

Name:

Date:

P6 - Test 1
Waves
Beginner

GCSE

PHYSICS

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

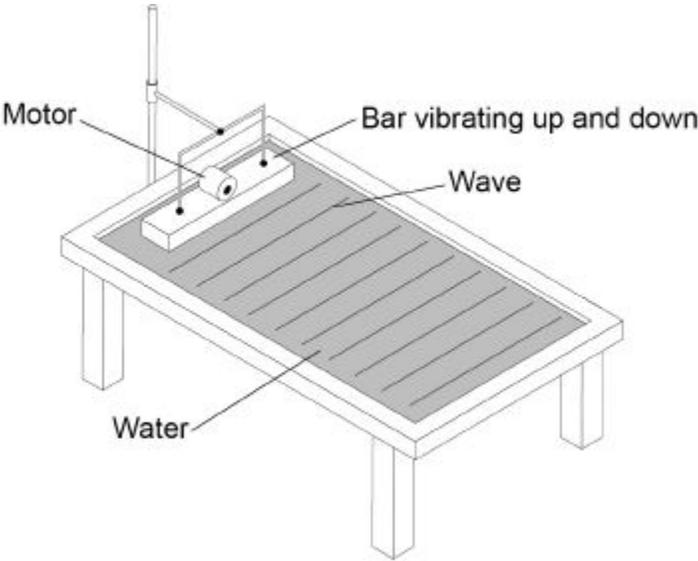
- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1.

The diagram below shows a ripple tank that a student used to investigate water waves.



(a) The student adjusted the speed of the motor so that the bar hit the water more times each second.

What happened to the frequency of the waves produced?

Tick **one** box.

Decreased

Did not change

Increased

(1)

(b) Describe how the frequency of the water waves in the ripple tank can be measured.

(2)

(c) The student measured the frequency of the water waves as 5 hertz.

Calculate the period of the water waves.

Use the equation:

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

Choose the unit.

metres	metres / second	seconds
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Period = _____ Unit = _____

(3)

(Total 6 marks)

2.

(a) Which one of the following is not an electromagnetic wave?

Tick **one** box.

- Gamma rays
- Sound
- Ultraviolet
- X-rays

(1)

(b) What type of electromagnetic wave do our eyes detect?

(1)

(c) What is a practical use for infrared waves?

Tick **one** box.

Cooking food

Energy efficient lamps

Medical imaging

Satellite communications

(1)

Scientists have detected radio waves emitted from a distant galaxy.

Some of the radio waves from the distant galaxy have a frequency of 1 200 000 000 hertz.

(d) Which is the same as 1 200 000 000 hertz?

Tick **one** box.

1.2 gigahertz

1.2 kilohertz

1.2 megahertz

1.2 millihertz

(1)

(e) Radio waves travel through space at 300 000 kilometres per second (km/s).

How is 300 000 km/s converted to metres per second (m/s)?

Tick **one** box.

$300\,000 \div 1000 = 300\text{ m/s}$

$300\,000 \times 1000 = 300\,000\,000\text{ m/s}$

$300\,000 + 1000 = 301\,000\text{ m/s}$

$300\,000 - 1000 = 299\,000\text{ m/s}$

(1)

(f) Write the equation which links frequency, wavelength and wave speed.

(1)

(g) Calculate the wavelength of the radio waves emitted from the distant galaxy.

Give your answer in metres.

wavelength = _____ m

(3)

(Total 9 marks)

3.

The figure below shows an incomplete electromagnetic spectrum.



(a) What name is given to the group of waves at the position labelled **A** in the figure above?

Tick **one** box.

infrared

radio

visible light

X-ray

(1)

(b) Electromagnetic waves have many practical uses.

Draw **one** line from each type of electromagnetic wave to its use.

Electromagnetic wave	Use
Gamma rays	For fibre optic communications
Microwaves	For communicating with a satellite
Ultraviolet	To see security markings
	To sterilise surgical instruments

(3)

(c) Complete the sentence.

Use an answer from the box.

black body	ionising	nuclear
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X-rays can be dangerous to people because X-rays are
_____ radiation.

