1 An electromagnetic wave enters a fibre-optic cable from air. On entering the cable, the wave slows down to three-fifths of its original speed.
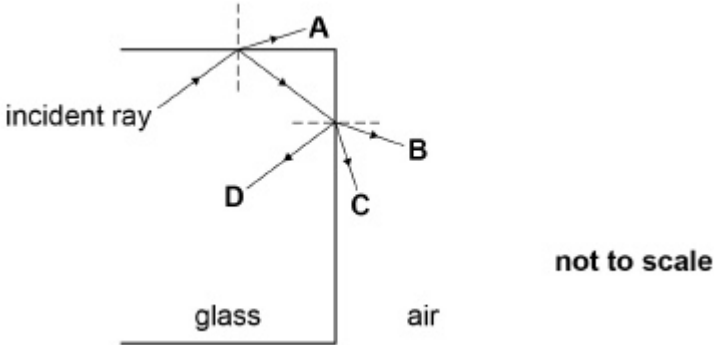
What is the refractive index of the core of the fibre-optic cable?

A   0.67

B   1.33

C   1.50

D   1.67

(Total 1 mark)

2 A ray of light is incident on a glass–air boundary of a rectangular block as shown.

not to scale

The refractive index of this glass is 1.5
The refractive index of air is 1.0
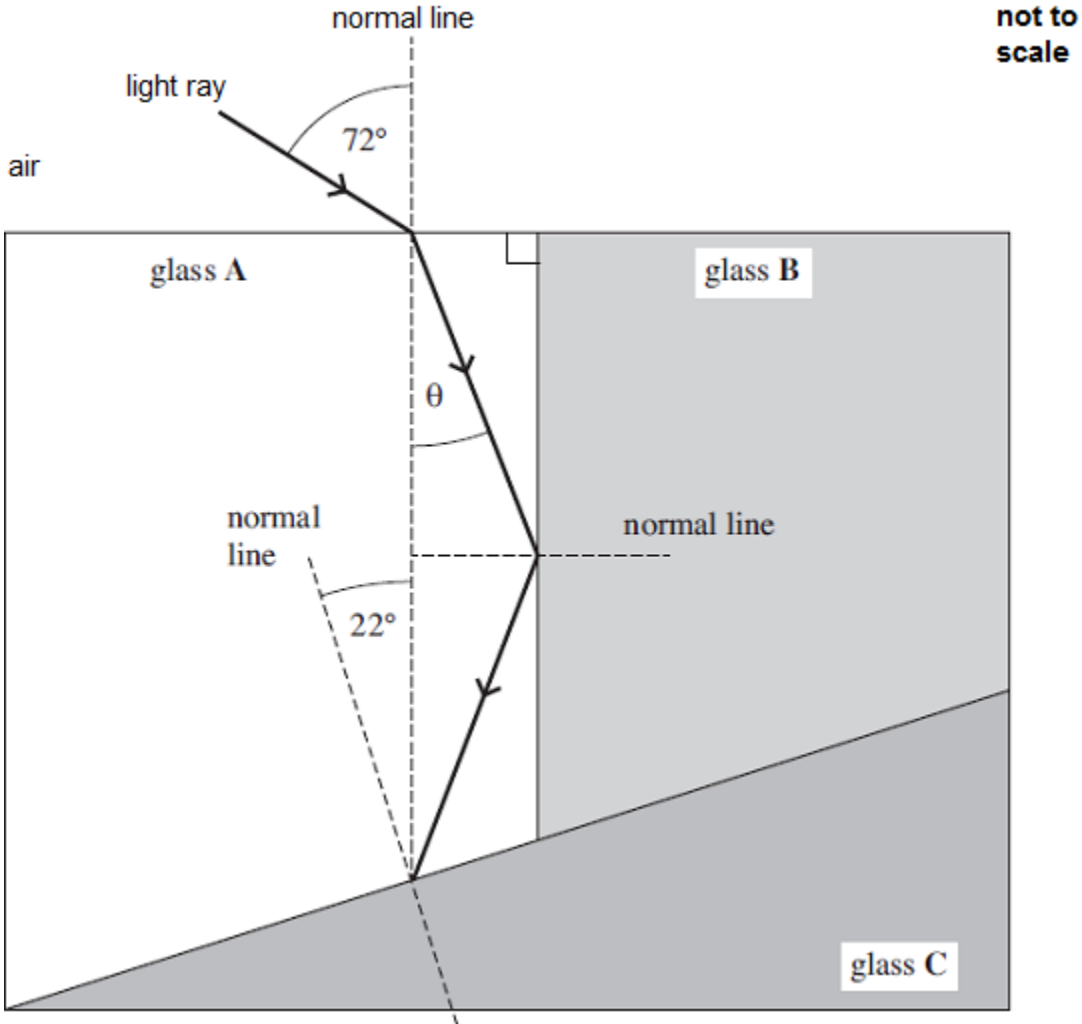The angle of incidence of the light at the first glass–air boundary is 44°

What is the path of the ray of light?

A

B

C

D

(Total 1 mark)

3 The diagram below shows three transparent glass blocks **A**, **B** and **C** joined together. Each glass block has a different refractive index.

(a) State the **two** conditions necessary for a light ray to undergo total internal reflection at the boundary between two transparent media.

condition 1 _____

_____

condition 2 _____

_____

(2)

(b)   Calculate the speed of light in glass **A**.

refractive index of glass **A** = 1.80

speed of light _____ ms^{-1}

(2)

(c)   Show that angle θ is about 30º.

(2)

(d)   The refractive index of glass **C** is 1.40.

Calculate the critical angle between glass **A** and glass **C**.

critical angle _____ degrees

(2)

(e)   (i)   State and explain what happens to the light ray when it reaches the boundary
                between glass **A** and glass **C**.

_____

_____

_____

(2)

(ii)   On the diagram above continue the path of the light ray after it strikes the boundary
        between glass **A** and glass **C**.

(1)

(Total 11 marks)