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Level 1 Physics, 2016

90938 Demonstrate understanding of aspects of wave behaviour

2.00 p.m. Tuesday 15 November 2016
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.

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 2–14 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.

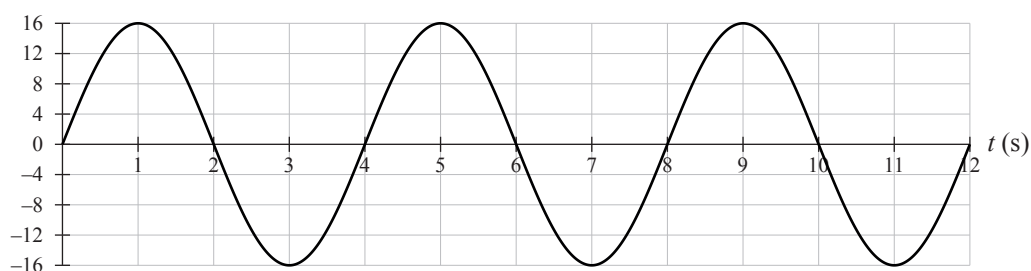
TOTAL

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- (c) A circuit that has an alternating current is connected to an oscilloscope. The oscilloscope screen displays a waveform of the alternating current, as shown below.

- (i) On the diagram, **draw** and **label** the amplitude of the wave.

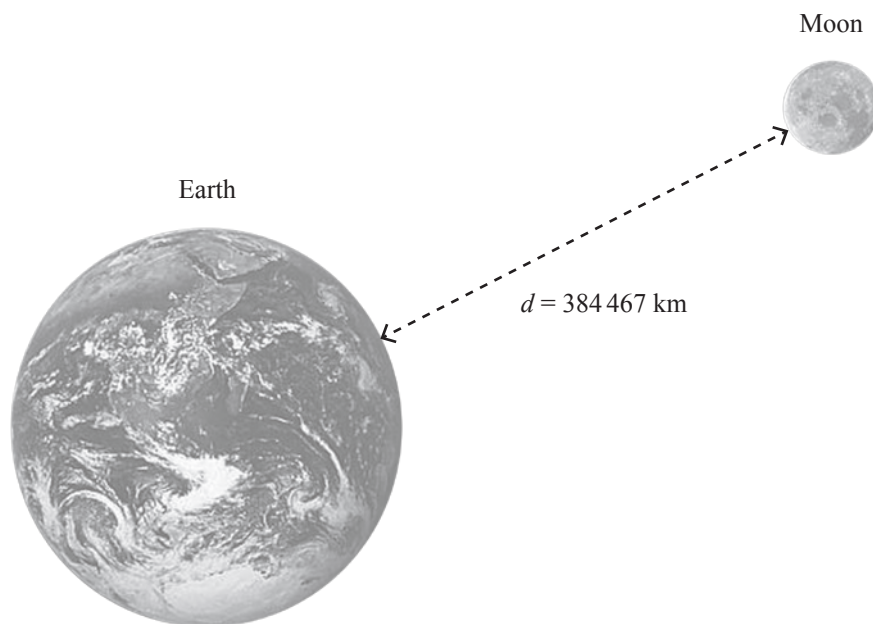
If you need to redraw your response, use the diagram on page 11.



- (ii) Use the information in the diagram above to determine the **frequency** of the wave.
Give a unit with your answer.

Frequency: _____ Unit: _____

- (d) Scientists have been able to calculate the distance between the Earth and the Moon by shining a red laser from Earth and reflecting the red laser on a mirror left on the Moon by the Apollo 11 mission back to a receiver on Earth.



- (i) The scientists are using a red laser with a wavelength of $6.5 \times 10^{-7}\text{ m}$ and a period of $2.17 \times 10^{-15}\text{ s}$.

Show that the speed of the red laser light is $3.0 \times 10^8\text{ m s}^{-1}$.

- (ii) The distance between the Earth and the Moon is 384 467 km.

Calculate the time it takes for the laser light to leave Earth and return to hit the receiver.

