NAME	**INDEX NUMBER**
SCHOOL	**DATE**

REFRACTION OF LIGHT

1. **1995 Q18 P1**

Light travels through glass of refractive index 1.5 with a speed v. Calculate the value of v
(speed of light in air = 3.0×10^8 m/s) (3 marks)

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2. **1995 Q20 P1**

A ray of light incident on the surface of a glass prism is observed to behave as represented in the diagram in figure 6

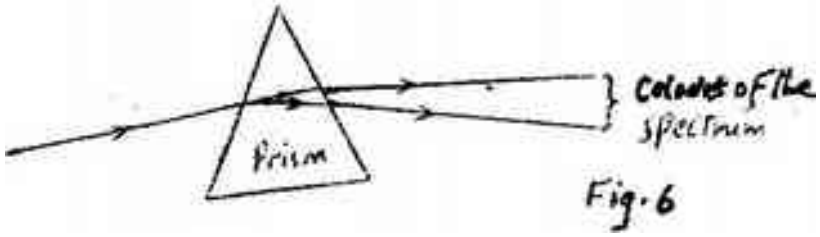

Fig. 6

Explain this observation (3 marks)

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3. 1996 Q23 P1

A small object lies at the bottom of a water pond at a depth of 1.2 m. Given that the refractive index of water is 1.3, determine the apparent depth of the object. (Give your answers to 1 decimal place)

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4. 1997 Q27 P1

Figure 10 shows the apparent position of a fly in air as seen by a fish in water

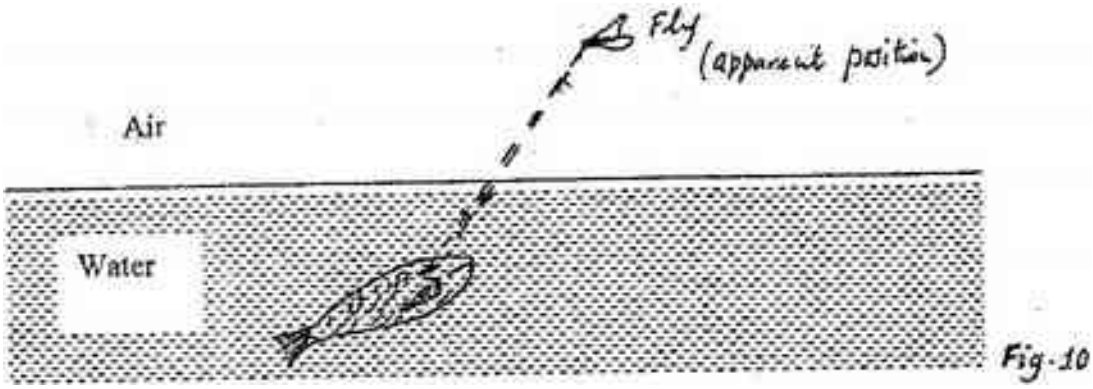

Fig. 10

Sketch on the same diagram rays to show the actual position of the fly

5. 1997 Q31 P1

Figure 12 shows an experiment arrangement. S_1 S_2 and S are narrow slit

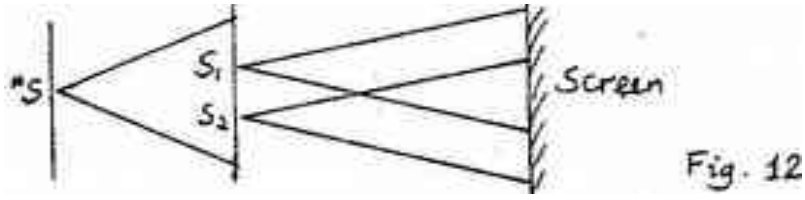

Fig. 12

State what is observed on the screen when the source is?

(a) Monochromatic

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(b) White light

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6. 1998 Q5 P2

a) A ray of white light is incident on one face of a rectangular glass prism.

i) Draw a ray diagram to illustrate the dispersion of white light by the prism, showing only the red (R) and violet (V) rays.

ii) On the same diagram drawn in (i), mark and label the initial angle of incidence, 1, and the angles of reflection on the first face for red r_R and for violet r_V.

iii) Snell's law for the red and colours can be written as $n_R = n_R \frac{\sin i}{\sin r_R}$ and $n_V \frac{\sin i}{\sin r_V}$ respectively. Show that $n_V > n_R$. (2 marks)

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b) Calculate the critical angle for a material whose refractive index is 1.40.

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7. 1999 Q22 P1

A microscope is focused on a mark on horizontal surface. A rectangular glass block 30mm thick is place on the mark. The microscope is then adjusted 10mm upwards; to bring the mark back to focus, determine the refractive index of the glass.

