

WWW.FIXURSCORE.COM

Light Waves

Problems by Topic (2012-2016)

Edexcel International GCSE

4 A student is investigating refraction of light.

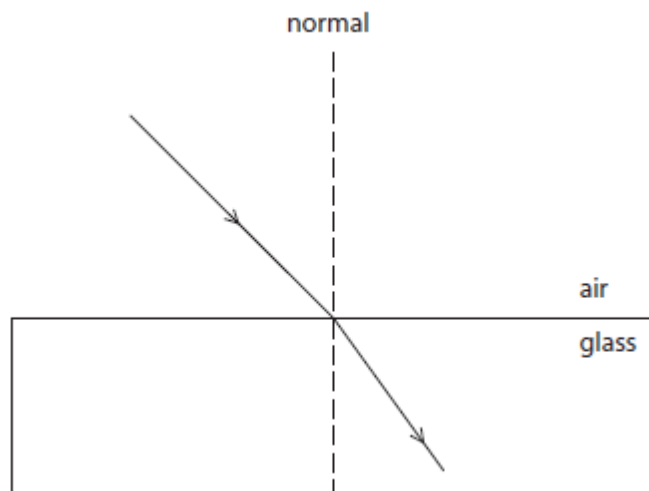
(a) What is **refraction**?

(1)

(b) The diagram shows a ray of light travelling from air to glass.

Add labels to show the angle of incidence, i , and the angle of refraction, r .

(2)

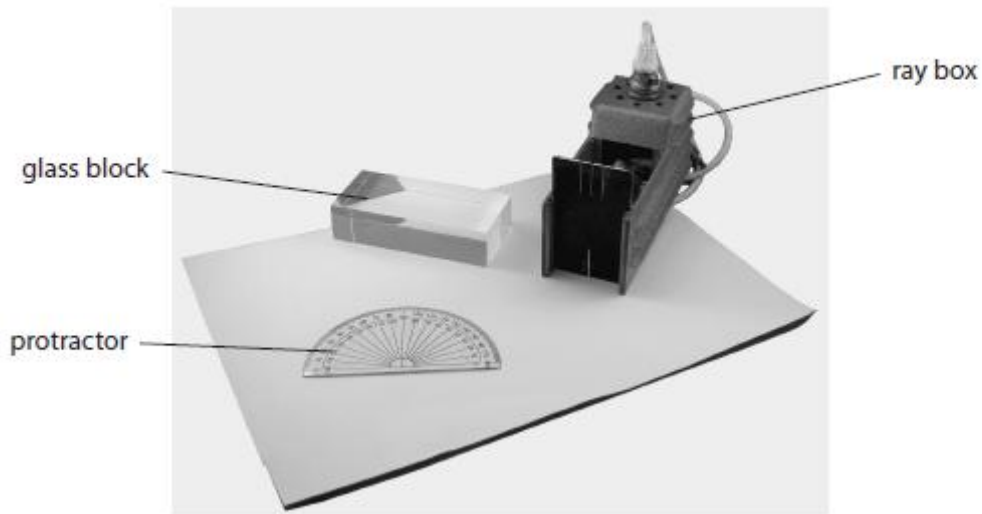


(c) The student wants to find the refractive index of the glass.

(i) State the equation linking refractive index, angle of incidence and angle of refraction.

(1)

(ii) The photograph shows the apparatus the student has available.



Describe how the student should carry out the experiment.

You should include:

- what the student should measure
- how the measurements should be made
- how the student should use a graph to find the refractive index.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

January 2012

2 This question is about the reflection of light.

(a) Light reflects from a plane mirror.

(i) Use words from the box to complete the sentence below.

(1)

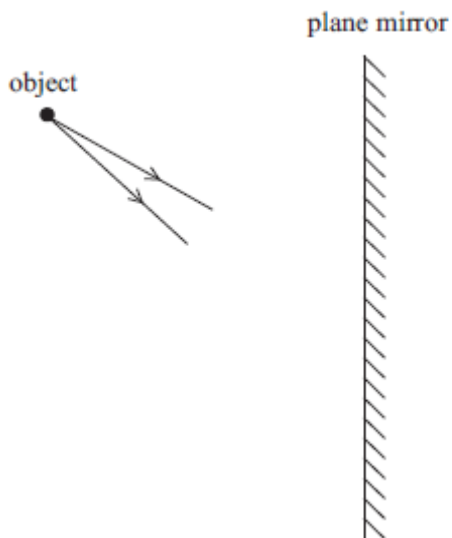
less than	equal to	greater than
-----------	----------	--------------

When light reflects from the surface of a plane mirror, the angle of incidence is the angle of reflection.

