

91170



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2

SUPERVISOR'S USE ONLY

Tick this box if
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Level 2 Physics 2020

91170 Demonstrate understanding of waves

9.30 a.m. Monday 16 November 2020
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of waves.	Demonstrate in-depth understanding of waves.	Demonstrate comprehensive understanding of waves.

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 L2–PHYSR.

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

Numerical answers should be given with an appropriate SI unit.

If you need more space for any answer, use the page(s) 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: AT THE SWIMMING POOL

Mia and Aria are at the swimming pool. They notice the lifeguards are using a convex mirror on the wall to help them see the swimmers in the pool.

- (a) Complete the ray diagram below to show the formation of the image.



- (b) Describe the nature, size, and orientation of the images of the swimmers formed by the mirror.

If you need to redraw your ray diagram, use the spare diagram on page 9.

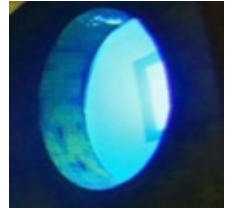
Assume the mirror is far away from the swimmers.

- (c) The lifeguards could have used a plane or concave mirror.

By describing the possible images from each mirror, explain whether either mirror is suitable for the lifeguards to see the whole of the pool.

- (d) The children's play pool has a small partition with a large **convex lens** built into it to create patterns in the water.

Mia is 1.70 m tall and stands 2.00 m away from the lens, which has a focal length of 0.50 m.



ASSESSOR'S
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- (i) Calculate the distance of her image from the lens.

- (ii) Calculate the height of her image.

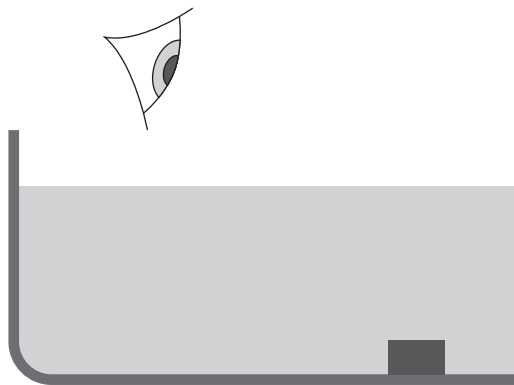
- (iii) Describe the nature, size, and orientation of her image.

QUESTION TWO: THE BOTTOM OF THE POOL

Aria sees an object on the bottom of the pool at the shallow end, and reaches down to grab it. She finds the object is actually deeper than it looked to be.

- (a) Name the phenomenon that causes the object to appear at a different depth.

- (b) The formation of the image can be represented using a ray diagram.



If you need to redraw your ray diagram, use the spare diagram on page 9.

Complete the diagram above to locate the image of the object.

- (c) Use physics principles to give a full explanation of how the process in part (b) causes the observer to see the image at the position located by your diagram.

QUESTION THREE: THE WAVE MACHINE

There is a third pool with a wave machine. The pool has a deep and a shallow end.



The wave machine generates waves with a period of 2.3 s.

The speed of the waves in the deep end is 2.75 m s^{-1} .

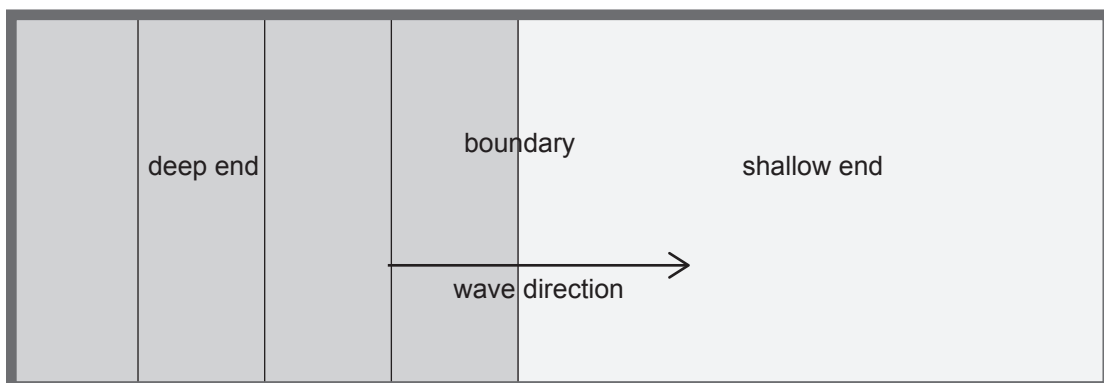
- (a) Calculate the wavelength of the waves in the deep end.

- (b) The waves move from the deep end to the shallow end of the pool.



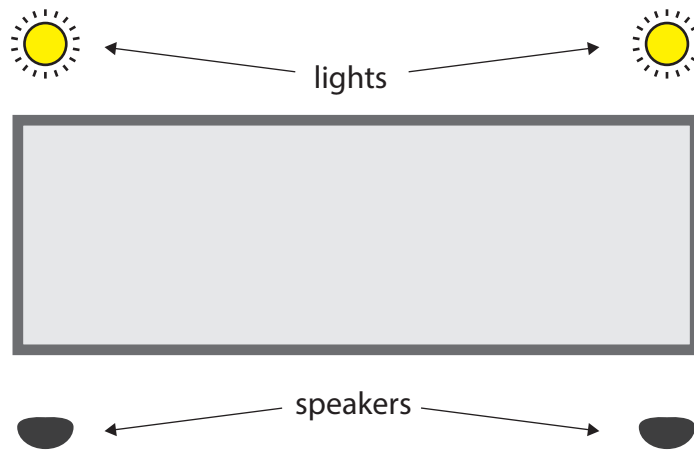
If you need to redraw your wavefronts, use the spare diagram on page 9.

- (i) Complete the figure below to show the effect of change on depth on the appearance of the wavefronts.



- (ii) Use your diagram to describe and explain how the wavelength, amplitude, and frequency of the waves would be affected as they move from deep to shallow water.

On one side of the pool there are two lights, and on the other side of the pool there are two speakers.



- (c) Describe and explain the differences between the waves emitted by the lights, and the sound waves emitted by the speakers.

Your answer should include comparison of the wave type, the need for a medium, and the speed of the waves.

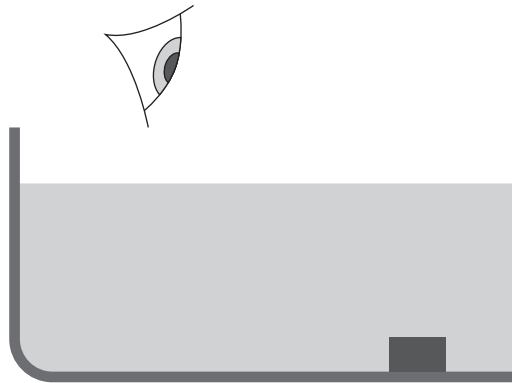
**Question Three continues
on the following page.**

SPARE DIAGRAMS

If you need to redraw your ray diagram for Question One (a), use the diagram below. Make sure it is clear which diagram you want marked.



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



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

