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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, 2012

90938 Demonstrate understanding of aspects of wave behaviour

2.00 pm Monday 26 November 2012
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 2–10 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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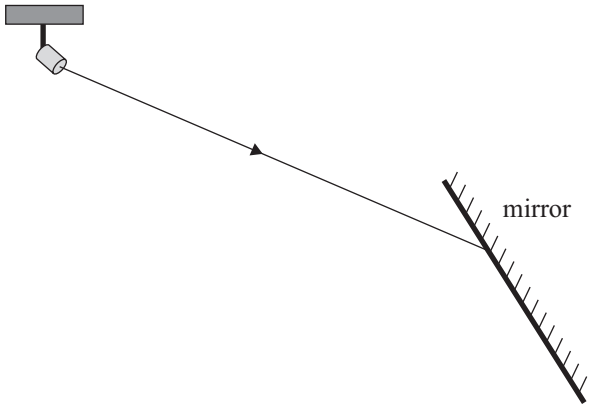
QUESTION ONE: SHOPPING

A display mirror is mounted on a sloped surface in a shop. Light from a lamp in the ceiling is incident on the mirror, as shown in the diagram below.



(a) On the above diagram:

(i) Draw a normal at the point of incidence, and then draw an arrow to show the approximate path of the reflected ray.

(ii) Label the angle of incidence and the angle of reflection.

(b) How does the angle between the incident ray and the mirror compare with the angle between the reflected ray and the mirror?

Give a reason for your answer.

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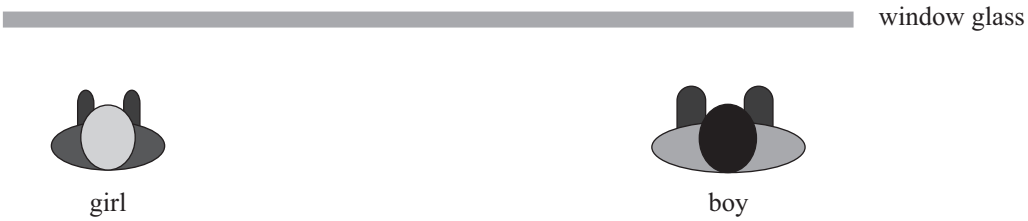
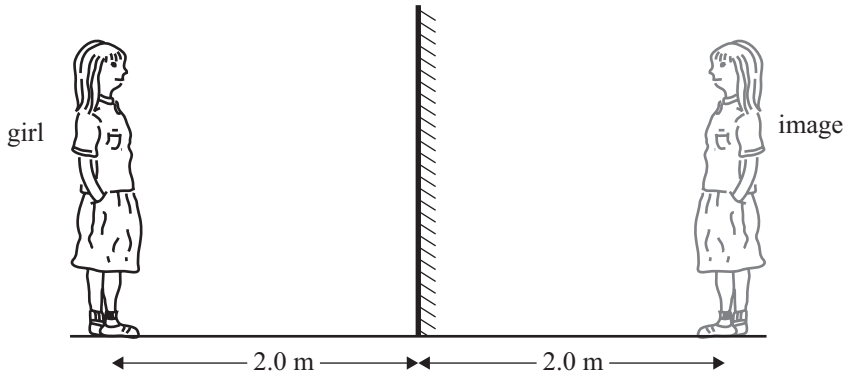
(c) A girl and a boy are looking into the shop through a large glass window, as shown below. They both see their own image in the window-glass.



(i) On the above diagram, use the letter 'X' to mark the position of the **girl's** image as seen by the **boy**.

(ii) On the above diagram, draw TWO rays to show why the boy sees the girl's image in the position you have drawn.

(d) A girl is checking out her new shirt in front of a mirror. She stands 2.0 m from the mirror, as shown in the diagram below.



(i) On the above diagram, draw single rays to show how she sees the image of:

- her eyes in the mirror
- her feet in the mirror.

(ii) Use your drawing to explain why the girl only needs approximately half the mirror to see her image.

