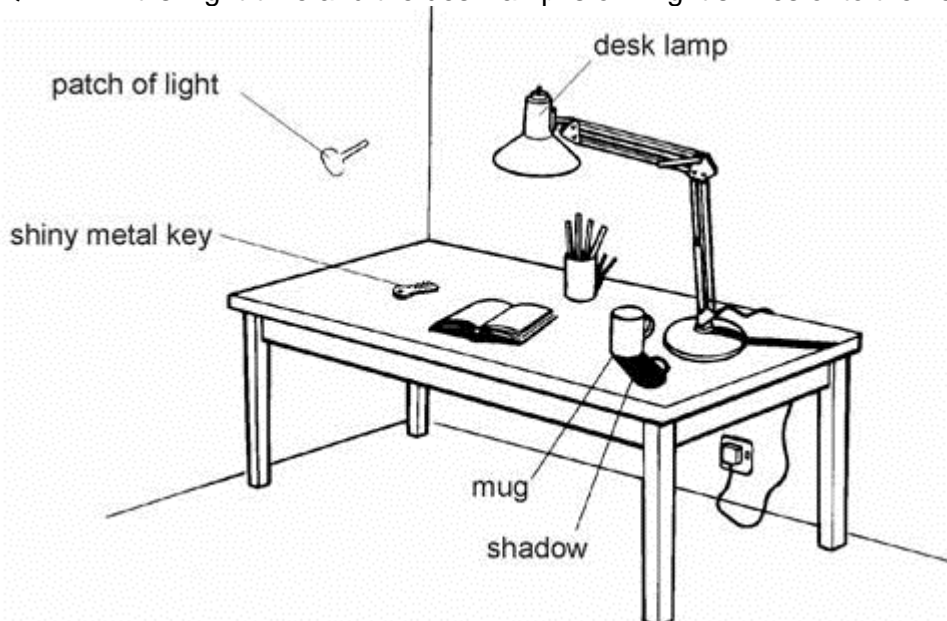


KS3 Phx 8K EQ 4Students 82marks 19Pgs

Q1. It is night-time and the desk lamp is on. Light shines onto the key.



(a) (i) Draw **one** ray of light on the diagram to show the light shining from the lamp onto the key. Use a ruler.

Put an arrow on the ray to show the direction of the light.

2 marks

(ii) There is a patch of light on the wall. This light has been reflected from the key. Draw a reflected ray of light on the diagram.

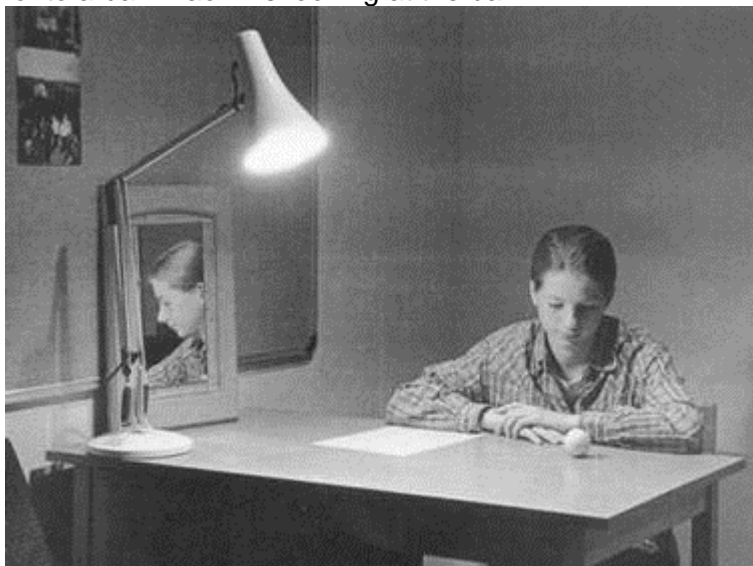
Use a ruler.

1 mark

(b) There is a dark shadow on the table beside the mug. Explain how this shadow is formed.

1 mark

Q10. Light shines onto a ball. Naomi is looking at the ball.



(a) Describe how light from the lamp lights up the ball and makes it visible to Naomi.

2 mark

(b) (i) Naomi uses different colours of light and different coloured balls. Complete the table to show the colours that the balls appear to Naomi.



colour of ball	colour of the light	the colour the ball appears to Naomi
white	red	
green	white	

2 marks

(ii) Why does a black object appear black in any light?

1 mark

(c) Choose from the following terms to complete the sentences below.

less than equal to greater than

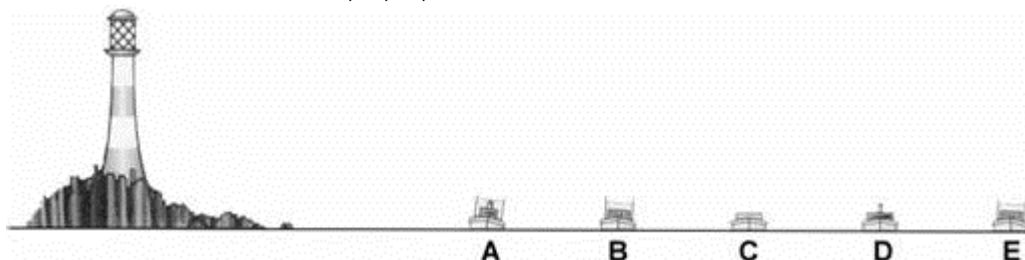
At a plane mirror, the angle of incidence is
the angle of reflection. The distance from the object to the mirror is
..... the apparent distance from the mirror to the image.

2 marks

(d) A beam of white light shines onto a sheet of white paper. An identical beam of light shines onto a mirror. The light is scattered from the paper and reflected from the mirror. Describe how scattering by paper and reflection by a mirror are **different** from each other.

2 mark

Q11. The diagram shows a lighthouse on a rock. It is night-time and there are boats at A, B, C, D and E.



(a) On which boat, A, B, C, D or E, would the light from the lighthouse be brightest?

1 mark

(b) Each boat makes a shadow on the water.

(i) Draw a cross (X) on the diagram to show where the shadow of boat A will be.

1 mark

(ii) Explain why the shadow forms there.

1 mark

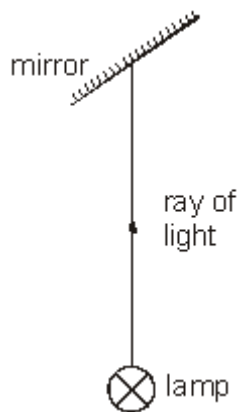
(c) The weather changes and the fog horn on the lighthouse makes a loud sound. On which boat, A, B, C, D or E, would the sound of the fog horn be quietest?

1 mark

(d) Inside the lighthouse there is a powerful lamp and some mirrors.

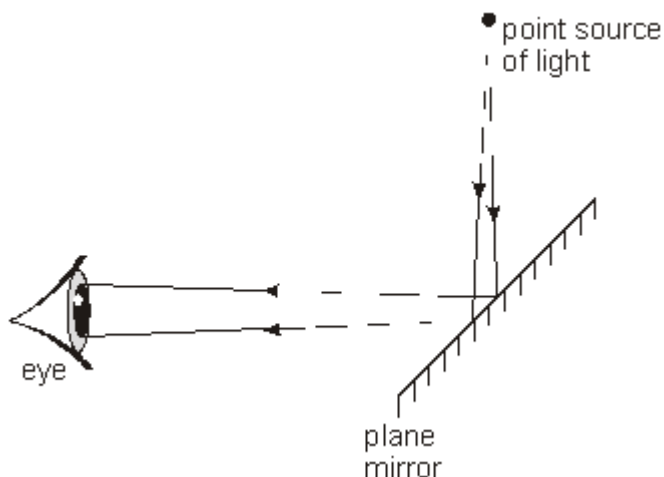
The diagram shows the lamp and a mirror. A ray of light from the lamp is shown. Carefully draw the ray which is reflected from the mirror. Use a ruler.





2 marks

Q12.



The diagram shows rays of light coming from a point source, reflecting in a plane mirror, and entering a person's eye. The person sees an image of the light source at a point behind the mirror.

