Rosary School – Marj Elhamam

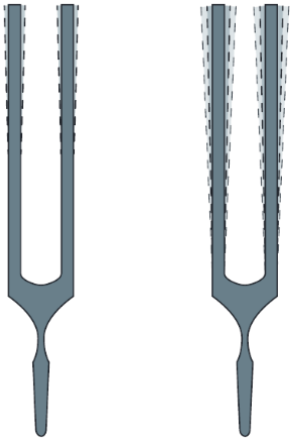
Worksheet 1

Name: _____ Date: ____ /____ / 2025

Grade: 7 (A,B,C,D,E) Subject : Physics

7L Sound

7La Moving sounds



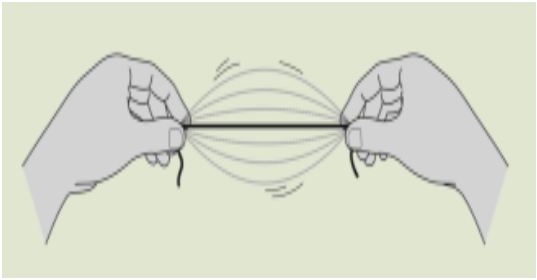
- Sound is a way of transferring **energy**. Sounds are made through **vibrations.**
- The vibrations are passed on by **particles**. Sound therefore needs a **medium** (substance) to pass on the vibrations, so it can travel through solids, liquids and gases but not through empty space (vacuum).

Loudness (intensity)

It describes how **loud** or **soft** the sound is. It depends on the size of vibration (**amplitude**). The louder the sound the more energy it has.

If you tap the tuning fork on the right hard, it makes a **loud** sound. If you tap it gently, it makes a **soft (quiet)** sound.

The loudness of a sound is measured using a **sound intensity meter**. The units are decibels (**dB**).



The loudness of a sound depends on how big the vibration of the source of sound and air is.

- If air particles move back and forth a lot, we hear a **loud sound**.
- If the source of a sound makes the particles vibrate more gently, we hear a **softer (quieter)** sound.

Pitch and frequency

Pitch of a sound is how high or low a sound is. It depends on the speed of the vibrations (**frequency**).

The more stretched a rubber band is, the **quicker** it vibrates and the **higher the pitch** of the sound.

The pitch of a sound depends on how quickly the source of sound and air vibrate.

- When air particles move back and forth **quickly** we hear a **high pitch** sound.

- When the air vibrates **less quickly** we hear a **low pitch** sound.

Note: Smaller, shorter, thinner and tighter objects vibrate faster so they produce high pitched sounds. While bigger, longer, looser and thicker objects vibrate slower producing lower pitched sounds.

- **Frequency:** the number of vibrations (complete vibrations) passing each second. The unit of frequency is **hertz (Hz)**.

$$Frequency\ (Hz) = \frac{number\ of\ vibrtions\ (complete\ waves)}{time\ (seconds)}$$

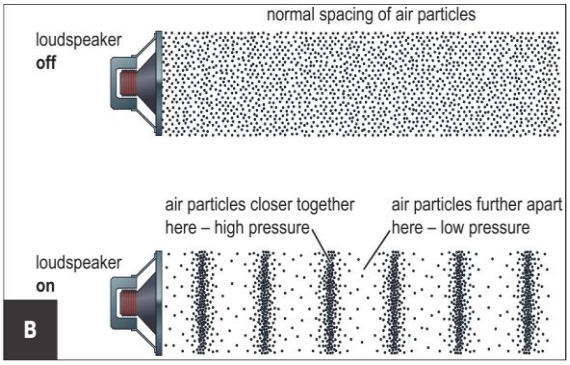
- **Amplitude**: how far the particles move as the vibrations pass. The larger the amplitude, the louder the sound.

