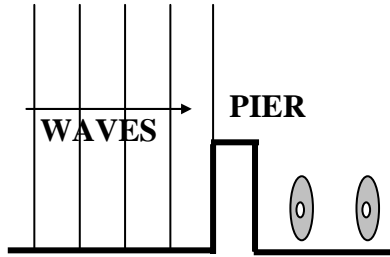


GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

High Demand Questions

QUESTIONSHEET 1

The diagram below shows a aerial view of two boats anchored behind a harbour wall. A set of identical sea waves move towards the boats from the left. Both boats are seemingly sheltered from the effects of the waves. However, the boat on the right is seen to bob up and down.



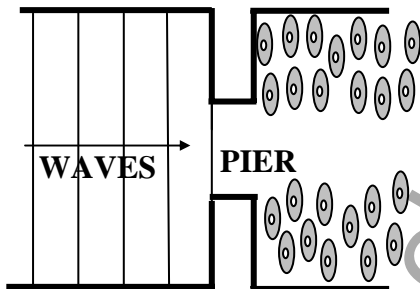
(a) (i) On the diagram draw the waves after they pass the harbour wall.

..... [2]

(ii) State the name of this process.

..... [1]

The diagram below shows a similar harbour. The harbour has two walls.



(b) On the diagram draw the waves after they pass the harbour wall.

..... [1]

(c) Sometimes the waves were seen to have a larger wavelength. Explain how this altered the number of boats that bobbed up and down.

..... [2]

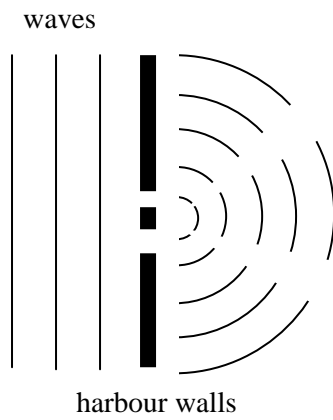
(d) Waves that had a short wavelength were seen to be the most common. To prevent damage the gap between the harbour walls was steadily reduced. Explain how this affected the number of bobbing boats.

..... [2]

(Continued...)

QUESTIONSHEET 1 CONTINUED

The diagram below shows yet another harbour wall system. There are two gaps where the waves can enter the harbour. Interference wave patterns can be seen in the harbour.



(e) Explain these interference patterns.

.....

.....

.....

..... [4]

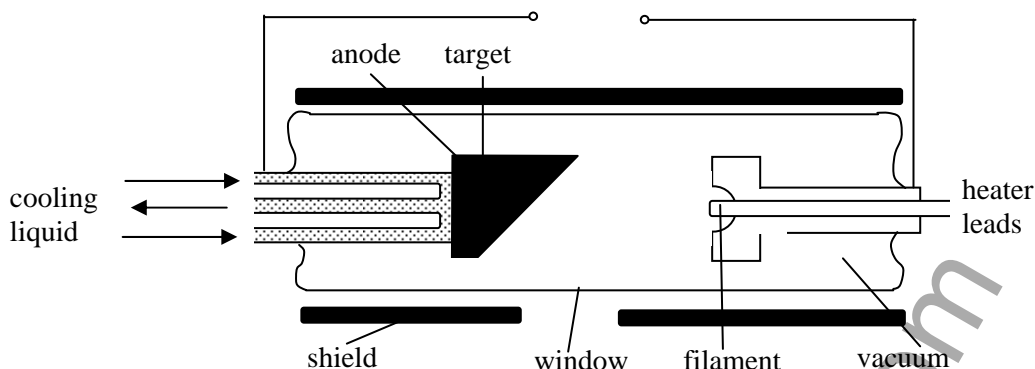
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High Demand Questions

QUESTIONSHEET 2

The diagram shows a picture of a machine that produces X-rays. There is a high potential difference between the target and the filament. The target is connected to the positive side and is called the anode.



(a) On the diagram draw three straight lines (representing X-rays) to show the direction of travel of the X-rays. [2]

(b) State the name given to the filament when it is connected to the negative side of the potential difference. [1]

.....

(c) State an approximate value for the potential difference across the X-ray tube. [1]

.....

(d) Describe what happens when the filament is heated in the X-ray tube. [2]

.....

.....

(e) Explain why a cooling system is needed near the anode. [2]

.....