QUESTION TWO: WAVE MOTION

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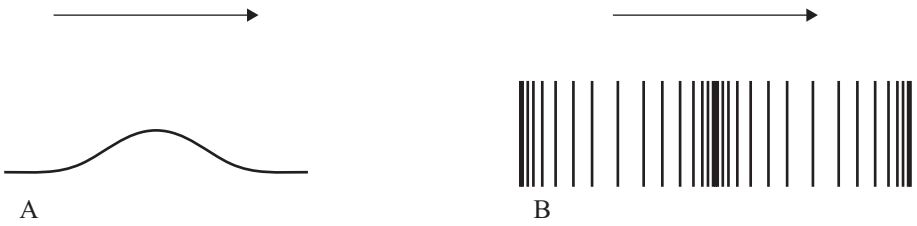
(a) The diagram shows two different sorts of wave motions carrying energy in the direction shown.



A B

(i) What type of wave is represented by A?

(ii) What type of wave is represented by B?

(b) Which of the above waves can be used for communication in space.

Explain your answer.

(c) A speaker produces a sound of a certain frequency and amplitude. The frequency is then **halved** and the amplitude is **doubled**.

Explain how these changes affect the **pitch** and **loudness** of the sound produced.

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(d) A cable echo-meter is an electronic device used by technicians to locate faults in underground telephone cables. The cable echo-meter sends a pulse through a cable. When the pulse reaches a damaged or broken section of the cable it is reflected back to the cable echo-meter. When the cable echo-meter receives the echo, it displays the time of travel and the distance of the fault from the test terminal.

A cable is being tested by a cable echo-meter as shown in the diagram below.

(i) Describe the meaning of the term '**pulse**'.

(ii) The meter sends a pulse through a suspected faulty cable, and it receives an echo 2.3×10^{-6} s later. The speed of the pulse in the cable is 0.60 times the speed of light in air. The speed of the light in air is 3.0×10^{8} m s^{-1}.

Calculate how far the fault is from the test terminal.

Write down your answer in metres.

Distance _____ m

QUESTION THREE: WATER WAVES

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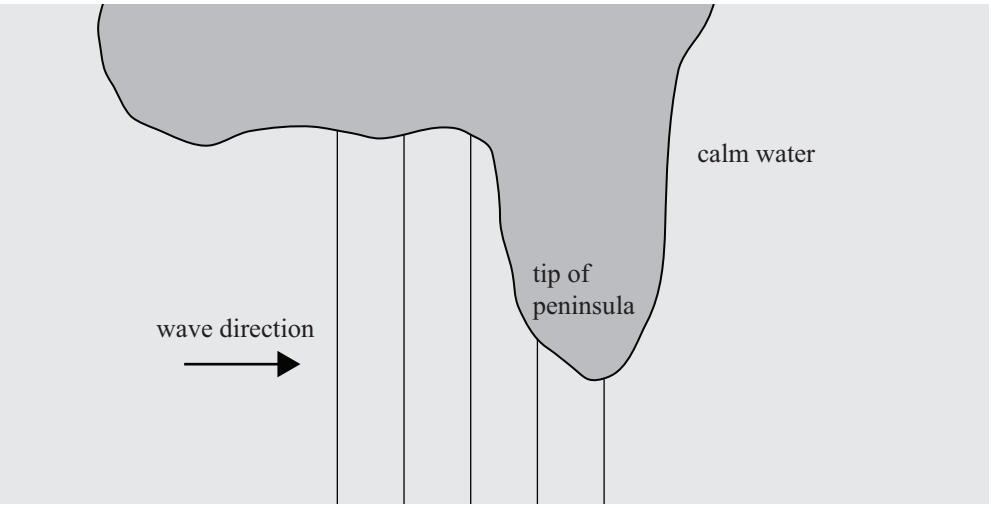
(a) (i) Describe the meaning of the term 'diffraction'.

(ii) State whether diffraction is affected by wavelength of the waves.

