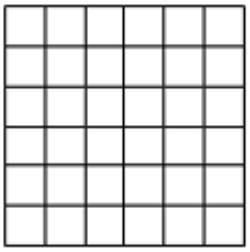




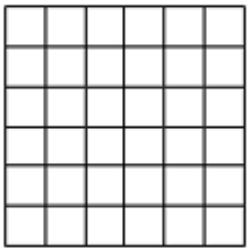
Higher pitch
Same volume



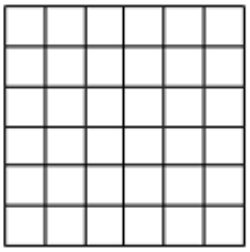
Lower pitch
Same volume



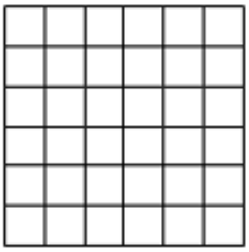
Higher pitch
Quieter sound



Same pitch
Louder sound



Same pitch
Quieter sound



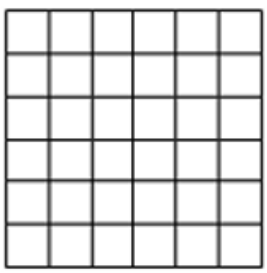
Lower pitch
Quieter sound

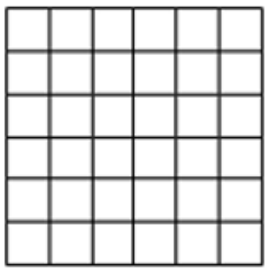
Extension

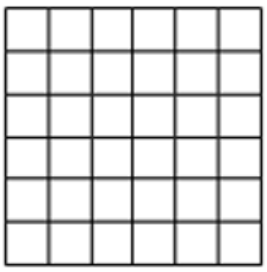
1. Write down the names of three musical instruments.

   _____ _____ _____

2. Draw the sound pattern you think each instrument would give.







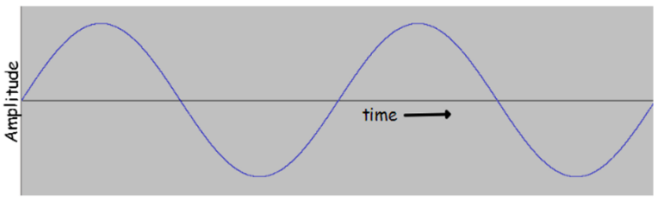
Date: _____

The Range of Human Hearing

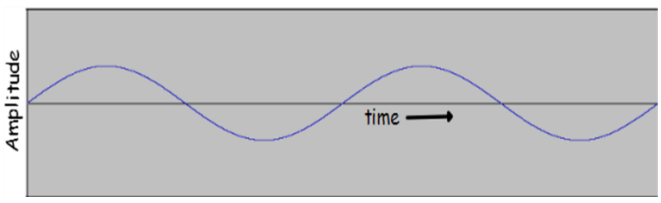
Starter

Two sound waves are generated:

Wave 1



Wave 2



On hearing the sounds, what would you hear to be different between wave 1 and 2?

Draw a wave that would be just as loud as the first sound but of a higher pitch.

Learning Intentions

- State the frequency range of human hearing.
- Explain the terms ultrasound and infrasound.

Success Criteria

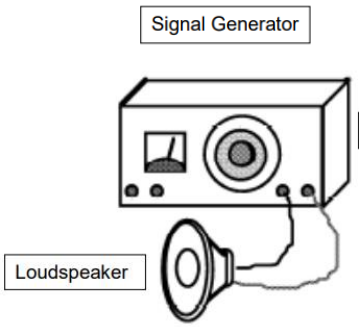
☐ I can state the frequency range of human hearing.

☐ I can explain the terms ultrasound and infrasound.

The Range of Human Hearing

Aim: To measure the frequency range of human hearing.

Method:



Results:

I started to hear sounds at _____ Hz.

I stopped hearing sounds at _____Hz.

Conclusion:
Compare your range of hearing with the theoretical range for humans of 20 Hz to 20000 Hz.

Summary

The normal range of human hearing is from _____ to _____ hertz.

_____ are high frequency sounds _____ our hearing range (above 20000 Hz).

_____ are low frequency sounds _____ our hearing range (below 20 Hz).

Extension

Write down as many jobs that you can think of where hearing is important.

