

- 1 (a) Fig. 8.1 is a ray diagram of a convex lens being used as a magnifying glass to produce a virtual image.

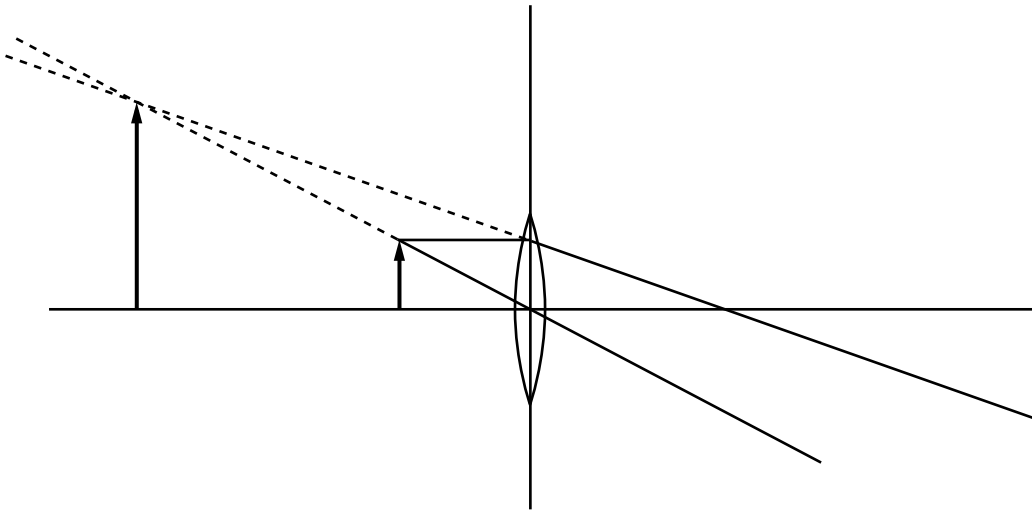


Fig. 8.1

On Fig. 8.1,

- (i) label the object O,
- (ii) label the image I,
- (iii) label a principal focus F,
- (iv) put arrows on the two rays to indicate their directions.

[4]

- (b) Fig. 8.2 shows a ray of light in air incident on an interface with glass. The refractive index of glass is 1.5.

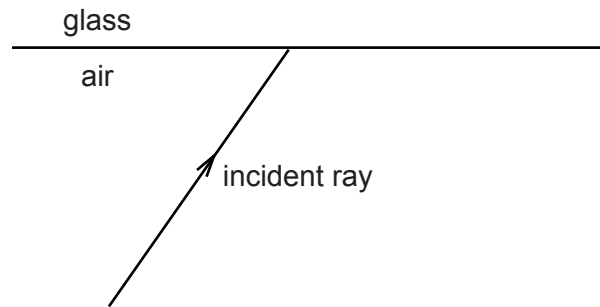


Fig. 8.2

On Fig. 8.2, accurately draw the ray as it travels in the glass. You will need to take a measurement from Fig. 8.2 and carry out an appropriate calculation. Show your working.

[3]

[Total: 7]

- 2 (a) The refractive index of a type of glass is 1.6.
Calculate the critical angle for light in this type of glass.

critical angle =[3]

- (b) A waterproof laser is immersed in water. Fig. 7.1 shows the laser shining light up towards the horizontal surface of the water.

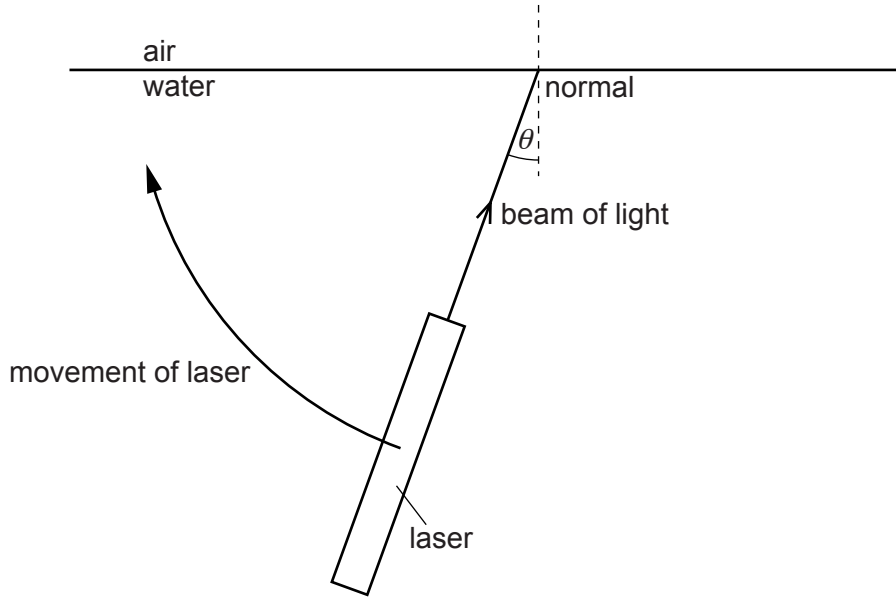


Fig. 7.1

Initially, the angle θ is much less than the critical angle for this light in water.

