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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, 2011

90938 Demonstrate understanding of aspects of wave behaviour

2.00 pm Thursday 24 November 2011
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 room for any answer, use the extra space provided at the back of this booklet.

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

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You are advised to spend 60 minutes answering the questions in this booklet.

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QUESTION ONE: REFRACTION

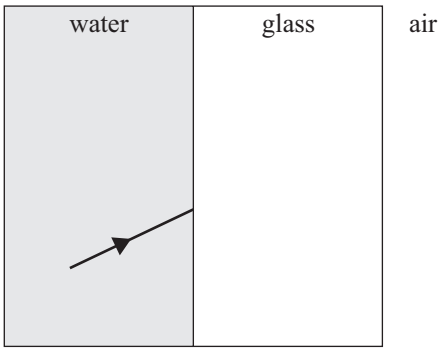
(a) Light refracts through a thick glass vase with water in it, placed near a window.

The diagram below shows a ray of light travelling through the water. It then travels through the glass and into the air.

Complete the diagram to show how the ray is refracted at:

(i) the water-glass interface

(ii) the glass-air interface.



(b) Explain why refraction takes place at the interfaces, as shown by your sketch in the completed diagram above.

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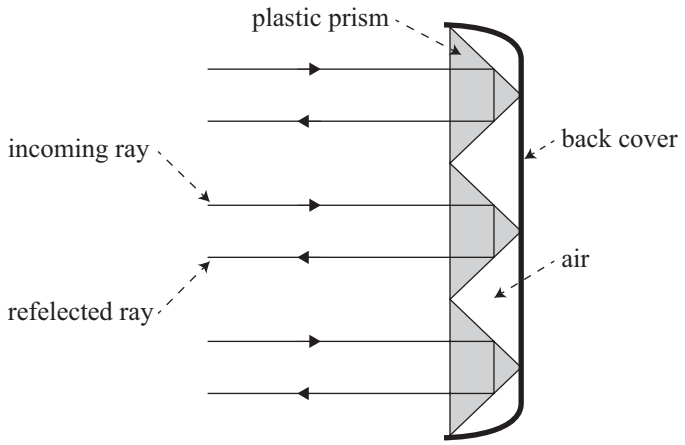
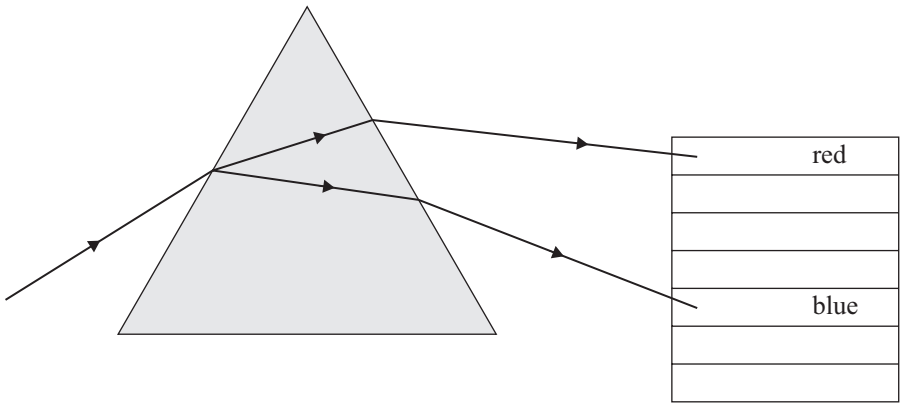
(c) Bicycle reflectors are made from plastic, and have prisms to reflect light back in the direction from which it came. The ray diagram below shows how a bicycle reflector reflects light.



Use physics ideas to explain why the prism in the bicycle reflector reflects light back in the direction from which it came, as shown in the diagram.

(d) When white light passes through a glass prism, it disperses to produce a spectrum of seven colours. The table next to the diagram shows the positions of red and blue light in the spectrum.



On the above diagram write down the relative positions of the **yellow, green** and **violet** colours.

(e) Explain why the blue light ray is refracted more than the red, when entering the glass.

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QUESTION TWO: REFLECTION

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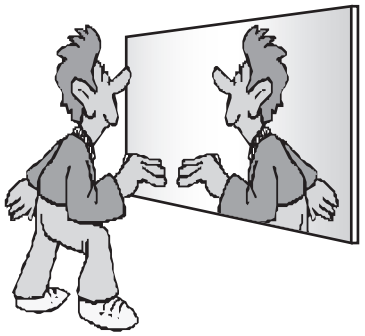
A man sees his image formed in a flat mirror. One of the properties of the image produced by a flat mirror is lateral inversion.