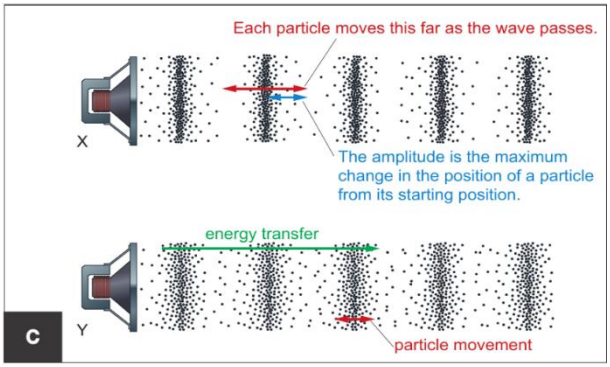
➔ **Workbook pages 136**

7Lb Moving sounds + 7Le Comparing waves

Longitudinal waves:

- When sound is produced, for example from a vibrating loudspeaker, air particles close by will be pushed and start to vibrate backwards and forwards.
- The vibrating air particles will start to push on the air particles next to them, so the vibrations are passed on and spread out through the air.
- Although the particle moves back and forth, it doesn't actually go anywhere, it just passes the movement on. The moving vibrations form a **sound wave.**
- The particles in a sound wave are squashed in some places (**high pressure)** and spread out in other places **(low pressure)**. This is why sound wave are called **pressure waves.**
- Sound is an example of a **longitudinal wave** because the particles vibrate in the **same direction as the wave (energy)** travels.
- The **amplitude** of a longitudinal wave is the maximum change in the position of a particle from its starting position.
- Pressure waves (sound waves) **transfer energy** from one place to another. They don't transfer particles. The *louder the sound*, the *more energy* it is transferring.

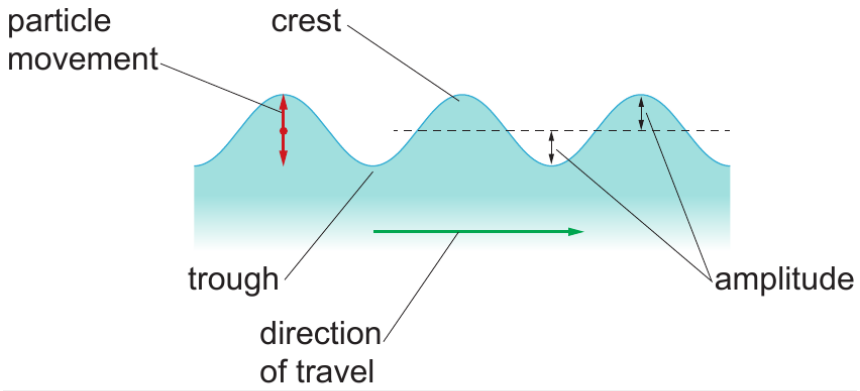




➔ **Workbook pages 137**

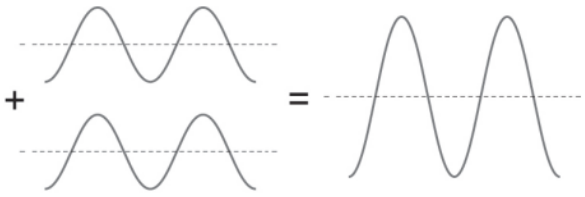
Transverse waves:

- Waves on the surface of a water are **transverse waves.**
- In a transverse wave the particles vibrate or move up and down **at right angles** to the **direction the wave (energy)** is travelling.
- The **amplitude** of a transverse wave is the maximum distance the particles move up or down from their original position.
- The amplitude of a waves on water gets smaller as the waves get further from their source because the energy transferred by the wave gets more spread out.
- Waves on water can be reflected when they hit a solid barrier.

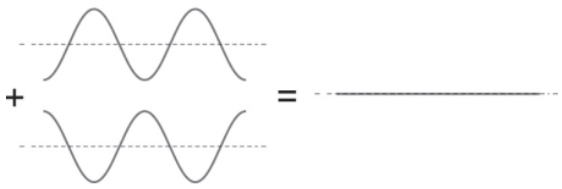


C | Waves on water are transverse waves.

- Waves going in different directions can pass through each other. Their effects can either **add together** or **cancel out** in a process called **superposition.**



When two crests or two troughs meet they add together to make a bigger wave.



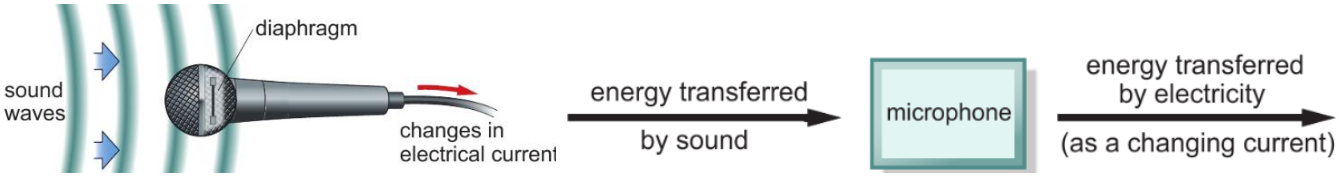
When a crest meets a trough they cancel each other out.