(ii) The diagram shows two rays of light coming from an object.

Continue the two rays and add further lines to the diagram to show how an image is formed by a plane mirror.

(2)



(iii) The image in a plane mirror is a **virtual image**.

How can you tell this from your diagram?

(1)

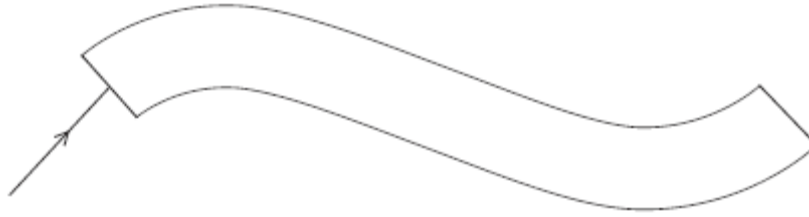
.....

.....

(b) Light can also reflect along optical fibres by total internal reflection.

- (i) Complete the diagram to show the path of the ray of light as it enters and passes through the optical fibre.

(2)



- (ii) State **two** conditions required for total internal reflection to happen.

(2)

1

2

- (iii) Telephone signals can be sent along optical fibres using light. In earlier systems the signals were sent using electric currents in copper wires.

Suggest **one** advantage of sending signals using optical fibres.

(1)

.....

.....

(Total for Question 2 = 9 marks)

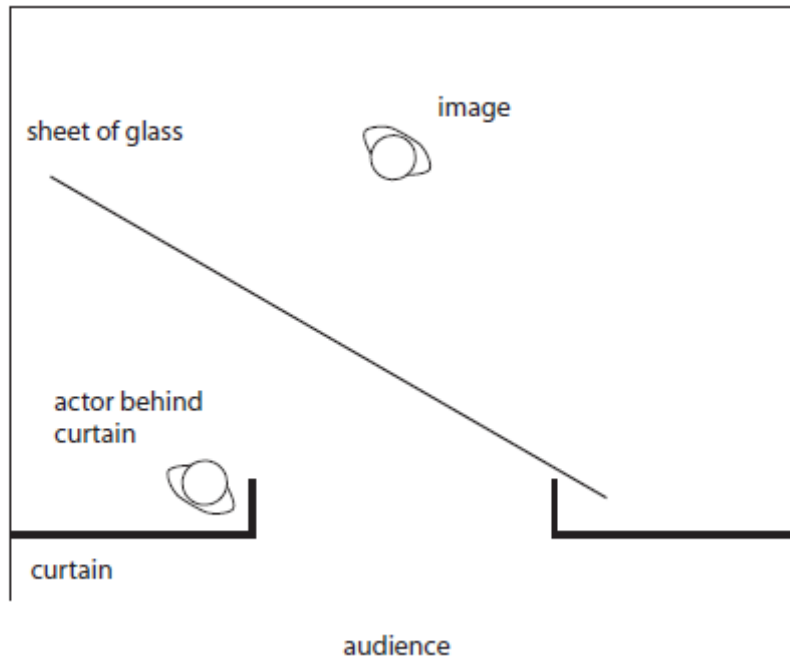
January 2013

2 Pepper's Ghost is a theatre effect used to make it appear that there is an image on stage.

The diagram shows a theatre viewed from above.

A sheet of glass is placed on the stage. A brightly lit actor stands behind a curtain at the side of the stage.

The audience sees the reflection of this actor in the glass.



(a) Add a ray diagram to show how light from the actor appears to come from the image.

(3)

(b) The image formed by the glass is a virtual image.

State what is meant by the term **virtual image**.

(1)

(c) Light travels as a transverse wave.

Some waves travel as longitudinal waves.

(i) Give an example of a wave that travels as a longitudinal wave.

(1)

(ii) Describe the difference between transverse waves and longitudinal waves.

You may draw diagrams to help your answer.

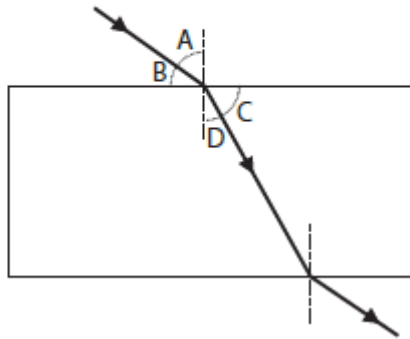
(3)

(Total for Question 2 = 8 marks)

January 2014

11 A student plans to measure the refractive index of glass.

She traces a ray of light through a glass block as shown in the diagram.



