

1

A rocket was fired above a seaside town to call out the lifeboat crew. The rocket exploded, giving out light and sound at the same time.

(a) Lisa was outside the town. She saw the flash of the rocket exploding and heard the bang.

(i) Which sentence is true?  
Tick the correct box.

She heard the bang first.

She saw the flash first.

She heard the bang and saw the flash at the same time.

1 mark

(ii) Give the reason for your answer.

.....  
.....

1 mark

(b) Some people were nearer to the rocket than Lisa. How did the sound seem to them?

Tick the correct box.

It was quieter.

It was louder.

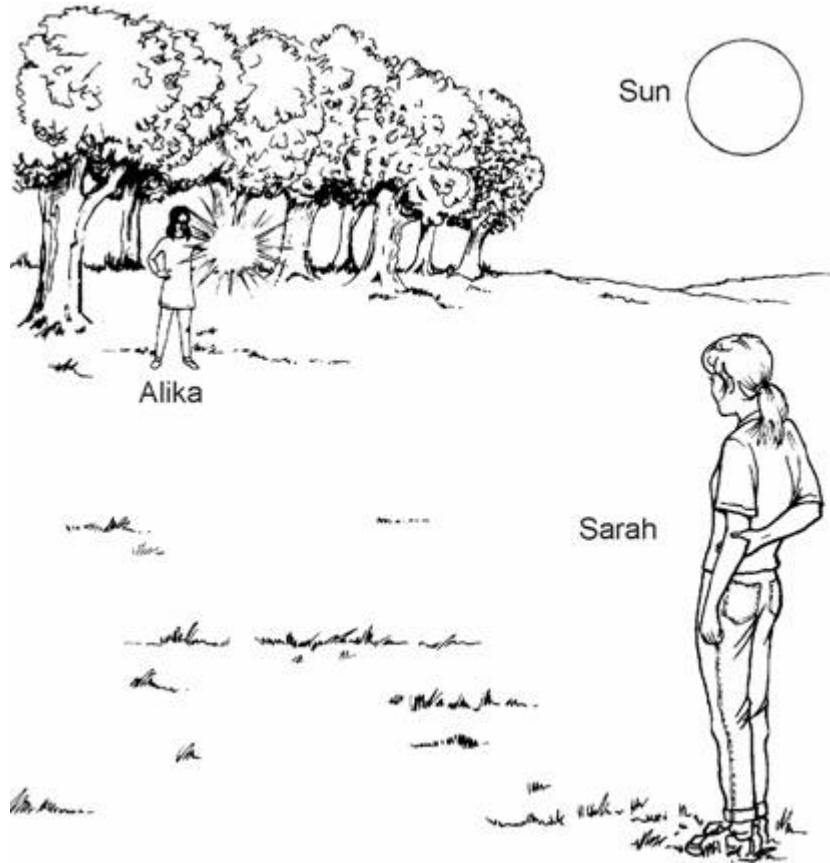
It was higher pitched.

It was lower pitched.

1 mark

Maximum 3 marks

2



It is a sunny day. Alika is using the sunlight to signal to Sarah.

(a) What simple object could Alika use to send bright flashes of sunlight to Sarah?

.....

1 mark

(b) What does this object do to the rays of the sun?

.....

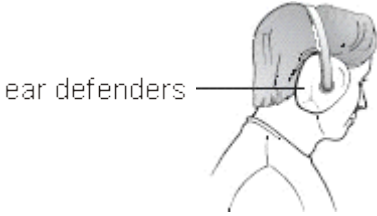
1 mark

Maximum 2 marks

3

Three pupils watched a firework display.

(a) A man lit the fireworks. He wore ear defenders.



Why should he wear ear defenders when he is close to loud fireworks?

.....

.....

1 mark

(b) A rocket exploded making a loud sound and a bright flash. Peter, Sabrina and Jan were standing at different distances from the rocket.



When the rocket exploded, Jan heard the quietest sound. Why did Jan hear the quietest sound?

.....

.....

1 mark

(c) Jan saw the flash before she heard the sound.

What does this tell you about the speed of light and the speed of sound?

.....  
.....

1 mark

(d) Complete the sentences below using words from the list.

**chemical    electrical    heat    light    sound**

(i) Jan, Sabrina and Peter could **see** the rocket explode because it gave out ..... energy.

1 mark

(ii) They could **hear** the rocket explode because it gave out ..... energy.

1 mark

(e) When the rocket stopped burning it fell to the ground. What force caused it to fall to the ground?

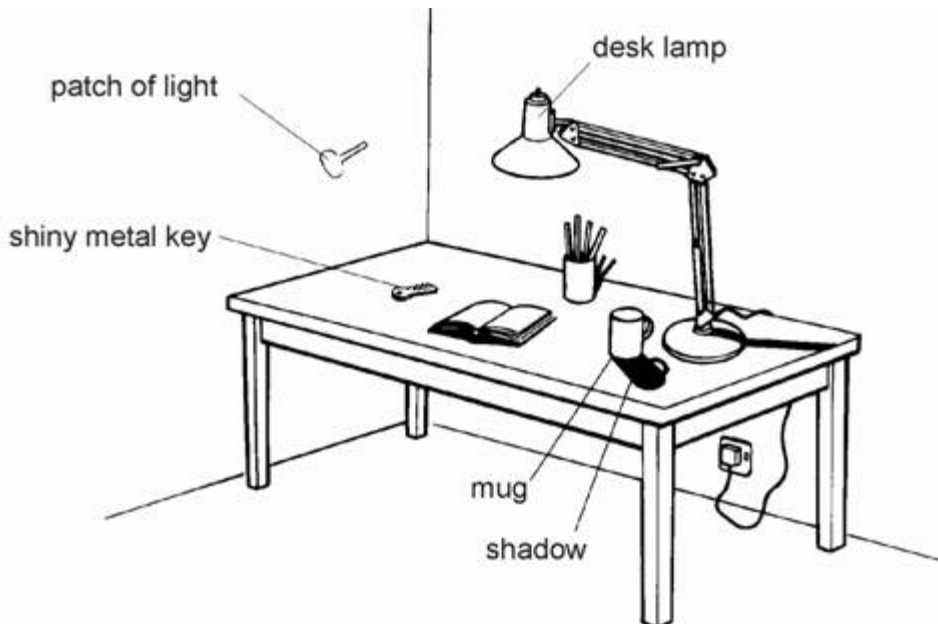
.....

