

Light

Question Paper

Course	CIE IGCSE Physics
Section	3. Waves
Topic	Light
Difficulty	Medium

Time Allowed **60**

Score **/43**

Percentage **/100**

Question 1a

Fig. 9.1 shows two rays of light X and Y leaving an object O. The rays strike a plane mirror.

Ray X is reflected as shown.

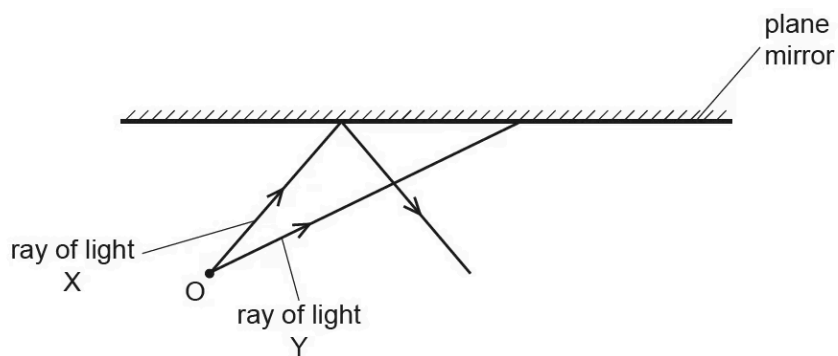


Fig. 9.1

- (i) On Fig. 9.1, draw the normal at the point where ray X strikes the mirror.

[1]

- (ii) On Fig. 9.1, draw the path of ray Y after it strikes the mirror.

[1]

[2 marks]

Question 1b

An object O is placed on the left of a thin converging lens. F is the principal focus.

This arrangement is shown in Fig. 9.2.

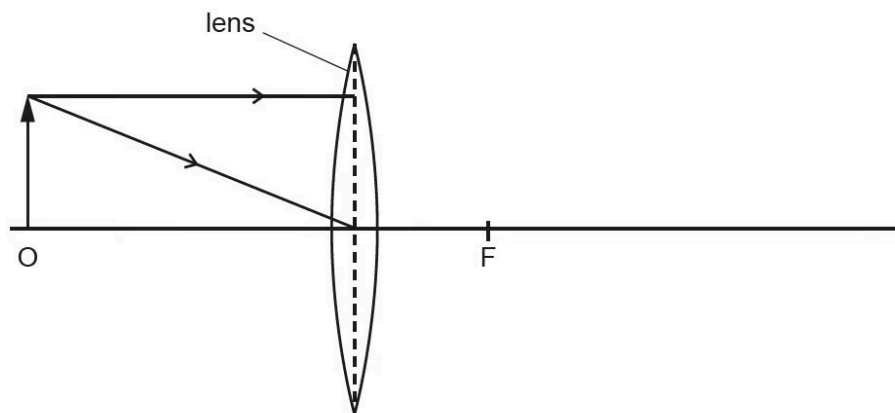


Fig. 9.2

Two rays from the top of the object are incident on the lens, as shown in Fig. 9.2.

On Fig. 9.2, draw the path of each ray to locate the position of the image of O formed by the lens.

On Fig. 9.2, draw an arrow to represent the image and label it I.

[3 marks]

Question 2a

Fig. 7.1 shows a converging lens and the image I formed when an object is placed to the left of the lens. The principal foci are labelled A and B and the centre of the lens is labelled C .

- (i) On Fig. 7.1, draw two rays to locate the position of the object.

Draw the object and label it O .