➔ **Workbook pages 145**

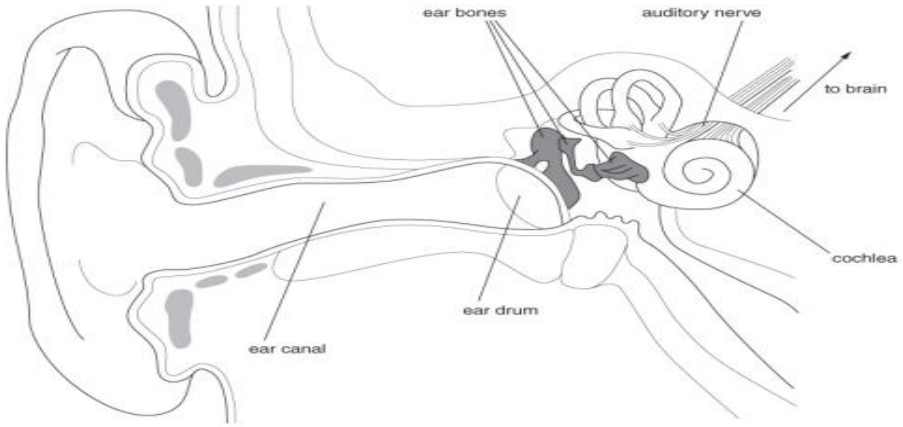
Speed of sound

- The speed of sound is usually **faster** through materials in which particles are **closer** together. Closer particles hit each other more easily and so the energy is more likely to be passed from one particle to the next.
- Sound travels faster in solids than in liquids, and it travels slowest in gases.
- Sound waves spread out from a **source.** As you get further from the source, the energy carried by the sound wave **has spread further**.
- The **further** you are from the source the **less the energy** that it is there for your ears to detect.

7Lc Detecting sounds

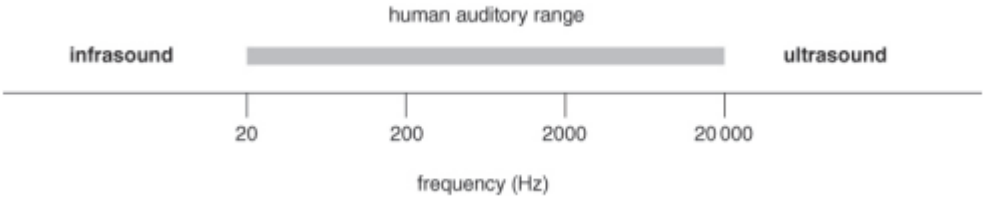


- Sound is detected by ears and microphones. In a microphone, sound waves make a diaphragm vibrate, and electronics are used to convert the vibrations into changes in an electrical current.



- Ears work in a similar way:
    1. Sound wave approaches the ear and enters the **ear canal.**
    2. the **eardrum** is a thin membrane that **vibrates** when the sound waves hit it.
    3. Vibrations are passed on to tiny **ear bones** (hammer, anvil, stirrup) which **amplify** the vibrations (make them bigger).
    4. Vibrations are passed on to the liquid inside the **cochlea**. **Tiny hairs** inside the cochlea detect these vibrations and create electrical signals called **impulses**.
    5. Impulses travel along the **auditory nerve** to reach the brain. You hear the sound when the impulses reach your brain.
- Loud sounds can damage our ears. We often need to wear **ear protection** made of certain materials to **absorb** some of the energy transferred by sound waves. In our homes soft materials like carpets and curtains help to absorb sounds.

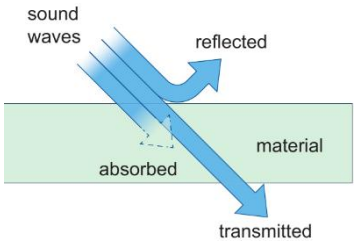
- The auditory range of an animal is the range of frequencies of sound it can hear. Animals such as bats and dolphins can hear **ultrasounds** (sounds with frequencies greater than 20 000 Hz). Some animals can hear **infrasounds** (frequencies less than 20 Hz).
- The human auditory range is between 20Hz to 20000Hz.