.....

(f) Explain what would happen if there was a gas inside the tube instead of a vacuum. [2]

.....

.....

(g) The machine is almost entirely surrounded by a metal shield. Name this metal and explain why this metal must surround it. Also, explain why the person who operates the machine must wear a similar metal shield. [3]

.....

.....

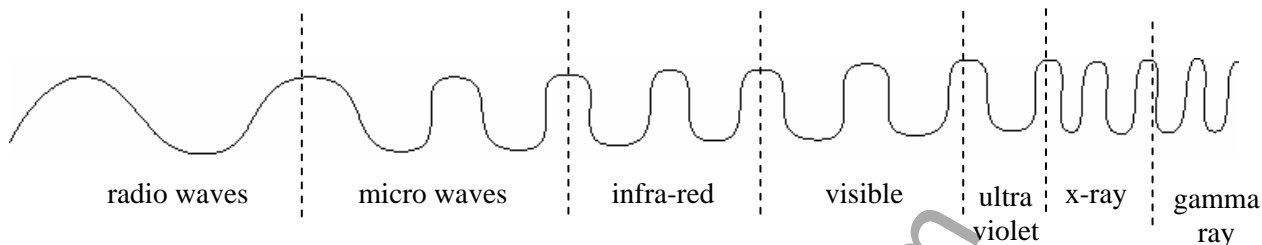
.....

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

High Demand Questions

QUESTIONSHEET 3

The various types of electromagnetic radiation form a continuous sequence known as the electromagnetic spectrum. The ‘light’ we can see is just one type of electromagnetic radiation. The diagram shows the relationship of the components of the electromagnetic spectrum.



(a) (i) State two properties shared by all types of electromagnetic radiation.

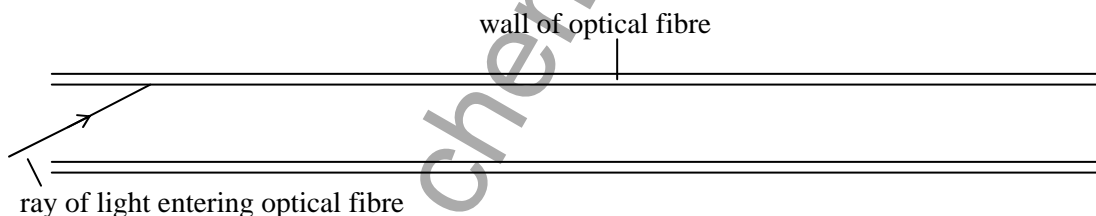
.....
 [2]

(ii) Describe two ways in which X rays are different to radio waves.

.....
 [2]

(b) Different types of electromagnetic radiation can be used in different ways. Visible light can be used to transmit information along optical fibres. These are very thin glass or plastic fibres.

(i) The diagram shows an optical fibre with a ray of light entering the fibre.

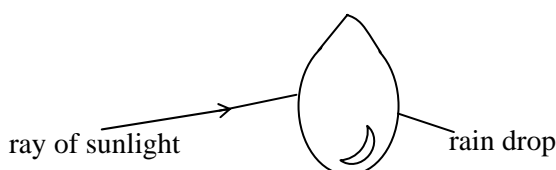


Complete the diagram to show how the light ray travels along the fibre. [2]

(ii) Why does light not pass through the wall of a glass optical fibre?

.....
 [2]

(c) A spectrum of visible light is often called a rainbow. Rainbows are formed naturally when the sun’s light passes through rain drops in the atmosphere. The diagram shows a ray of light from the sun entering a rain drop. Complete the diagram to show how a “rainbow” is formed.



[2]

