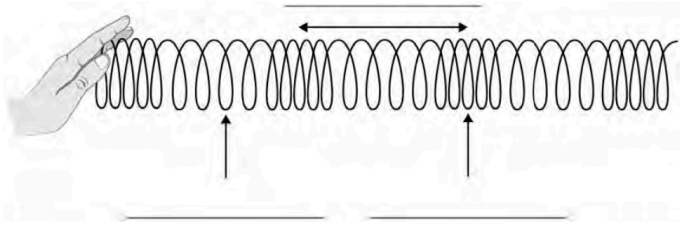
Q1. (2018)

0 2 **Figure 2** shows a slinky spring used to model a sound wave.

Figure 2



0 2 . 1 Label the arrows on **Figure 2**

Choose the answers from the box.

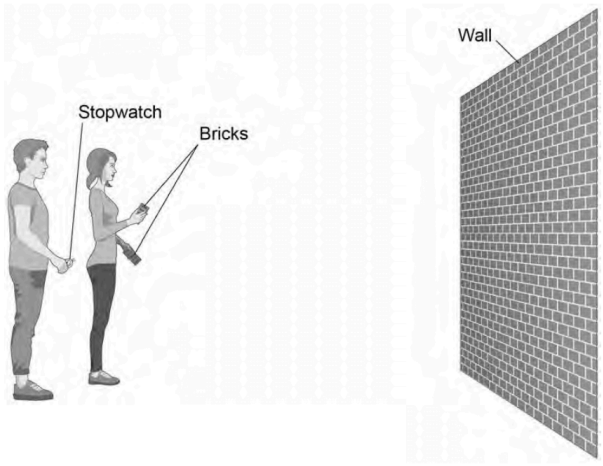
[3 marks]

amplitude	**compression**	**frequency**
rarefaction		**wavelength**

Q2. (2018)

0 2 . 3 **Figure 3** shows two students measuring the speed of sound in air.

Figure 3



One student bangs two bricks together.

The sound wave produced is reflected from the wall and travels back to the students.

Describe how they can determine the speed of sound.

[4 marks]

Q3. (2019)

0 6 . 4 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

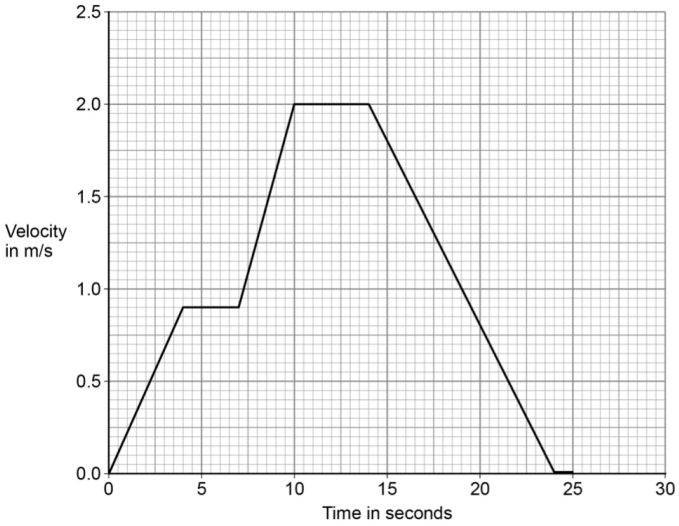
Q4. (2019)

0 6 **Figure 9** shows a runner using a smart watch and a mobile phone to monitor her run.

Figure 9

Figure 10 is a velocity–time graph for part of the runner's warm-up.

Figure 10



The smart watch and mobile phone are connected to each other by a system called Bluetooth.

Bluetooth is wireless and uses electromagnetic waves for communication.

0 6 . 5 The electromagnetic waves have a frequency of 2 400 000 000 Hz

The speed of electromagnetic waves is 300 000 000 m/s

Calculate the wavelength of the electromagnetic waves.

[3 marks]

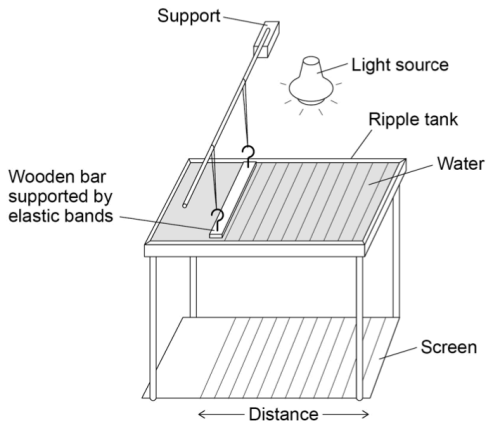
Q5. (2019)

0 7 **Figure 11** shows the equipment a teacher used to determine the speed of a water wave.