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8. 2000 Q24 P1

Fig 13. Shows a semicircular glass block placed on a bench. A ray of light is incident at point O as shown. The angle of incidence, I , is just greater than the critical angle of glass.

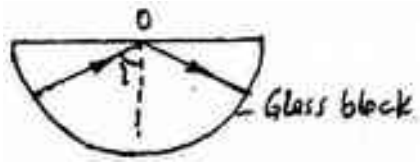

Fig 13

A drop of water is now placed on the bench so as to make contact with the glass at point O. Sketch on the same figure the path followed by the ray after placing the drop of water.

9. 2001 Q21 P1

Fig. 14 shows a ray of light incident on a glass prism.

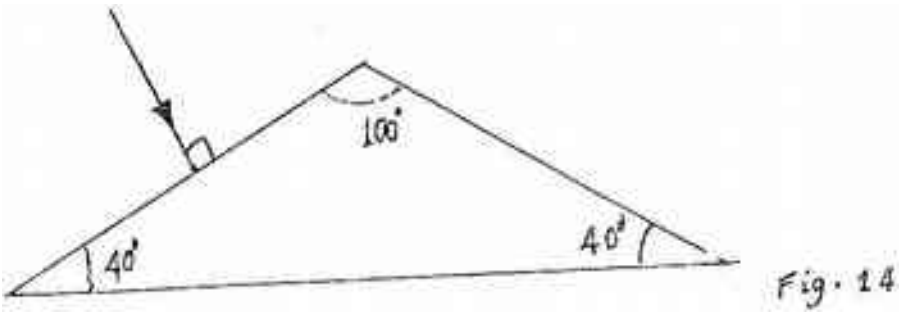

Fig. 14

If the critical angle of the glass is 39° sketch on the same diagram the path of the ray until it emerges from the prism.

10. 2002 Q8 P1

Fig. 3 shows two rays of A and B entering a semi – circular glass block which has a critical angle of 42°. The rays are incident at an air – glass boundary at point O.

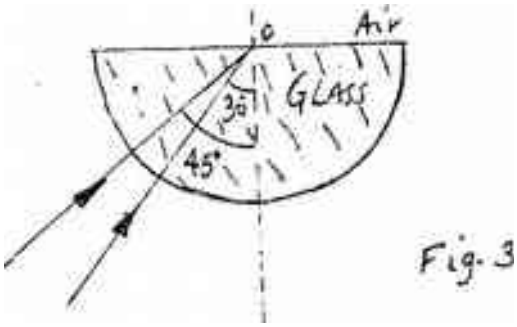

Fig. 3

Complete the path of the two rays from point O. label A' and B' the corresponding rays.

11. 2002 Q1 P2

Figure 1 shows the path of array of yellow light through a glass prism. The speed of yellow light in the prisms is 1.88 x 10^8m/s.

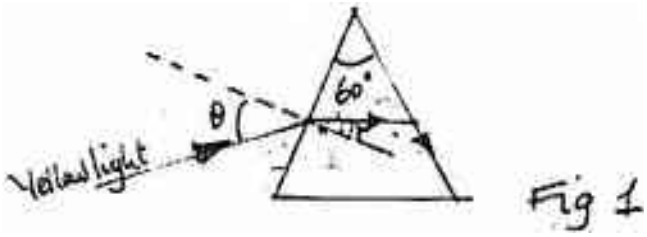

Fig 1

a) Determine the refractive index of the prism material for the light (speed of light in vacuum e = 3.0 x 108 ms^{-1})

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b) Show on the figure the critical angle, c, and determine its value.

c) Given that r = 21.2°, determine the angle θ

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d) On the same figure, sketch the path of the light after striking the prism if the prism was replaced by another of similar shape but lower refractive index. (Use dotted line for your answer)

12. 2003 Q15 P1

One of the conditions for total internal reflection to occur is that angle of incidence must be greater than the critical angle of the medium. State the other condition.

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13. 2004 Q24 P1

Figure 13 shows a coin placed in a large empty container. And observer looking into the container from the position shown is unable to see the coin.

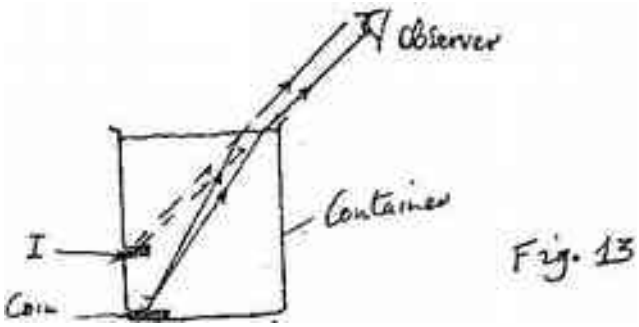

Fig. 13

Sketch two rays from a point on the coin to show how the observer is able to see the image of the coin after the container if filled with water.