(a) (i) Describe TWO other **properties** of the image produced by a flat mirror.

(1) _____

_____

(2) _____

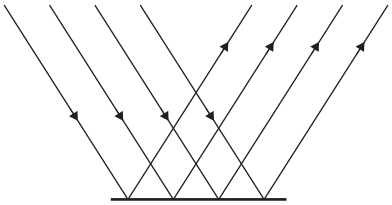
_____

(ii) The man above holds the card shown in front of the mirror.

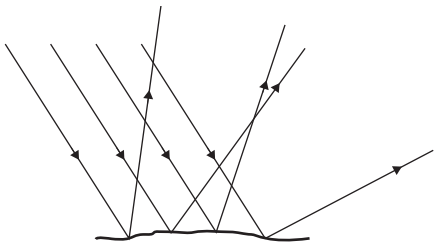
Write the word as he sees it in the mirror.

_____

(b)



Surface A



Surface B

The diagrams show similar sets of parallel rays of light reflecting off two surfaces made from the same material.

(i) Describe how the two reflections are different.

_____

_____

(ii) Explain why the same set of parallel rays reflect differently from the surfaces A and B.

_____

_____

_____

_____

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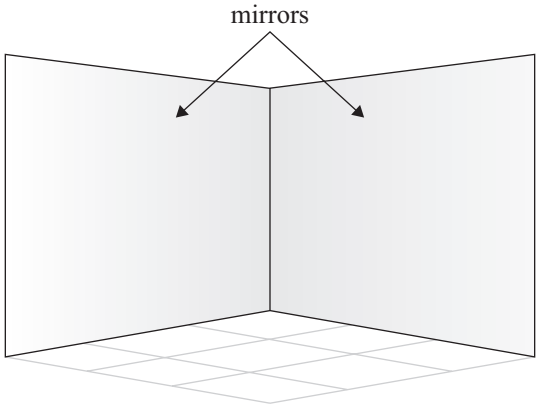
(c) Two adjoining walls of a small bathroom are lined with mirrors, as shown in the diagram below.

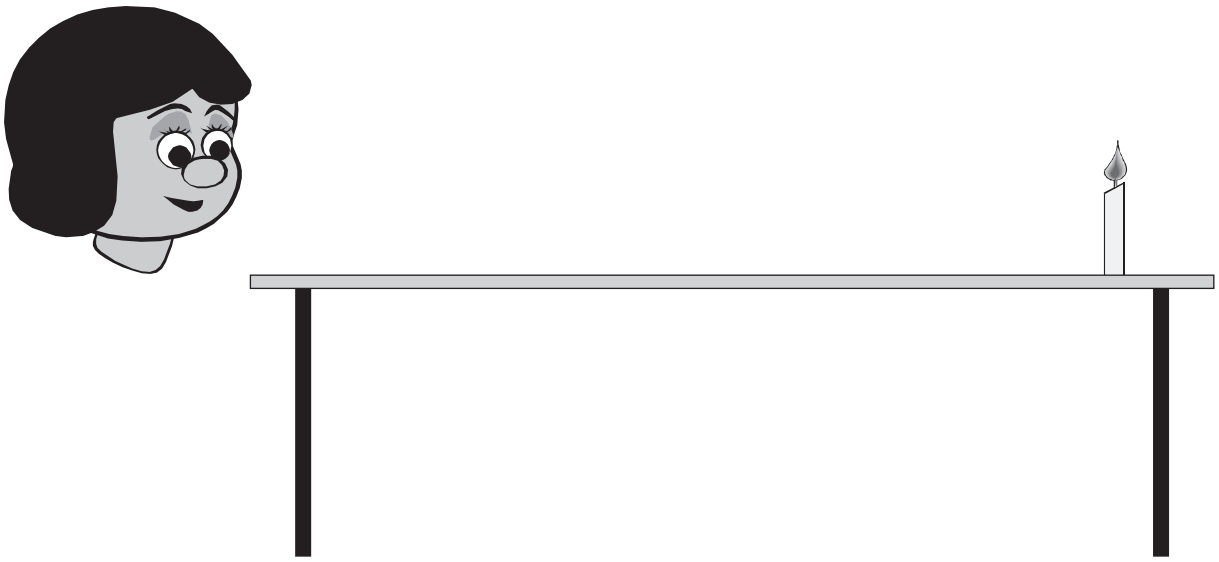


Explain how the mirror walls make the room appear larger than it really is.