The laser moves and θ gradually increases until it is much greater than the critical angle.

Describe, for different angles of the laser, what happens to the light beam after it hits the surface.

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

[4]

- 3 Fig. 6.1 shows a glass block ABCD surrounded by air. A ray of red light, PQ, is incident on face CD of the block.

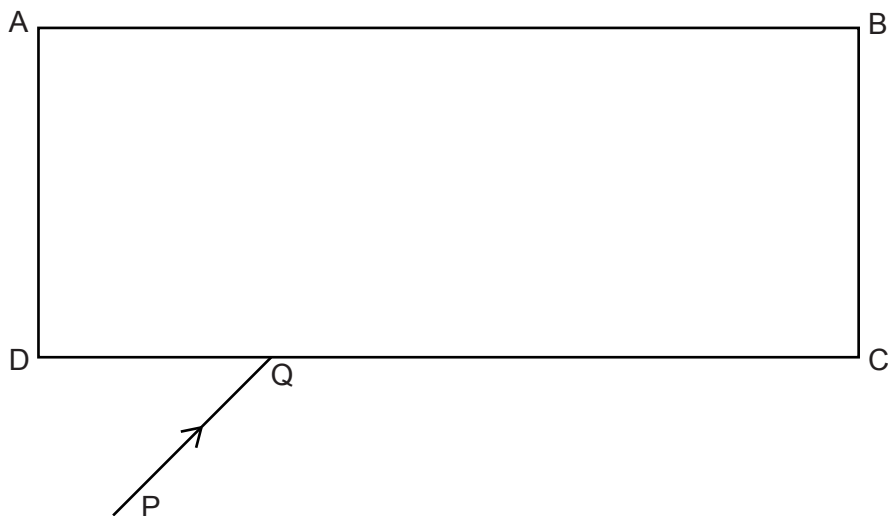


Fig. 6.1

- (a) On Fig. 6.1,
- (i) draw the normal at Q and the refracted ray inside the block so that it meets face AB,
 - (ii) draw the ray emerging from face AB of the block and the normal where the ray emerges,
 - (iii) between the rays and the normals you have drawn, label two equal angles X.

[3]

(b) The angle of incidence of another red ray is 65° . The refractive index of the glass of block ABCD for red light is 1.62.

(i) Calculate the angle of refraction in the glass for this ray.

angle = [2]

(ii) The speed of light in air is 3.0×10^8 m/s.

Calculate the speed of the red light in the glass.

speed = [2]

(c) For the same angle of incidence, the angle of refraction of red light in glass is greater than the angle of refraction of violet light.

State the term which describes the separation of red and violet refracted rays in glass.

..... [1]

[Total: 8]

4 (a) Fig. 6.1 shows a ray of light incident on the surface of a glass block.

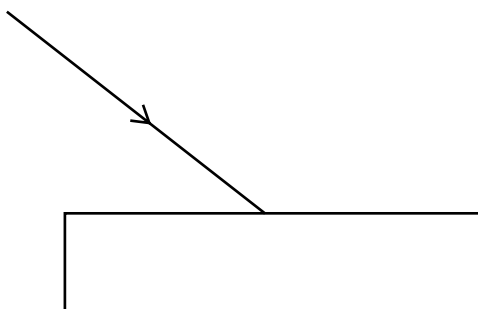


Fig. 6.1

On Fig. 6.1, accurately draw the reflected ray.

[2]

(b) Fig. 6.2 shows a ray of light incident on a glass prism.

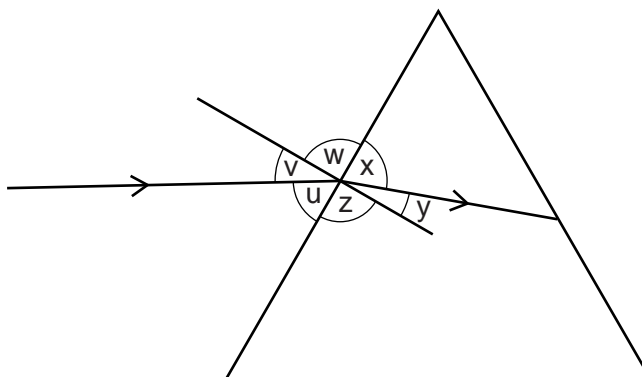


Fig. 6.2

Put **one tick only** in each line of the table to indicate which of the angles labelled in Fig. 6.2 are the angle of incidence and the angle of refraction.

	u	v	w	x	y	z
angle of incidence						
angle of refraction						

[2]

- (c) The refractive index of water is 1.33. A ray of light passes from water into air. The angle of incidence at the water-air interface is 30° .