1 mark

maximum 6 marks

**4**

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

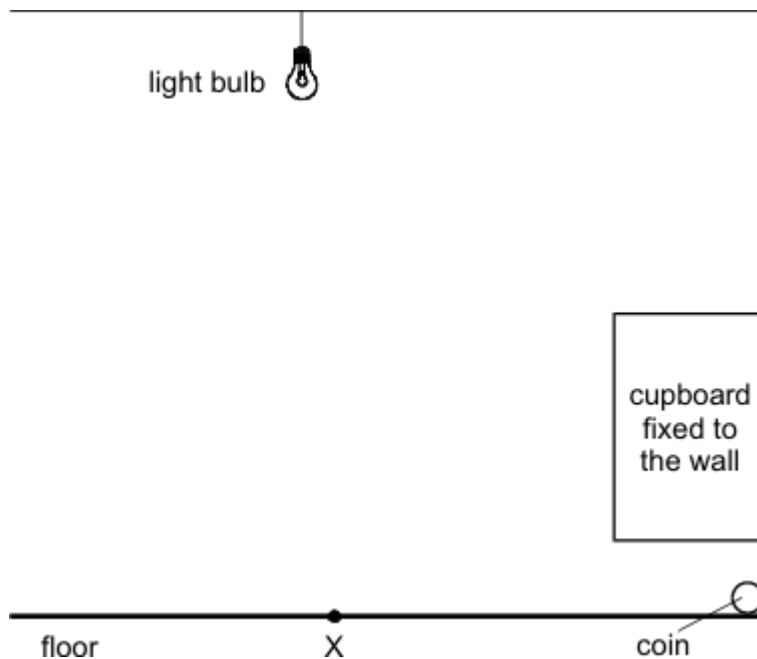
- (b) There is a dark shadow on the table beside the mug.  
 Explain how this shadow is formed.

.....  
 .....

1 mark  
 Maximum 4 marks

**5**

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.

1 mark

(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.

2 marks

(iii) Use the correct word to complete the sentence.

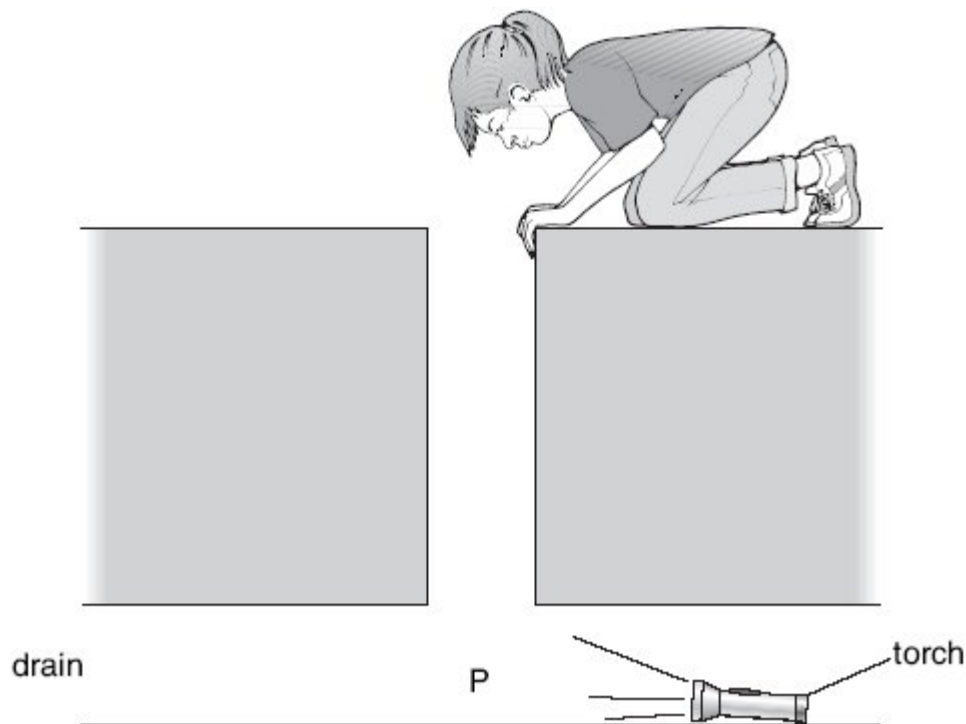
At the mirror, the light is .....

1 mark

Maximum 5 marks

6

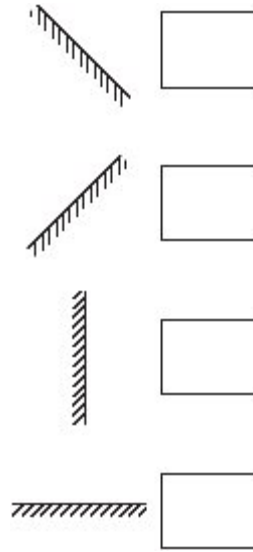
Jenny dropped her torch down a drain. The torch was still switched on but Jenny could **not** see it.