(a) On the diagram, draw construction lines to find the position where the image appears. Label the image I.

1 mark

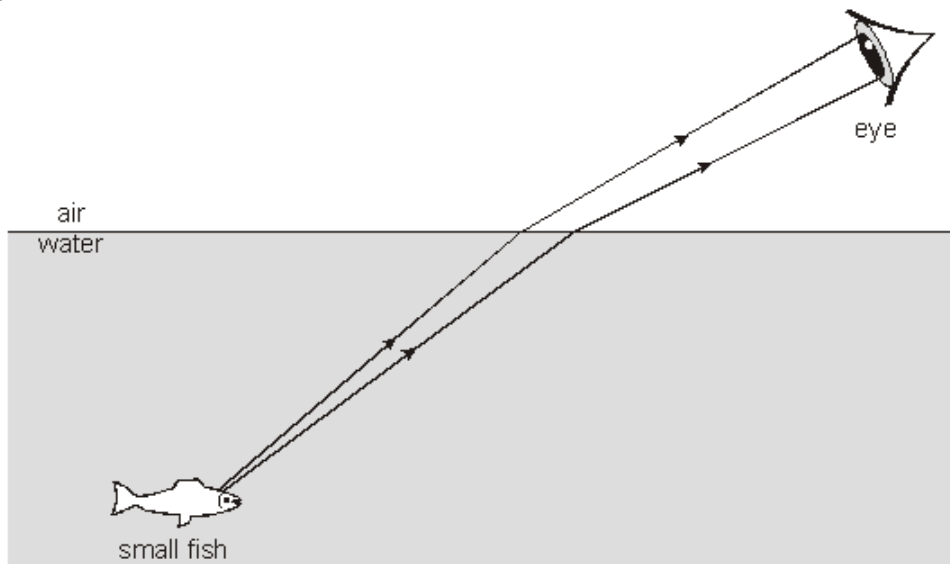
(b) (i) The person moves further away from the mirror. How does this affect the position of the image relative to the mirror?

1 mark

(ii) The point source of light is moved closer to the mirror, How does this affect the position of the image?

1 mark

The diagram shows two rays of light coming from a small fish in some water. The rays enter a person's eye.



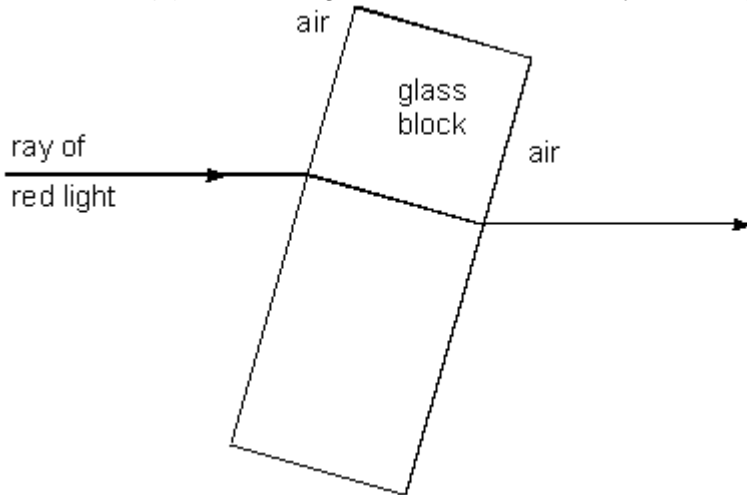
(c) The person sees an image of the fish under the water.
On the diagram, draw construction lines to find the position of the image.
Label the image I.

1 mark

(d) In some parts of the world, people catch fish using spears.
When they see the image of a fish in the water, where should they aim?

1 mark

Q13. (a) The diagram below shows a ray of red light entering a glass block.



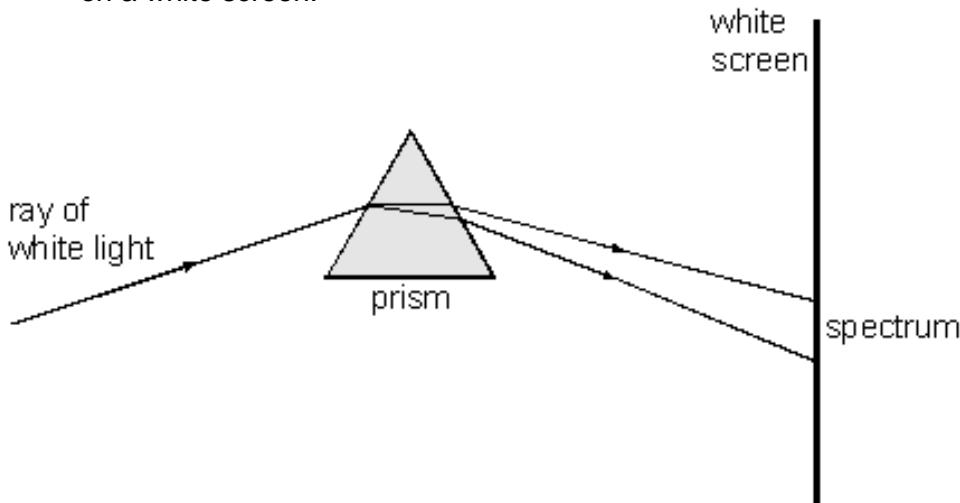
(i) Most of the light goes into the glass block, but some does not.
What happens to the light which does **not** go into the glass block?

1 mark

(ii) As the light goes into the glass block, it changes direction.
What is the name of this effect?

1 mark

(b) The diagram below shows white light passing through a prism and forming a spectrum on a white screen.



The spectrum contains light of all colours. Red is at one end of the spectrum. Write **blue**, **green** and **violet** below in the order of the spectrum.

Red

1 mark



(c) A pupil puts a green filter in the ray of white light. What happens to the spectrum on the screen?

Tick the correct box.

The whole spectrum turns green.

The green part of the spectrum disappears, but the other colours stay the same.

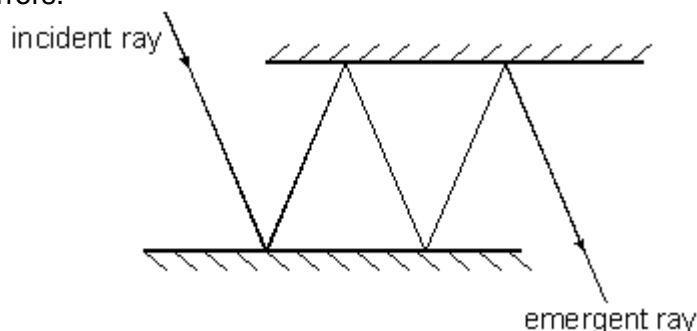
The green part of the spectrum stays the same, but the other colours disappear.

The whole spectrum disappears.

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

1 mark
Maximum 4 marks

Q14 (a) The diagram shows a ray of light reflecting several times between two parallel mirrors.



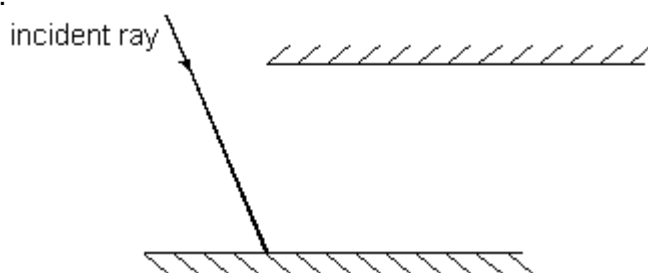
(i) What relationship is there between the angle of incidence for the **first** reflection and the angle of reflection for the **last** reflection?

1 mark

(ii) At each reflection there is a small loss in the intensity of the light. Suggest **one** reason why there is a small loss in the intensity of light when it is reflected.

1 mark

(b) In the diagram below, the angle of incidence has changed, but the mirrors are in the same positions.