(a) Which letter represents the angle of refraction?

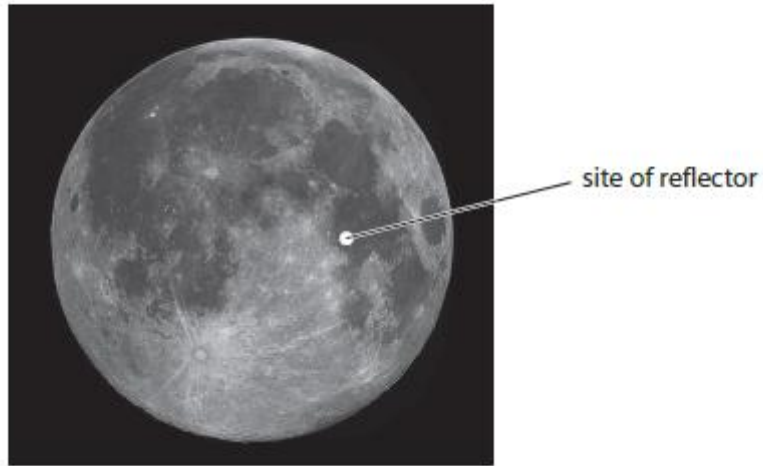
(1)

- A
- B
- C
- D

(b) Explain how the student can use the glass block to find an accurate value for the refractive index of glass.

(4)

15 In 1969, astronauts left a reflector on the surface of the Moon.



Author: Gregory H. Revera

The reflector consists of mirrors at 90° to each other.

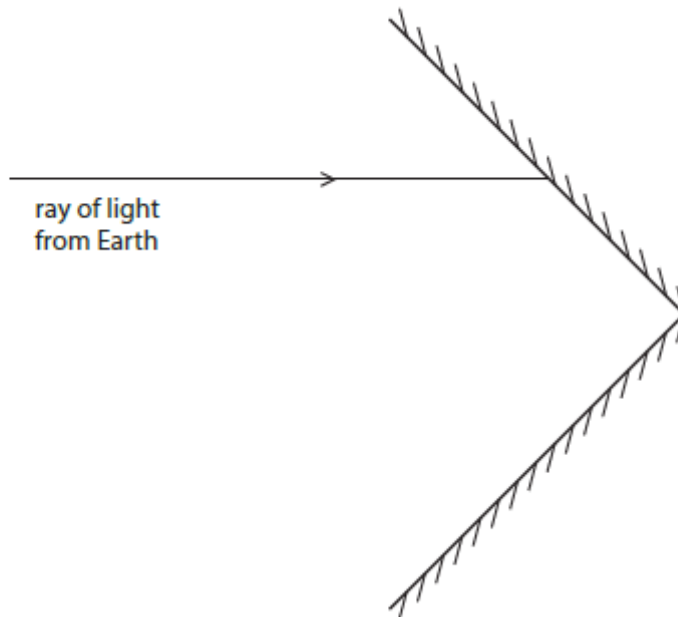
Scientists on Earth aim light from a laser at the reflector.

This light reflects back to them.

(a) The diagram shows two mirrors in the reflector.

Complete the diagram to show the path of the ray of light.

(2)



(b) The speed of light in a vacuum is 300 000 km/s.

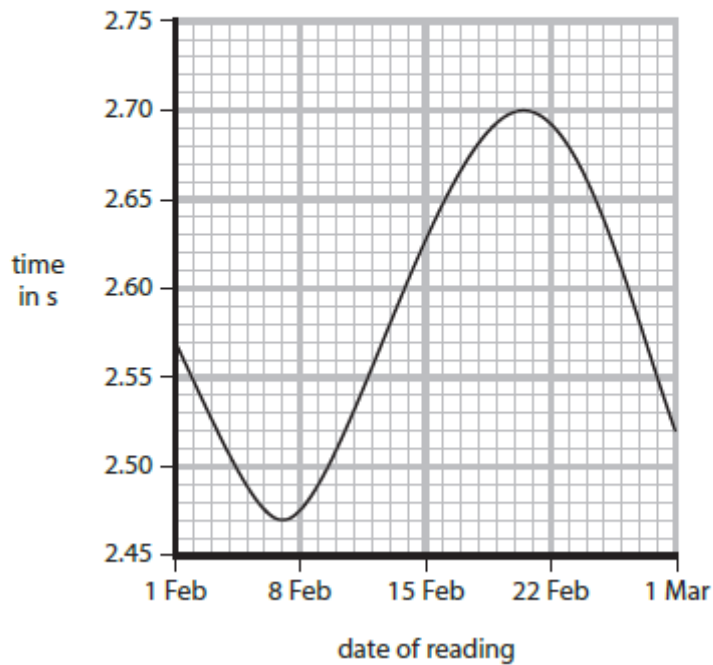
The average time for a ray of light to travel to the Moon and back is about 2.6 s.

