90938

909380

1

SUPERVISOR'S USE ONLY

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Level 1 Physics, 2019

90938 Demonstrate understanding of aspects of wave behaviour

2.00 p.m. Tuesday 19 November 2019
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of wave behaviour.	Demonstrate in-depth understanding of aspects of wave behaviour.	Demonstrate comprehensive understanding of aspects of wave behaviour.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Make sure that you have Resource Sheet L1–PHYSR.

In your answers use clear numerical working, words and / or diagrams as required.

Numerical answers should be given with an appropriate SI unit.

Useful information for calculation questions is available on the Resource Sheet.

If you need more space for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

ASSESSOR'S USE ONLY

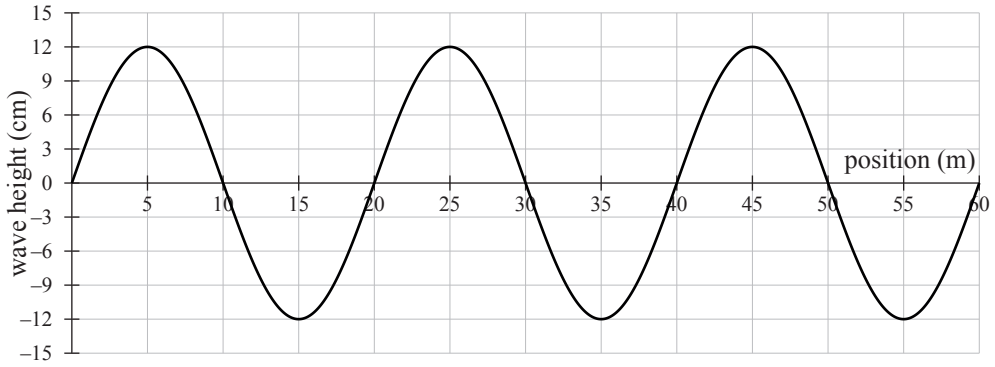
QUESTION ONE: FISHING TRIP

ASSESSOR'S USE ONLY

James takes his boat out one day to go fishing. As his boat moves, it creates waves on the surface of the water as shown below.

http://www.wakeworld.com/forum/showthread.php?t=802698

(a) A plot of the shape of the wave produced by James' boat is shown below.



State the amplitude of the wave.

Give the correct unit with your answer.

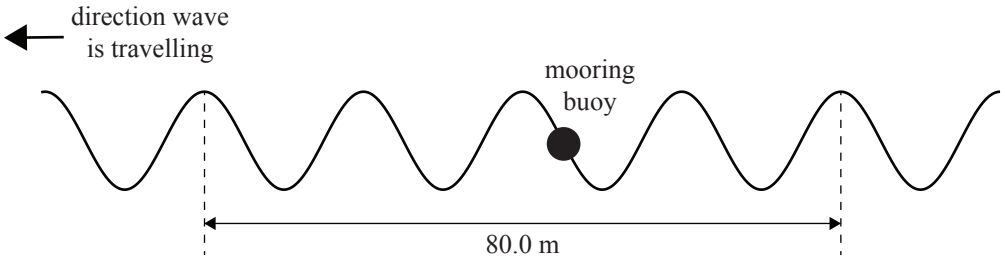
Amplitude = _____ (____)
Unit

ASSESSOR'S USE ONLY

(b) James' boat passes by a mooring buoy (right) floating on the surface of the water. When the wave caused by James' boat reaches the mooring buoy, the wave makes the mooring buoy move.

https://www.marinefiberglassdirect.com/products/taylor-made-sur-moor-t3c-mooring-buoy-24

The wave passing the mooring buoy is shown in the diagram below (not to scale).



(i) State the name of this type of wave.

(ii) In the diagram above, the wave is travelling towards the left.