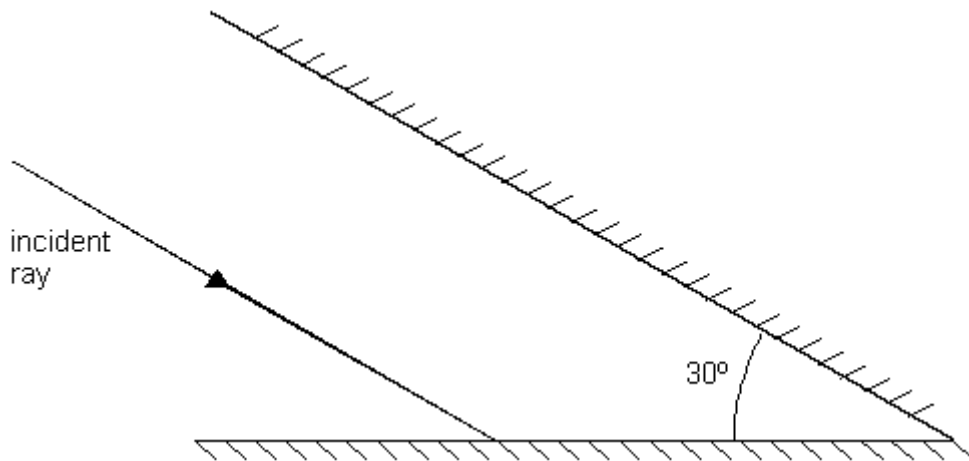


State how this change in the angle of incidence would affect the intensity of the emergent ray. Explain your answer.

1 mark

(c) The two mirrors are now moved so that they are at exactly 30° to each other. The incident ray is parallel to one of the mirrors.



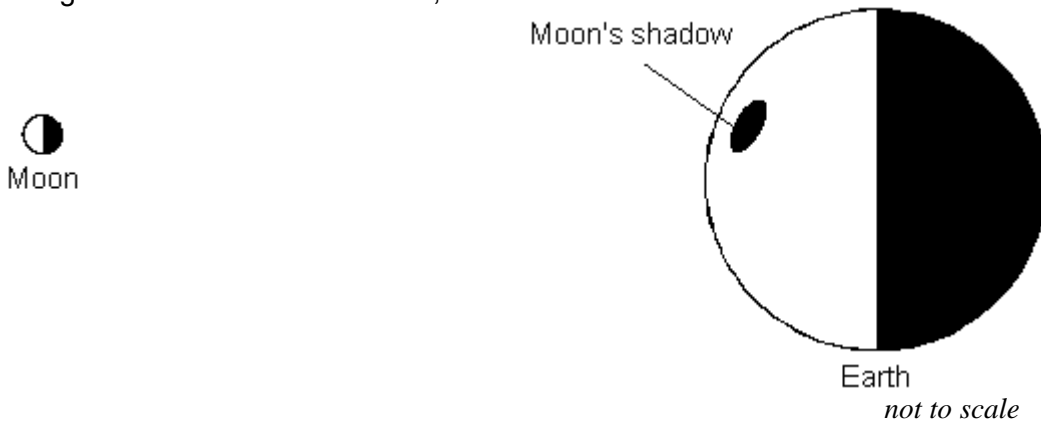


Draw the path of the ray of light on the diagram. Use a ruler and a protractor. Label the **emergent** ray and draw an arrow to show its direction.

2 marks
Maximum 5 marks

Q15 On 11th August 1999 there will be an eclipse. The shadow of the Moon will pass over part of the Earth.

(a) The diagram below shows the Moon, the Moon's shadow and the Earth.



On the diagram, draw an arrow pointing towards where the Sun must be.

1 mark

(b) At about midday the Moon's shadow will pass over Cornwall in England. Where, in the sky, is the Sun at midday?

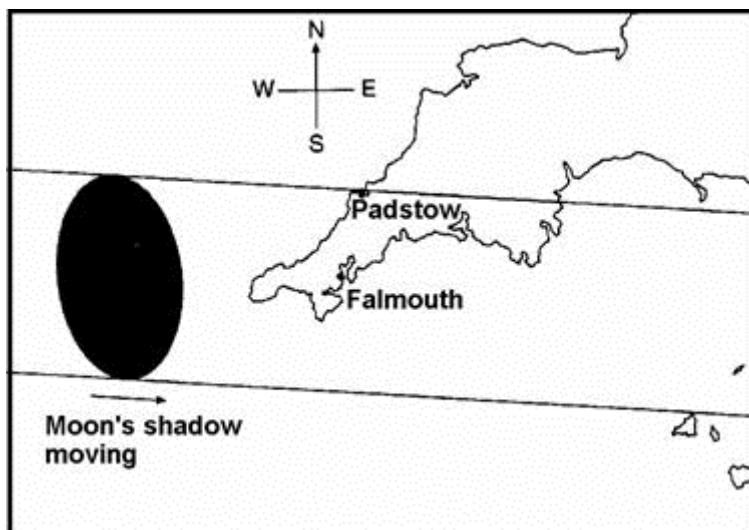
Tick the correct box.

- | | |
|-------------------|--------------------------|
| towards the North | <input type="checkbox"/> |
| towards the West | <input type="checkbox"/> |
| towards the East | <input type="checkbox"/> |
| towards the South | <input type="checkbox"/> |

1 mark

(c) The map shows the shape of the Moon's shadow and the path it will take across Cornwall.



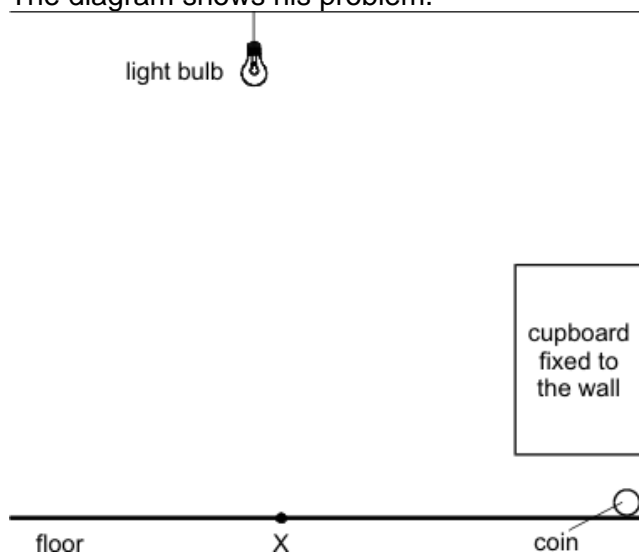


The Moon's shadow will take about 2 minutes to move across a house in Falmouth. It will take less than 2 minutes to move across a house in Padstow.

Explain why it will take less time for the Moon's shadow to move across a house in Padstow than to move across one in Falmouth.

..... 1 mark
 (d) Why does the Moon's shadow move over the surface of the Earth?

..... 1 mark
 Q16 James's coin has rolled under a cupboard. It is dark under the cupboard, and he cannot see the coin even though the light is on.
 The diagram shows his problem.



(a) Explain why a shadow forms under the cupboard.

..... 1 mark
 (b) James uses a mirror to shine light from the light bulb onto the coin.
 He holds the mirror so that it touches the floor at point X.

(i) The symbol for a mirror is



Copy the symbol onto the diagram at point X to show the correct angle for the mirror.

(ii) On the diagram, draw the ray of light from the bulb to the coin.
 Draw an arrow on the ray to show which way the light is travelling.
 Use a ruler.



- (iii) Use the correct word to complete the sentence.
At the mirror, the light is

1 mark

Maximum 5 marks

- Q17 The human eye detects red light, blue light and green light. A combination of red, green and blue light is seen as white. We 'see' other colours when different combinations of red, blue and green enter the eye. This is shown in the table.

light entering the eye	colour 'seen' by the eye
no light	black
red	red
blue	blue
green	green
red + blue	magenta
blue + green	cyan
red + green	yellow
red + blue + green	white

- (a) Some magenta paint is illuminated by a combination of red, green and blue light. Explain why the paint appears magenta.

.....

2 mark

- (b) A mixture of cyan paint and yellow paint appears green in a combination of red + blue + green light. Explain what happens to:

(i) the red light?

1 mark

(ii) the blue light?

1 mark

(iii) the green light?

1 mark

- (c) Most colours of paint can be obtained by mixing different combinations of cyan, magenta and yellow paints.

What combination of these paints makes:

(i) blue paint?

