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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 1 Physics, 2013

90938 Demonstrate understanding of aspects of wave behaviour

2.00 pm Monday 25 November 2013
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 2–11 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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You are advised to spend 60 minutes answering the questions in this booklet.

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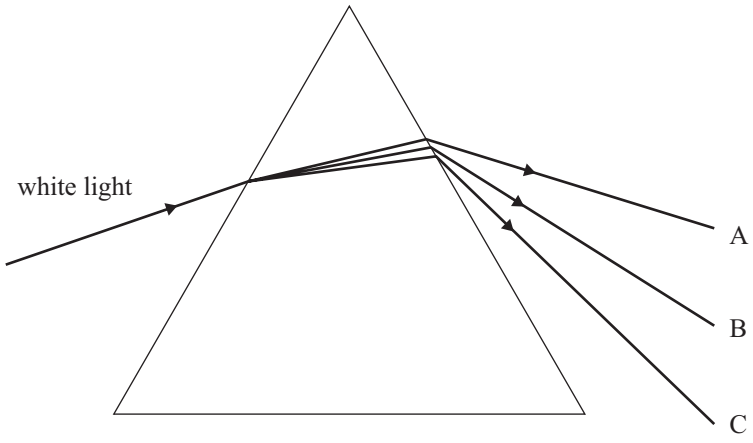
QUESTION ONE: LIGHT AND PRISMS

When a ray of white light is shone into a prism, a spectrum of colours emerges on the other side of the prism. In the diagram below, the colour B is seen in the middle of the spectrum.



(a) Name the colours labelled A, B and C, in the diagram.

A = _____

B = _____

C = _____

(b) Explain what this effect shows about the nature of white light.

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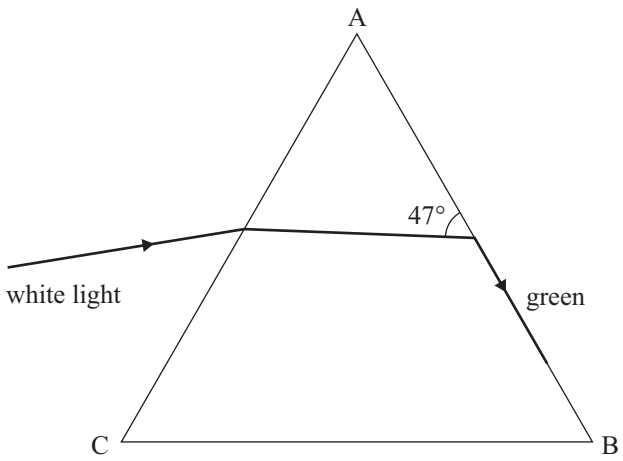
The direction of the incident white ray is now adjusted so that the green component of the white light emerges along the face AB of the prism, as shown in the diagram below. The green light makes an angle of 47° to the side of the glass inside the prism.



(c) (i) Calculate the critical angle for green light in the prism.

Angle _____

(ii) State and explain what will be seen if the angle of the green light with the face AB of the prism was slightly **increased** from 47°.

(d) Explain one **similarity** and one **difference** between orange light and blue light.

QUESTION TWO: WATER WAVES

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A radio-controlled toy boat is sailing in a lake. As it sails, waves are produced behind the boat. At one point of travel, the boat produces 10 waves in 5.0 seconds.

(a) (i) Define the term 'period'.

(ii) Calculate the period of the waves produced.

Period _____

(b) A paddle from a canoe produces 9 waves in 15 s. Each wave travels 4.8 m in 12 s.

Calculate the wavelength of waves produced by the paddle.

Wavelength _____

A gentle wind causes straight waves on the lake surface. The diagram shows waves approaching the edge of a wall. The depth of the water is the same on either side of the wall.

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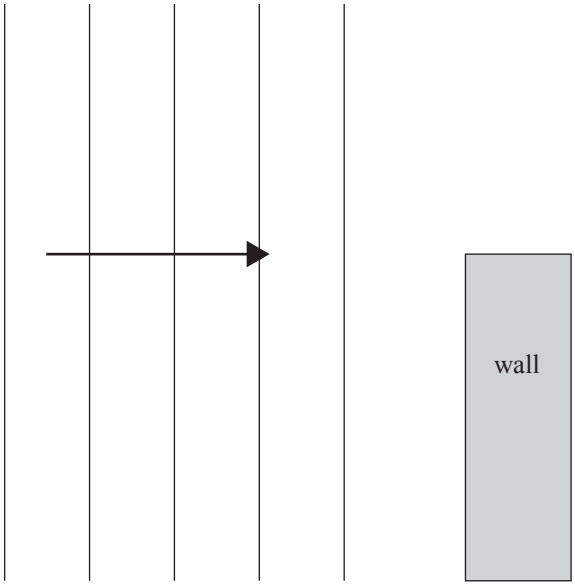

(c) Describe and explain what happens to the waves when they pass the edge of the wall.