_____

_____

_____

Date: _____

Animals and Sound

Starter

What is the range of human hearing?

_____

_____

Describe what the words ultrasound and infrasound mean.

_____

_____

Learning Intentions

- State that animals can hear different frequencies
- Describe the term echolocation.

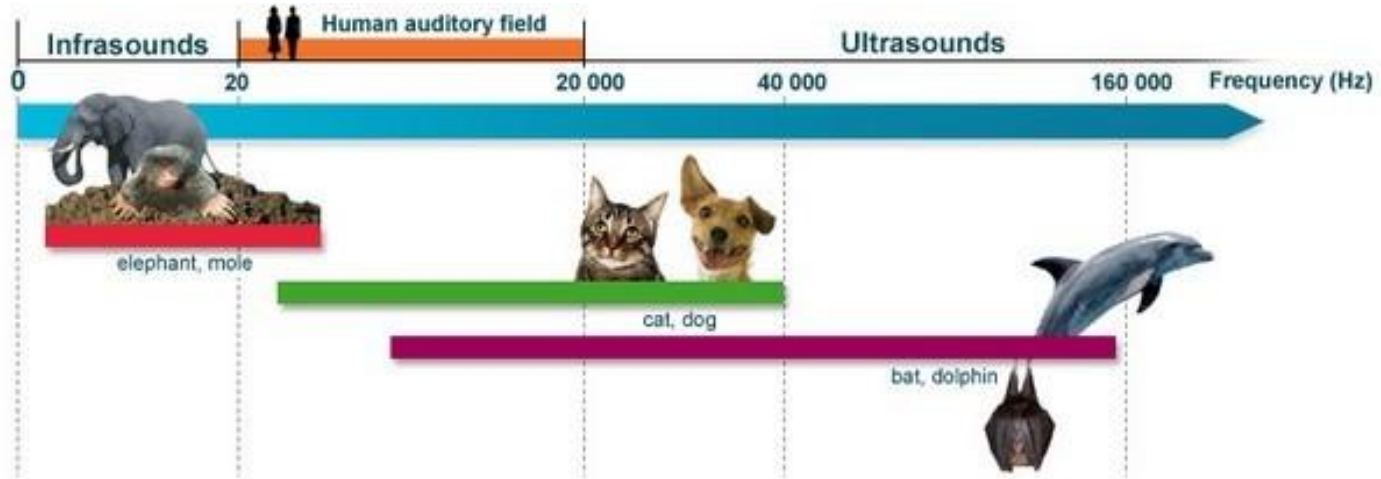
Success Criteria

☐ I can state that animals can hear different frequencies

☐ I can describe the term echolocation.

Different animals' range of hearing

Aim: What frequency can animals hear?



Use this information to fill out the table at the bottom of the page.

Just because humans can't hear sounds over 20,000 hertz doesn't mean that other animals can't. Dogs and cats can hear frequencies up to about 35,000 hertz. This is why 'silent' dog whistles can be used – the frequency they produce is too high for us, but dogs can hear it.

Mice can hear even higher frequencies – up to 50,000 hertz. This is one of the reasons that these animals sound very 'squeaky' to us – they make high-pitched sounds so other mice can hear them.

