

- 1 (a) Fig. 7.1 shows a ray of monochromatic red light, in air, incident on a glass block at an angle of incidence of 50° .

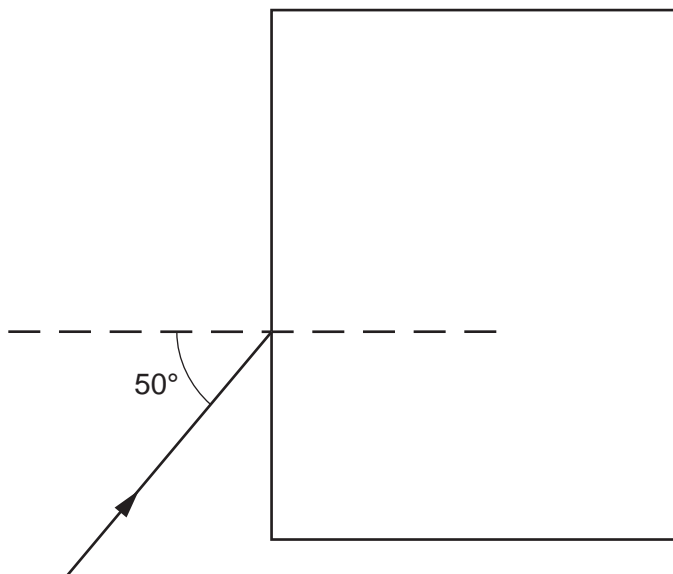


Fig. 7.1

- (i) State what is meant by *monochromatic* light.
.....[1]

- (ii) For this red ray the refractive index of the glass is 1.52. Calculate the angle of refraction for the ray.

angle of refraction =[2]

- (iii) Without measuring angles, use a ruler to draw the approximate path of the ray in the glass block and emerging from the block. [2]

(b) The red ray in Fig. 7.1 is replaced by a ray of monochromatic violet light. For this violet ray the refractive index of the glass is 1.54. The speed of light in air is 3.00×10^8 m/s.

(i) Calculate the speed of the violet light in the glass block.

speed =[2]

(ii) Use a ruler to draw the approximate path of this violet ray in the glass block and emerging from the block. Make sure this path is separated from the path drawn for the red light in **(a)(iii)**. Mark both parts of this path with the letter V. [2]

[Total: 9]

2 Fig. 6.1 shows an enlarged view of a spherical raindrop, centre O.

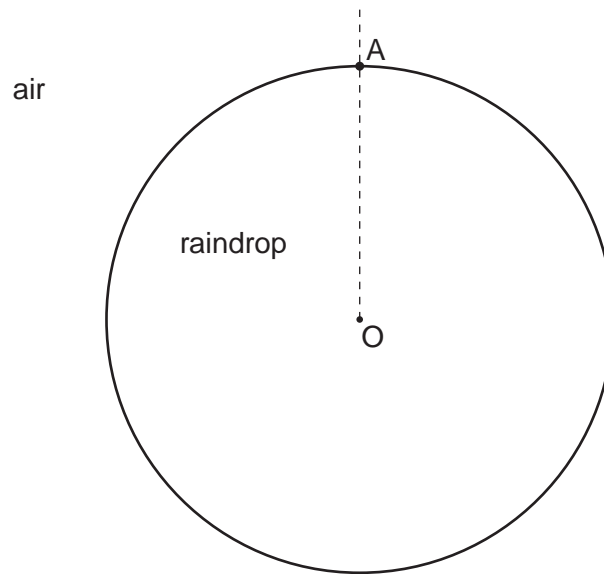


Fig. 6.1

- (a) On Fig. 6.1, draw a ray in the air striking the raindrop at A with an angle of incidence of 59° and coming from the left. [1]
- (b) The water in the raindrop has a refractive index of 1.33.
- (i) Show by calculation that the angle of refraction at A is about 40° .

[2]

- (ii) On Fig. 6.1, draw the path of the refracted ray to the point where it strikes the inner surface of the raindrop. Label this point B. [1]

(c) The ray is partially reflected at B.
Draw the normal and the reflected ray at B. [1]

(d) Extend the reflected ray to strike the surface of the raindrop again. At this point it is partially refracted out of the raindrop. Draw the approximate path of this ray as it emerges into the air. [1]

[Total: 6]