*not to scale*

- (a) (i) Jenny lowered a mirror into the drain and placed it at position P.

At which angle should Jenny put the mirror to see the torch?  
Tick the correct box.



1 mark

- (ii) What happens to the light from the torch when it hits the mirror?

.....

1 mark

- (b) The diagrams below show the symbols for three parts of the torch circuit.

- (i) On the line below each diagram, give the name of the part.



.....

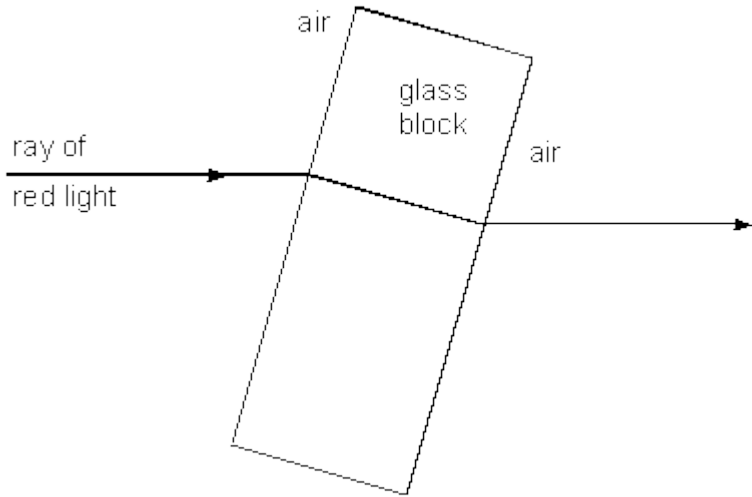
3 marks

- (ii) In the space below, draw a circuit diagram to show how these **three** parts are connected in a torch.

1 mark  
maximum 6 marks

7

(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?

.....  
.....

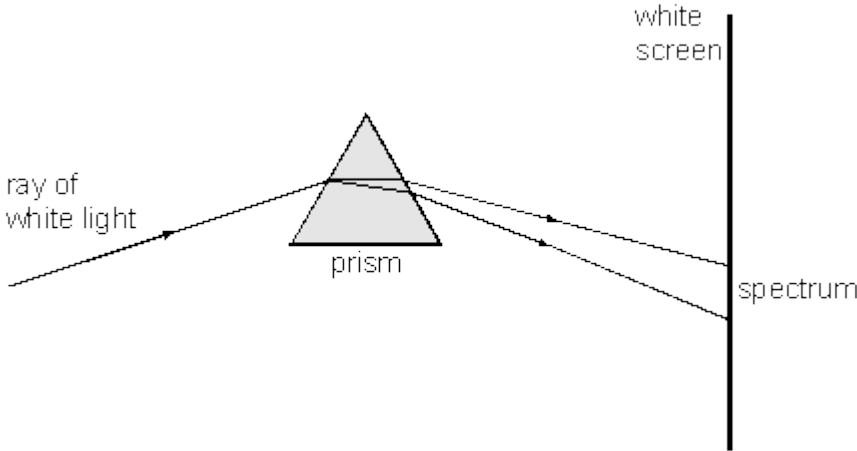
1 mark

(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

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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.

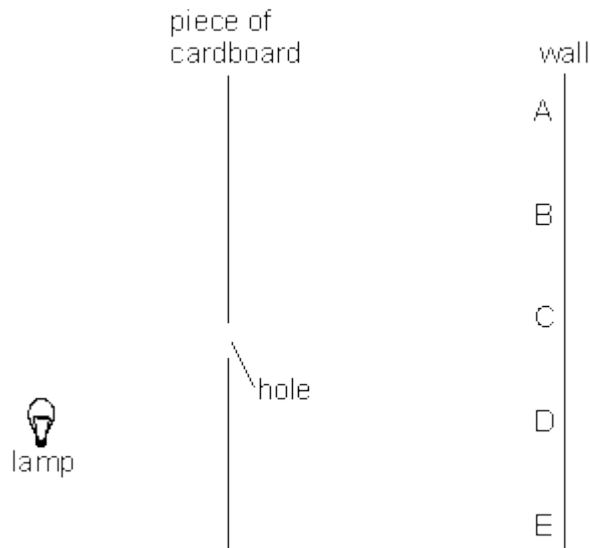
The green part of the spectrum stays the same, but the other colours disappear.

The whole spectrum disappears.

1 mark  
Maximum 4 marks

8

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.

.....  
.....