The equipment includes:

- a ripple tank filled with water
- a wooden bar that creates ripples on the surface of the water
- a light source which causes a shadow of the ripples on the screen.

Figure 11



a)

0 7 . 1 Describe how equipment in **Figure 11** can be used to measure the wavelength, frequency and speed of a water wave.

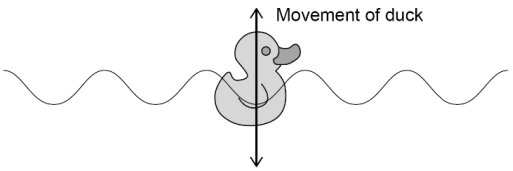
[6 marks]

b)

The teacher put a plastic duck in the ripple tank as shown in **Figure 12**.

The plastic duck moved up and down as the waves in the water passed.

Figure 12



0 7 . 3 The teacher measured the maximum height and the minimum height of the plastic duck above the screen as the wave passed.

The teacher repeated his measurements.

Table 4 shows the teacher's measurements.

Table 4

Maximum height in mm	509	513	511
Minimum height in mm	503	498	499

Calculate the mean amplitude of the water wave.

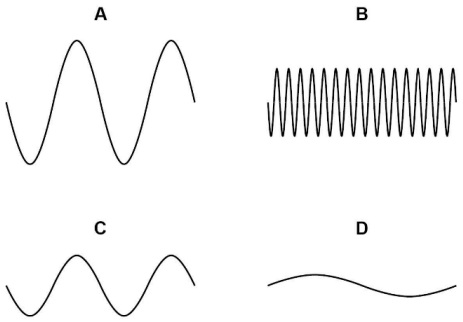
[3 marks]

Q6. (2020)

0 5 **Figure 6** shows four waves.

The waves are drawn to the same scale.

Figure 6



a)

0 5 . 1 Which wave has the greatest amplitude?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

b)

0 5 . 2 Which wave has the greatest frequency?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

c)

0 5 . 3 Which wave has the greatest wavelength?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Q7. (2020)

0 5 . 4 A wave has a frequency of 1650 Hz and a wavelength of 0.200 m

Calculate the wave speed.

Use the equation:

wave speed = frequency × wavelength

[2 marks]

Q8. (2020)

A student uses a mobile phone app that displays sound waves.

Figure 7 shows the student holding the mobile phone close to a loudspeaker.

Figure 7

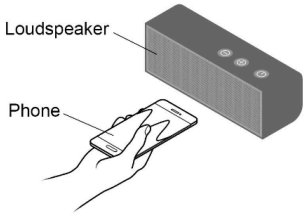
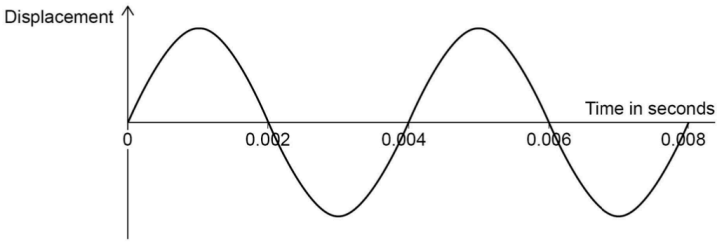


Figure 8 shows the wave pattern seen on the phone screen.

Figure 8



a)

0 5 . 5 What is the period of the wave shown in **Figure 8**?

[1 mark]

Tick (✓) **one** box.

0.002 s ☐ 0.004 s ☐ 0.006 s ☐ 0.008 s ☐

b)

0 5 . 6 Determine the frequency of the wave shown in **Figure 8**.

Use the Physics Equations Sheet.

[3 marks]

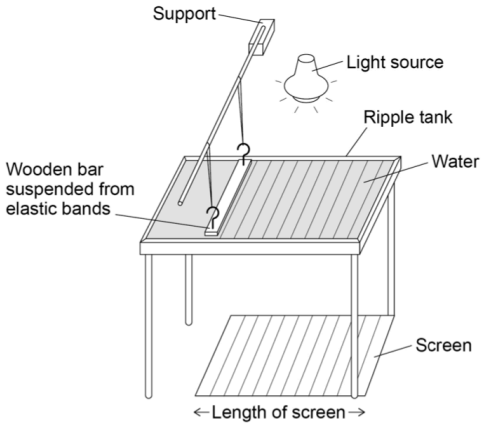
Q9. (2021)

0 4 **Figure 7** shows a ripple tank.