3 Fig. 9.1 represents a ray of monochromatic light passing through a rectangular glass block.

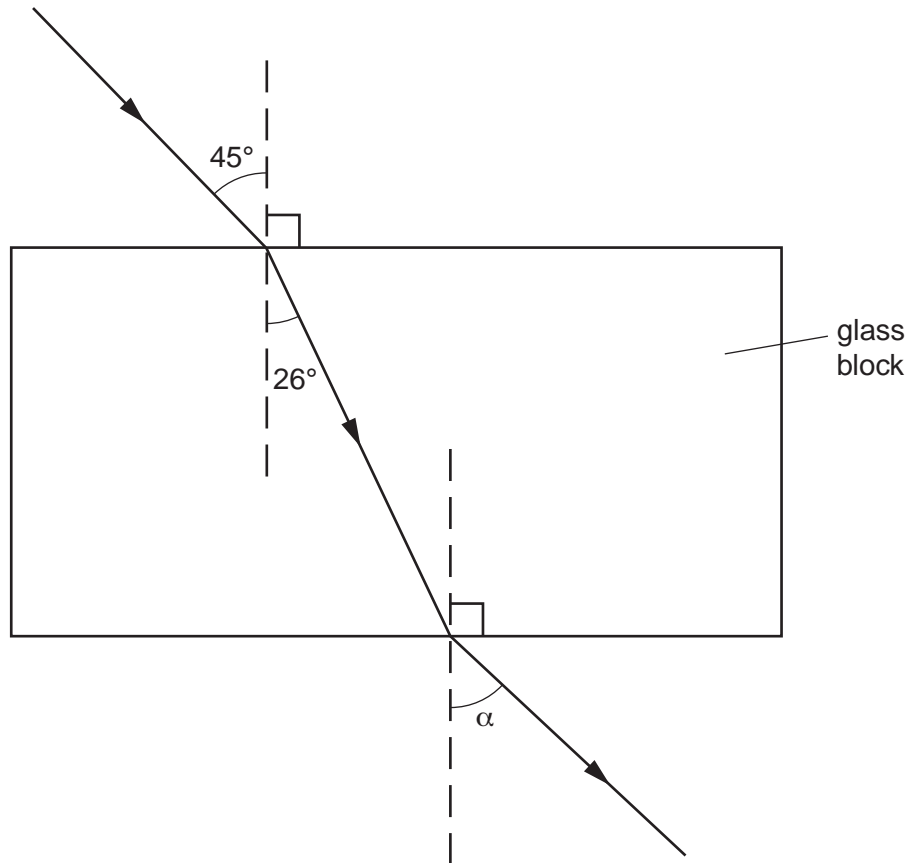


Fig. 9.1 (not to scale)

(a) What is meant by the term *monochromatic*?

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

(b) Use the information on Fig. 9.1 to determine the refractive index of the glass.

refractive index =[2]

(c) The angle α on Fig. 9.1 is not drawn with the correct value.

State the correct value of angle α .

$\alpha =$ [1]

(d) After the ray has left the glass block, it passes into a block of ice, whose refractive index is 1.31.

How does the speed of light in ice compare with

(i) the speed of light in air,

(ii) the speed of light in glass.

[2]

[Total: 6]

4 A ray of monochromatic light passes through the glass prism shown in Fig. 6.1.

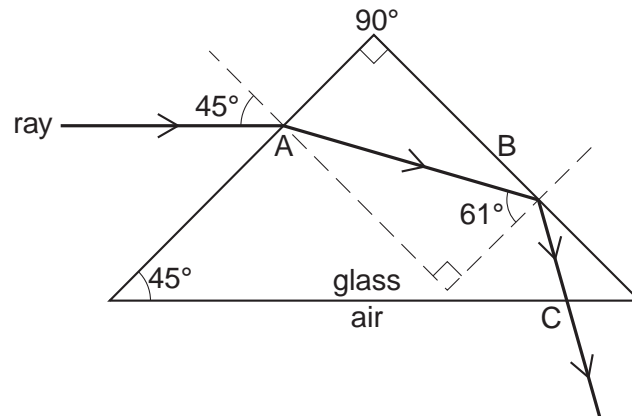


Fig. 6.1

(a) State what is meant by the term *monochromatic*.

.....
 [1]

(b) State the name given to what happens to the ray at A.

..... [1]

(c) Use the values on the diagram to calculate the angle of refraction at A (The angles in a triangle add up to 180°).

angle of refraction = [1]

(d) Calculate the refractive index of the glass.

refractive index = [3]

(e) Explain why the ray does not emerge into the air at B, but does emerge at C.

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

(f) An identical prism is stuck to the first prism using a transparent adhesive with the same refractive index as the glass. This is shown in Fig. 6.2.

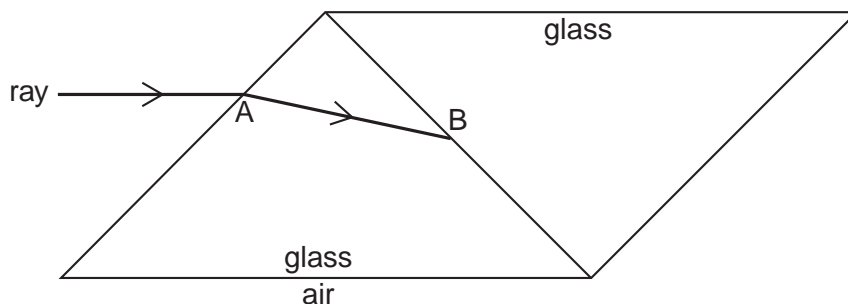


Fig. 6.2

On Fig. 6.2, draw the path of the ray after it has reached B and until it has passed into the air again. [3]

[Total: 11]