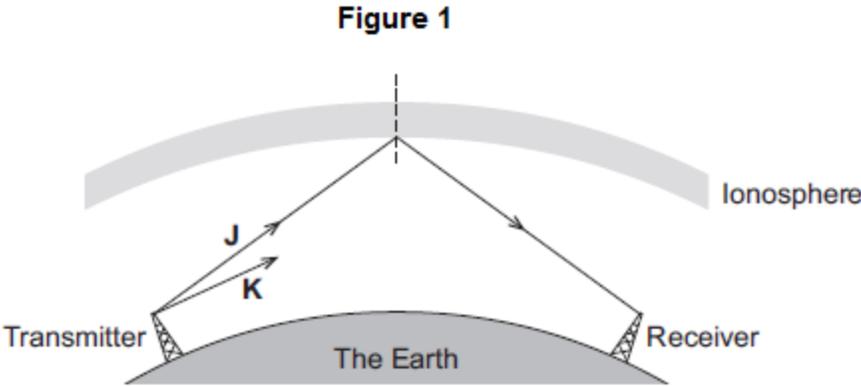
(1)

(Total 5 marks)

4.

Different parts of the electromagnetic spectrum are useful for different methods of communication.

(a) **Figure 1** shows a transmitter emitting two electromagnetic waves, **J** and **K**.



Wave **J** is reflected by a layer in the atmosphere called the ionosphere.

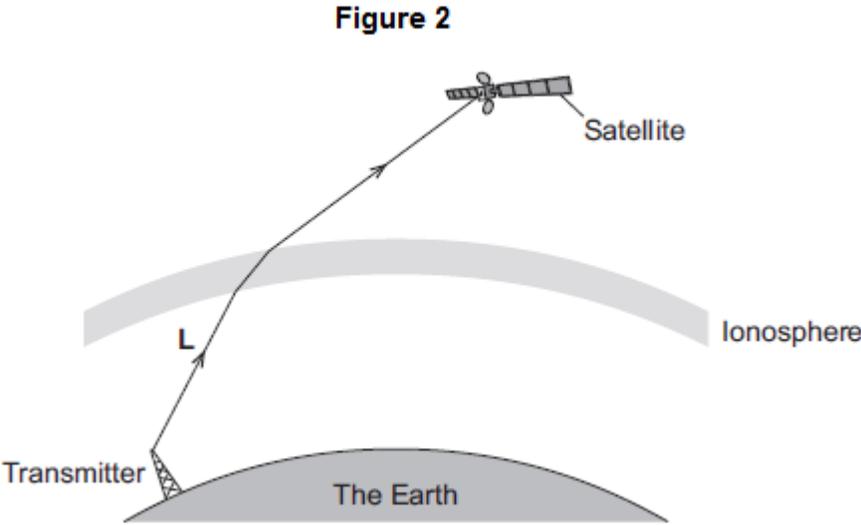
(i) Wave **K** will also be reflected by the ionosphere. On **Figure 1**, draw the path of wave **K** to show that it **does not** reach the receiver.

(2)

(ii) What is the name given to the dashed line in **Figure 1**?

(1)

(b) **Figure 2** shows a transmitter sending a signal to a satellite orbiting the Earth.



(i) Which type of electromagnetic wave is used to send a signal to a satellite?

Draw a ring around the correct answer.

gamma **microwave** **ultraviolet**

(1)

- (ii) What name is given to the process that occurs as wave **L** passes into the ionosphere?

Draw a ring around the correct answer.

diffraction

reflection

refraction

(1)

- (c) Waves **J**, **K** and **L** are electromagnetic waves.

What are **two** properties of **all** electromagnetic waves?

Tick (✓) **two** boxes.

Property	Tick (✓)
All electromagnetic waves are longitudinal.	
All electromagnetic waves are transverse.	
All electromagnetic waves are mechanical.	
All electromagnetic waves have the same speed in a vacuum.	
All electromagnetic waves have the same frequency.	

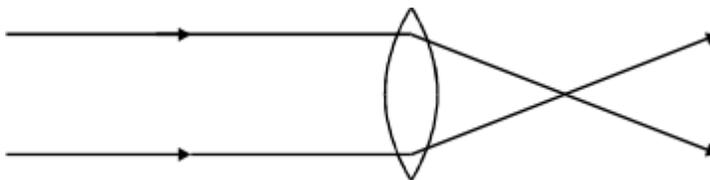
(2)

(Total 7 marks)

5.

- (a) The diagram shows how parallel rays of light pass through a convex lens.

- (i) Mark the position of the focus.