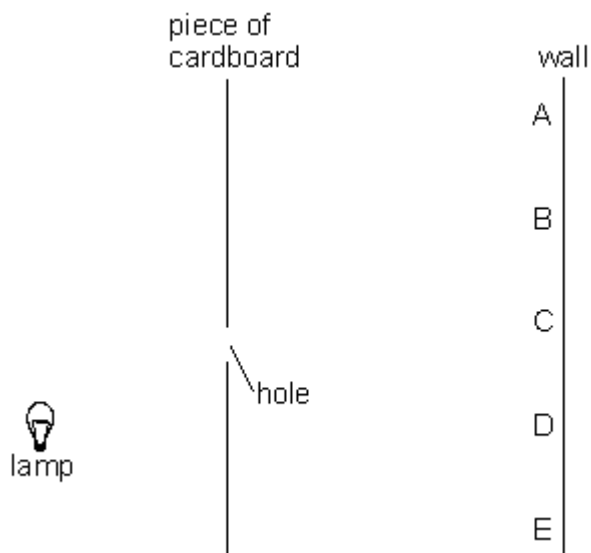
..... 1 mark

(ii) red paint?

..... 1 mark

- Q18. The diagram shows a lamp and a piece of cardboard. The piece of cardboard has a hole in it. Light from the lamp passes through the hole and forms a bright spot on a wall.





(a) (i) Which point on the wall, A B, C, D or E, is lit up by the lamp?

..... 1 mark

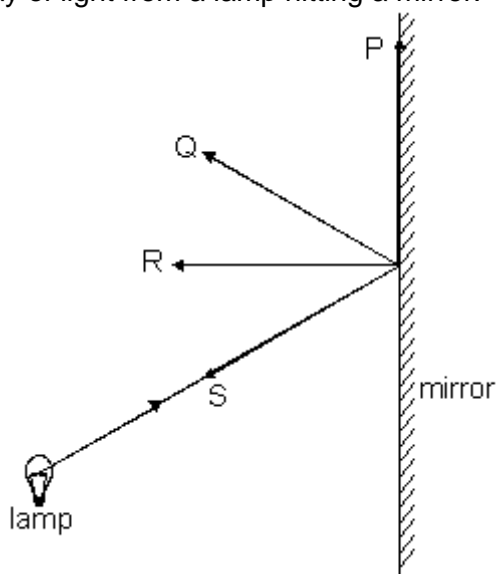
(ii) Explain why the **other** points on the wall are **not** lit up by the lamp.

..... 1 mark

(b) A piece of clear green plastic is placed over the hole.
What is the colour of the light which shines on the wall?

..... 1 mark

(c) The diagram shows a ray of light from a lamp hitting a mirror.

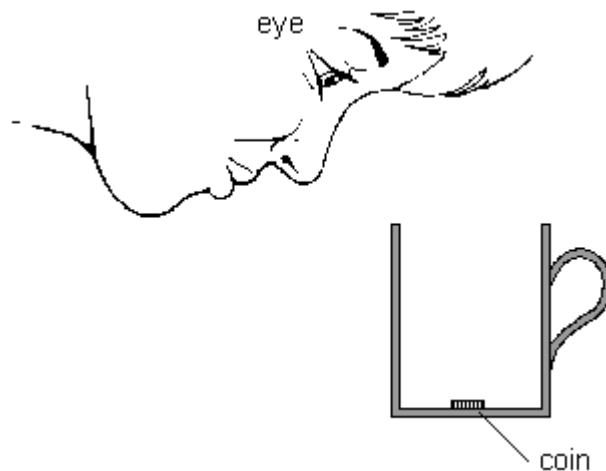


Which arrow, P, Q, R or S, shows the reflected ray?

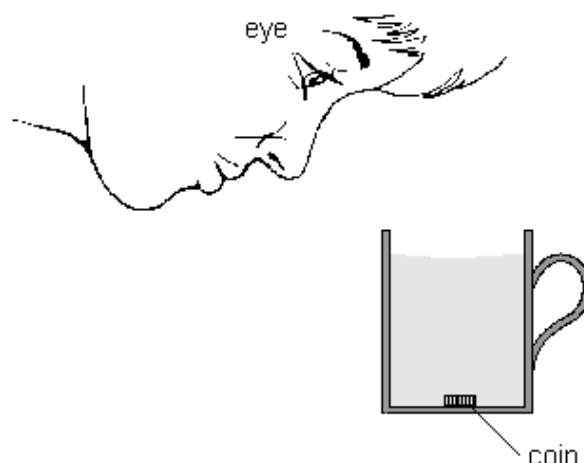
..... 1 mark

Q19. Sophie places a coin at the bottom of an empty mug. She cannot see the coin with her eye in the position shown.





- (a) Sophie fills the mug with water. Her head is in the same position as before, but now she can see part of the coin.



Draw a ray of light on the diagram to show how Sophie can see part of the coin.

Use a ruler.

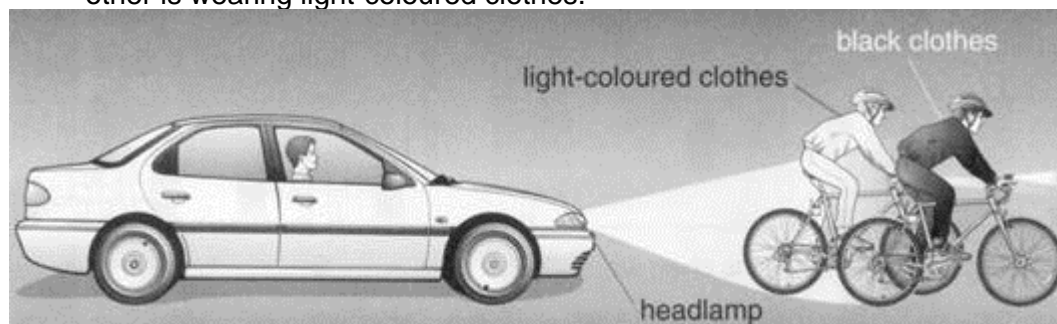
Draw an arrow on the ray to show its direction.

3 marks

- (b) Sophie pours some concentrated blackcurrant juice into the water. The blackcurrant drink acts like a red filter and makes the coin look red. Explain how a red filter works.

2 mark

- Q20.** Two cyclists are riding along a dark road at night. One is wearing black clothes and the other is wearing light-coloured clothes.



A car is driving behind the two cyclists. Light from the car headlamp shines on the cyclists.

- (a) What happens to the light when it reaches the light-coloured clothes?

1 mark

- (b) **On the drawing above**, draw a ray of light to show how light from the headlamp reaches the driver so that he can see the cyclist in the light-coloured clothes. Draw arrows to show the direction of the light.

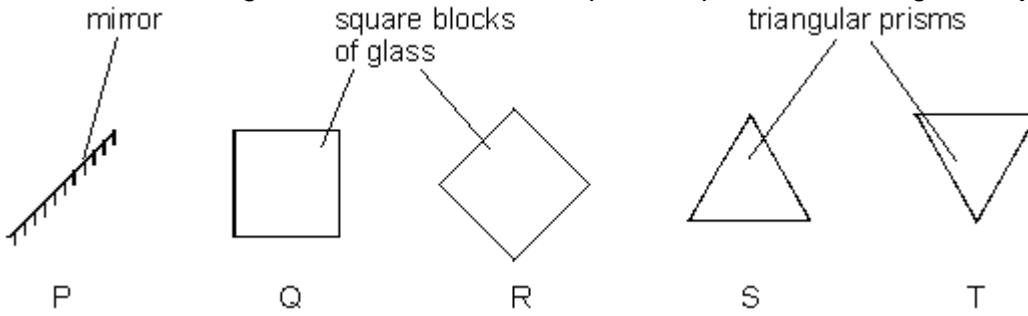


3 marks

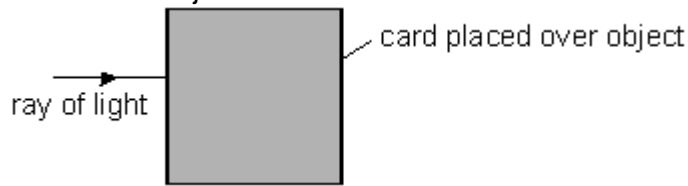
(c) What happens to the light when it reaches the black clothes?