TOTAL / 10

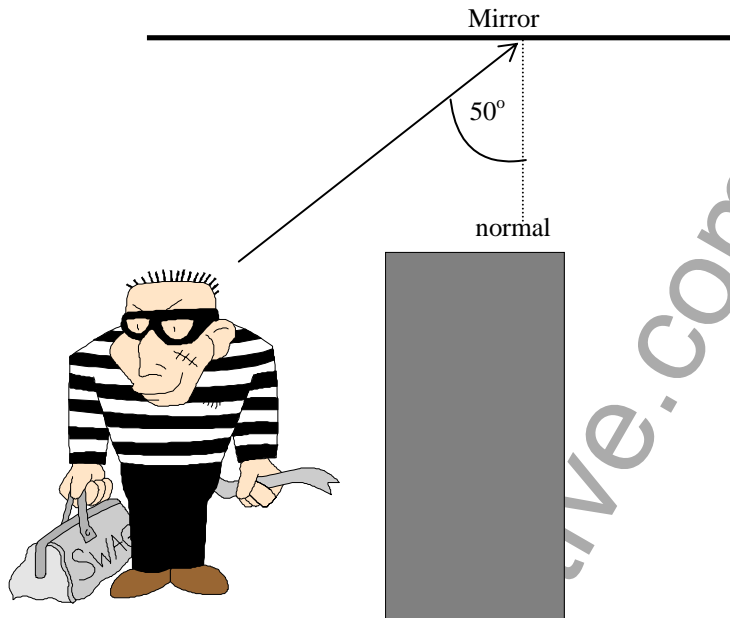
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High Demand Questions

QUESTIONSHEET 4

The diagram shows a burglar hiding behind a wall. Rays of light from his head strike a plane mirror at an angle of 50 degrees, measured to the normal line.

(a) When a person stands in the right place they can see the burglar.



- (i) On the diagram, continue the light ray after it hits the mirror. [2]
- (ii) On the diagram, draw a person in the right position so that they can see the burglar. [1]
- (iii) On the diagram, mark the angle of incidence and the angle of reflection [2]

(b) A plane mirror forms an image of an object. How does the size of the image compare to the size of the object? [1]

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High Demand Questions

QUESTIONSHEET 5

(a) Draw a diagram to explain why an object viewed through a pinhole camera is inverted.

[3]

(b) How can the image through a pinhole camera be made

(i) sharper

.....
..... [2]

(ii) larger

.....
..... [2]

(c) The hole in the pinhole camera is made larger. Draw a diagram to explain why the image is now blurred.

[3]

TOTAL / 10

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High Demand Questions

QUESTIONSHEET 6

A ray of light falls on a plane mirror at an angle of 40° to the mirror.

(a) (i) What is the angle of incidence of the light ray?

..... [2]

(ii) What is the angle of reflection of the ray?

..... [1]

(iii) Draw a labelled diagram of the rays and the mirror.

[2]

(b)(i) A girl stands 2 metres from a plane mirror.
Where will her image be?

.....
..... [2]

(ii) The girl walks away from the mirror at a speed of 2 m/s.
Describe accurately what will be seen in the mirror.

.....
..... [2]

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High Demand Questions

QUESTIONSHEET 7

(a) State **two** uses of microwaves.

.....
..... [2]

(b) Give the full names of the following waves and state a use for each one.

(i) UHF

.....
..... [2]

(ii) VHF

.....
..... [2]

(c) All electromagnetic waves travel at 300 000 000 m/s in a vacuum.

(i) The path taken by an electromagnetic wave from USA to Britain via a satellite is 90 000 km in length. Calculate the time for taken for the waves to cover the distance.

.....
.....
..... [3]

(ii) The sun is 165 000 000 km from the earth. How long does it take light from the sun to reach us?

.....
.....
..... [3]

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High Demand Questions

QUESTIONSHEET 8

Jude experimented with a convex lens. He placed an object at different distances from the front of the lens and measured how far away the image was formed.

Object distance /cm	120	60	40	30	25
Image distance /cm	40	30	60	24	100

Unfortunately, Jude has jumbled his results.