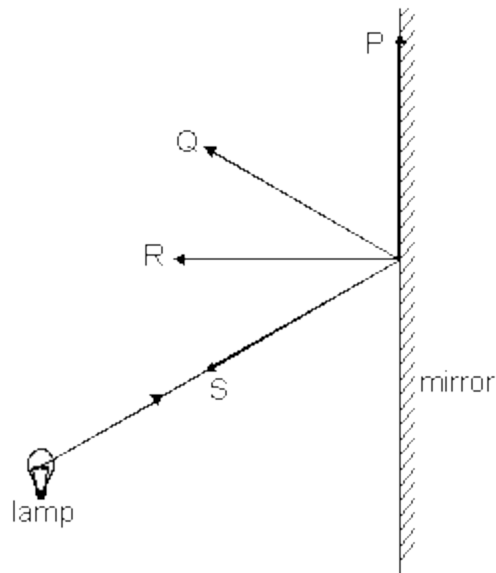
1 mark

(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

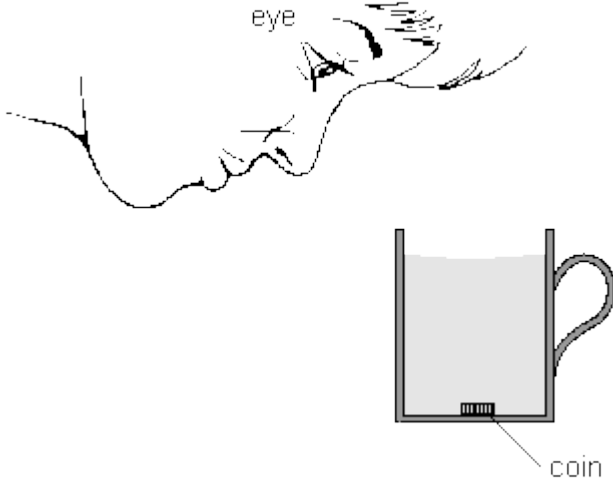
Maximum 4 marks

9

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

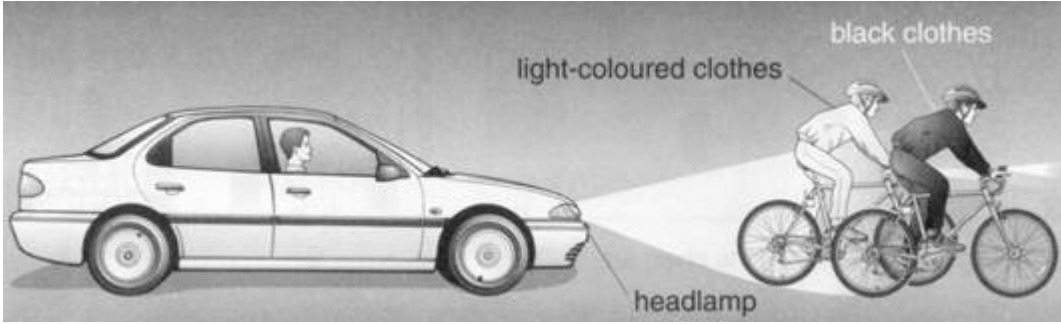
(b) Sophie pours some concentrated blackcurrant juice into the water.  
The blackcurrant drink acts like a red filter and makes the coin look red.  
Explain how a red filter works.

.....  
.....  
.....

2 marks  
Maximum 5 marks

10

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?

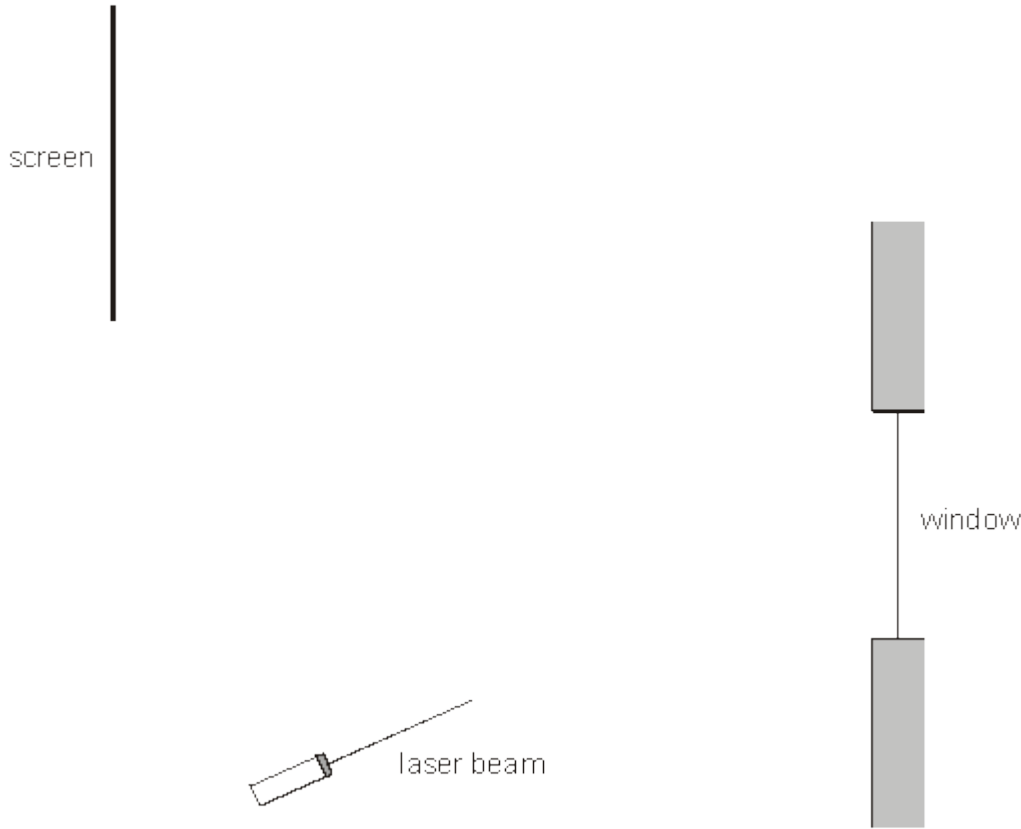
.....

1 mark

Maximum 5 marks

11

(a) A teacher shines a laser beam onto a classroom window. It reflects off the window and onto a screen.



On the diagram above, continue the laser beam to show its path as it reflects off the window and onto the screen. Use a ruler.  
Add arrows to show the direction of the laser beam.