1 mark

Q21. The diagram below shows the shapes and positions of five glass objects.

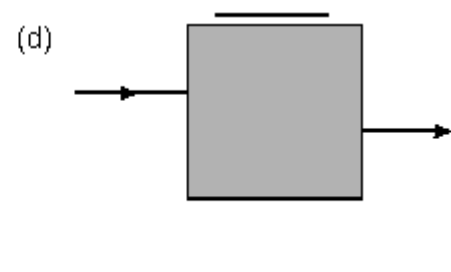
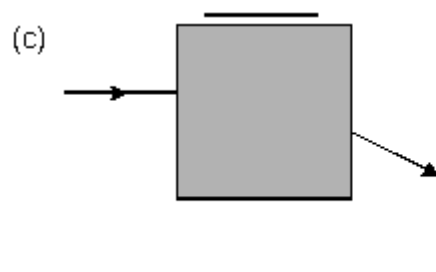
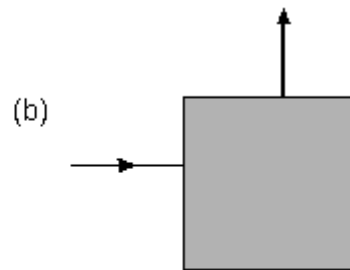
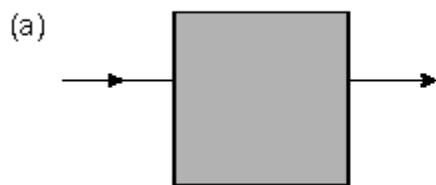
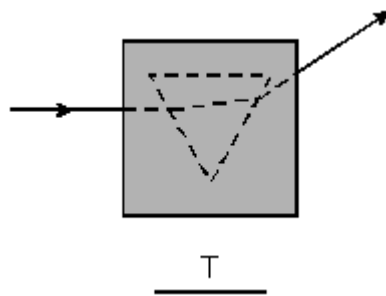


Harriet put a square of black card on top of each glass object. She shone a ray of red light onto each object.



The diagrams below show the rays of light going under the cards and coming out again. Which object is under each card? Write the correct letter below each diagram. One has been done for you.

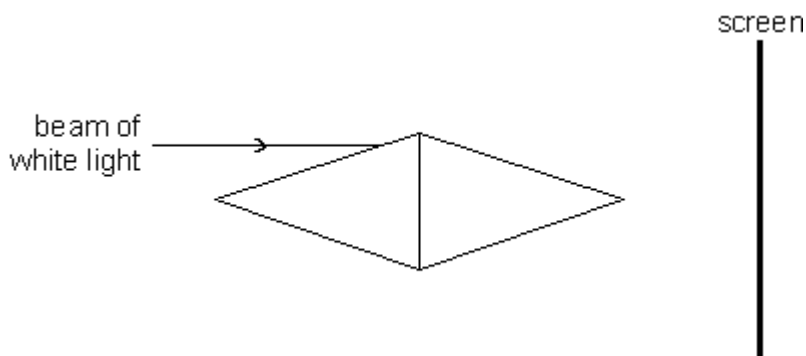
4 marks



Maximum 4 marks

Q22. Two identical triangular glass prisms were placed together. A narrow beam of white light was shone into them as shown below.

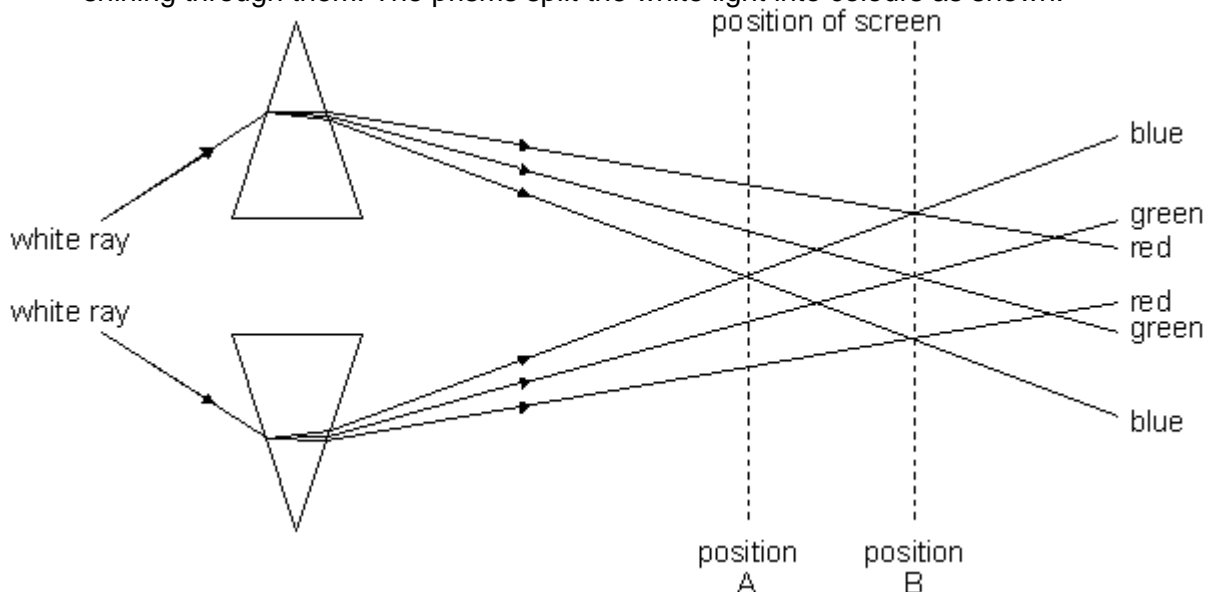




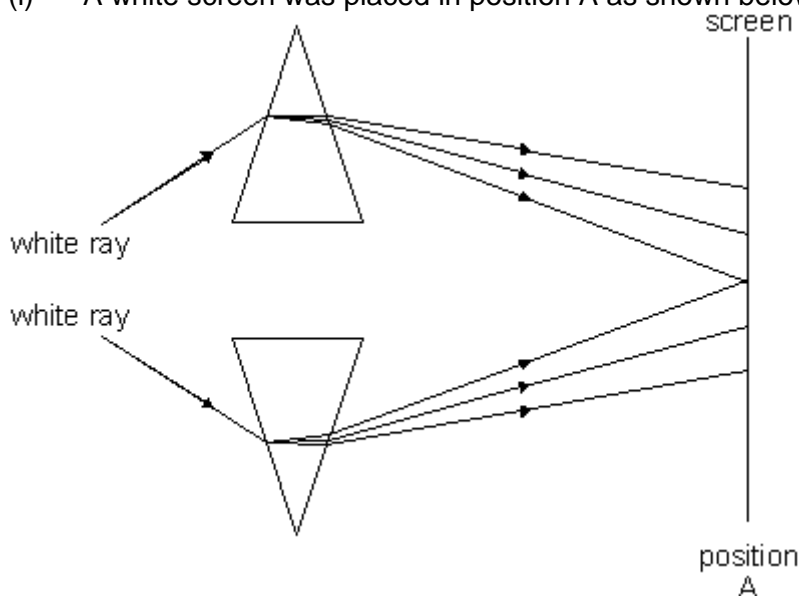
(a) Draw the ray of light through the two prisms and on to the screen.

2 marks

(b) The prisms were then separated and set up as shown in the diagram, with rays of white light shining through them. The prisms split the white light into colours as shown.



(i) A white screen was placed in position A as shown below.