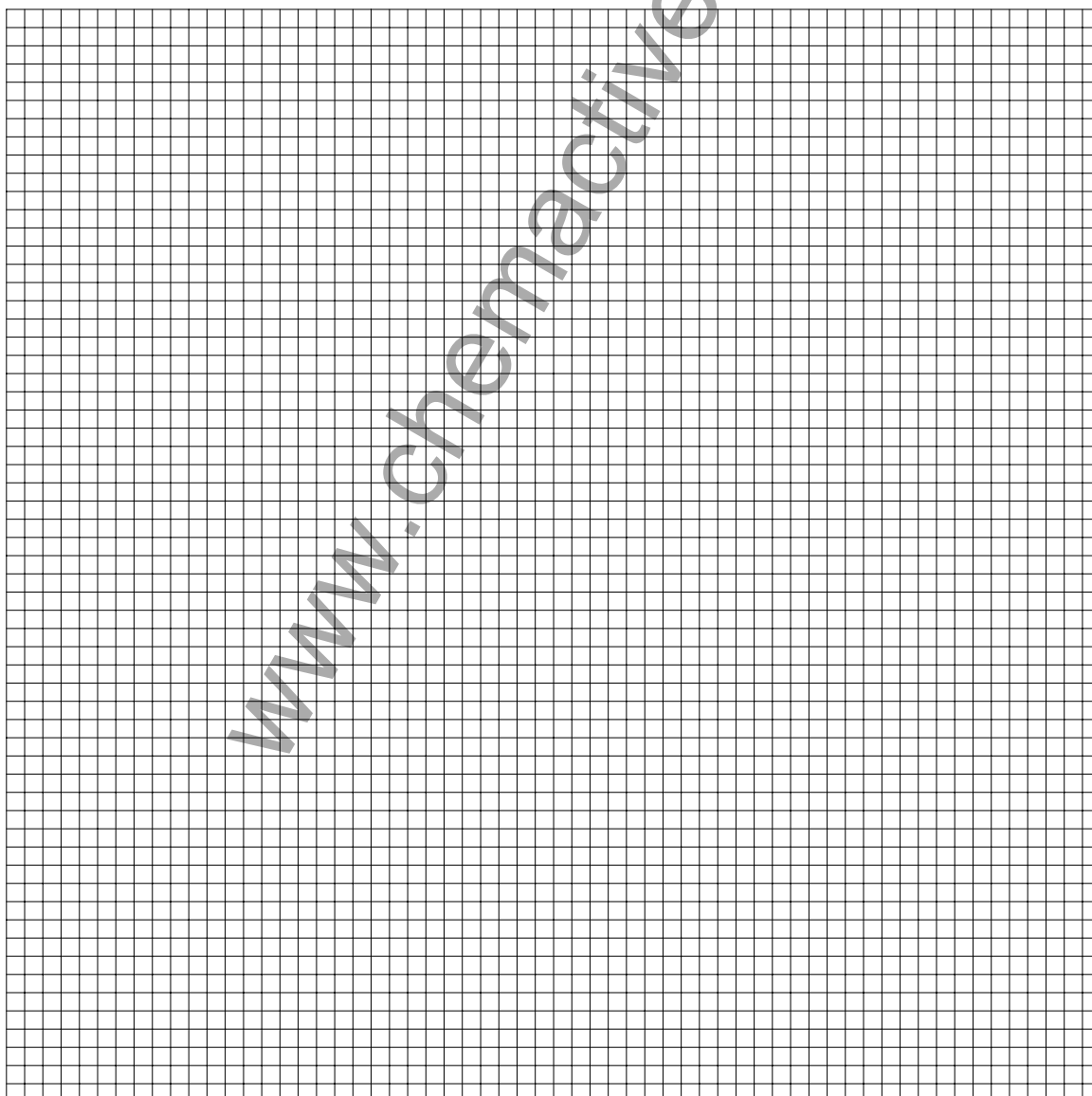
(a) Fill in the correct results in the table below

Object distance /cm	120	60	40	30	25
Image distance /cm					

[3]

(b)(i) Plot a graph of object distance against image distance.

[3]



(Continued...)

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QUESTIONSHEET 8 CONTINUED

(ii) If the object distance was 75 cm, what would be the image distance?

.....
..... [1]

(c) Which object distance would give the largest image?

..... [1]

(d) Calculate the focal length of Jude's lens.

.....
..... [2]

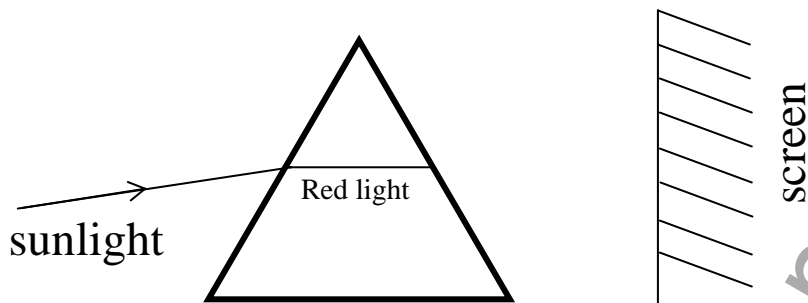
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GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 9

The diagram below shows a prism used to split light from the sun into parts of the electromagnetic spectrum including the colours of the spectrum. The red end of the spectrum can be seen in the prism. The other colours have not been drawn on the diagram.