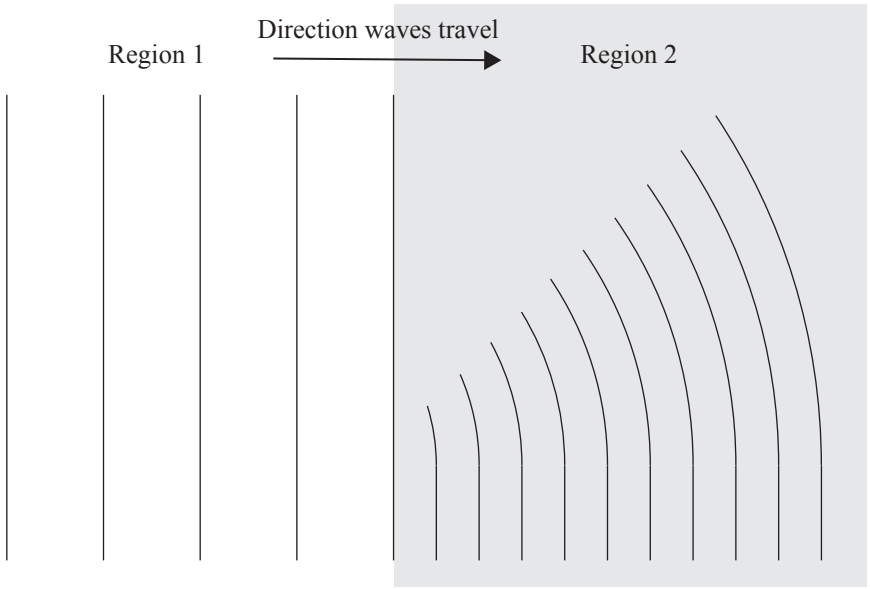
Explain the direction in which the mooring buoy will be moving at the instant shown in the diagram above, by relating the motion of the mooring buoy to the type of wave.

(c) The speed of the wave produced by James' boat is 5.60 m s^{-1} and there are 5 crests in 80.0 m as shown in the diagram above.

Calculate the period of the wave.

ASSESSOR'S USE ONLY

(d) Later the waves produced by James' boat travel from one area of water, Region 1, to another, Region 2, as shown below. As the waves travel from Region 1 to Region 2, the waves change. The causes of the changes are not visible in the diagram.



Describe TWO changes that occurred to the waves as they moved from Region 1 to Region 2 in the diagram above, and explain how each of these changes was caused.

You may make changes on the diagram above to help with your explanation.

Change 1:

Change 2:

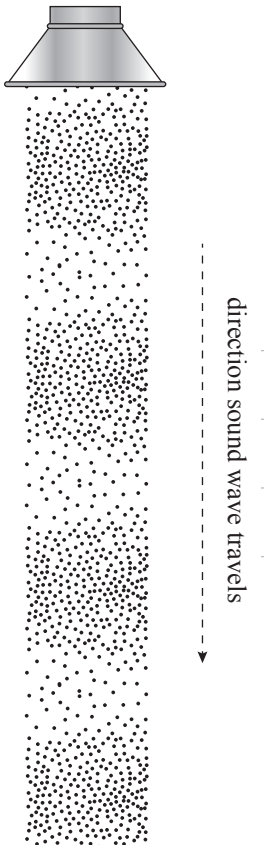
QUESTION TWO: FINDING FISH

ASSESSOR'S USE ONLY

Once James reaches his favourite fishing spot, he turns on an ultrasonic fish finder. The fish finder emits a high frequency sound wave into the water and detects the sound wave that reflects back from underwater objects such as fish or the ocean floor.

(a) State the definition of the physics term "wave".

(b) The diagram on the right represents the water particles at one moment as the sound wave travels downwards through the water.



(i) State the name of this type of wave.

(ii) Describe the motion of the water particles as the sound wave travels downwards through the water.

ASSESSOR'S USE ONLY

(c) The fish finder has two different frequencies that it can use: 50 kHz or 200 kHz.

(i) Explain which of these frequencies, 50 kHz or 200 kHz, will have the longer wavelength.

No calculations are required.

(ii) Calculate the wavelength of 200 kHz sound in salt water.