(d) A girl is sitting at one end of a glass-topped table. A burning candle is placed at the opposite end. She sees the light from the candle reflected by the glass table top.

Draw a ray diagram to show how the girl sees the image of the candle produced by the glass top of the table.

On your diagram show the **size,** the correct **position**, and the **orientation** of the image, as seen by the girl.



QUESTION THREE: WAVE MOTION

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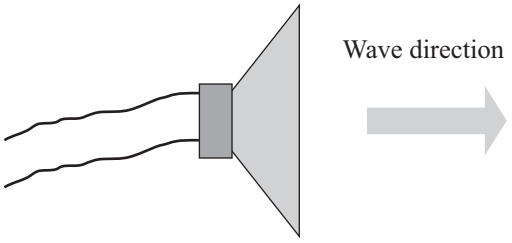
A speaker cone is vibrating at a constant frequency, and this causes compressions and rarefactions in air.



(a) Describe what is meant by the terms **compression** and **rarefaction**.

Compression: _____

_____

_____

Rarefaction: _____

_____

_____

(b) The sound wave from the speaker has a frequency of 550 Hz, and it travels in air at a speed of 330 m s^{-1}.

Calculate the distance from the centre of a compression to the centre of the nearest rarefaction.

_____

_____

_____

_____

_____

Distance _____

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(c) The frequency of the speaker's vibration now increases.

State how this affects the distance from the centre of a compression to the centre of the nearest rarefaction.

Explain your answer.

(d) The speed of sound in air is 330 m s^{-1}. The wavelength of the waves produced by the vibration of the speaker cone is now 3.7 m.

Calculate the period of the sound waves.

Period _____

QUESTION FOUR: WATER WAVES

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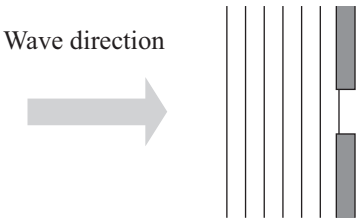
The diagram below shows water waves approaching a gap in a sea wall.



(a) Give the scientific name that describes what happens when the waves pass through the gap.

(b) Complete the above diagram to show the shape of THREE waves that have passed through the gap.

(c) Describe how the **wavelength** and the **shape** of the wave pattern changes if the gap width is reduced to **half** of its original length.

You may sketch a diagram to aid your explanation.

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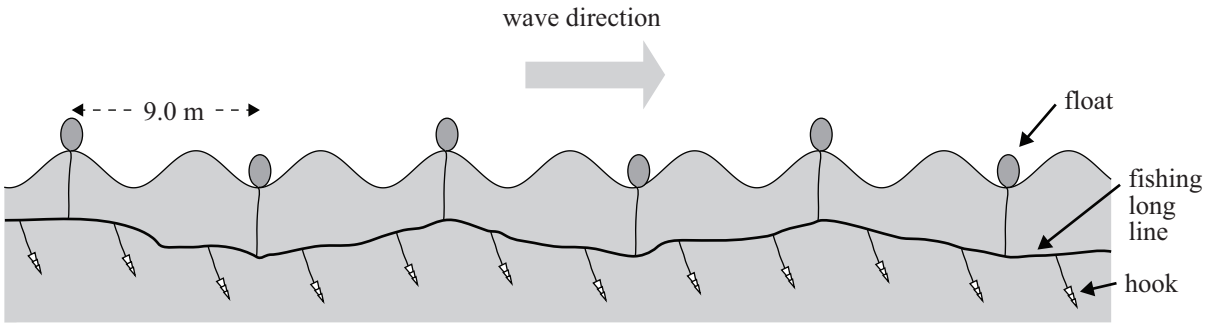
(d) A fishing long line has many hooks attached to it. The line is supported by ropes attached to floats, as shown in the diagram.



The floats are spaced 9.0 m apart in a straight line. Waves from the sea travel past the floats; it takes 1.0 minute for a crest to travel from the first float to the last float. The wavelength of the wave is 6.0 m.

Calculate the frequency of the wave.

Frequency _____

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

QUESTION NUMBER

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