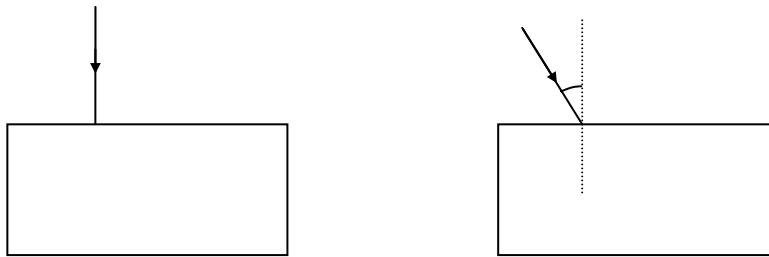
- (a) What is the name for this bending of light at a boundary?
..... [1]
- (b) Complete the diagram to show what happens to the violet part of the spectrum within the prism.
..... [1]
- (c) Continue both rays out of the prism so that they hit the screen.
.....
.....
..... [3]
- (d) Name the colour that will be found just below the red colour on the screen.
..... [1]
- (e) Name a type of electromagnetic radiation that can be found above the red colour on the screen.
..... [1]
- (f) Name a type of radiation that can be found below the violet colour on the screen.
..... [1]
- (g) Explain how a prism can split white light into the colours of the spectrum.
.....
.....
..... [3]

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 10

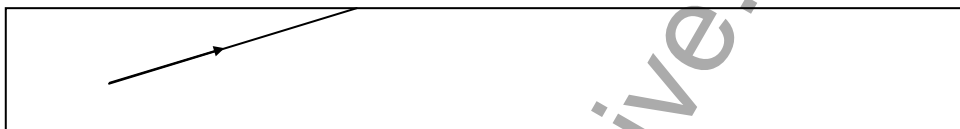
(a) The diagram shows a glass block. Two light rays are hitting the glass block at different angles.



On the diagram continue the rays until they hit the edge of the diagram.

[4]

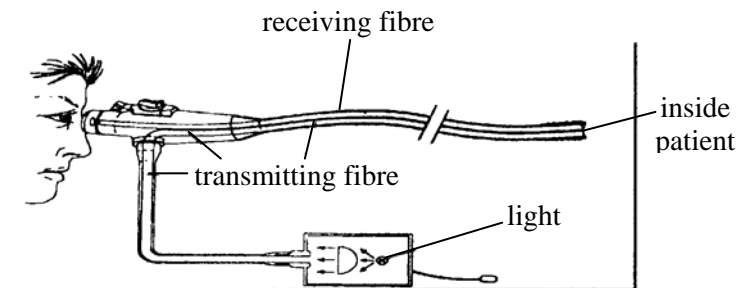
(b) The diagram shows a light ray hitting the the top edge of the glass block. The light ray is coming from inside the glass block. The critical angle for glass is 42°



Continue the ray of light until it hits the edge of the diagram.

[3]

(c) The diagram below shows an instrument used by doctors for seeing inside a patient.



Explain how it works.

.....

.....

..... [3]

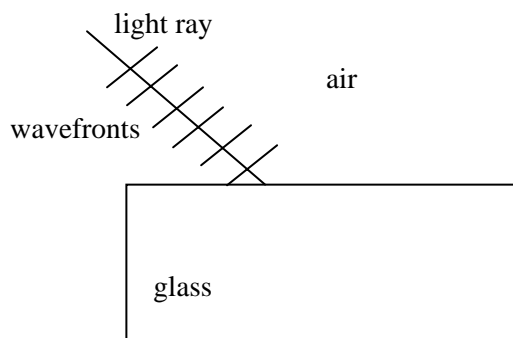
TOTAL / 10

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 11

(a) The diagram below shows a light ray and its associated wavefronts entering a glass block.



(i) State the angle between the wavefronts and the light ray.

..... [1]

(ii) On the diagram continue the light ray and wavefronts.

[4]

(b) Describe how the speed of the wave changes in the diagram that you have drawn.

.....
..... [2]

(c) State what causes the speed of the wave to change as it enters the glass block.