Show that the Moon is about 400 000 km from the Earth.

(3)

(c) Scientists measure the time for the light to travel to the Moon and back very accurately, but the time is different every day.

The graph shows how these times change over the period of one month.



(i) Suggest what can be deduced about the orbit of the Moon from the information in the graph.

(3)

(ii) The scientists also discovered that the average time for light to travel to the Moon and back increases gradually every year.

What further information does this give about the orbit of the Moon?

(1)

(Total for Question 15 = 9 marks)

January 2015

7 A student uses a semicircular glass block to investigate refraction in glass.

(a) List three other pieces of equipment that he needs for this investigation.

(3)

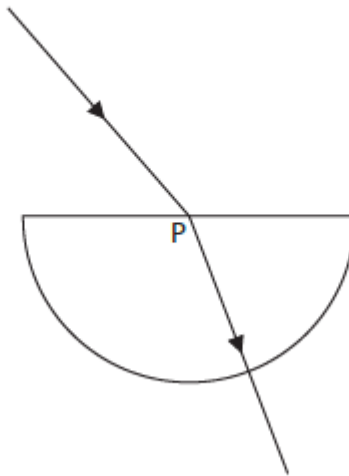
1.....

2.....

3.....

(b) He shines a ray of light into the block at point P, as shown.

P is the middle of the flat surface.



(i) On the diagram, draw the normal at P.

(1)

(ii) Measure the angle of incidence and the angle of refraction.

(2)

angle of incidence.....

angle of refraction

(iii) Explain why the ray of light changes direction at P.

(2)

.....

.....

.....

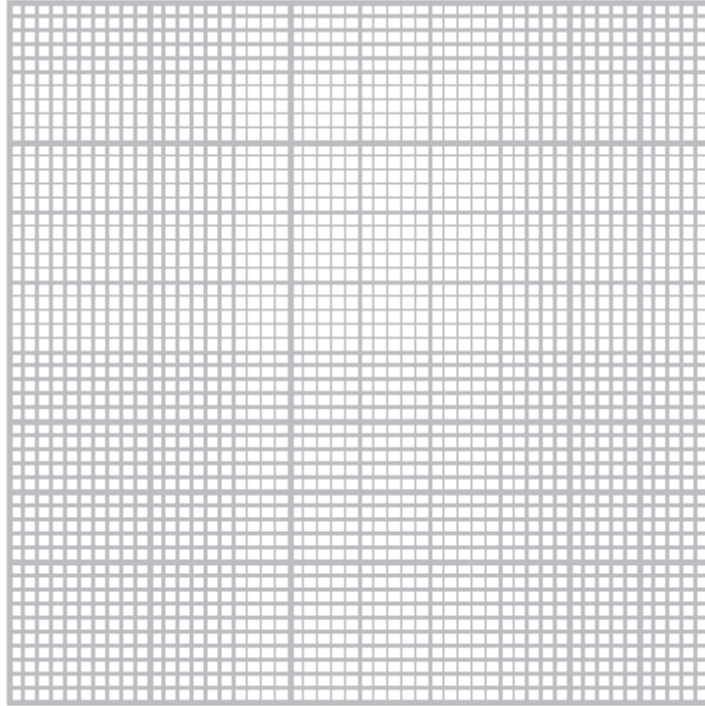
.....

(c) The student varies the angle of incidence and obtains this table of results.

Angle of Incidence i	Angle of refraction r	$\sin i$	$\sin r$
11°	7°	0.19	0.12
24°	15°	0.41	0.26
47°	28°	0.73	0.47
65°	36°	0.91	0.59
90°	40°	1.00	0.64

(i) Plot a graph of $\sin i$ against $\sin r$.

(4)



(ii) Draw the straight line of best fit. (1)

(iii) State the relationship between refractive index, angle of incidence and angle of refraction. (1)

(iv) Use your graph to find the refractive index of glass. (2)

refractive index =

January 2016