2 marks

(b) (i) When a pupil plays her flute in the classroom the window vibrates.  
Give the reason for this.

.....  
.....

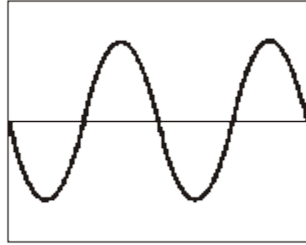
1 mark

(ii) When the window vibrates, what happens to the laser beam that is reflected off the window?

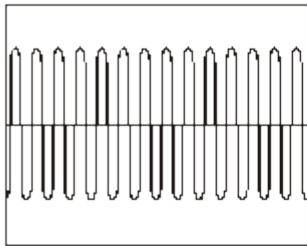
.....  
.....

1 mark

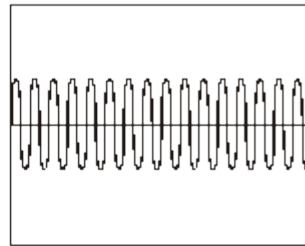
- (c) The teacher places a microphone near the pupil as she plays her flute. The diagram below shows the pattern on an oscilloscope screen.



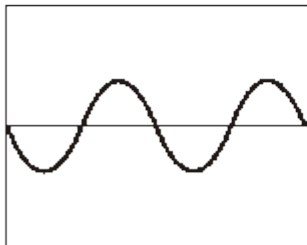
The pupil then plays her flute at a **higher pitch** and **more quietly**.  
Which diagram below shows the pattern that would be seen on the oscilloscope?  
Tick the correct box.



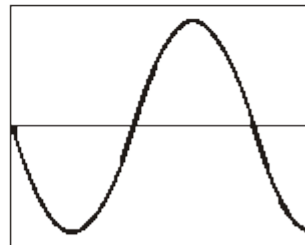
A



B



C

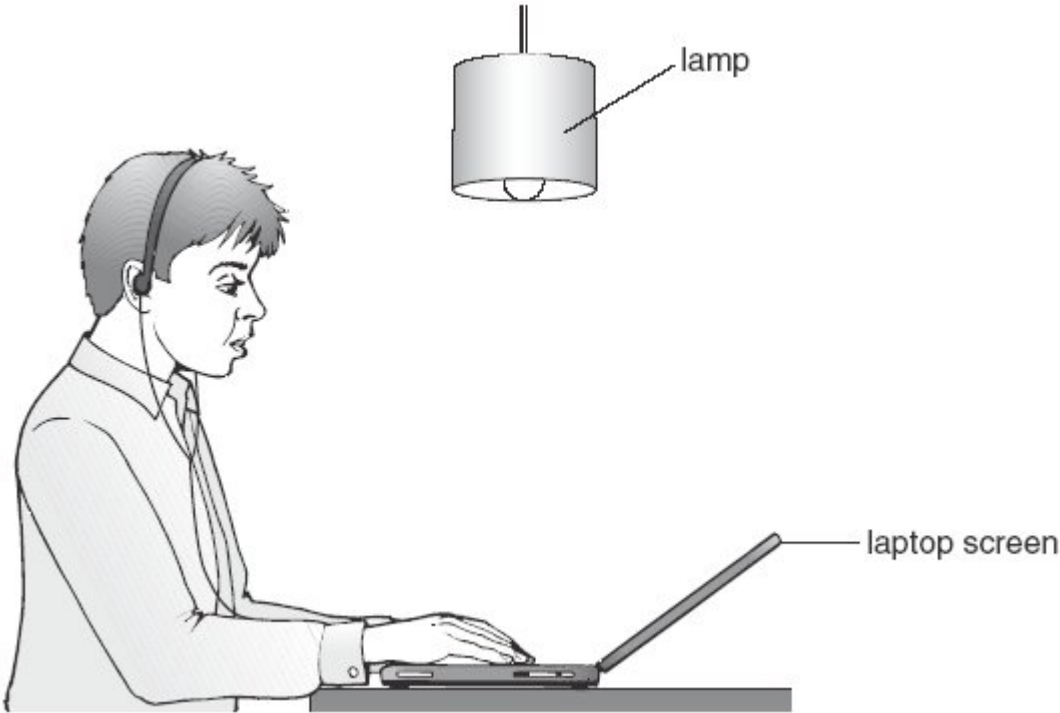


D

1 mark  
maximum 5 marks

12

(a) The diagram below shows George using his laptop. Light from the lamp is reflected by the laptop screen.