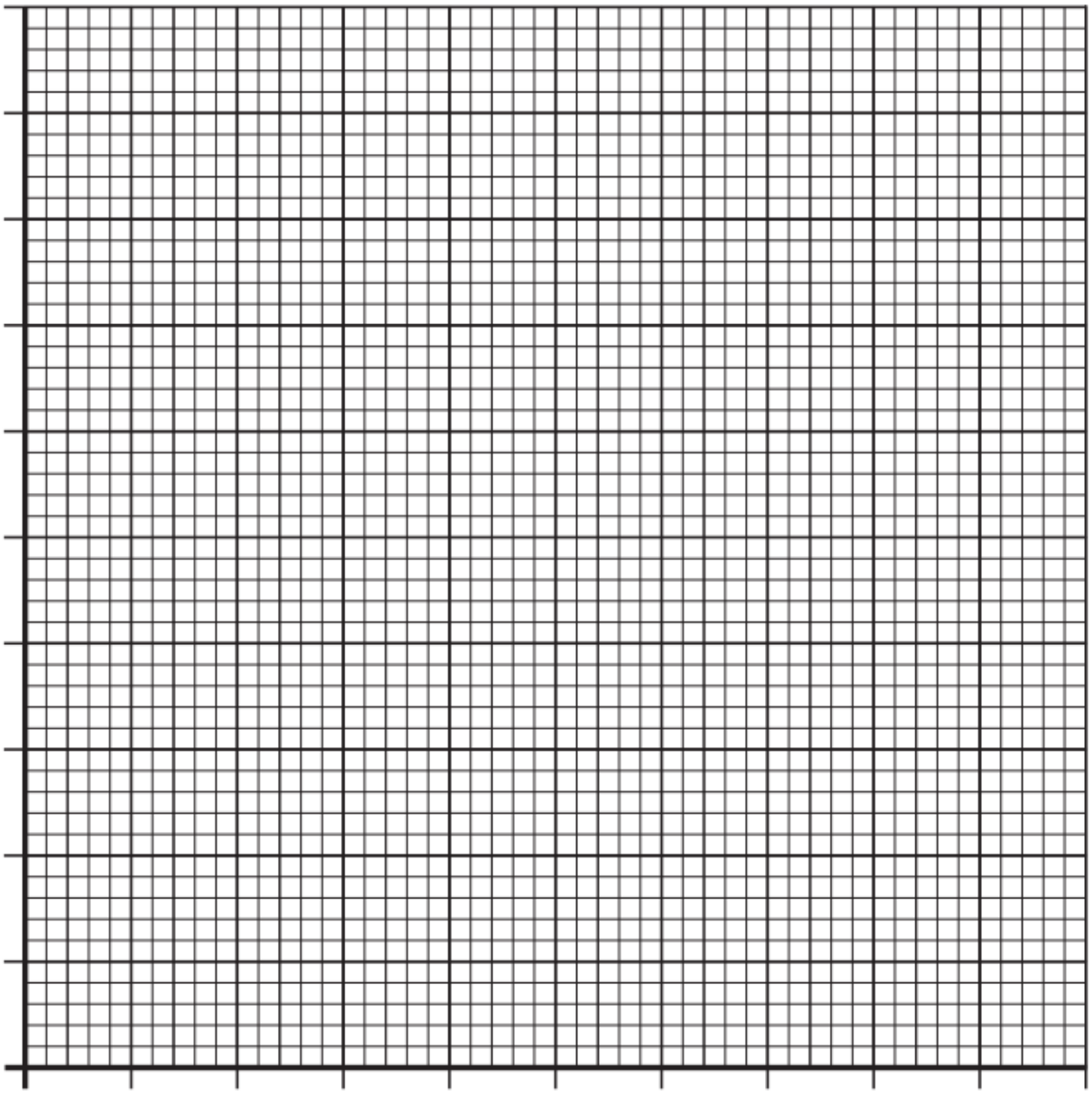
Bats produce sounds at an amazing 80,000 to 100,000 hertz. Bats use these high-pitched ultrasounds to find their way about in the dark. The ultrasounds bounce off objects and echo back to the bat. The bat uses the echoes to work out where things are.

On the other hand, some animals have a lower hearing range than humans. The highest frequency an elephant can hear is about 6,000 hertz. Blue whales communicate by sending out very low frequency sounds. This is because the highest sounds they can hear are just a few hundred hertz.

Animal	Highest frequency heard	Additional information

Extension

Plot a suitable graph of the maximum frequency the animals can hear.



Date: _____

Uses of Ultrasound

Starter

What do we use sound for?

_____

_____

What is ultrasound?

_____

_____

What can ultrasound be used for?

_____

_____

Learning Intentions

- Describe how ultrasound is used in medicine.
- Describe how ultrasound is used in industry.

Success Criteria

☐ I can describe how ultrasound is used in medicine.

☐ I can describe how ultrasound is used in industry.

Ultrasound

Ultrasound is used to scan _____ and _____. A probe sends a _____ frequency sound wave into the body.

The sound wave _____ from different tissue in the body. The scanner detects the reflections, and they form an _____ on the screen.

Ultrasound scans are much _____ than X-rays, which may be harmful.