..... [1]

(d) Explain why the wavelength changes in the diagram.

.....
.....
..... [3]

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 12

(a) Complete the table below to show the colours seen when light is mixed.

Colours of light mixed	Colour seen
Red & green	
Red & blue	
Blue & green	

[3]

(b) What colour is produced when all three colours are mixed?

..... [1]

(c) (i) What is meant by complimentary colours?

..... [1]

(ii) Name three pairs of colours which are complimentary.

.....
.....
..... [3]

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GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 13

(a) Explain why a pencil dipped in water appears to bend.

.....
.....
..... [3]

(b)(i) The speed of light in air is 300 000 000 m/s and in water is 225 000 000 m/s.
Calculate the refractive index of water.

.....
.....
..... [3]

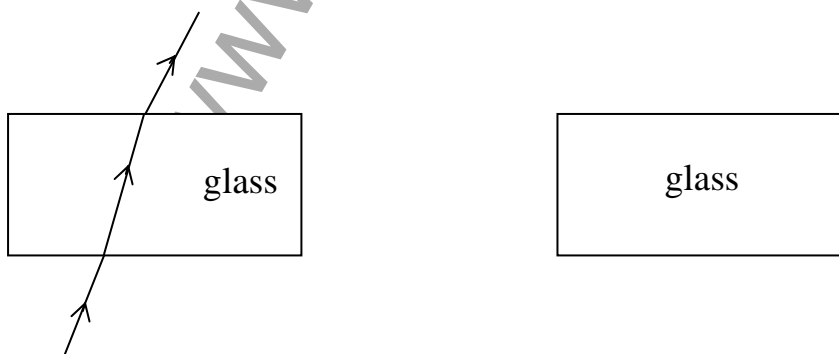
(ii) How can the refractive index be calculated from the angles of light with the two materials?

.....
..... [1]

(c)(i) What is meant by the critical angle of incidence?

..... [1]

(ii) The diagram below shows light refracting through a glass block.



On the second part of the diagram, draw a ray of light which enters the glass block at greater than the critical angle.

[1]

TOTAL / 9

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Medium Demand Questions

QUESTIONSHEET 14

(a) A slide in a projector is focussed on a screen. The projector is moved further away from the screen.

(i) List the **three** changes that occur in the image.

.....
.....
..... [3]

(ii) How should the lens in the projector be adjusted to re-focus the image?

..... [1]

(b)(i) What sort of lens is used in a magnifying glass?

..... [1]

(ii) What **two** things would happen to the image seen through a magnifying glass if the curvature of the lens was increased?

.....
..... [2]

(c) Why should a camera with an uncovered lens not be left on the parcel shelf of a car on a sunny day?

.....
..... [2]

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GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 15

(a) List **three** uses of concave mirrors.

.....
.....
..... [3]

(b) Convex mirrors are found at the top of the stairs on double-decker buses.
Why are convex mirrors used for this purpose?

.....
..... [2]

(c) (i) Draw a ray diagram to show how a periscope enables someone to see over the heads of people in a crowd.

[3]

(ii) What is the angle of incidence and reflection in the periscope?

[1]

(iii) What is often used in place of a mirror in a periscope?

[1]

TOTAL / 10

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Medium Demand Questions

QUESTIONSHEET 16

(a) Complete the two ray diagrams below showing a concave lens and convex lens.



[4]

(b) Images can be magnified or diminished by convex lenses.

$$\text{Magnification} = \frac{\text{height of image}}{\text{height of object}}$$

Explain what is meant by

(i) A magnification greater than one

..... [1]

(ii) a magnification less than one

..... [1]

(iii) a magnification equal to one

..... [1]

(c) A lens has a focal length of 5 cm. An object 4 cm high is placed 15cm from it.

Draw a scale diagram to find the position and size of the image.

[2]

Distance of image from lens [1]

Height of image [1]

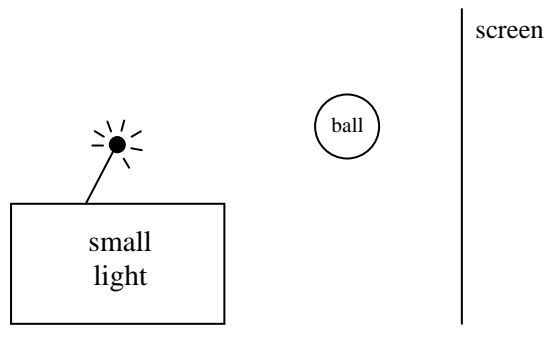
TOTAL / 11

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Low Demand Questions

QUESTIONSHEET 17

The diagram below shows a very small light, a ball and screen.