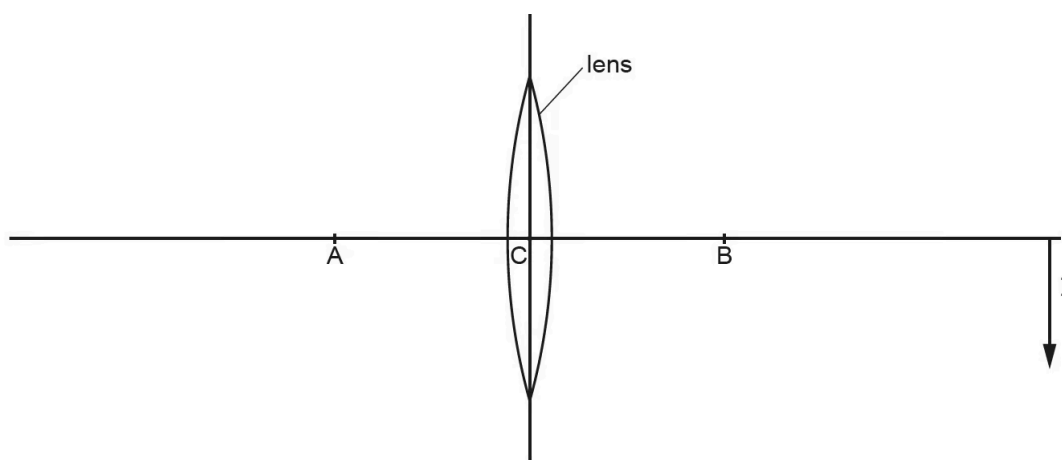


Fig. 7.1

[3]

- (ii) Ring all of the following distances that are equal to the focal length of the lens.

AB

AC

CB

2AB

[2]

[5 marks]

Question 2b

Fig. 7.2 shows green light passing through a triangular glass block.

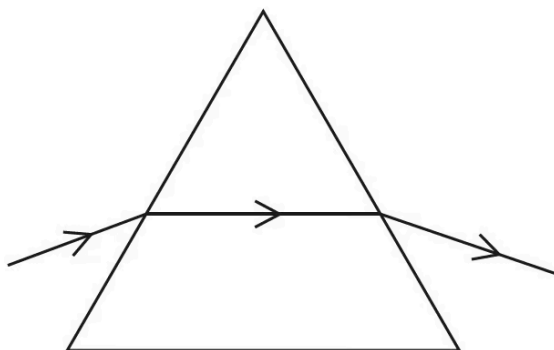


Fig. 7.2

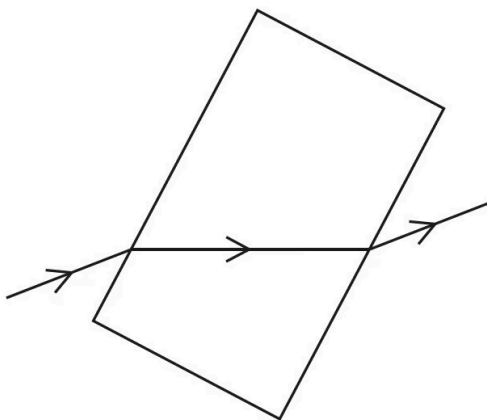
Red light enters the triangular glass block shown in Fig. 7.2 along the same path as the green light.

- (i) On Fig. 7.2, draw the path of the red light within the triangular glass block.

[1]

- (ii) Fig. 7.3 shows green light passing through a rectangular glass block.

Red light enters the rectangular glass block shown in Fig. 7.3 along the same path as the green light.

**Fig. 7.3**

On Fig 7.3 draw the path of the red light within the rectangular glass block.

[1]

- (iii) On Fig 7.3 draw the path of the red light after leaving the rectangular glass block.

[1]

[3 marks]

Question 3a**Extended tier only**

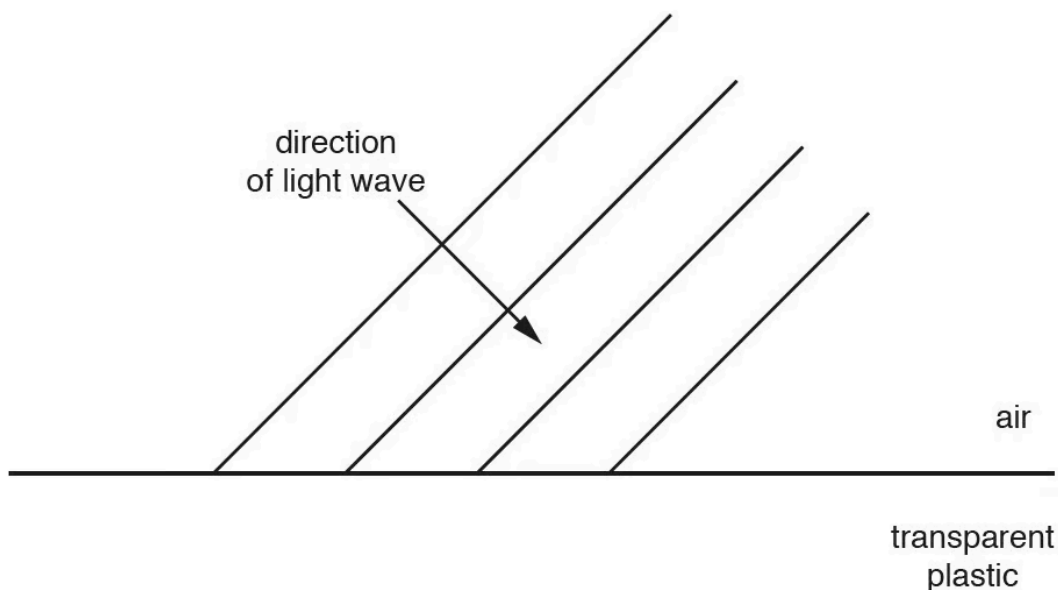
The speed of a light wave in air is 3.00×10^8 m / s. The refractive index of water is 1.33.