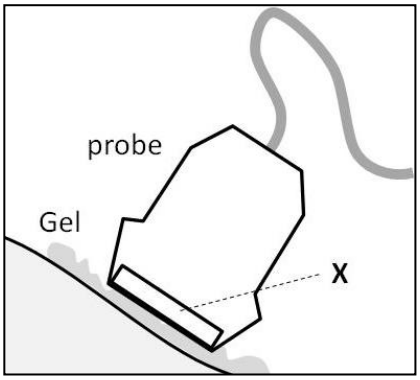
Extension – Ultrasound Worksheet

The following equations may be useful for the calculations:

Frequency = 1 ÷ time period	time period = 1 ÷ frequency
1 kHz = 1000 Hz	
Distance = speed x time	depth = distance/2

Answer the questions about ultrasound below.

1. In order to produce an ultrasound scan, like the one shown below, a probe and gel are used.



(a) Why is the gel used?

(b) In the diagram above the part of the probe that produces the ultrasound waves is labelled X. What does X contain?

2. A doctor use 5000 kHz ultrasound waves to scan a foetus.

(a) Why can humans not hear these waves?

(b) Ultrasound waves are longitudinal. What is a longitudinal wave?

(c) What is the time period for a 5000 kHz wave?

3. Dolphins also scan using ultrasound. A dolphin hears an echo from a fish 0.02 seconds after it makes a noise (speed of sound in water is 1500 m/s)

(a) How far has the ultrasound wave travelled?

(b) How far away is the fish?

(c) The dolphin swims closer to a distance of 9 m from the fish, how long will it take to hear the echo?

(d) Other than medical imaging, give one other example of scanning using ultrasound

Date: _____

The Ear

Starter

List three uses of ultrasound.

_____ _____ _____

Choose one of your answers and explain how ultrasound is used.

_____

_____

Learning Intentions

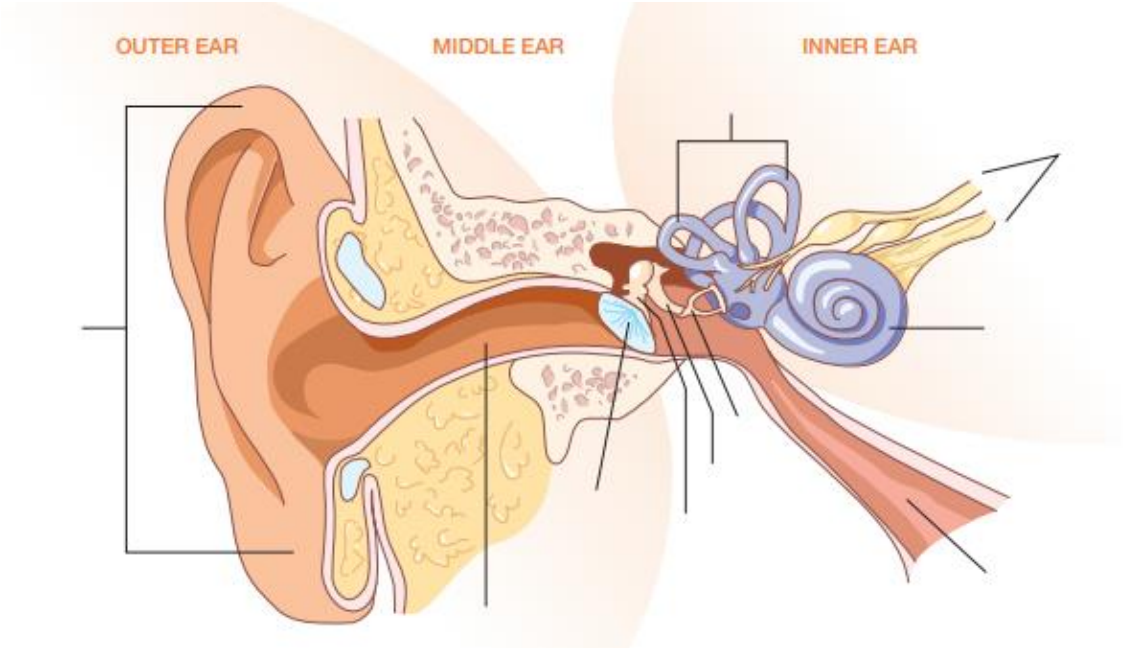
- To describe how our ear works
- To describe how echolocation can be used to help you ‘see’.

Success Criteria

☐ I can describe how our ear works

☐ I can describe how echolocation can be used to help you ‘see’.