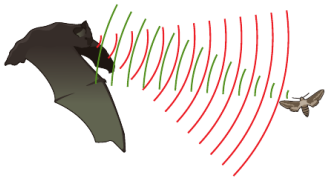
➔ **Workbook pages 141,142**

7Ld Using sound:

Sound waves transfer energy from one place to another. The energy transferred by sound waves is **transmitted** through some materials, or it can be **absorbed** or **reflected.**

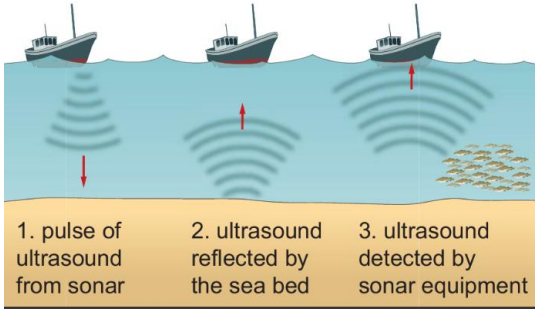


- Humans and other animals use sound for communication.
- Some animals, such as bats and dolphins, use **ultrasound** to locate prey and avoid obstacles. These animals produce *bursts of ultrasound* and listen for the sound waves **reflected** by objects or prey. They detect how far the object is *by the time* it takes the echo to return.



D | Some species of bat use echolocation to detect prey such as insects.

- Humans use ultrasound in sonar, to find the depth of the sea or locate fish or submarines.



E | Humans use sonar to find fish in the sea and to investigate the depth of the sea. Warships can use it for finding enemy submarines.

- Humans use the energy transferred by ultrasound to clean delicate objects (such as jewelry) or in physiotherapy (to relieve pain or aid healing).

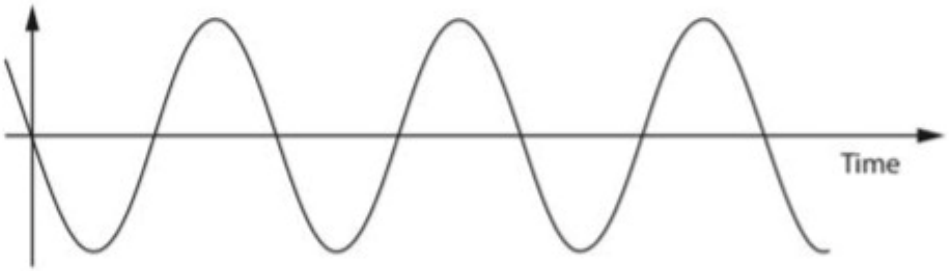
➔ **Workbook pages 143**

Achievement test questions

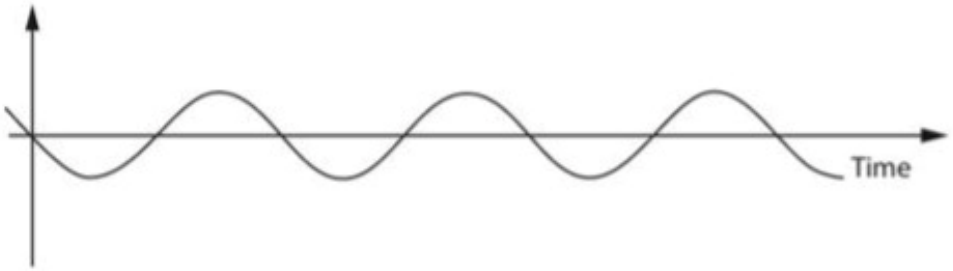
14 Which of the following sound waves has the **highest** pitch?

The scales used on each diagram are the same.