Calculate the speed of the light wave in water.

speed =
[2 marks]

Question 3b

Fig. 7.1 shows parallel wavefronts of a light wave in air incident on a boundary with a transparent plastic.



On Fig. 7.1,

- (i) draw the positions of the four refracted wavefronts in the plastic,
- (ii) draw an arrow to show the direction of travel of the refracted wave,
- (iii) label the angle of refraction r of the light wave.

[3]

[1]

[1]

[5 marks]

Question 4a

Fig. 6.1 shows a mirror periscope. The periscope is used to view a golfer over the heads of other people. The periscope has two plane mirrors each at an angle of 45° to the vertical.

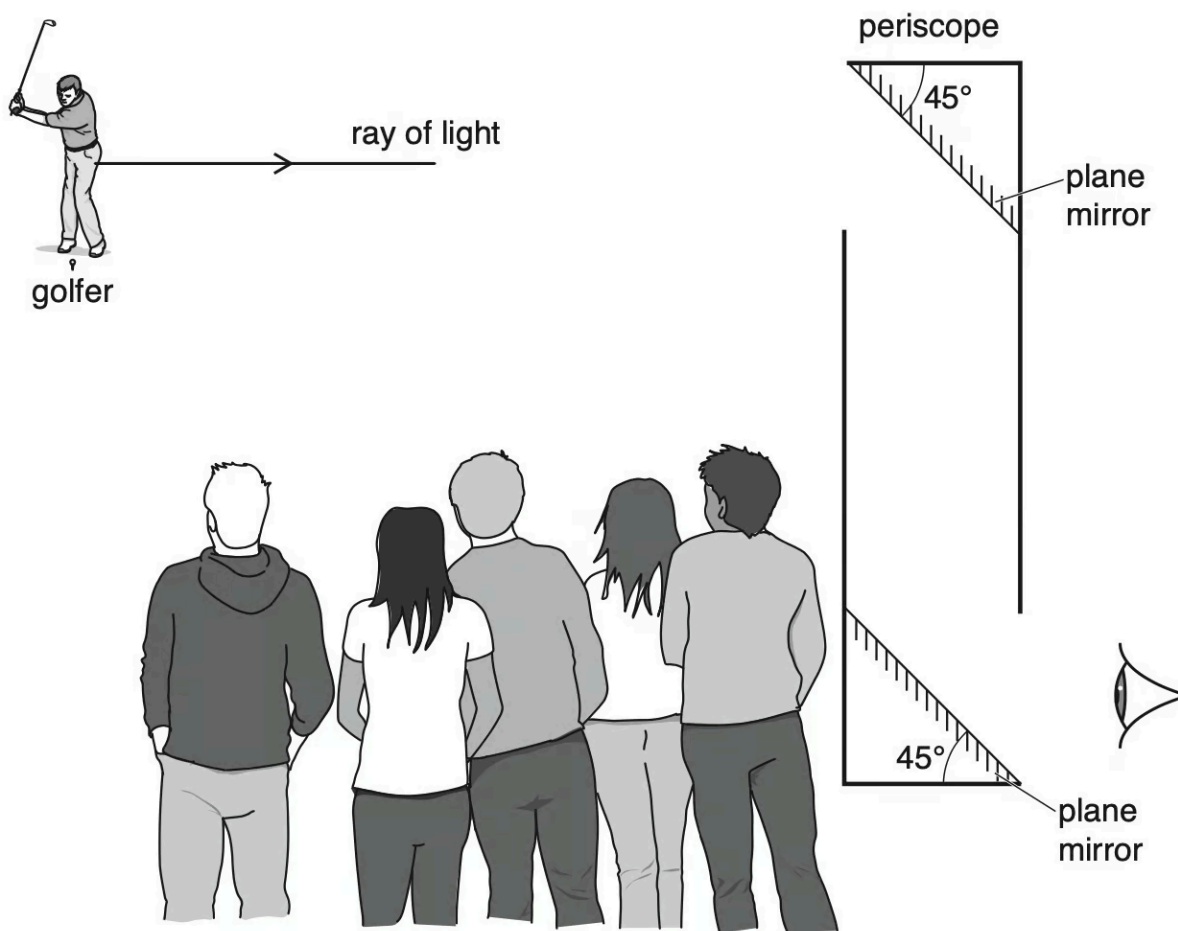


Fig. 6.1 (not to scale)