Diagram of the ear



Function of the ear

- The human ear has two functions: _____ and _____.
- The ear has three main parts: the _____, _____ and _____ ear.
- The outer ear is the part you can see and opens into the ear canal. The _____ separates the _____ _____ from the _____ _____.
- Three _____ _____in the middle ear transmit sound vibrations to the inner ear.
- The inner ear contains the _____ which converts the _____ into _____ _____. These _____ _____ pass along the nerve to the brain.
- The _____-_____ _____ in the ear have nothing to do with hearing. They are required for _____.

Write a short description explain how your ear works.

Try to include the following words in your description.

Sound Vibrations Ear drum Cochlea Nerves

_____

_____

_____

_____

_____

_____

_____

Date: _____

Sound Level

Starter

Name 3 sounds which are very quiet.

_____

_____

Name 3 sounds which are very loud.

_____

_____

Learning Intentions

- Measure the sound level of different areas.
- Draw a bar chart
- Give typical examples of readings on the decibel scale.

Success Criteria

☐ I can measure the sound level of different areas.

☐ I can draw a bar chart

☐ I can give typical examples of readings on the decibel scale.

Measuring sound level

Sound level is measured in _____ (____) with a sound level meter or _____ meter.

Measuring Sound Level

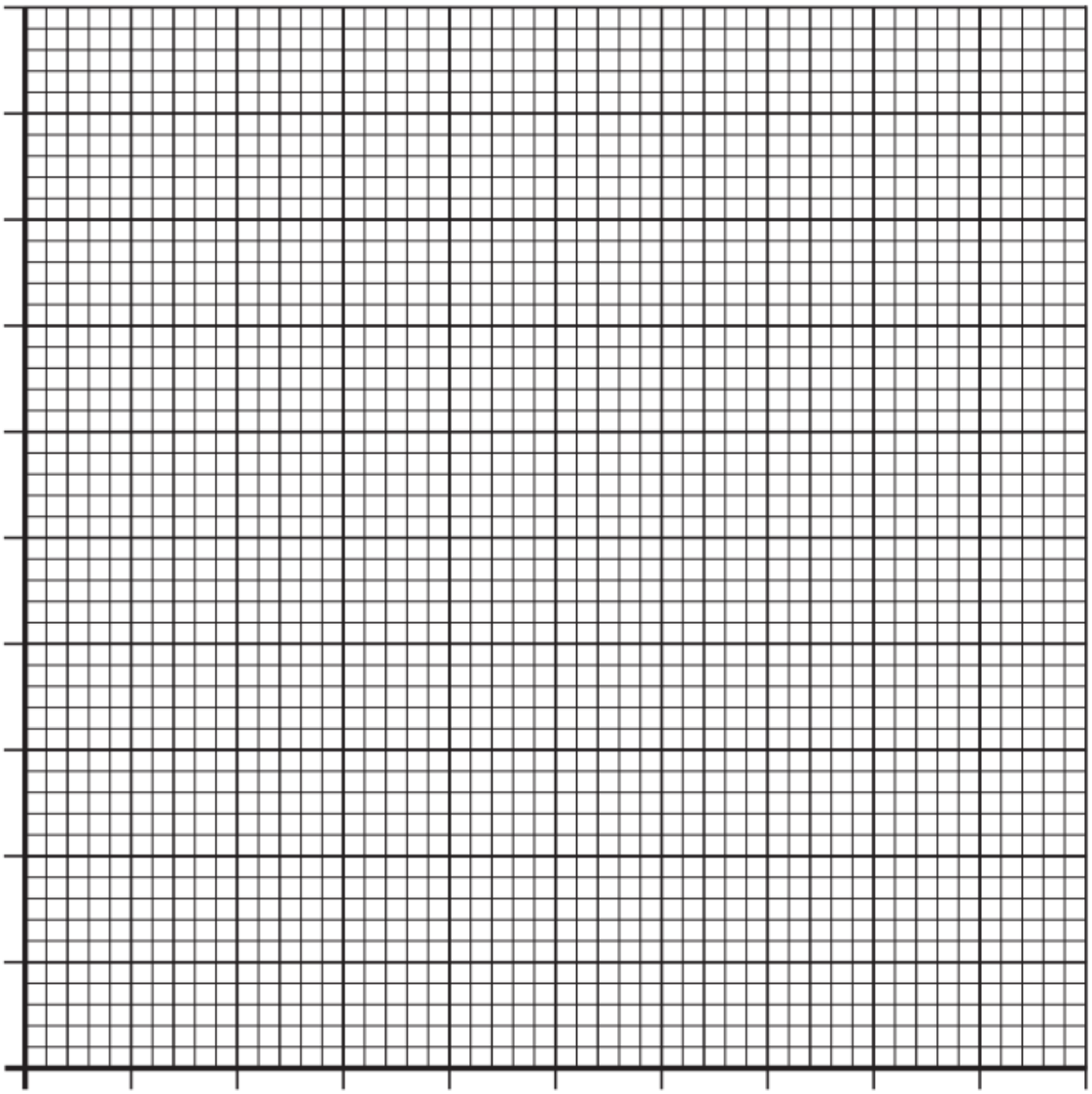
Aim: To measure the sound level of different areas.