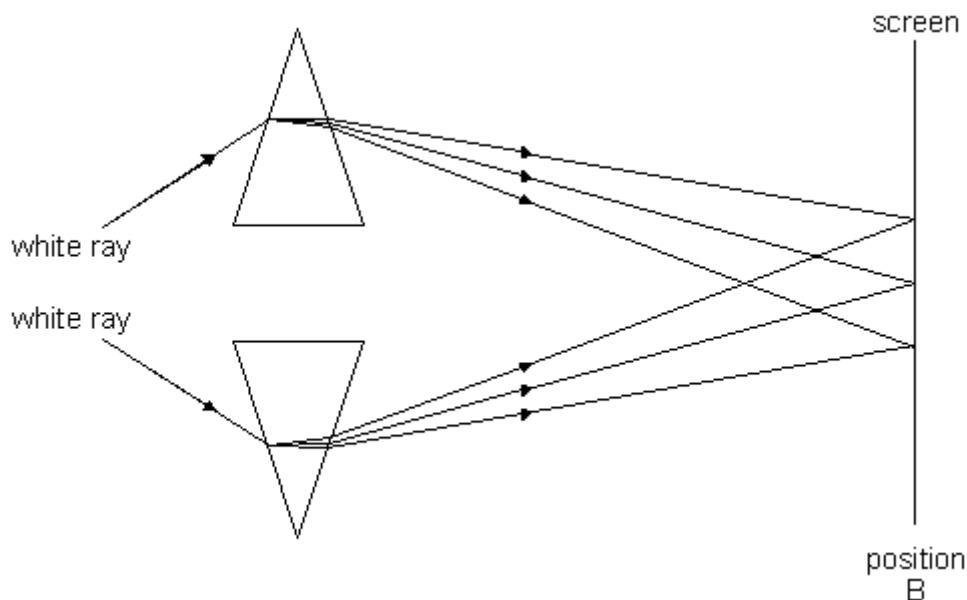
The rays of red, green and blue light are shown.
Describe the appearance of the light on the screen.

.....

(ii) The white screen was moved away from the prisms to position B as shown below.

2 mark





The rays of red, green and blue light are shown.
Describe the appearance of the light on the screen.

.....

..... 2 mark

Q23. In 1610, the Italian scientist, Galileo, observed four bright moons near Jupiter.
Each night the moons moved.

(a) (i) The Sun and stars are light sources, and the planets are seen by reflected light.
Explain how we can see the moons of Jupiter.

.....

..... 2 mark

(ii) The four moons are approximately the same distance from the Earth.
However, they do **not** have the same brightness.
Suggest **one** reason for this.

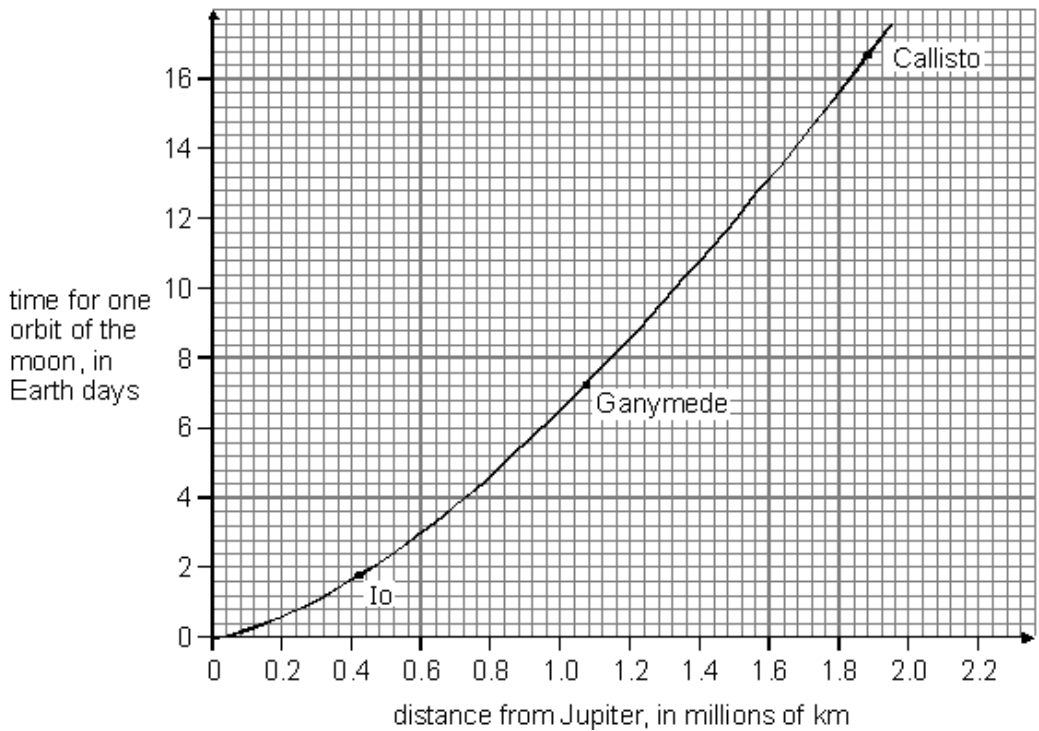
..... 1 mark

(b) The table shows the distances of the four moons from the centre of Jupiter, and the times of their orbits. Europa's distance has been left out.

name of moon	distance from Jupiter, in millions of km	time for one orbit, in Earth days
Io	0.42	1.8
Europa		3.6
Ganymede	1.07	7.2
Callisto	1.88	16.7

The graph was plotted using the information in the table.





Use the graph to estimate Europa's distance from Jupiter.

..... millions of km

1 mark

- (c) Galileo realised that Jupiter and its moons formed a model of our Solar System. In this model:

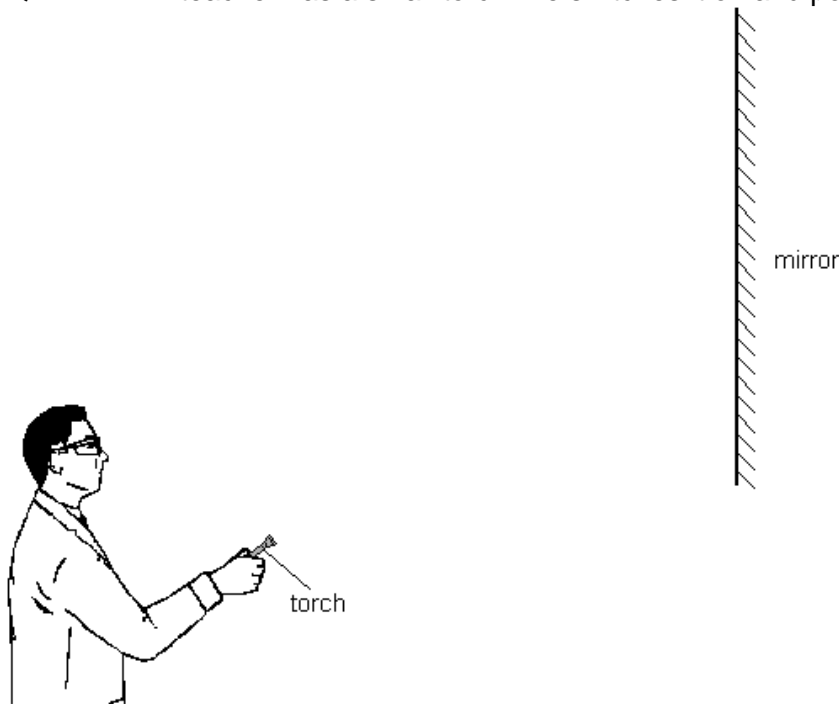
what did Jupiter represent?

what did the moons represent?

1 mark

Maximum 5 marks

- Q24.** A teacher has a small torch. He switches it on and points it towards a mirror.



- (a) A ray of light from the torch reflects off the mirror. Use a ruler to draw the ray of light:
 (i) from the torch to the mirror;
 (ii) reflecting off the mirror.

Add arrows to the rays to show the direction of the light.



1 mark

2 marks

(b) A laser beam is a very bright and powerful beam of light. It is very dangerous to point a laser beam towards people or animals.

Which part of the body can be most easily damaged by a laser beam?

.....