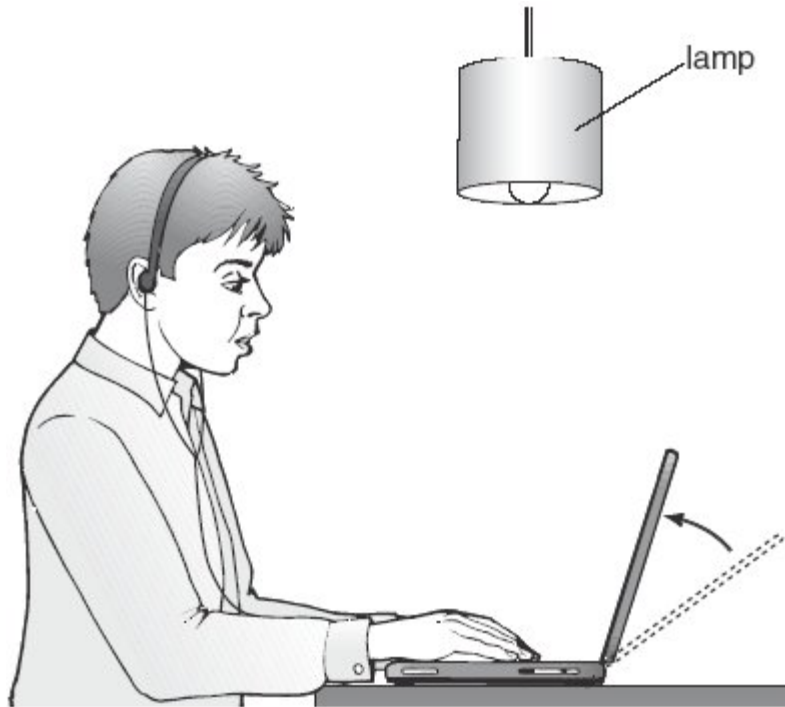


(i) **On the diagram above** draw a ray of light to show how George sees the light from the lamp reflected by the laptop screen. Use a ruler.

Draw arrows to show the direction of light.

3 marks

- (ii) With the laptop screen in the position shown in part a(i), George sees an image of the lamp on the screen.  
George tilts the screen forwards as shown below.



When the screen is tilted forwards it is easier for George to see the words on the screen.

What happens to the reflected ray of light when the screen is tilted?

.....  
.....

1 mark

- (b) George listens to music on his headphones.

Complete the sentence below using words from the box.

<b>chemical</b>	<b>electrical</b>	<b>gravitational potential</b>
<b>sound</b>	<b>thermal</b>	

The useful energy change in the headphones is from .....

energy into ..... energy.

1 mark  
maximum 5 marks



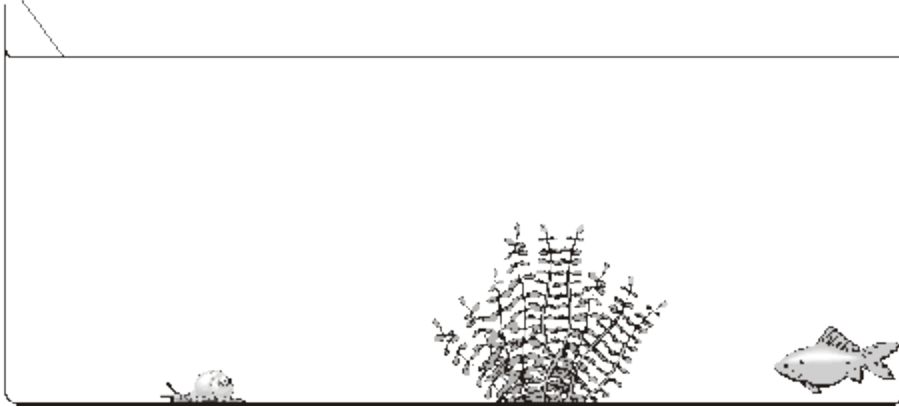
13

(a) The diagram below shows a fish tank.

The surface of the water acts like a mirror.

The fish can see the snail reflected in the surface of the water.

surface  
of water  
(mirror)



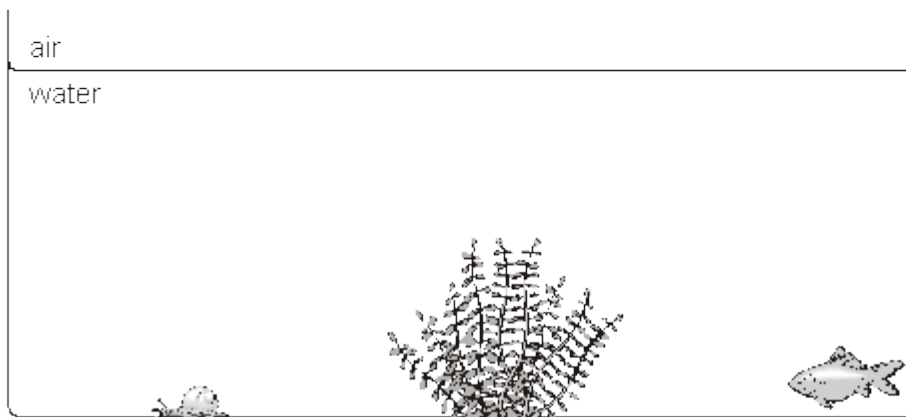
Draw a ray of light which passes from the snail, and reflects from the surface, to show how the fish can see the snail. Use a ruler.

Put arrows on the ray of light.

3 marks

(b) Andrew is looking at the snail.

Andrew



When a ray of light passes from water to air it changes direction.

- (i) Draw a ray of light from the snail to Andrew to show how Andrew can see the snail. Use a ruler.

Put arrows on the ray of light.

2 marks

- (ii) What is the name given to this change in the direction of a ray of light?

.....

1 mark  
maximum 6 marks

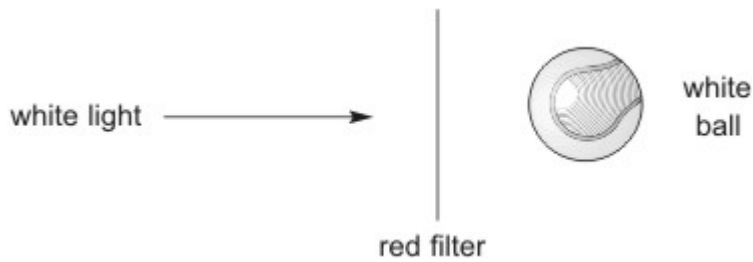
14

- (a) Peter had two different coloured tennis balls as shown below.



He shone white light through a red filter onto each ball.