Method:
Draw your method below.

Results:

source of sound	sound level (decibels)
talking at 20 cm away	
whisper at 20 cm away	
quiet classroom	
chatty classroom	

Draw a graph using the data from your results table.



Conclusion:

_____

_____

_____

Evaluation:

_____

_____

_____

Common Sound Levels

Decibel Scale (dB)	Situation
	Minimum sound that can be heard
	Whisper/ticking of watch/quiet country lane
	Average house/normal private office
	Conversational speech
	Noisy office/electric shaver/alarm clock
	Passing truck/car horn at 5m/ lawnmower
	Thunder/fireworks display
	Above threshold of pain. Jet engine around 40m away

Date: _____

Noise Pollution

Starter

What is the decibel scale used to measure?

_____

State the sound level of a typical conversation.

_____

Why would it not be recommended to listen to sounds above 80dB for a long period of time?

_____

_____

Learning Intentions

- List ways to prevent damage to your ear through noise pollution.
- Describe how sound is amplified in medicine.

Success Criteria

☐ I can list ways to prevent damage to your ear through noise pollution.

☐ I can describe how sound is amplified in medicine.

Noise pollution

Noise Pollution is unwanted sounds. For example, _____ noise or _____ work.

Too much loud noise can damage your _____.

We can protect our hearing from noise pollution by:

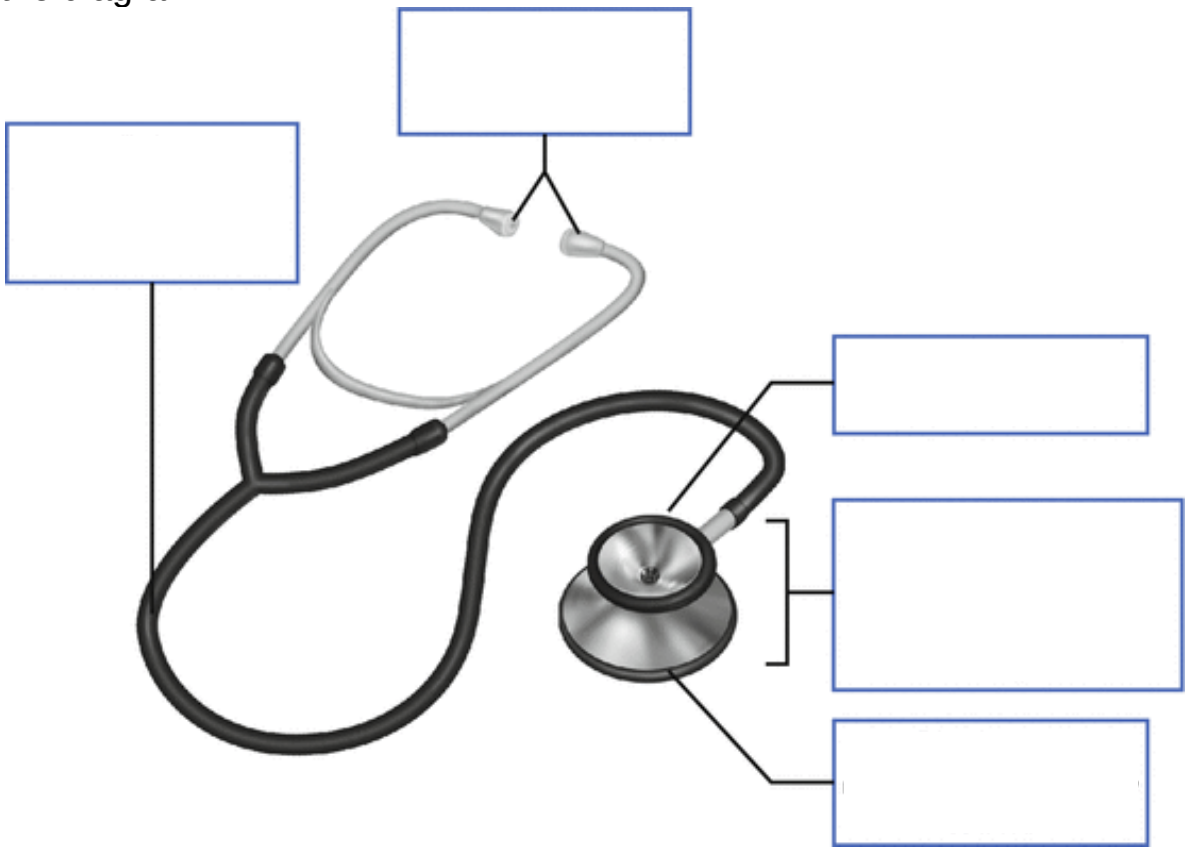
- wearing ear _____ or ear _____.
- avoiding loud _____.
- turning _____ down, especially when using _____
- limiting the length of _____, we are exposed to _____ sound.