Calculate the angle of refraction.

angle of refraction = [3]

- (d) Fig. 6.3 shows rays of violet and red light incident on a prism. The dashed line shows the path taken by the ray of violet light in the prism.

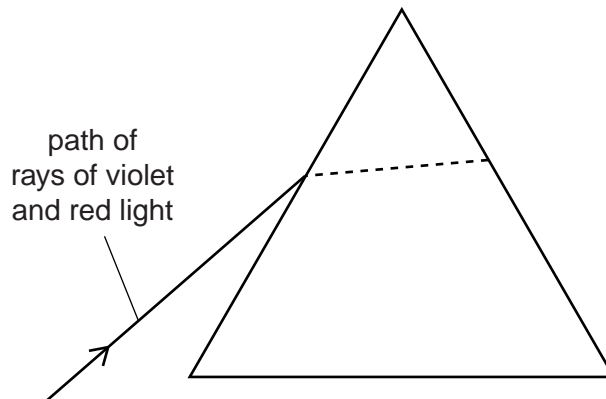


Fig. 6.3

On Fig. 6.3, draw and label the path that the ray of red light takes in the prism. A calculation is not required. [2]

[Total: 9]

- 5 A lamp in a large room is suspended below a horizontal mirror that is fixed to the ceiling. Fig. 8.1 is a scale diagram of the lamp and mirror.

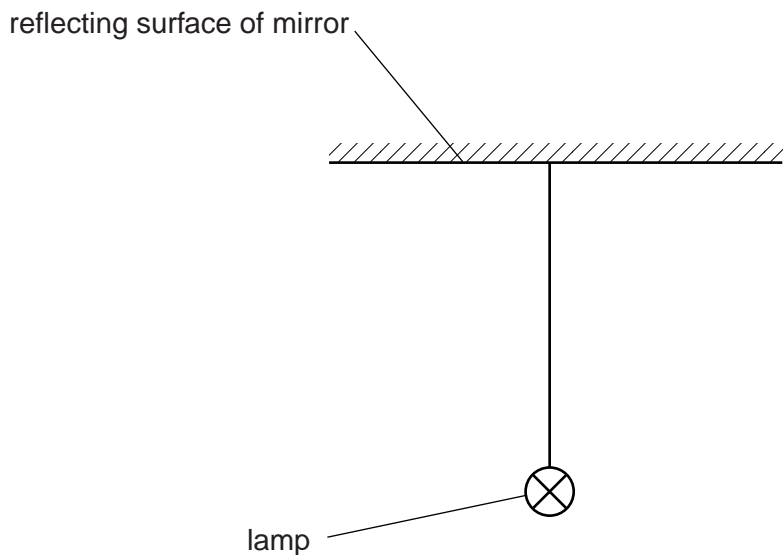


Fig. 8.1

An image of the lamp is formed by the mirror.

- (a) (i) On Fig. 8.1, draw two rays from the centre of the lamp that strike the mirror. Use these rays to locate the image. Label the image I. [3]

- (ii) State **two** characteristics of this image.

1.

2.

[2]

- (b) Suggest an advantage of positioning a mirror above the lamp.

.....

..... [1]

[Total: 6]

- 6 (a) Fig. 6.1 shows an object O placed in front of a plane mirror M. Two rays from the object to the mirror are shown.