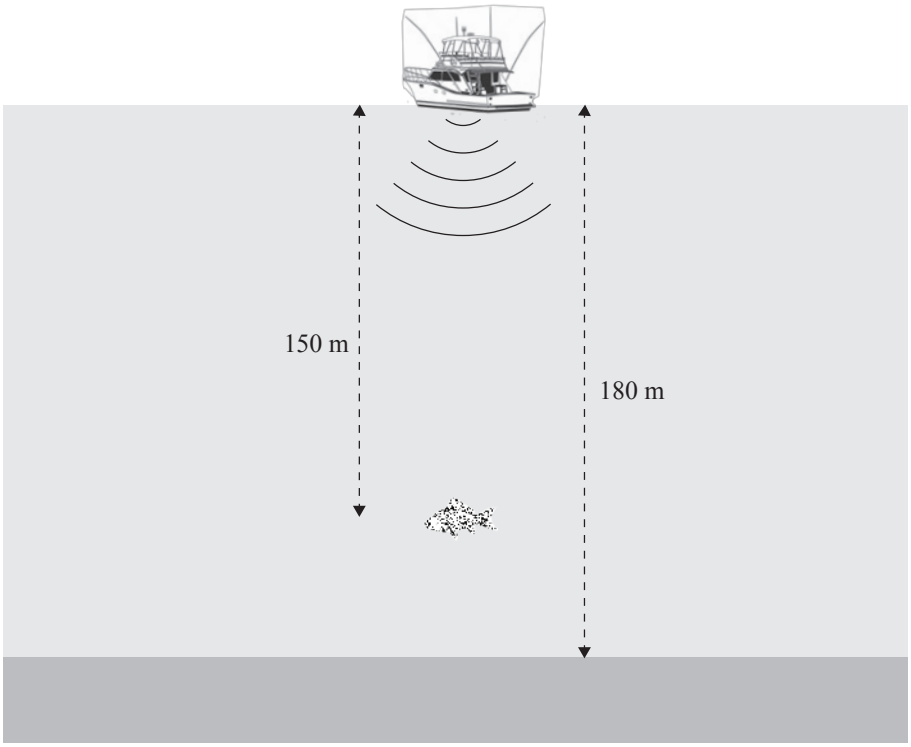
The speed of sound in salt water is 1500 m s^{-1}.

ASSESSOR'S USE ONLY

(d) The fish finder is set to 50 kHz, and a single pulse of sound is emitted into the water. Two reflected pulses are received by the fish finder, one from a fish 150 m below the water surface, and one from the sea floor 180 m below the water surface.

Calculate the time between the two reflected pulses being received by the fish finder.

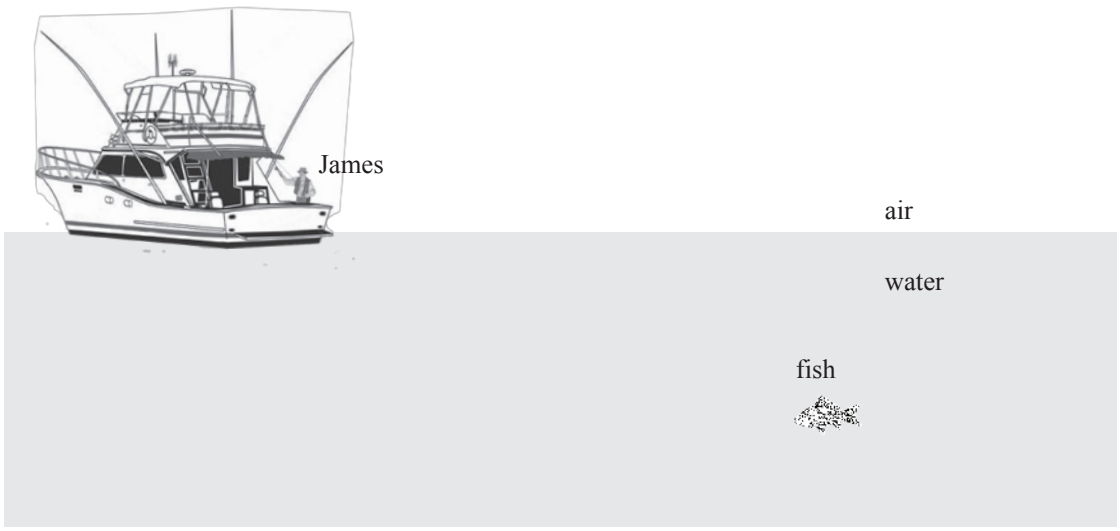
The speed of sound in salt water is 1500 m s^{-1}.