You may draw waves on the diagram to aid your explanation.

(d) A short time later, a wind produces waves of **higher** frequency.

Explain how the pattern of waves would be different to those produced in (c) when the waves pass the edge of the wall.

QUESTION THREE: RADIO-CONTROLLED BOAT

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A radio-controlled toy boat has a small siren that produces a sound. The siren can be turned on by sending radio waves from a remote control.

(a) State TWO differences between the radio waves and the sound waves.

(b) The siren produces a frequency of 800 Hz, and the wavelength of the sound waves in air is 41 cm.

Show that the speed of sound in air is 328 m s^{-1}.

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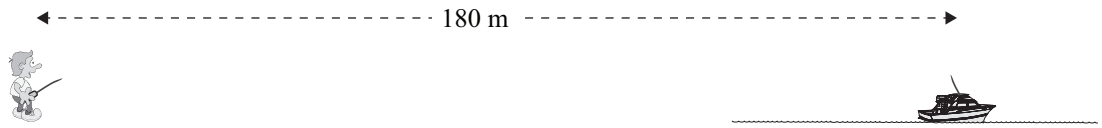
(c) The boat is 180 m from the remote control. A radio wave is sent to turn on the siren. A person is standing with the remote control.



Calculate the time from when the remote control sends the radio wave to when the person hears the sound.

Explain any assumptions you make.

The speed of sound in air is 328 m s^{-1}.

Time _____

(d) Explain how sound energy is transferred from the siren to the person holding the remote control, even though no air particles move from the siren to the person.

QUESTION FOUR: REFLECTION IN A WINDOW

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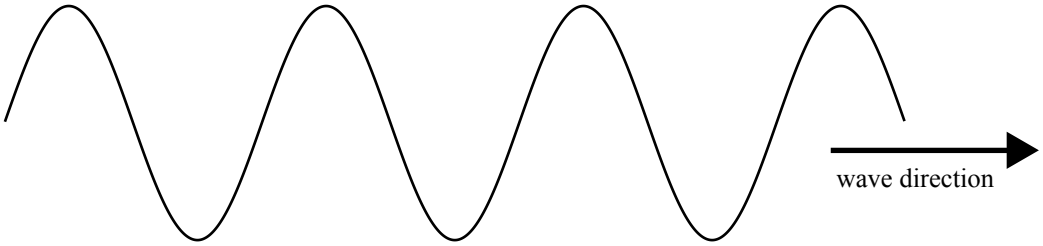
The diagram below shows a wave travelling to the right.

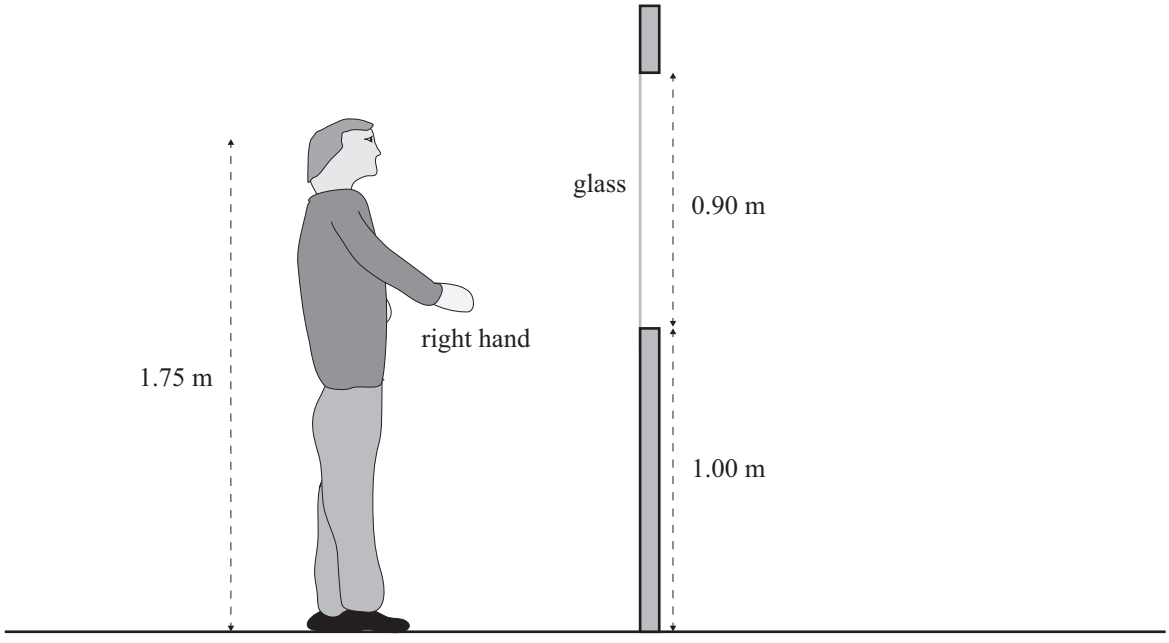


(i) On the diagram above, label the amplitude and the wavelength of the wave.