(i) On Fig. 6.1:

1. Continue the ray of light from the golfer towards the upper mirror of the periscope.
2. Draw and label the normal at the point where the ray strikes the mirror.

[1]

- (ii) On Fig. 6.1, continue the ray of light after reflection at the upper mirror until it leaves the periscope.

[1]

- (iii) State the law of reflection used to deduce the position of the ray of light after striking the mirrors.

[1]

[3 marks]

Question 4b

Fig. 6.2 shows three rays of red light each entering a semi-circular glass block.

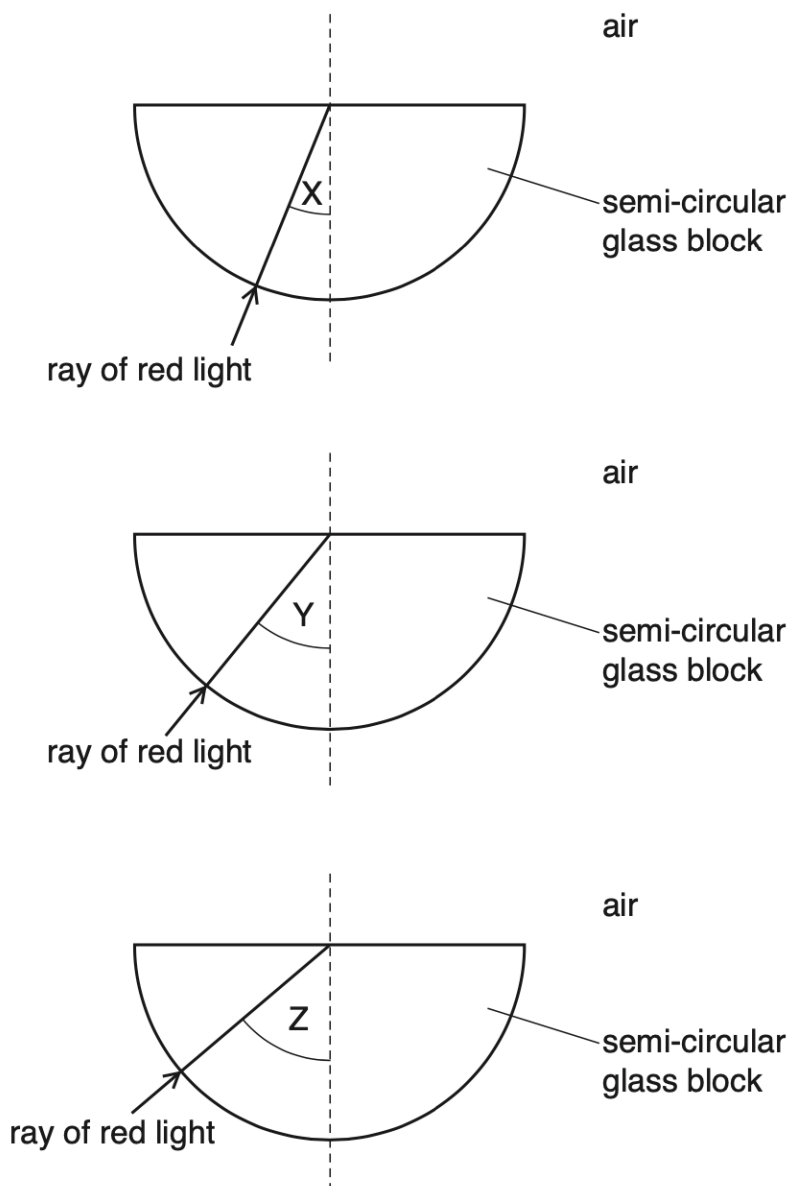


Fig. 6.2

Table 6.1

angle of incidence	description
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X	less than the critical angle
Y	equal to the critical angle
Z	greater than the critical angle

Using the information in Table 6.1, draw on Fig. 6.2 to complete the path of each ray of red light.