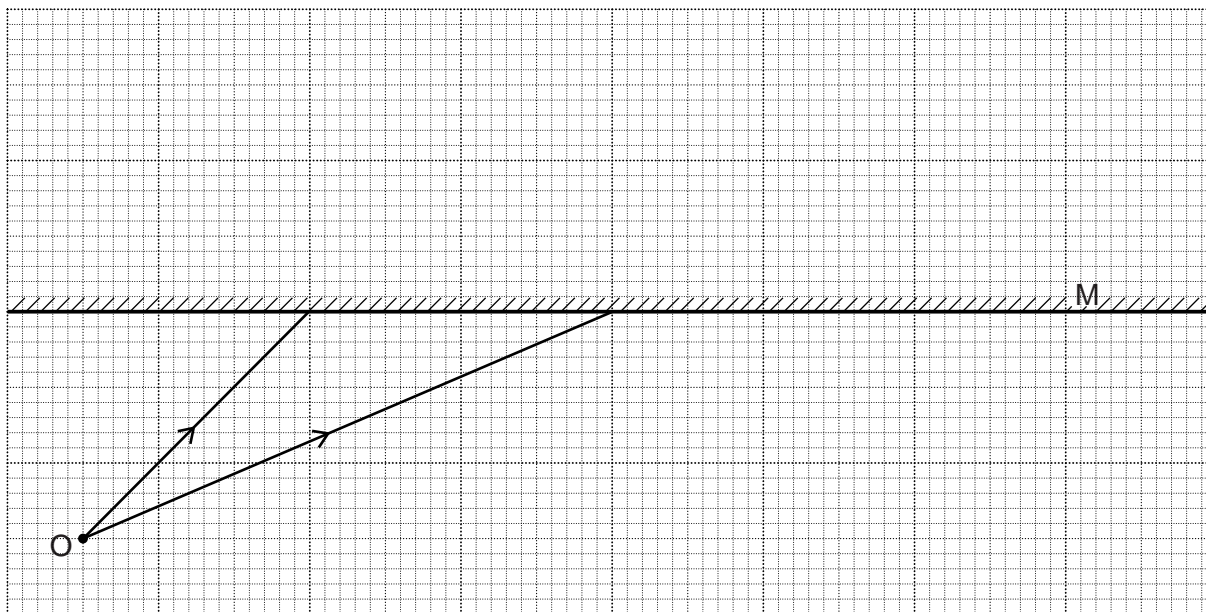


Fig. 6.1

- (i) On Fig. 6.1, for **one** of the rays shown,

1. draw the normal to the mirror,
2. mark the angle of incidence. Label this angle X.

[2]

- (ii) On Fig. 6.1, draw

1. the reflected rays for both incident rays,
2. construction lines to locate the image of O. Label this image I.

[2]

(b) In Fig. 6.2, circular wavefronts from a point source in a tank of water strike a straight barrier.

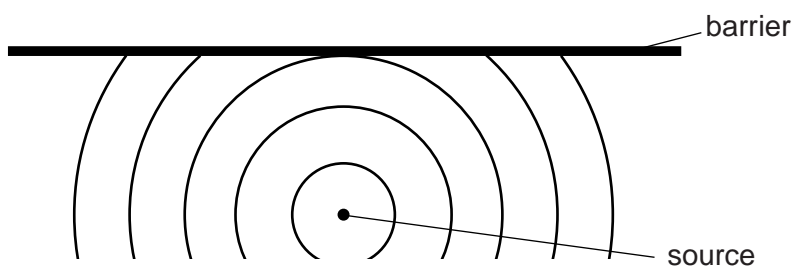


Fig. 6.2

(i) The reflected wavefronts seem to come from a single point.

On Fig. 6.2, mark a dot to show the position of this point. Label this point C. [1]

(ii) Draw, as accurately as you can, the reflected circular wavefronts. [2]

[Total: 7]

7 Fig. 11.1 shows part of the path of a ray of light PQ travelling in an optical fibre.

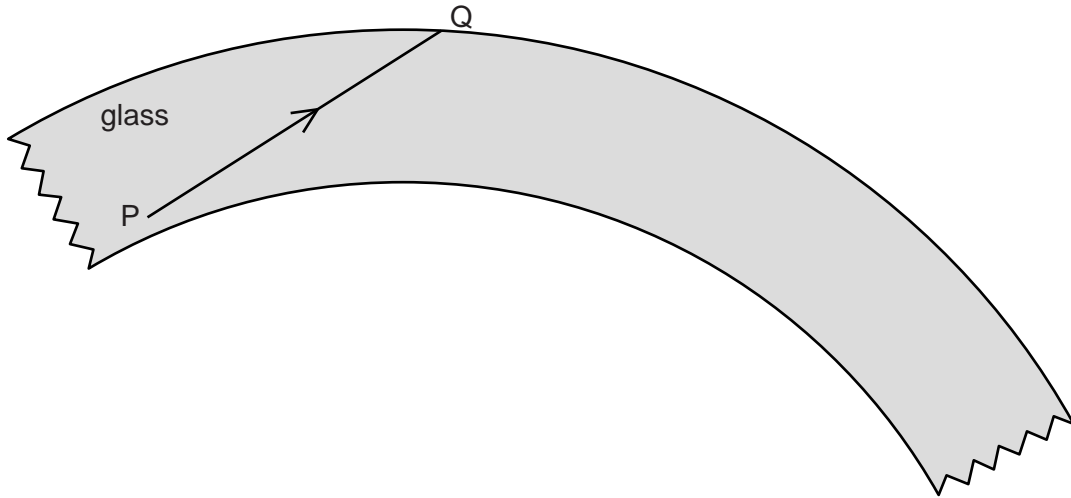


Fig. 11.1

- (a) On Fig. 11.1, carefully complete the path of the ray of light, until it leaves this section of the optical fibre. [2]
- (b) The material of an optical fibre has a refractive index of 1.52.
Calculate the critical angle.

critical angle =[2]

- (c) (i) State what sort of reflection takes place within an optical fibre.
..... [1]

- (ii) Explain your answer.
.....
..... [1]

[Total: 6]