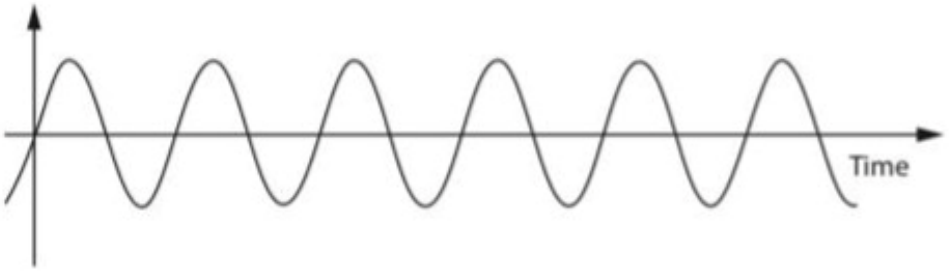
☒ **A**



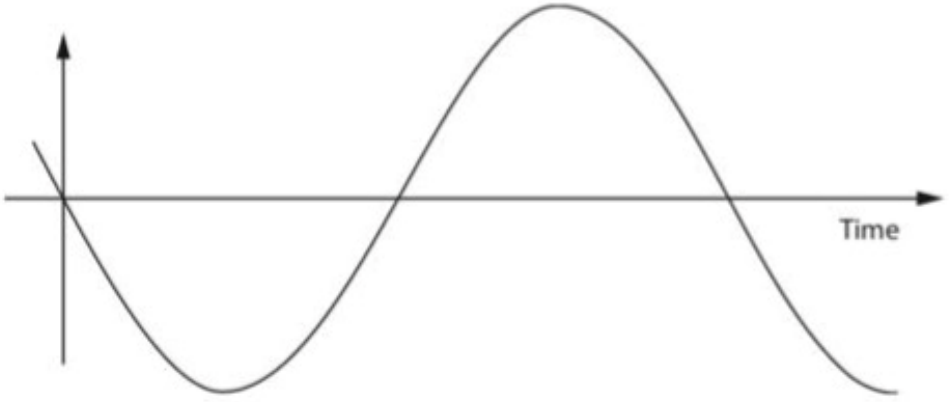
☒ **B**



☑ **C**

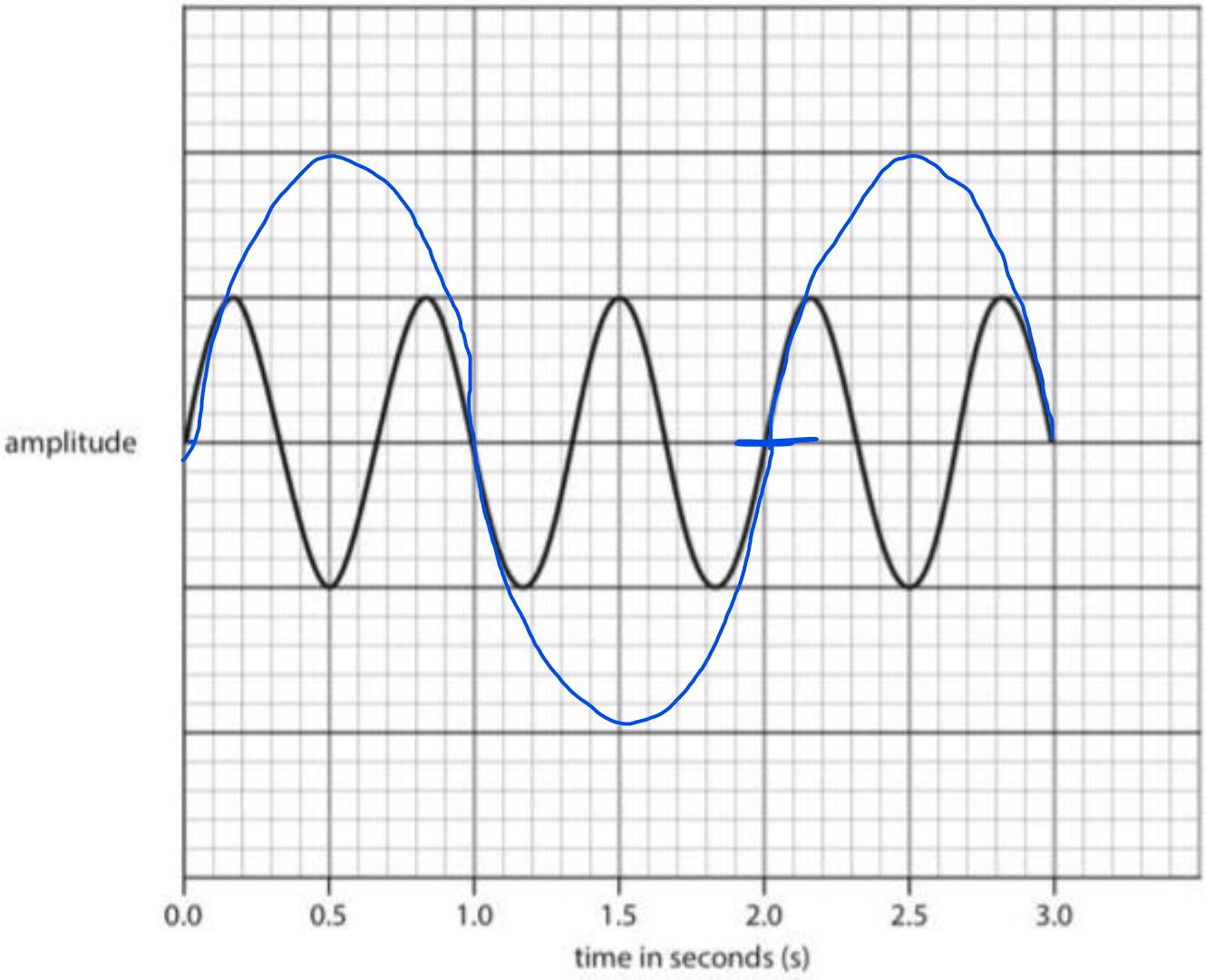


☒ **D**



(Total for Question 14 = 1 mark)

21 This graph represents a sound wave.



(a) What is the frequency of the sound wave?

You should include a unit with your answer.

(2)

frequency = $\frac{\text{number of waves}}{\text{time (s)}} = \frac{3}{2} = 1.5$ unit Hz

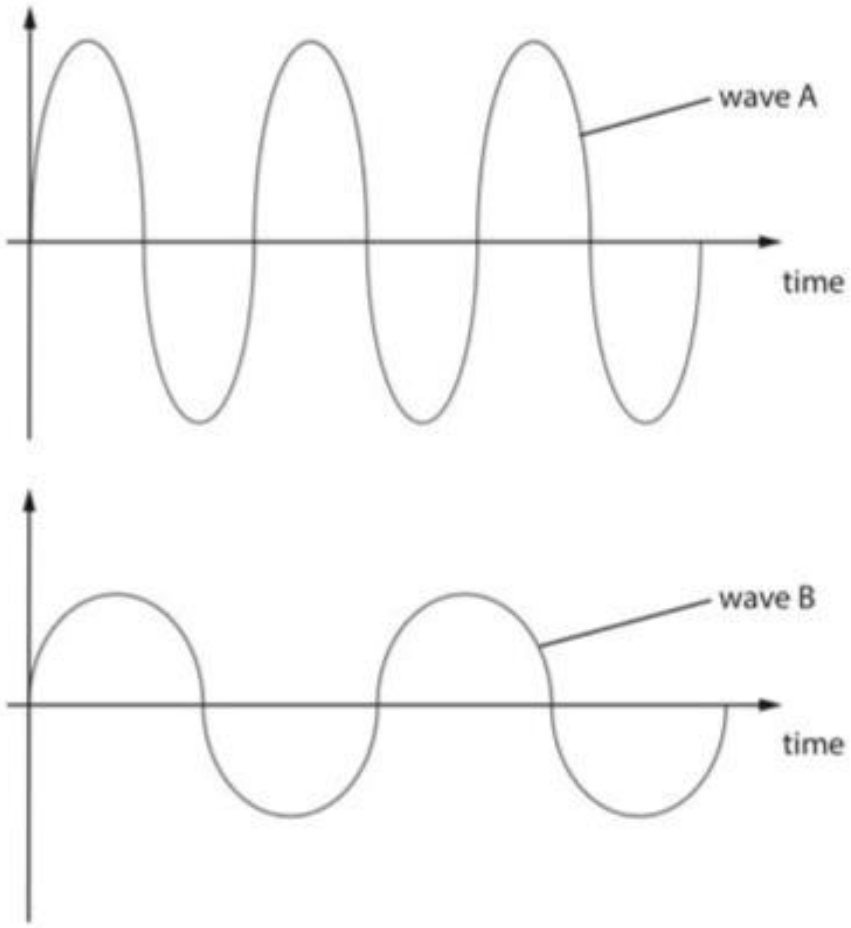
(b) Draw another sound wave on the graph which would have a lower pitch, but sound louder than the wave shown.

(2)

(Total for Question 21 = 4 marks)

12 The diagrams show two sound waves.

The scales on each diagram are the same.



State **two** ways in which wave A would sound different to wave B.

1 louder

2 higher frequency

(Total for Question 12 = 2 marks)

notes related to the uses of ultrasound:

- physiotherapy : energy transferred by sound gets absorbed and changes into heat. Sound → thermal energy
- Cleaning jewelry : Vacuum bubbles are formed, when they burst, they push the dirt away Sound → force