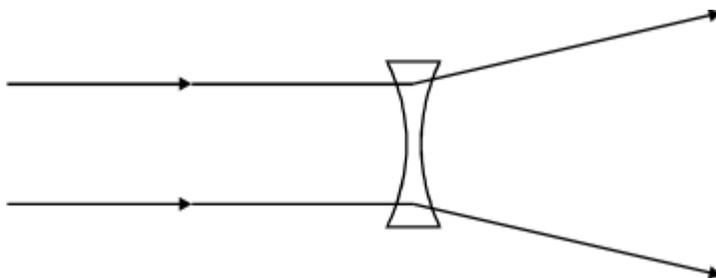
(1)

- (ii) Is this a **converging** lens, a **diverging** lens, **both** or **neither**?

(1)

(b) The diagram shows how parallel rays of light pass through a concave lens.

(i) Mark the position of the focus.



(1)

(ii) Is this a **converging** lens, a **diverging** lens, **both** or **neither**?

(1)

(c) Complete these sentences by crossing out the **two** lines in each box that are wrong.

In a camera, a

converging
diverging
parallel

 lens is used to produce an image of an

object on a

film
lens
screen

.

The image is

larger than
smaller than
the same size as

 the object.

The image is

further from
nearer to
the same distance from

 the lens, compared to the distance of the object from the lens.

(4)

(d) In a cinema projector, a convex lens is used to produce a *magnified, real* image.



(i) What does *magnified* mean?

(1)

(ii) What is a *real* image?

(1)

(e) You are in a dark room. You have a box containing some lenses. Only **one** of them is a converging lens.

Describe how, by just feeling the lenses, you can pick out the converging lens.

(2)

(Total 12 marks)

6.

Light changes direction as it passes from one medium to another.

(a) Use the correct answer from the box to complete the sentence.

diffraction	reflection	refraction
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The change of direction when light passes from one medium to another is called _____ .

(1)

(b) Draw a ring around the correct answer to complete the sentence.

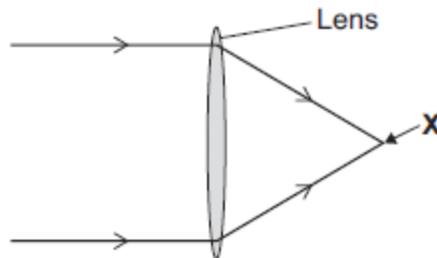
When light passes from air into a glass block, it changes

direction	away from the normal.
	towards the normal.
	to always travel along the normal.

(1)

(c) **Diagram 1** shows light rays entering and passing through a lens.

Diagram 1



(i) Which type of lens is shown in **Diagram 1**?

Draw a ring around the correct answer.

concave **convex** **diverging**

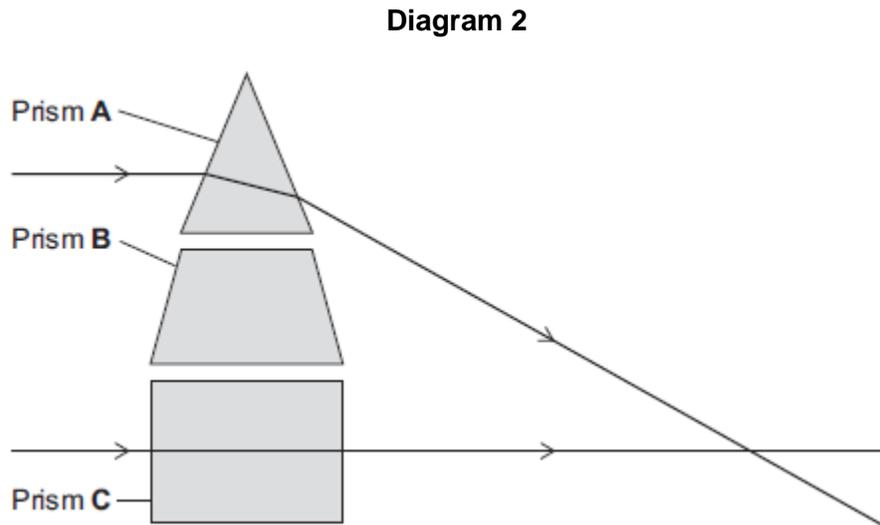
(1)

(ii) In **Diagram 1**, what is the point **X** called?