[3 marks]

Question 5a

Fig. 6.1 shows an arrangement of glass prisms inside a box. The angles of the prisms are 45° , 45° and 90° .

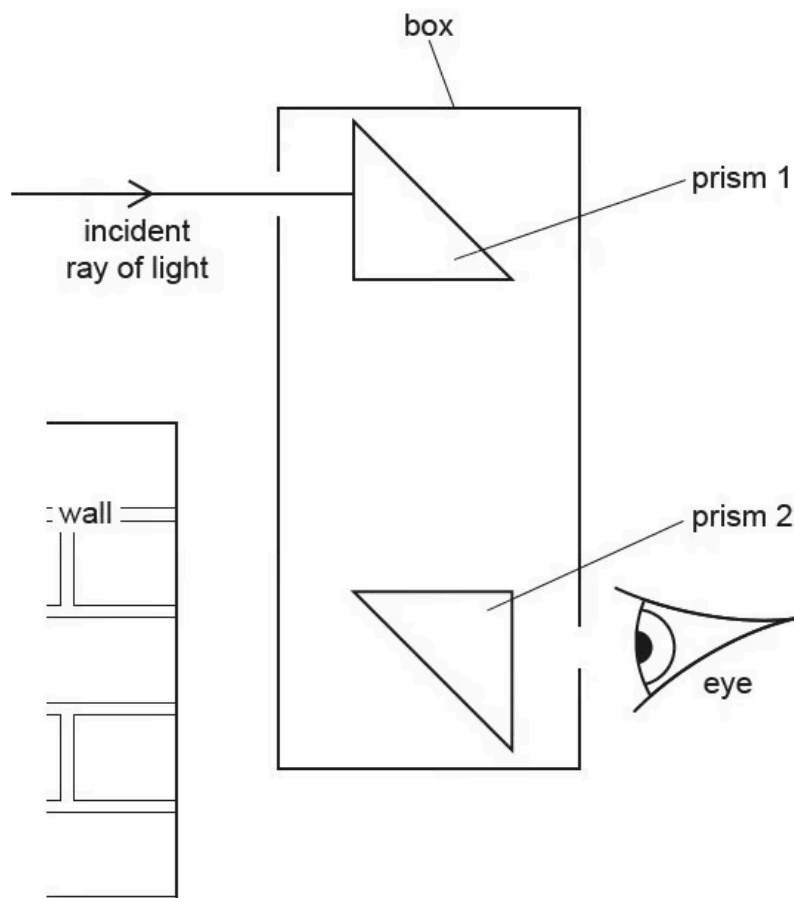


Fig. 6.1 (not to scale)

This is a device used to view objects that are behind a wall.

The incident ray of light undergoes total internal reflection in the prisms.

On Fig. 6.1, complete the path of the ray through the device and show the ray as it emerges from the box.

[3 marks]

Question 5b**Extended tier only**

Show that the refractive index of glass with a critical angle of 45° is 1.41.

[2 marks]

Question 6a

Fig. 8.1 is a partially completed ray diagram.