- (i) **experiment 1**

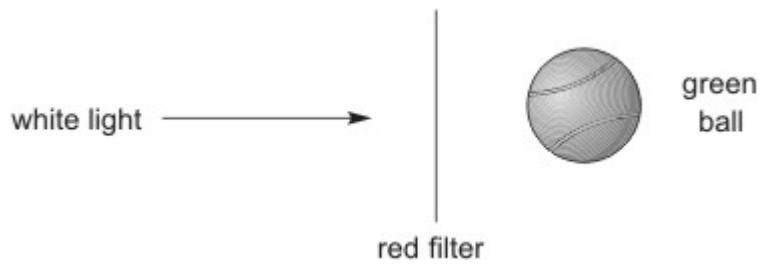


The white ball appeared red.  
Explain why this ball appeared red.

.....  
.....  
.....  
.....

2 marks

(ii) **experiment 2**



What colour did this ball appear?

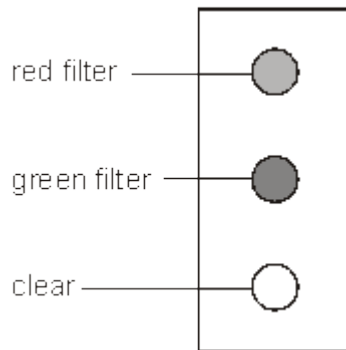
.....

Explain your answer.

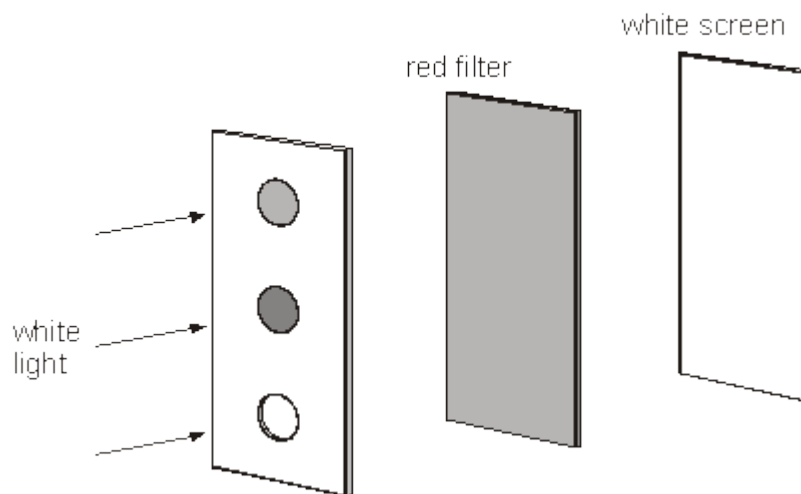
.....  
.....

2 marks

- (b) Peter set up a different experiment.  
He cut three holes in a piece of card.  
Two of the holes were covered by coloured filters as shown below.



Peter placed a red filter between the piece of card and a white screen.  
He shone white light at the piece of card with three holes in it.



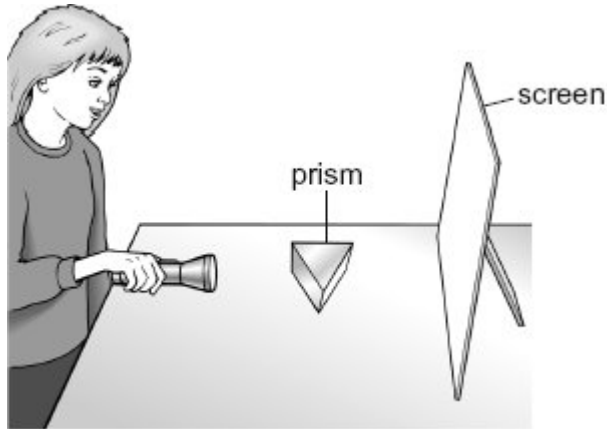
What would Peter see on the screen?

.....  
.....

1 mark  
maximum 5 marks

15

Ann shines a ray of white light at a glass prism.

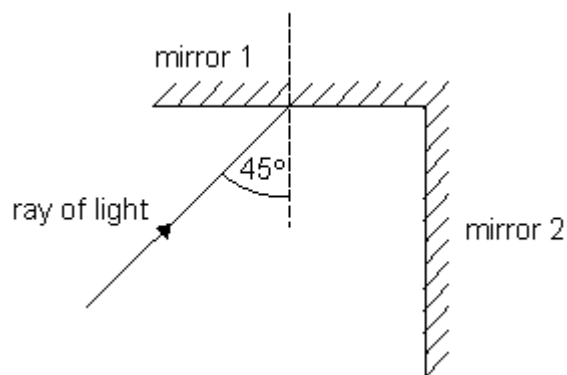


(a) Tick one box in each row to show if each sentence is **true** or **false**.

	<b>true</b>	<b>false</b>
The light refracts as it enters the prism.	<input type="checkbox"/>	<input type="checkbox"/>
The light refracts as it travels through the prism.	<input type="checkbox"/>	<input type="checkbox"/>
The light disperses as it leaves the prism.	<input type="checkbox"/>	<input type="checkbox"/>
The light forms a spectrum of colours on the screen.	<input type="checkbox"/>	<input type="checkbox"/>

2 marks

(b) Ann places two mirrors at  $90^\circ$  and shines a ray of light at mirror 1.



(i) **On the diagram above** continue the ray of light to show how it is reflected by both mirrors. Use a ruler.

2 marks

(ii) **On the diagram above** label the incident ray (i) and the reflected ray (r) for the light striking **mirror 2**.

1 mark

(c) Ann shines the torch at a red book.