(1)

(d) A lens acts like a number of prisms.

Diagram 2 shows two parallel rays of light entering and passing through prism **A** and prism **C**.



Draw a third parallel ray entering and passing through prism **B**.

(4)

(e) What **two** factors determine the focal length of a lens?

1. _____

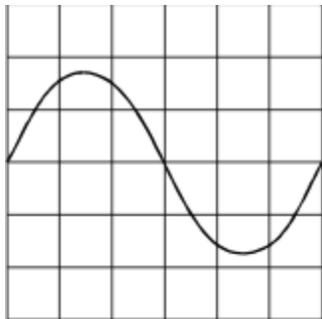
2. _____

(2)

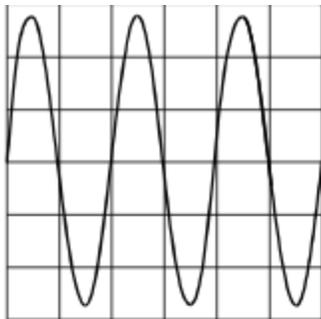
(Total 10 marks)

7.

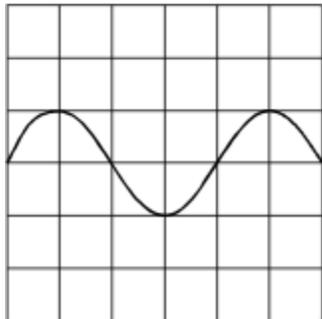
The diagram shows four oscilloscope wave traces. The controls of the oscilloscope were the same for each wave trace.



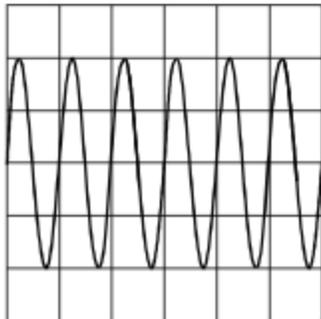
A



B



C



D

Which **one** of the waves traces, **A**, **B**, **C** or **D**, has:

(i) the largest amplitude," _____

(1)

(ii) the lowest frequency? _____

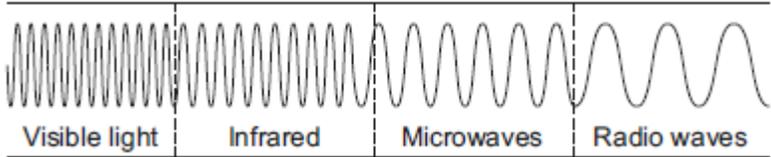
(1)

(Total 2 marks)

8.

Infrared and microwaves are two types of electromagnetic radiation.

The diagram below shows the positions of the two types of radiation within part of the electromagnetic spectrum.



(a) Name **one** type of electromagnetic radiation which has more energy than infrared.

(1)

(b) Use the correct answer from the box to complete each sentence.

Each answer may be used once, more than once or not at all.

greater than	less than	the same as
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The wavelength of infrared is _____ the wavelength of microwaves.

The frequency of microwaves is _____ the frequency of infrared.

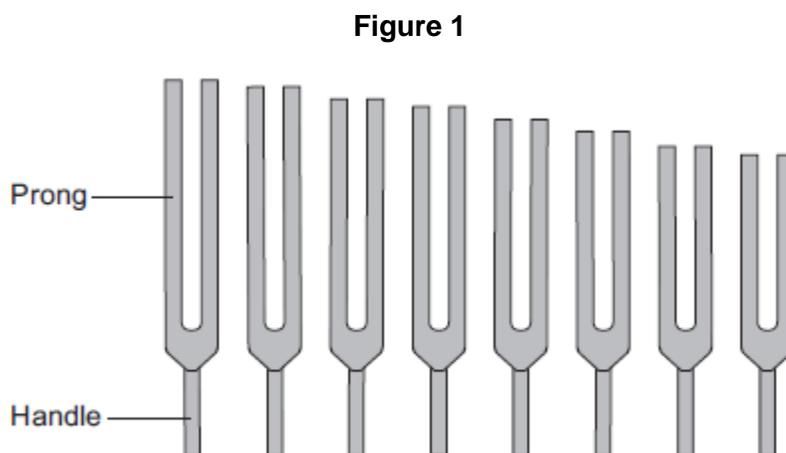
The speed of microwaves in a vacuum is _____ the speed of infrared in a vacuum.