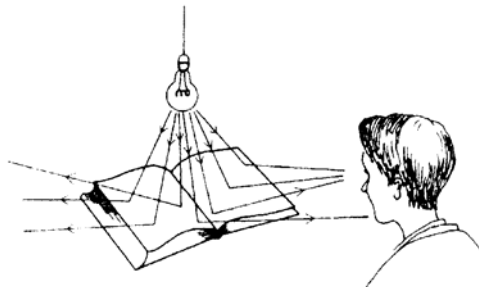


(a) On the diagram draw two rays to show how the shadow of the ball is formed on the screen. Label the part of the screen that is in shadow. [2]

(b) Describe two ways in which the shadow will be different if a larger light source is used.

 [2]

(c) The diagram below shows a boy reading a book. A light shines onto the book.



Use the idea of light rays to complete the following sentences: -

(i) “The boy can see the light bulb because _____.”
 “The boy can see the book because _____.” [2]

Explain why the boy cannot see an image of the light bulb in the book’s pages.

.....
 [2]

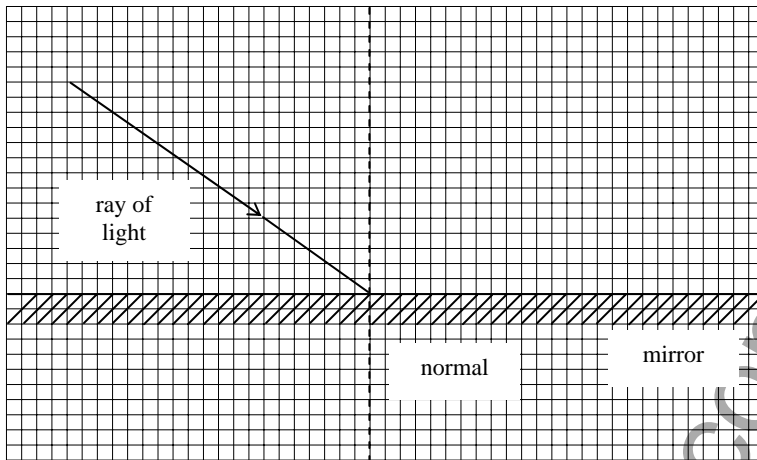
TOTAL / 8

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Low Demand Questions

QUESTIONSHEET 18

(a) The diagram below shows a plan view of a ray of light striking a plane mirror.



(i) On the diagram complete the ray of light after it is reflected off the mirror. [2]

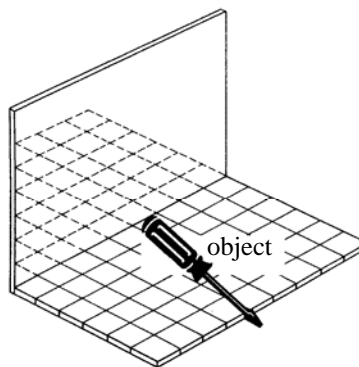
For the following sentences choose words from the list below.
Smaller, the same size, larger, real, virtual, inverted, the same way up.

“The size of the reflected image is _____ when compared to the object.” [1]

“The orientation of the reflected image is _____ when compared to the object.” [1]

“The type of image is said to be _____.” [1]

(b) The diagram below shows an object placed in front of a bathroom mirror.

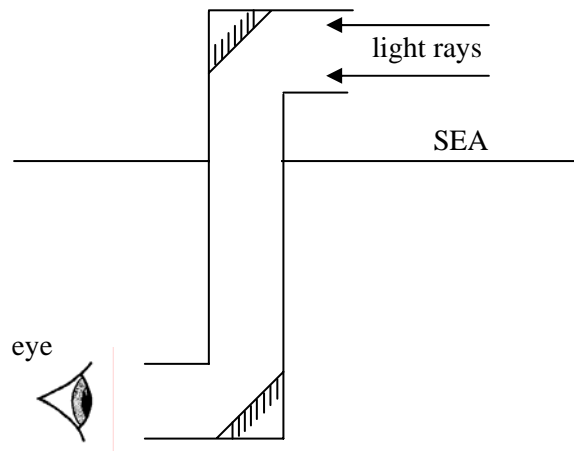


On the diagram draw what would be seen in the mirror. [2]

(Continued...)