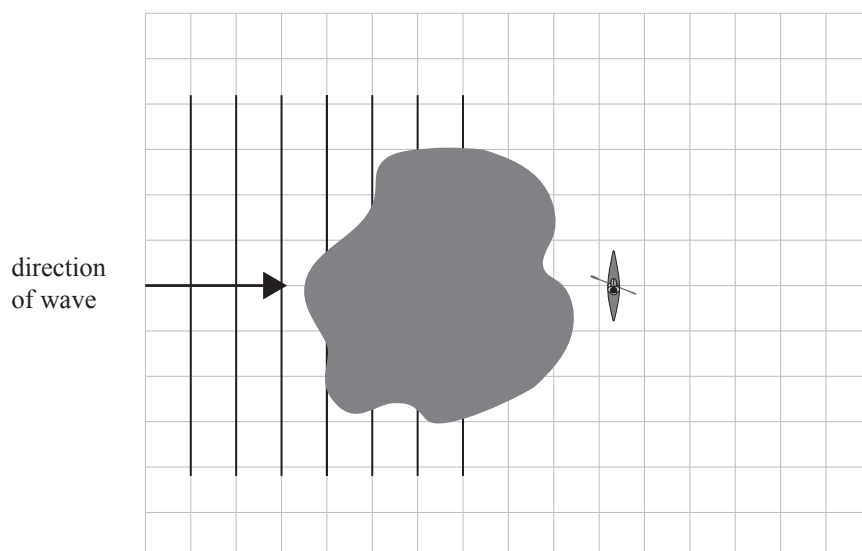
Time: _____

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QUESTION TWO: WATER AND LIGHT

- (a) While sea kayaking, people can go behind small islands for safety from large ocean waves.

Complete the diagram below to show how the waves travel around the small island.



If you need to redraw your response, use the diagram on page 11.

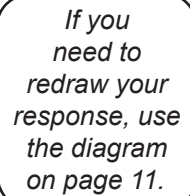
- (b) (i) With help from the diagram in (a), explain why a kayaker would go behind the island for safety.

- (ii) As the kayaker is watching the waves pass from behind the island, he counts 6 waves in 4 seconds.

Calculate the period of the wave.

Period: _____

- Draw and label all seven colours.



- Explain why the prism alters the path of **red** and **blue** light differently, as you have drawn in the diagram above.

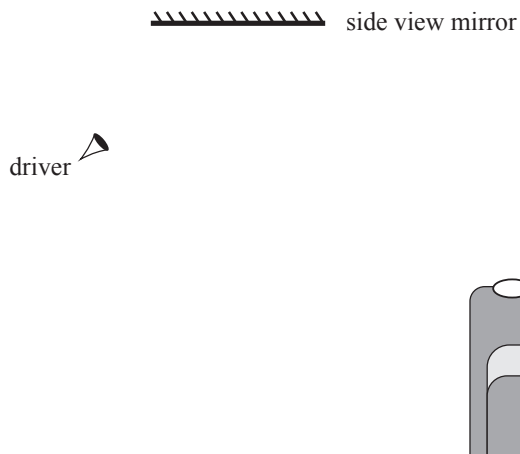
QUESTION THREE: CAR MIRRORS

Side mirrors on the outside of cars are designed to reflect light so the driver can see what is beside them.



- (a) (i) Complete a ray diagram to show how the side view mirror allows the light to travel from the car to the driver.

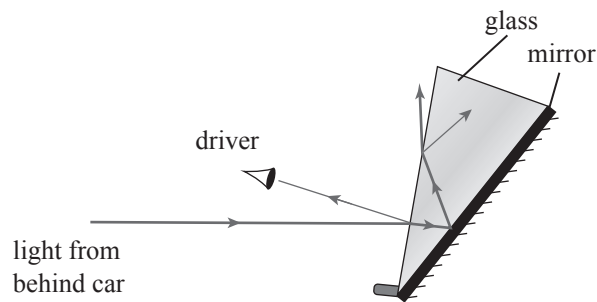
Show where the image of the car is formed.



If you need to redraw your response, use the diagram on page 12.

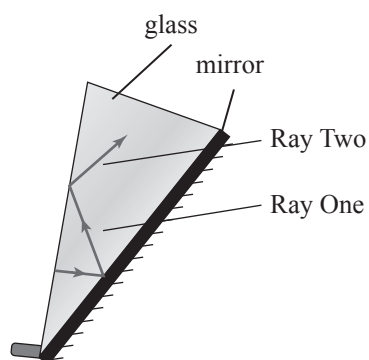
- (ii) On your diagram above, label ONE of the rays with the angle of incidence and the angle of reflection.
- (iii) How does the angle of incidence compare with the angle of reflection?

- At night, the reflected glare from the headlights of a following car can impede the vision of the driver. With the pull of a lever, the mirror can be moved to a night-time position, which reduces the glare, as shown in the diagram below.



Using the diagram above, explain how reflection and refraction alter the path of the **remaining light** so that the glare of the headlights of the following car seen by the driver is reduced.