(ii) Describe the motion of the particles in this wave.

Tom looks through a glass window and sees his own reflection in the glass.

(b) On the diagram below, draw TWO rays to show how Tom can see his right hand in the glass. Locate and label the image of his right hand.



(c) Explain whether Tom will be able to see his feet in the glass when he stands as shown in the diagram.

You may draw on the diagram below to aid your answer.

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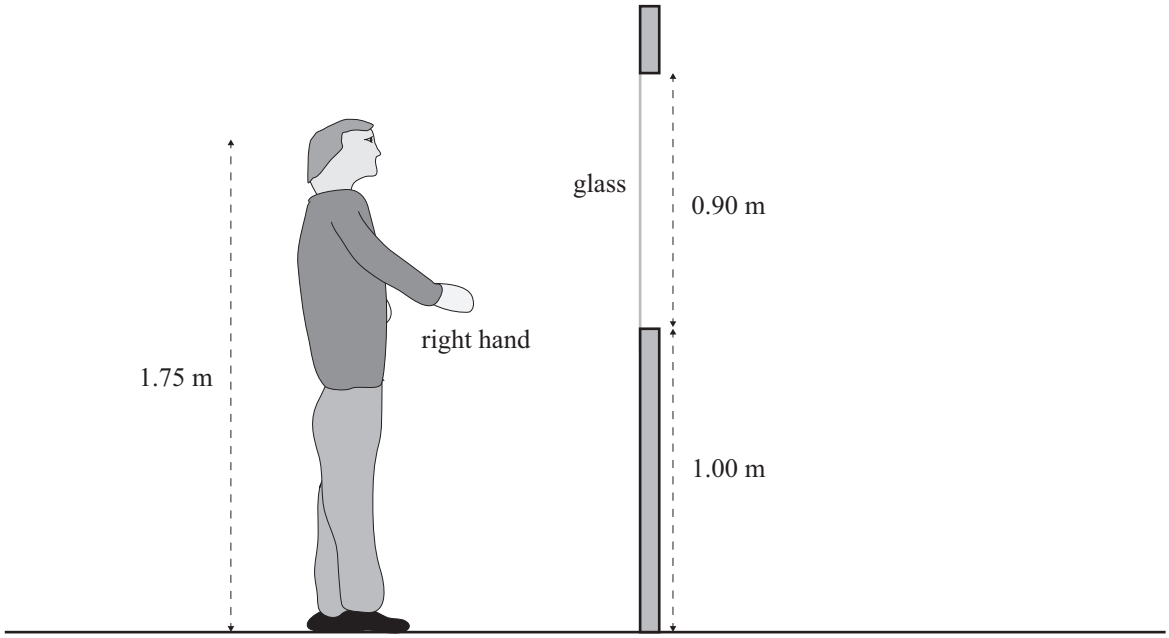

Question Four (d) continues on the following page.

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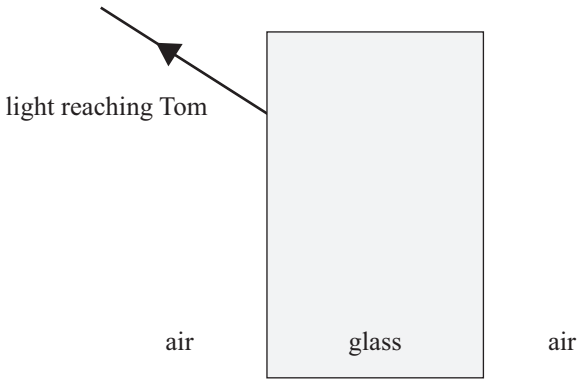
(d) The diagram below shows a ray of light from outside the window reaching Tom after it has travelled through the glass.



(i) Complete the diagram to show the path of the ray:

- when it travels through the glass, and
- when it is incident on the opposite side of the glass.

(ii) Name the effect that occurs when light passes into the glass, and give a reason why this occurs.

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

QUESTION NUMBER

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