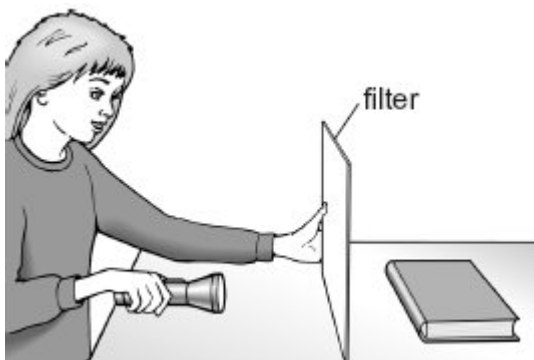


Explain why the object looks red in white light.

.....  
.....

2 marks

- (d) In a dark room, Ann puts different coloured filters in front of the torch. She records the colour the book appears.



Complete the table below to show the colour that the book would appear. Tick **one** box in each row. The first one has been done for you.

colour of filter	What colour does the red book appear?		
	red	green	black
no filter	✓		
red filter			
green filter			

1 marks  
maximum 8 marks

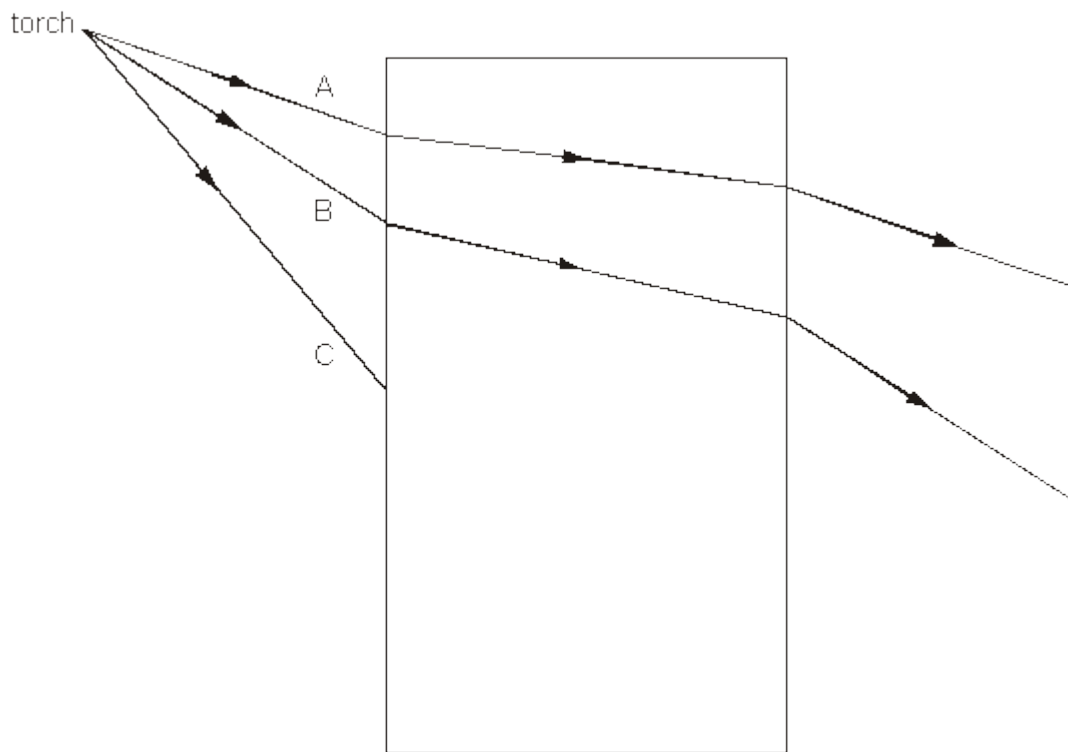
**16**

- (a) When light travels from air to glass, it changes direction. What is the name of this effect?

.....

1 mark

(b) The diagram below shows three rays of light A, B and C striking a glass block.



The paths of A and B have been drawn.

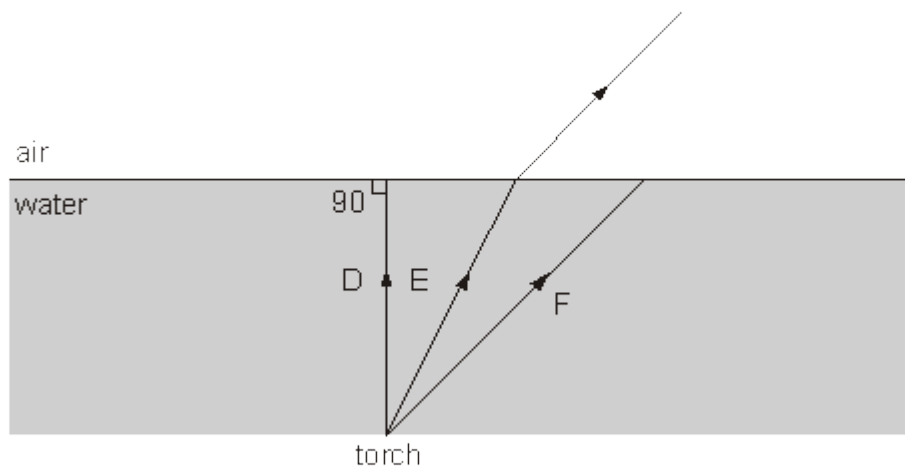
Continue ray C to show its path through the block and out the other side.  
Use a ruler.

2 marks

(c) The diagram below shows three rays of light, D, E and F, from a torch placed under water.

The path of ray E is shown as it leaves the water and enters the air.

Continue the paths of D and F as they pass through the air.  
Use a ruler.



2 marks  
maximum 5 marks