- (c) The diagram below shows the path that a ray of light takes as it travels in the glass wedge.

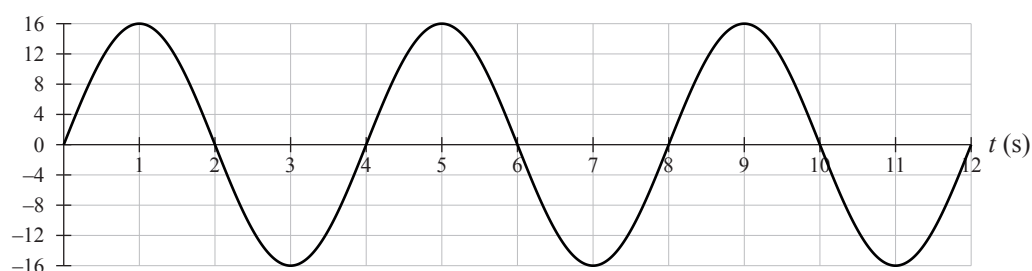


State what is occurring to Ray One at the boundary between the glass wedge and the air, that forms Ray Two.

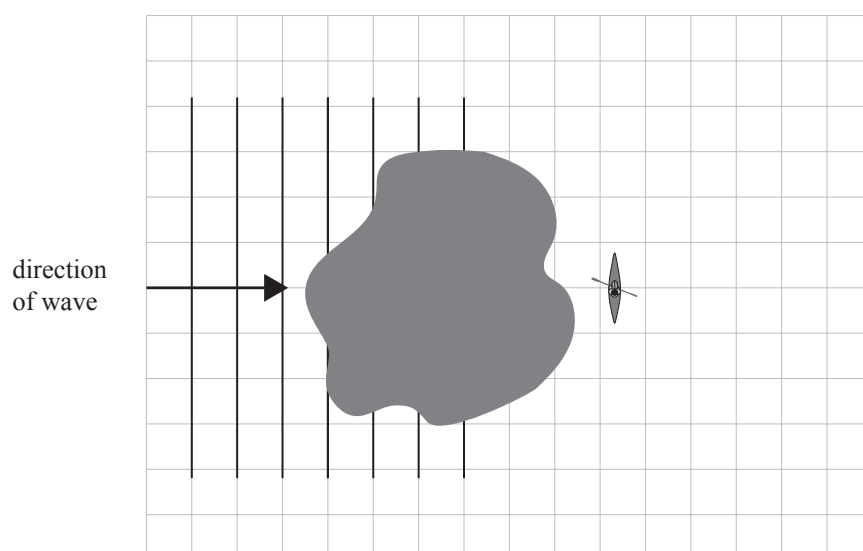
Give reasons why.

SPARE DIAGRAMS

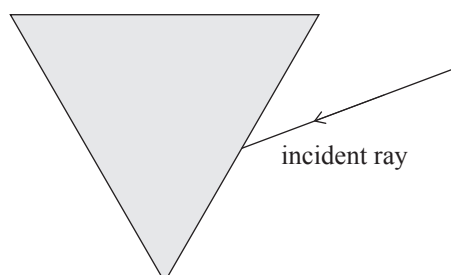
If you need to redraw your response to Question One (c)(i), use the diagram below. Make sure it is clear which answer you want marked.



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

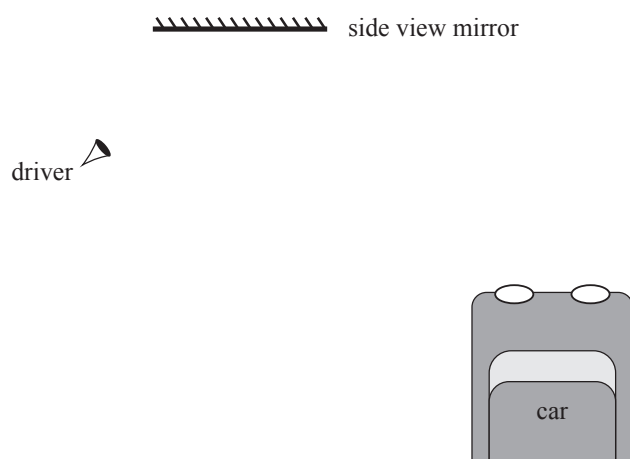


If you need to redraw your response to Question Two (c), use the diagram below. Make sure it is clear which answer you want marked.



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

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

QUESTION
NUMBER

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Write the question number(s) if applicable.

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