1 mark

KS3 Phx 8K EQ 4Teachers 183marks Mark Scheme

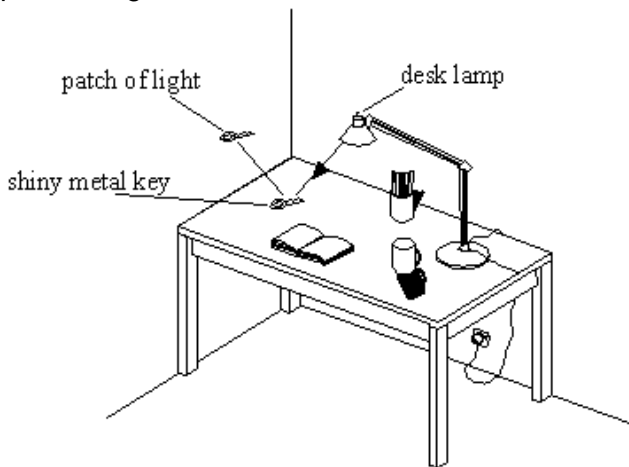
M1. (a) (i) the first mark is for a continuous straight line from the rim of the lamp to the key the line must reach the key

1 (L4)

the second mark is for the arrow on the line the arrow must point away from the lamp

1 (L4)

(ii) the mark is for a straight line from the key to the patch of light the line must both touch the key and reach the patch of light



do **not** accept broken lines
accept the reflected ray drawn from any part of the key irrespective of the first ray
the reflected ray need not have an arrow

1 (L4)

(b) any **one** from
• light cannot bend around the mug
accept 'light travels in straight lines'
• light cannot go through the mug
accept 'the mug absorbs or scatters the light'
or 'the mug is opaque' or 'the mug is in the way of the light'

do **not** accept 'light reflects off the mug'

1 (L4)
[4]

M10. (a) the light is scattered by the ball
accept 'it is scattered or reflected or bounces off the ball'

1 (L5)

some of the light from the ball enters Naomi's eye
accept 'it goes into or gets to her eye'

1

(b) (i)

colour of ball	colour of the light	the colour the ball appears to Naomi
white	red	red

do not accept 'pink' or 'light red'

green | white | green | do not accept 'light green'

(ii) any **one** from
• it absorbs all the light
accept 'it absorbs light'
• it does not scatter any light
accept 'it does not reflect light'

1 (L6)

(c) equal to

1 (L6)

equal to
accept 'equals' or 'the same as'

1 (L6)

(d) **one mark is for describing scattering and one mark is for describing reflection**

scattering sends or reflects light in all directions

accept 'scattered light goes all over the place' or 'the light from the paper goes off in lots of rays' or 'no image can be seen in the paper'

1 (L6)

reflection sends light in one direction or to one point
accept 'the light from the mirror is all in one ray or beam'

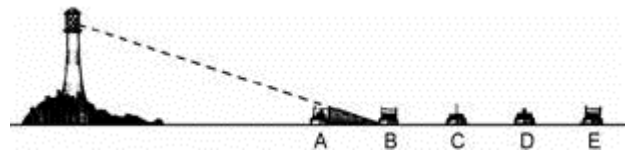
or 'reflected light goes at one exact angle' or 'an image can be seen in the mirror'

1 (L6)
[9]

M11. (a) A

1 (L3)

(b) (i) the centre of a cross (X) drawn in the shaded area between boats A and B



do **not** accept the centre of the cross below the water line
or above the shaded area

1 (L3)

(ii) any **one** from
• light cannot go through the boat
accept 'the boat is opaque' or 'the boat absorbs or blocks or stops or reflects the light'
• light travels in straight lines
accept 'light cannot bend round the boat'

1 (L4)

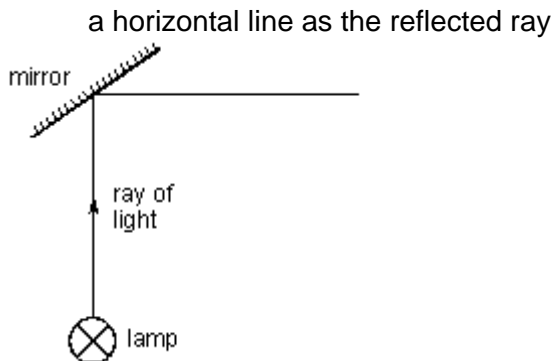
(c) E

1 (L3)

(d) the reflected ray touches the incident ray at the surface of the mirror



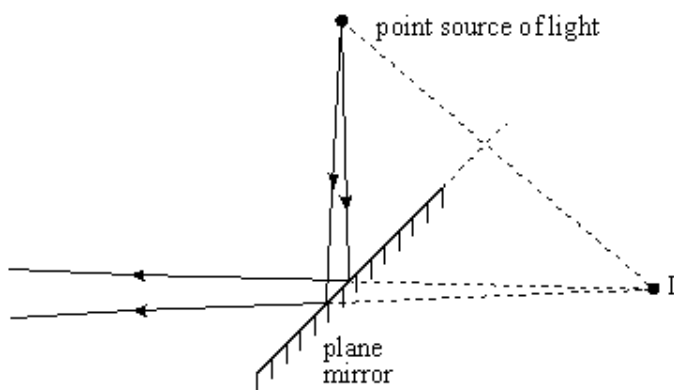
1 (L4)



if the reflected ray has been drawn without using a ruler,
do **not** award this mark
accept responses in which a normal has been drawn and
the angles of incidence and reflection are approximately equal, even if the reflected ray is not horizontal.

1 (L4)
[6]

M12. (a)



either the dashed construction lines - - - - or the dotted lines
must be drawn
accept a combination of construction lines and arcs of circles,
drawn with a compass, which enable the image to be located correctly
construction lines may be dotted, dashed **or** continuous
accept a dot instead of the letter I to indicate the position of the image
award no mark if construction lines are not drawn **or** if the position of the image is not very close to the correct position

1

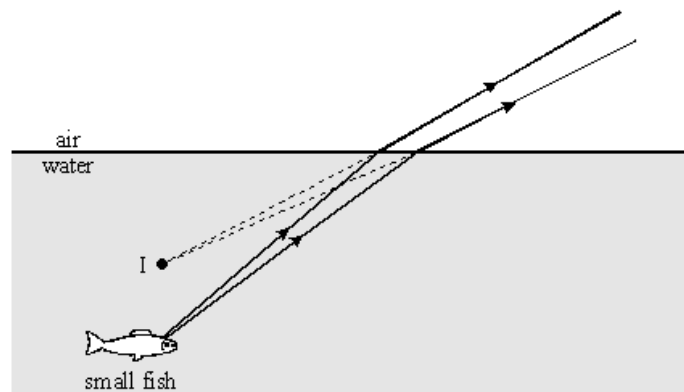
(b) (i) it is in the same place
accept 'it does not'

1

(ii) it is closer to the mirror
accept 'closer to the eye' **or** 'it is closer'

1

(c)



construction lines may be dotted, dashed **or** continuous
accept a dot instead of the letter I to indicate the position of the image
award no mark if construction lines are not drawn **or** if the position of the image is not very close to the correct position above the fish

1

(d) below the apparent position of the fish
accept 'below the image' **or** 'lower in the water' **or** 'below where they see the fish'
accept 'in front of the image'
do **not** accept 'below the fish'

1
[5]

M13. (a) (i) any **one** from

- it is reflected
accept 'bounces off'
- it is scattered
accept 'it is absorbed by the air'
do **not** accept 'it is absorbed by the glass' **or** 'it is absorbed' **or** 'it goes into the air'

1 (L5)

(ii) refraction

1 (L5)

(b) green
blue
violet

all three colours in the correct order are required for the mark
accept 'orange, yellow, green, blue, indigo, violet' in the correct order

1 (L5)

(c) The green part of the spectrum stays the same, but the other colours disappear. ✓
i.e. a tick in the third box if more than one box is ticked,
award no mark

1 (L6)
[4]

M14. (a) (i) they are the same **or** equal

1

(ii) any **one** from

- some light is scattered by unevenness of the surface
accept 'scattering'
- some light is absorbed in the mirror



accept 'absorption by the mirror'
do **not** accept 'absorption in the air' or
'absorption'
accept 'some is internally reflected between the
two
surfaces of the glass **or** mirror'
do **not** accept 'not all of the light is reflected'