The wooden bar vibrates up and down producing waves on the water.

The light source produces shadows of the water waves on the screen.

Figure 7



a)

0 4 . 1 Describe how the student can measure the frequency and wavelength of the waves.

You should refer to any equipment the student needs in your answer.

[4 marks]

b)

A student measured the frequency and wavelength of the waves produced.

Table 1 shows some of the results.

Table 1

Reading	**1**	**2**	**3**	**Mean**
Frequency in hertz	12.8	12.4	12.3	**X**

0 4 . 2 Calculate value **X** in **Table 1**.

[1 mark]

X = _____ Hz

c)

0 4 . 3 Why is it a good idea to take repeat readings and then calculate a mean?

[1 mark]

Tick (✓) **one** box.

To reduce the effect of random errors. ☐

To reduce the effect of systematic errors. ☐

To reduce the effect of zero errors. ☐

d)

0 4 . 4 The student changed the frequency of the waves in the ripple tank to 20 Hz.

Calculate the period of the waves.

Use the equation:

$$\text{period} = \frac{1}{\text{frequency}}$$

[2 marks]

e)

0 4 . 5 At a frequency of 20 Hz the wavelength of the waves was 0.012 m.

Calculate the wave speed.

Use the equation:

wave speed = frequency × wavelength

[2 marks]

Q10. (2022)

0 1 . 2 Complete the sentence.

Choose answers from the box.

[2 marks]

charge	**frequency**	**speed**	**wavelength**

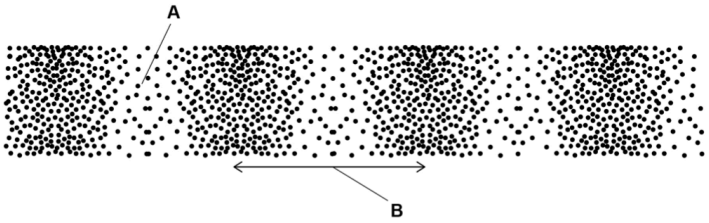
Different types of electromagnetic waves have a different _____

and a different _____ .

Q11. (2022)

0 6 **Figure 8** shows a longitudinal wave.

Figure 8



0 6 . 2 The wave shown in **Figure 8** has a frequency of 4.0 kHz

Calculate the period of the wave.

Use the Physics Equations Sheet.

Give the unit.

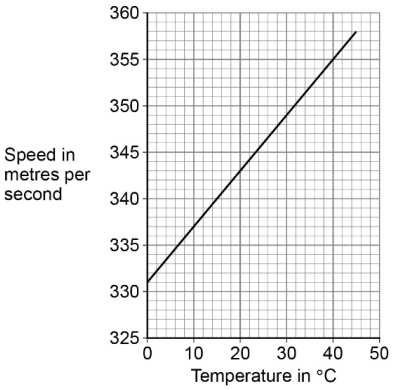
[4 marks]

Q12. (2022)

Sound waves are longitudinal.

Figure 9 shows how the speed of sound varies with the temperature of the air.

Figure 9



0 6 . 3 Write down the equation that links frequency (f), wavelength (λ) and wave speed (v).

[1 mark]

Q13. (2023)

Figure 10 shows a device a farmer uses to scare away birds.

Figure 10

The device emits a very loud sound.

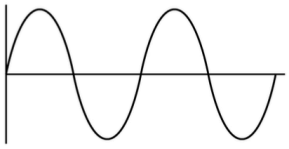
The farmer measures the sound emitted by the device at different distances from the device.

a)

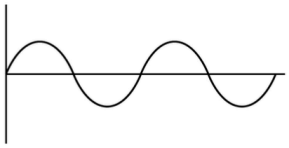
0 4 . 3 **Figure 11** shows a visual display of the sound waves at different distances from the device.

Both waves are drawn to the same scale.

Figure 11



At a distance of 80 m



At a distance of 200 m

Which property of the wave changes between 80 m and 200 m?

[1 mark]

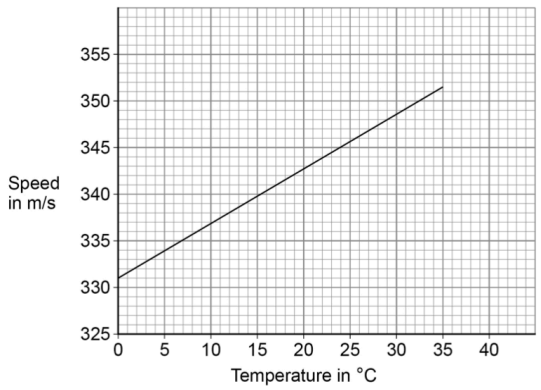
Tick (✓) **one** box.