Measuring Sound Level

Aim: To use the stethoscope to listen to your heart and lungs.

Method:

Label the diagram



Results:

_____

_____

_____

Conclusion:

_____

_____

_____

Date: _____

Noise Cancellation

Starter

List three ways to prevent damage to your ear through noise pollution.

Learning Intentions

- To understand how noise cancellation works
- To have an awareness of sound reproduction technologies.

Success Criteria

☐ I understand how noise cancellation works

☐ I have an awareness of sound reproduction technologies.

Noise Cancellation

Noise cancellation is the removal of _____ sound.

e.g. the sound of the _____ _____.

There two types of noise cancellation - _____ and _____ noise cancellation.

Active noise cancellation works in this way:

- A small _____ picks up the background noise
- These sounds are converted to an _____ _____, which is then _____ (turned upside down).
- The _____ signal is fed into a l_____ in the headphones.

Passive noise cancellation works in this way:

- _____ noise cancellation is the noise that headphones block out based on their physical design.
    - For example, the _____ _____ and springy headband.

Extension

Design an advert for a pair of noise cancelling headphones

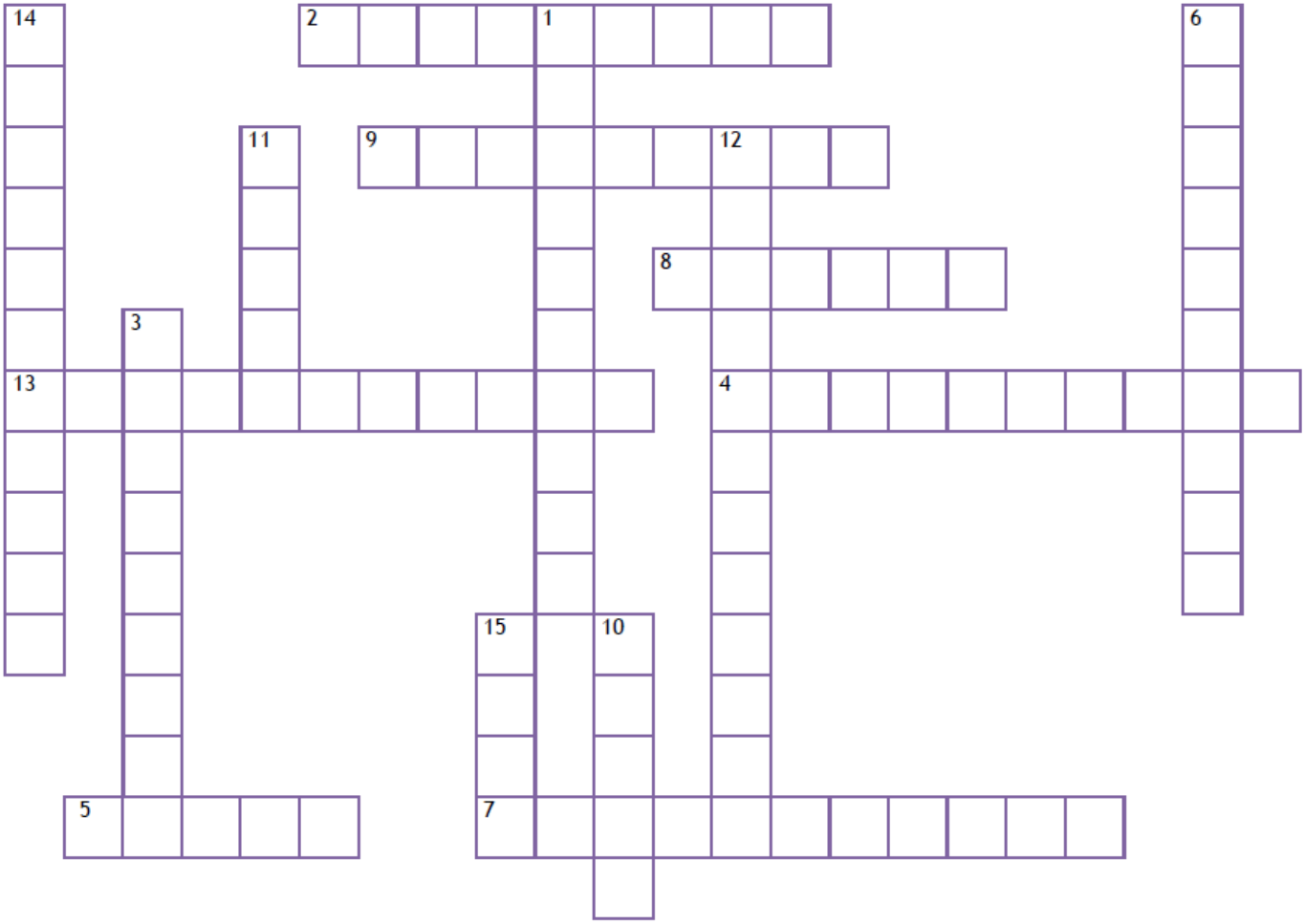
Must include:

- The important features of the headphones
- How noise cancellation works
- A description of active noise cancellation
- A description of passive noise cancellation

Sound

J N F E C H O L O C A T I O N L E
U U R G T V I N I V R B V S W U A
L X E H V H Y R D X T Q R F G S M
T I Q W H O B V G Z R C O O C P P