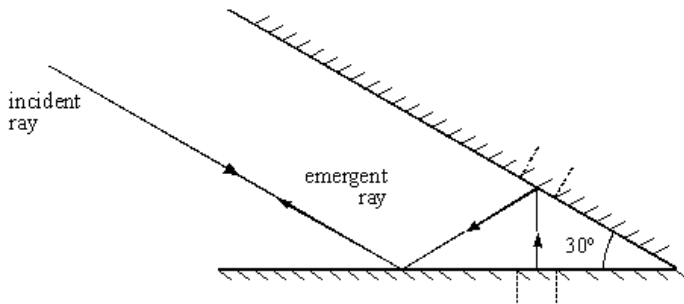
1

(b) the intensity would be greater because
there are fewer reflections

both the effect and the reason are required for
the mark

1

(c)



the first mark is for drawing the path of the ray
both parts of the path are required for this mark
the rays must touch the mirrors within the
tolerances shown

the second mark is for indicating that the ray
emerges along
the same line as the incident ray but in the
opposite direction
either the label or the arrow is sufficient

2

[5]

M15. (a) horizontal arrow pointing to the
left

the arrow may be drawn anywhere
on the diagram

1 (L5)

(b) towards the South ✓

if more than one box is ticked, award no mark

1 (L5)

(c) any **one** from

- the part of the shadow which passes over Padstow is narrower
- the part of the shadow which passes over Falmouth is wider **or** bigger

1 (L5)

(d) any **one** from

- the Moon moves around the Earth
 - the Earth spins on its axis
- accept 'the Earth turns **or** rotates **or** goes round'
do **not** accept 'the Earth moves around the Sun '
or 'the Earth moves' **or** 'the Sun moves'

1 (L5)

[4]

M16. (a) any **one** from

- light cannot go through the cupboard
 - light cannot bend round the cupboard
- accept 'the cupboard stops **or** blocks **or** absorbs

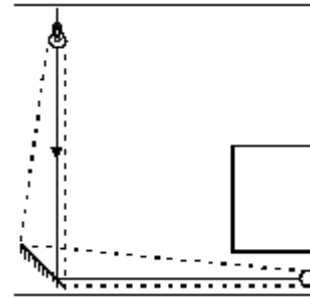
the light'

do **not** accept 'the cupboard reflects the light'

accept 'light travels in straight lines'

1 (L4)

(b) (i) mirror symbol is at approximately 45°
to the floor



the mirror must slope downwards to the right the
hatching

marks must be on the underside of the mirror

do **not** accept rectangular drawings of a mirror

1 (L4)

(ii) **at least one arrow showing the direction
of the ray is required
to award both marks**

ray from bulb to any part of mirror

1 (L3)

ray from mirror to coin

1 (L3)

(iii) reflected

the ray must be straight and must touch both the
bulb

and the mirror the ray need not be vertical
consequential marking applies

accept a ray drawn to the mirror regardless of
where the mirror has been drawn

the ray must be straight and must touch both the
mirror and the coin

the ray must touch the mirror at the same point as
the ray from the bulb

consequential marking applies

accept a ray drawn from the mirror regardless
of where the mirror has been drawn

accept 'reflecting'

do **not** accept 'scattered' **or** 'absorbed'

or 'refracted' **or** 'bounced off'

1 (L3)

[5]

M17. Answers may be in either order

(a) it absorbs the green light

accept 'the green light is not reflected'

1

it scatters the red and the blue light

both colours are required for the mark

accept 'it reflects the red and the blue light'

accept 'the eye receives only red and blue light'

accept 'it reflects only the red and the blue light'

or 'it absorbs only the green light' for both marks

1

(b) (i) it is absorbed by the cyan paint

do **not** accept 'it is absorbed'

1

(ii) it is absorbed by the yellow paint



do **not** accept 'it is absorbed'

1 (L5)

(iii) it is scattered **or** reflected by both paints
accept 'it is scattered **or** reflected'

1

(c) (i) cyan and magenta
colours may be in either order

1

(ii) magenta and yellow
colours may be in either order

1

M18. (a) (i) B

1
[7]

(ii) any **one** from
• light travels in straight lines
• light will not pass through the cardboard
accept 'the cardboard blocks the light'
or 'the cardboard is opaque'
• they are in the shadow of the cardboard
do **not** accept 'they are in the shadow'

1

(b) green

1

(c) Q

1
[4]

M19. (a) one mark for a ray from coin to eye, bending at the surface of the water, and not passing through the mug
both parts of the ray must slope upwards to the left
accept small discontinuities in the ray accept rays which are almost straight but which may have not been drawn with a ruler

1

one mark for accurately drawing the correct ray
do **not** award this mark unless the first mark was also awarded the ray must touch the coin, touch the pupil of the eye, and must be continuous
both parts of the ray must be drawn with a ruler

1

one mark for an arrow showing that the light enters the eye

1

(b) red light passes through
*answers may be in either order accept 'the filter **or** drink does not affect the red light'*
do **not** accept 'it reflects red light'

1

the other colours are absorbed
accept 'only the red light passes through the filter'
or 'every colour except red is absorbed' for both marks
do **not** accept 'the light turns red'

1
[5]

M20. (a) it is reflected
accept 'it is scattered'
accept 'it reflects **or** bounces off'

(b) one mark is for a ray from the headlamp to the light-coloured clothes and from them to the driver's eye
both parts of the ray are required
accept small discontinuities in the ray
accept rays which are almost straight but which have not been drawn with a ruler
do **not** accept dotted lines

1 (L5)

• one mark is for accurately drawing the correct ray
*this is a dependent mark do **not** award this mark unless the first mark was also awarded*
the ray must touch the headlamp, touch the cyclist's clothes, and touch the driver's eye the ray must be continuous
both parts of the ray must be drawn with a ruler

1 (L5)

• an arrow showing that the light enters the eye **or** leaves the headlamp
accept a correct arrow on an incomplete line

1 (L5)

(c) it is absorbed
accept 'it absorbs'
accept 'most is absorbed'
accept 'it is not reflected'
accept 'only some is reflected'

1 (L5)
[5]

M21. (a) Q
accept a drawing of the correct object

1 (L6)

(b) P
accept 'R'
accept a drawing of the correct object

1 (L6)

(c) S
accept a drawing of the correct object

1 (L6)

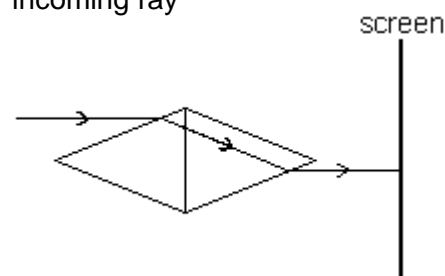
(d) R
accept a drawing of the correct object

1 (L6)
[4]

M22. (a) one mark for the ray bending the correct way at the first surface and passing through the prisms in a straight line

1

one mark for the ray emerging parallel to incoming ray



ray must emerge from the lower edge



1

- (b) (i) blue in centre 1
 any **one** from
 • spectrum spreading out from centre in both directions
do not accept 'rainbow'
 • red at the top and bottom 1
 (ii) green in the centre 1
 magenta at the top and bottom 1
[6]

- M23.** (a) (i) any **two** from
 • light from the Sun
do not accept 'light from the Sun and stars'
 • reflected from the moons' surfaces
do not accept 'the Sun reflects off the surface'
 • travels from the moons to the eyes
accept 'they reflect sunlight' for both marks 2 (L6)
 (ii) any **one** from
 • they reflect different amounts of light
accept 'they have different albedos'
accept 'some are dark' or 'they are different colours'
 • they are not the same size
accept 'one could be partly in the shadow of Jupiter'

- or another moon'* 1 (L7)
 (b) 0.68
the unit is not required for the mark
accept answers from 0.65 to 0.70 1 (L7)

- (c) the Sun
 planets
both answers are required for the mark 1 (L6)
[5]

- M24.** (a) (i) a straight line from the torch to the mirror 1 (L3)

- (ii) a straight ray which reflects off the mirror with the angle of reflection approximately equal to the angle of incidence
do not accept dotted lines
the incident ray must be continuous with the reflected ray 1 (L3)

- an arrow on either the incident ray **or** the reflected ray pointing in the correct direction 1 (L3)

- (b) the eye
accept any named part of the eye 1 (L4)
[4]