(3)

(Total 4 marks)

9.

Figure 1 shows a set of tuning forks.



A tuning fork has a handle and two prongs. It is made from metal.

When the prongs are struck on a hard object, the tuning fork makes a sound wave with a single frequency. The frequency depends on the length of the prongs.

(a) Use the correct answer from the box to complete each sentence.

direction	loudness	pitch	speed
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The frequency of a sound wave determines its _____ .

The amplitude of a sound wave determines its _____ .

(2)

- (b) Each tuning fork has its frequency engraved on it. A student measured the length of the prongs for each tuning fork.

Some of her data is shown in the table.

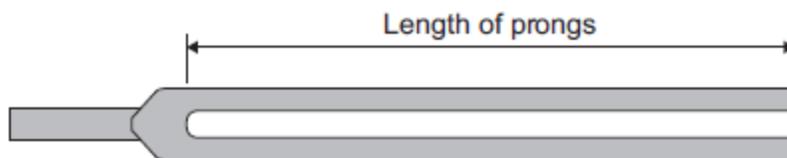
Frequency in hertz	Length of prongs in cm
320	9.5
384	8.7
480	7.8
512	7.5

- (i) Describe the pattern shown in the table.

(1)

- (ii) **Figure 2** shows a full-size drawing of a tuning fork.

Figure 2



Measure and record the length of the prongs.

Length of prongs = _____ cm

(1)

Use the data in the table above to estimate the frequency of the tuning fork in **Figure 2**.

Explain your answer.

Estimated frequency = _____ Hz

(3)

(c) Ultrasound waves are used in hospitals.

(i) Use the correct answer from the box to complete the sentence.

electronic	hydraulic	radioactive
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Ultrasound waves can be produced by _____ systems.

(1)

(ii) The frequency of an ultrasound wave used in a hospital is 2×10^6 Hz.

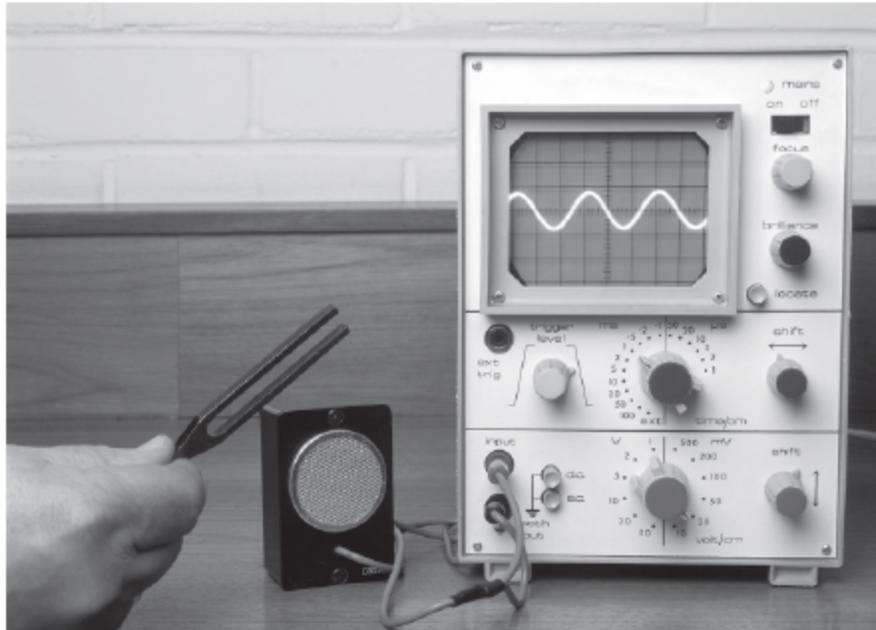
It is **not** possible to produce ultrasound waves of this frequency using a tuning fork.

Explain why.

(2)

- (d) **Figure 3** shows a tuning fork and a microphone. The microphone is connected to an oscilloscope.