QUESTION THREE: WATCHING FISH

ASSESSOR'S USE ONLY

While on the boat, James sees another fish near the surface of the water behind the boat.



To James the fish appears to be in a different position than it actually is.

(a) State the name of the phenomenon that occurs when light passes from one medium to another and causes the fish to appear to be in a different position.

(b) On the diagram above:

(i) draw the path that light would follow allowing James to see the fish

(ii) draw an 'X' to indicate the approximate position that the fish would appear to be to James.

If you need to redraw your ray diagram, use the diagram on page 10.

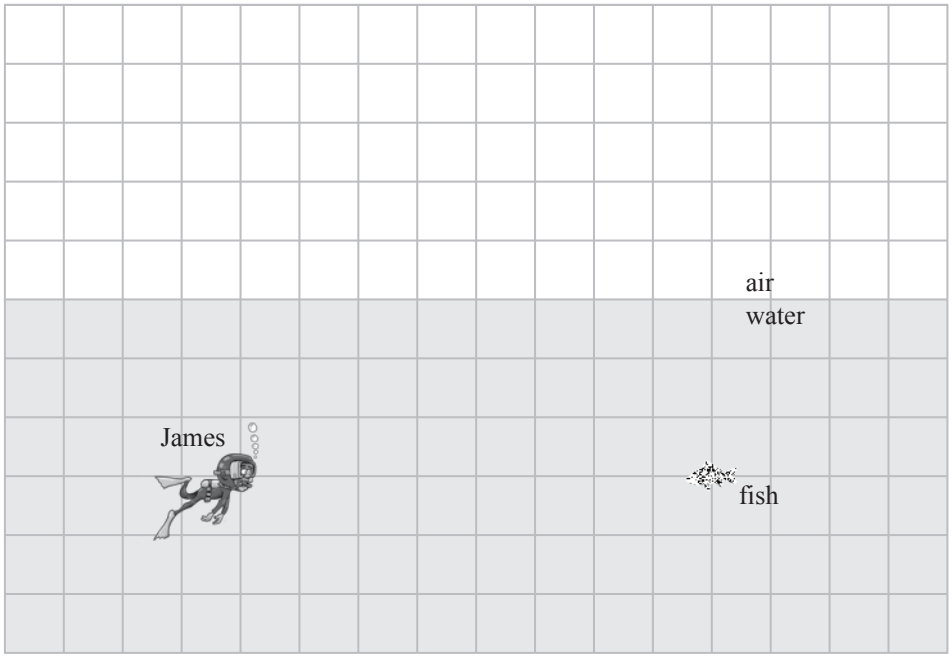
James goes diving, and while he is underwater, he sees a fish and its reflection in the surface of the water, as shown.

www.britannica.com/science/reflection-physics/images-videos

ASSESSOR'S USE ONLY

(c) On the diagram below, draw rays to show the path of light that allows James to see the image of the fish in the surface of the water.

Draw an 'X' to indicate the position of the image of the fish.



If you need to redraw your ray diagram, use the diagram on page 10.

(d) Explain how James is able to see an image of the fish in the surface of the water.