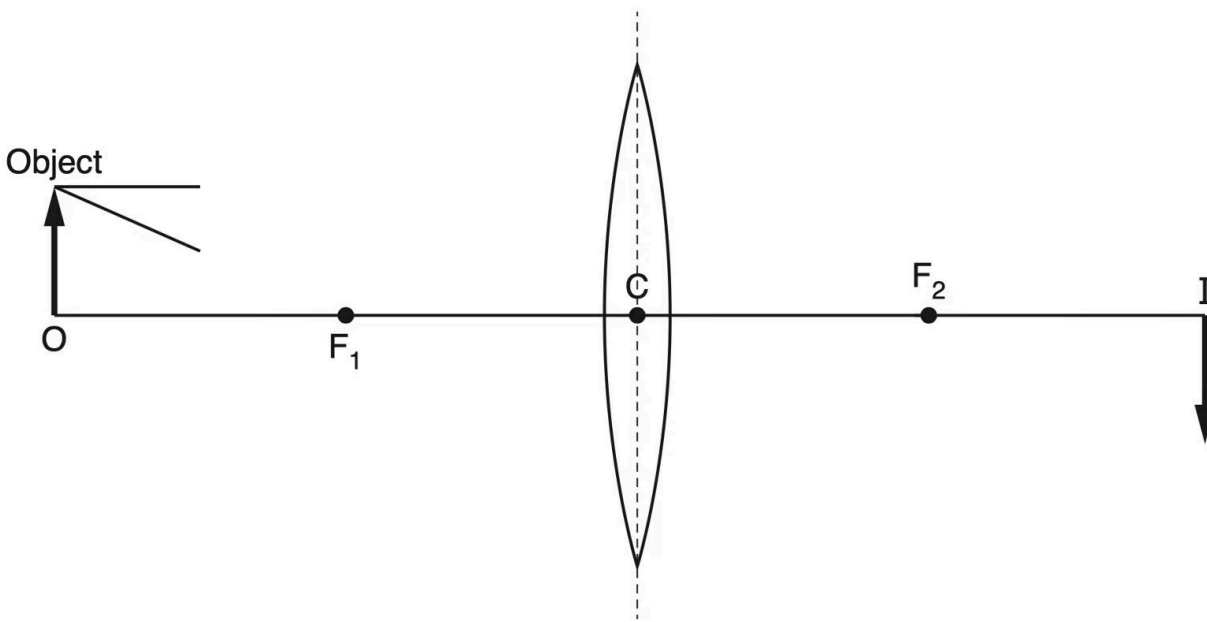


Fig. 8.1

The object is at O and its image is at I.

Which distance is the focal length of the lens? Tick **one** box.

- ☐ C to F_1
- ☐ O to C
- ☐ F_2 to I
- ☐ O to I

[1 mark]

Question 6b

On Fig. 8.1, extend the **two** rays from the arrowhead on the object until both reach the position of the image.

[3 marks]**Question 6c**

The object is moved a small distance **away** from the lens. State the effect, if any, this has on the position and size of the image.

[2 marks]

Question 7a

Fig. 8.1 shows a ray of light travelling through a glass block and then reflecting from a mirror.

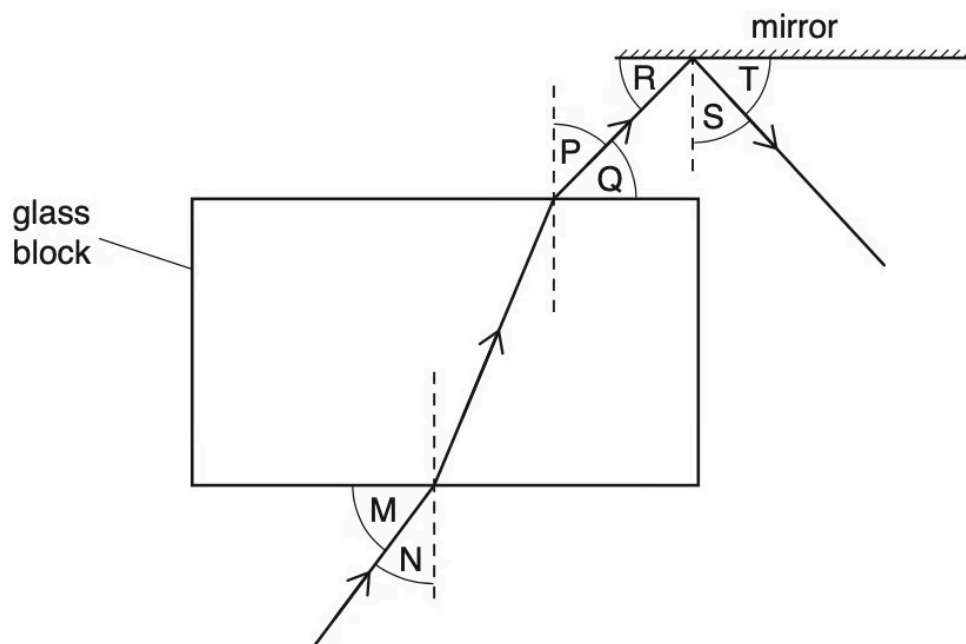


Fig. 8.1

State the term used for the dashed lines drawn in Fig. 8.1.

[1 mark]

Question 7b

Use Fig. 8.1 to identify the three angles in the list. Place the correct letter in the box to indicate each angle.

- ☐ angle of incidence
- ☐ angle of reflection
- ☐ angle of refraction

[3 marks]

Question 7c

The ray of light in Fig. 8.1 changes direction as it enters the glass block. State the name of this effect and explain why it happens.

[2 marks]