Figure 3

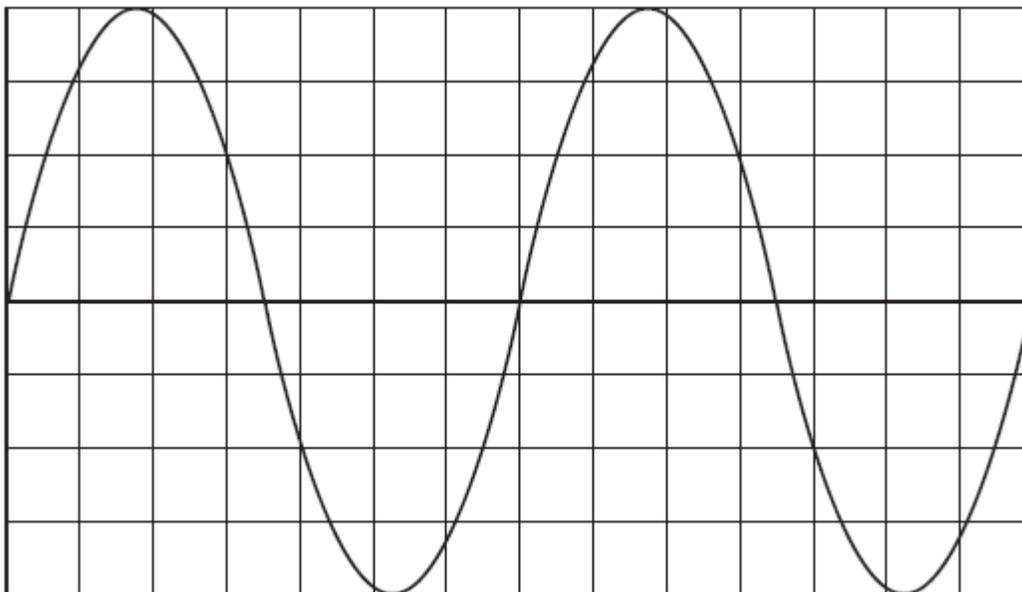


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When the tuning fork is struck and then placed in front of the microphone, a trace appears on the oscilloscope screen.

Figure 4 shows part of the trace on the screen.

Figure 4



Each horizontal division in **Figure 4** represents a time of 0.0005 s.

What is the frequency of the tuning fork?

Frequency = _____ Hz

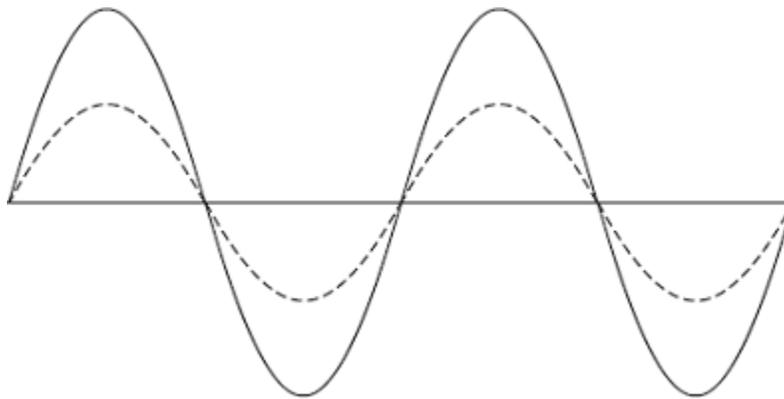
(3)

(Total 13 marks)

10.

(a) **Diagram 1** shows two waves.

Diagram 1



(i) Name **one** wave quantity that is the same for the two waves.

(1)

(ii) Name **one** wave quantity that is different for the two waves.

(1)

(iii) The waves in **Diagram 1** are transverse.

Which **one** of the following types of wave is **not** a transverse wave?

Draw a ring around the correct answer.

gamma rays

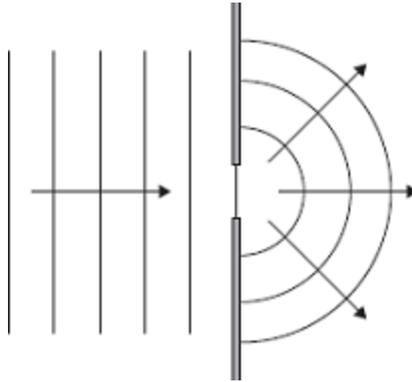
sound

visible light

(1)

- (b) **Diagram 2** shows water waves in a ripple tank moving towards and passing through a gap in a barrier.

Diagram 2



Every second, 8 waves pass through the gap in the barrier. The waves have a wavelength of 0.015 metres.

Calculate the speed of the water waves and give the unit.

Speed = _____

(3)
(Total 6 marks)