QUESTIONSHEET 18 CONTINUED

(c) A periscope can be used to see above the water in a submarine. The diagram below shows the outline of the periscope and light rays entering the periscope from above the water level.



- (i) On the diagram continue the light rays until they enter the eye. [3]
- (ii) Describe another situation where a periscope may be useful. [1]

..... [1]

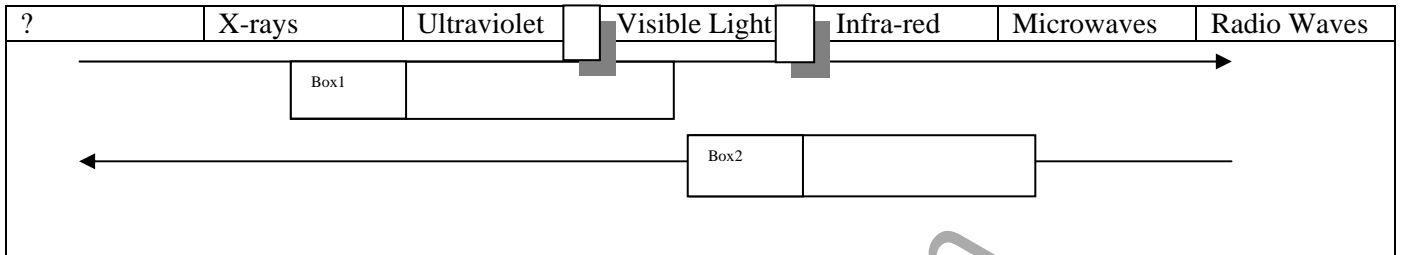
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GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Low Demand Questions

QUESTIONSHEET 19

The table below shows the different waves that make up the electromagnetic spectrum



(a) Choose from the following two sets of words to answer the following question.

Increasing wavelength, increasing frequency

Insert the correct label into box1

Insert the correct label into box2

[2]

(b) Visible light is made up of the colours of the spectrum.

Insert the correct colours in the two boxes at each end of the spectrum.

[2]

(c) State the main type of wave that is missing in the electromagnetic spectrum.

..... [1]

(d)(i) State one use for X –rays.

..... [1]

(ii) State one use for Ultraviolet waves.

..... [1]

(e) Explain why all three types of waves to the left of visible light are dangerous.

.....

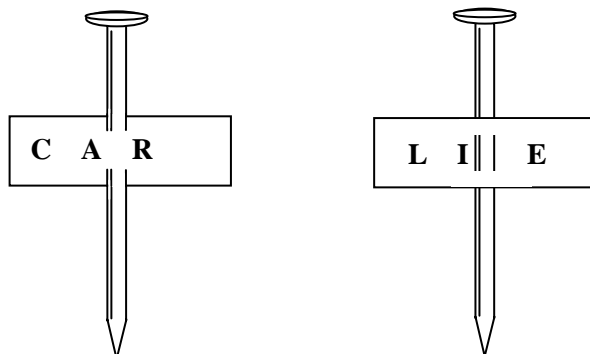
..... [2]

GCSE PHYSICS LIGHT & THE ELECTROMAGNETIC SPECTRUM

Low Demand Questions

QUESTIONSHEET 20

Claire printed every other letter of her name on one side of a piece of card.
On the other side she printed the other letter.
She inserted a knitting needle through the card and spun it whilst looking at it.



(a) Explain what Claire would see.

.....
..... [2]

(b) (i) Rabbits have their eyes at the sides of their heads.
Explain what this helps them to do.

.....
..... [2]

(ii) Owls have both eyes at the front of their heads.
Explain what this helps them to do.

.....
..... [2]

(c) (i) The first cinema films were projected on the screen at 8 frames a second.
Modern films use a speed of 24 frames per second.
What difference would you notice modern films were shown at the old speed?

..... [1]

(ii) Why do we see the frames as a moving picture?

..... [2]

(iii) How many frames would you have to draw to make a modern 5 minute cartoon?

.....
.....
..... [3]

TOTAL / 12