R Q U D K H E R T Z Q S F X F I L
A E E C M P W W F C O C H L E A I
S C N W O S O U N D Q I B E O C T
O Y C L E P Y C N O L D Q A U L U
U G Y A U D I T O R Y N E R V E D
N S A V D V E S X Y V J Y D Y A E
D W J T H A A E Y G V W K R R N C
Y C U V I B R A T I N G D U Z Y J
T B F M X Y F R C W D L S M C M S
W L I X O I G U H O B V H D B C G
T B Q B Y L L D E C I B E L S Q G
S G A C S O U N D W A V E S Q J L
N Q K C O S I E X F B Z E X E Q J

Amplitude **Auditory nerve** **Cochlea**
Decibels **Eardrum** **Echo location**
Frequency **Hertz** **Sound**
Sound waves **Ultrasound** **Vibrating**



Across

2. The number of waves that pass a certain point every second.
4. Sound waves with frequencies below the range of human hearing.
5. The unit that frequency is measured in.
7. Vibration.
8. All waves carry this.
9. A vacuum is a space without any _____
13. High pressure part of a longitudinal wave.

Down

1. A sound waves with a frequency higher than can be heard by a human.
3. The amount of energy carried by a wave.
6. Distance from the crest of one wave to the crest of another.
10. High frequency sounds waves produce high _____ sounds.
11. Technology that uses sound waves underwater to find fish.
12. Sound is this type of wave.
14. Low pressure part of a longitudinal wave.
15. Reflected sound wave.

Design a board game to teach about sound to someone in P4 (age 8).

Must include:

- Instructions
- Board and pieces
- Box design.

Draw a comic strip on one of the topics. Ask your teacher for ideas.


ELEMENTS OF MUSIC
Rhythm
Pitch
Dynamics
Timbre
Tempo
Texture
Structure
Harmony
Genre
Articulation
Doodle Art Alley ©