The diagram shows waves in the sea approaching the tip of a peninsula. The lines represent the crests of the waves. The water on the right hand side of the peninsula is calm.



(b) Complete the diagram to show the pattern produced by the waves as they pass the tip of the peninsula.

(c) The distance between two adjacent crests is 0.85 m. Two complete waves pass the tip of the peninsula every 3.0 s.

Calculate the speed of the waves.

Speed _____

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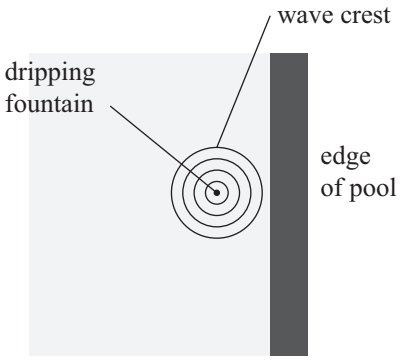
(d) The diagram below represents waves generated in a pool by steady dripping of water from a fountain at the centre of the pool. Each drip generates a wave which then travels towards the edge of the pool.



The speed of the waves in the pool is 0.64 m s^{-1}. There are exactly 3 complete waves in a 1.2 m distance.

(i) State the physics term that describes the time between the drips.

(ii) Calculate the time between the drips.

Time _____

QUESTION FOUR: BENDING LIGHT

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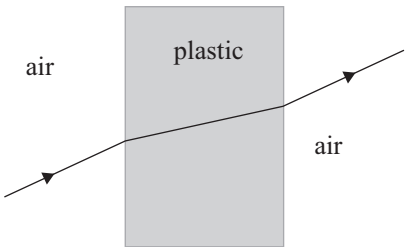
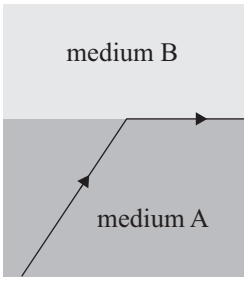
The diagram below shows a ray of light travelling through a piece of plastic placed in air.



(a) Describe how the speed of the light changes as it enters and then leaves the piece of plastic.

(b) The diagram below shows the path a ray of light takes as it travels from medium A towards medium B.



(i) What can you say about the optical densities of the two media if the ray takes the path shown in the diagram.

(ii) State one other condition for the ray to take the path as shown in the diagram.

The diagram below shows a ray of light striking side A of a glass prism. The ray of light enters the prism and strikes the side B at an angle of incidence greater than the critical angle of glass in air . It then leaves the prism through the side C.

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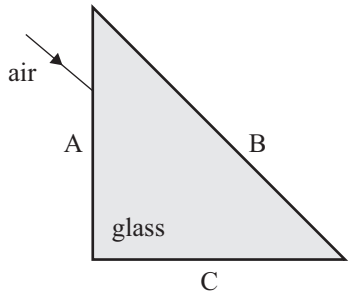
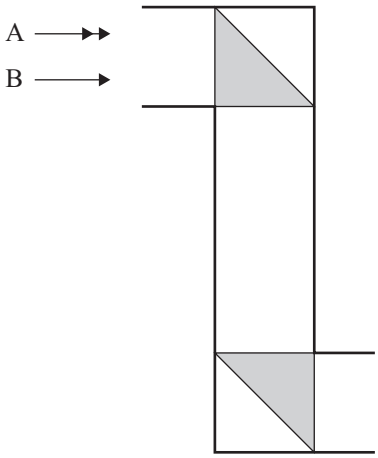


(c) On the diagram above, complete the path of the ray through the prism, and show how it leaves the side C.

(d) The diagram below shows two rays, A and B, from a distant object approaching a periscope. The periscope contains two glass prisms, as shown in the diagram.



(i) Complete the path of the two rays through the periscope to show how they exit the bottom prism.

(ii) Will the image of the object formed by the periscope be upright or upside down?

Explain your answer.

(iii) Prisms can disperse white light into different colours.

Explain why the prisms in the periscope do not disperse light.

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

QUESTION NUMBER

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