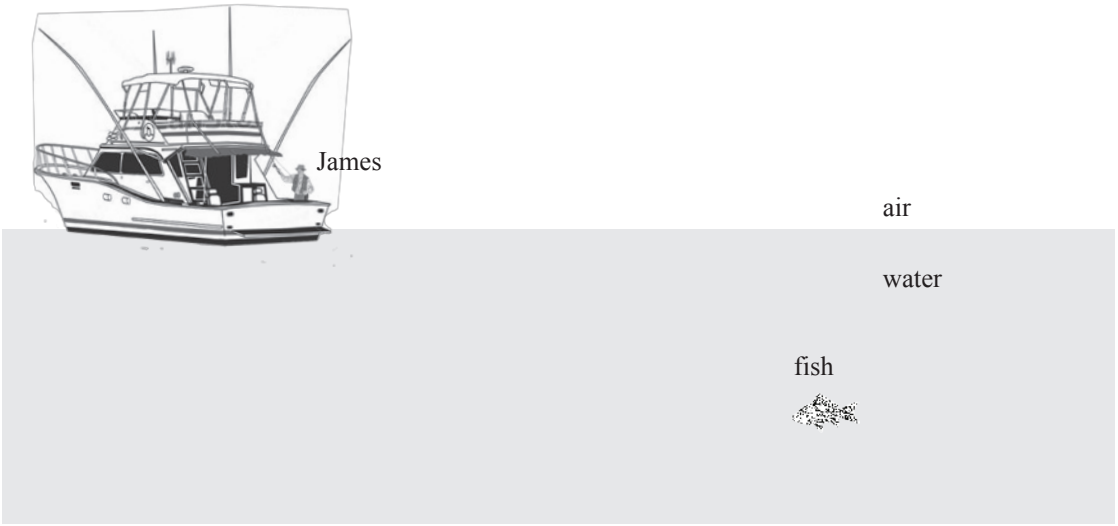
As part of your answer you should

- name the phenomenon that is occurring
- state the conditions necessary for this phenomenon to occur
- relate this behaviour to a fundamental optical property of light in water and in air.

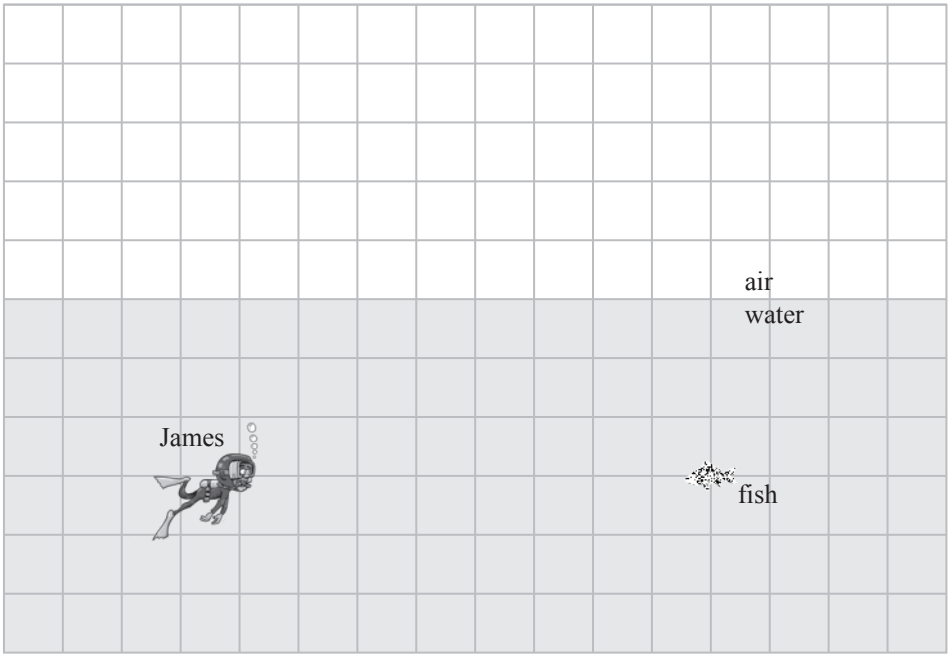
SPARE DIAGRAMS

ASSESSOR'S USE ONLY

If you need to redraw your response to Question Three (b), use the diagram below. Make sure it is clear which answer you want marked.



If you need to redraw your response to Question Three (c), use the diagram below. Make sure it is clear which answer you want marked.



Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

ASSESSOR'S USE ONLY

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

ASSESSOR'S USE ONLY

90938