- Amplitude ☐
- Frequency ☐
- Period ☐
- Wavelength ☐

b)

Figure 12 shows how the speed of the sound emitted by the device is affected by the temperature of the air.

Figure 12



0 4 . 4 The farmer tests the device on a day when the temperature of the air is 15 °C.

What is the speed of the sound emitted by the device when the temperature of the air is 15 °C?

[1 mark]

Speed = _____ m/s

c)

0 4 . 5 The farmer stands a safe distance from the device.

It takes a time of 0.20 s for the sound to travel from the device to the farmer.

Calculate the distance between the device and the farmer.

Use your answer to Question **04.4** and the equation:

distance = speed × time

[2 marks]

d)

0 4 . 6 Explain how the time taken for the sound to reach the farmer is affected by the temperature of the air.

Use **Figure 12**.

[2 marks]

Q14. (2023)

Use the Physics Equations Sheet to answer questions **06.4** and **06.5**.

a)

0 6 . 4 Write down the equation that links frequency (f), wavelength (λ) and wave speed (v).

[1 mark]

b)

0 6 . 5 The wave in the middle of the spectrum has a wavelength of 5.0×10^{-7} m.

wave speed of light = 3.0×10^{8} m/s

Calculate the frequency of the wave.

[3 marks]

Q15. (2024)

0 3 **Figure 6** shows an electronic whistle used by a referee in a football match.

Figure 6

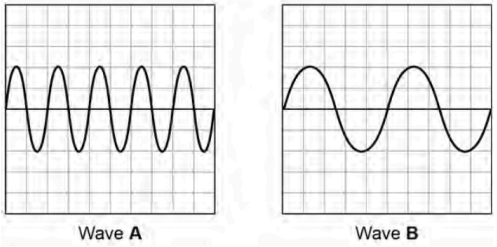
When the button is pressed the whistle emits sound waves that travel through the air.

The whistle can emit two different sound waves, **A** and **B**.

Figure 7 shows the two different sound waves as displayed on a screen.

The sound waves are drawn to the same scale.

Figure 7



a)

0 3 . 3 Complete the sentences to describe a difference and a similarity between the two waves.

Choose answers from the box.

[2 marks]

amplitude	**frequency**	**wavelength**	**period**

Difference

Wave **A** has a greater _____ than wave **B**.

Similarity

Wave **A** has the same _____ as wave **B**.

b)

0 3 . 4 Wave **A** has a frequency of 4.0 kHz.

Which of the following is the same as 4.0 kHz?

[1 mark]

Tick (✓) **one** box.

- 4.0 Hz ☐
- 4000 Hz ☐
- 4 000 000 Hz ☐
- 4 000 000 000 Hz ☐

c)

0 3 . 5 Calculate the period of wave **A**.

Use your answer from Question **03.4** and the equation:

$$\text{period} = \frac{1}{\text{frequency}}$$

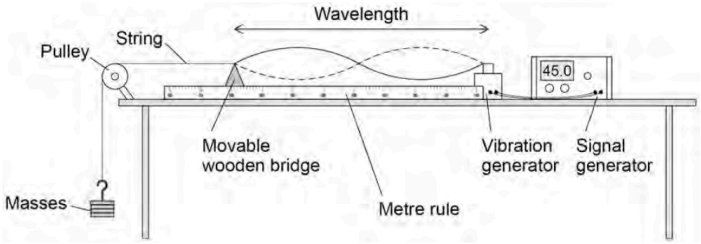
[2 marks]

Q16. (2024)

0 6 A teacher demonstrated how the frequency of a wave on a string affects the wavelength of the wave.

Figure 11 shows the equipment used.

Figure 11



The frequency of the signal generator is adjusted so that the wave shown in **Figure 11** is seen.

At this frequency the string vibrates between the two positions shown in **Figure 11**.

a)

0 6 . 1 Describe a method the teacher could use to investigate how the frequency of the wave affects the wavelength.

[4 marks]

b)

Use the Physics Equations Sheet to answer questions **06.2** and **06.3**.

0 6 . 2 Which equation links frequency (f), wavelength (λ) and wave speed (v)?

[1 mark]

Tick (✓) **one** box.

- $f = \lambda \times v$ ☐
- $\lambda = f \times v$ ☐
- $v = f \times \lambda$ ☐

c)

0 6 . 3 The wave on the string has a frequency of 45.0 Hz.

The wave speed is 35.1 m/s.

Calculate the wavelength of the wave.

[3 marks]