14. 2005 Q23 P1

Fig 13 shows rays of light AO, BO, and CO incident on a glass-air interface. OA' OB' and OC' are the corresponding emergent rays. Study and answer questions 14 and 15.

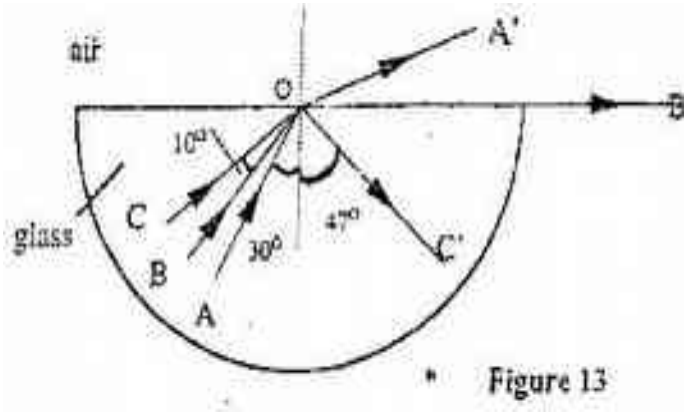

Figure 13

Determine the critical angles of the glass material

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15. 2005 Q24 P1

Determine the refractive of index of the glass material. (3 marks)

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16. 2006 Q19 P2

(a) Define the refractive index of a substance (1 mark)

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(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder. A pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The real depth and apparent depth were measured. The experiment was repeated with other values of real depth. The table below shows the results obtained.

Real depth (cm)	5	10	15	20	25
Apparent depth (cm)	3.3	6.7	10	13.3	16.7

(i) Plot the graph of real depth against apparent depth (5 marks)

(ii) From the graph determine the refractive index of the liquid (4 marks)

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(c) Figure 9 shows a ray of light incident on a glass – air interface

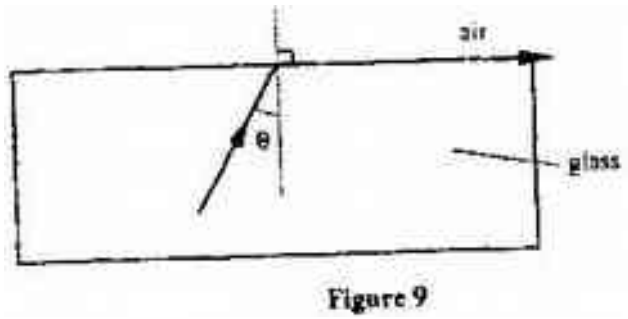

Figure 9

Given that the refractive index of the glass is 1.6. Determine angle θ

(3 marks)

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17. 2007 Q7 P2

Figure 6 shows a ray of light incident on the face of a water prism

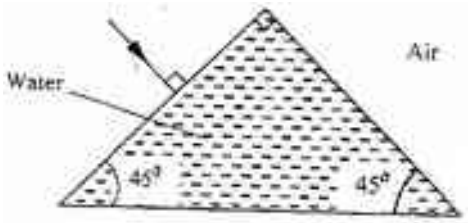

Figure 6

Sketch the path of the ray as it passes though the prism
Critical angle for water is 49^0 (1 mark)

18. 2008 Q16 P2

(a) State two conditions necessary for total internal reflection to occur

(2 marks)

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(b) Figure 9 shows a ray of light incident on the boundary between two media and at an angle θ

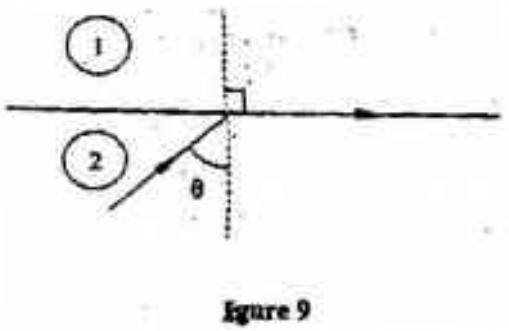

Figure 9

Show that the refractive index for a ray of light travelling from medium 1 to medium 2 is given by:

$M_2 = \frac{1}{\sin \theta}$ (2 marks)

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(c) Figure 10 shows a ray of light incident on one face of a block of ice of refractive index 1. 31 and totally reflected at the adjacent face

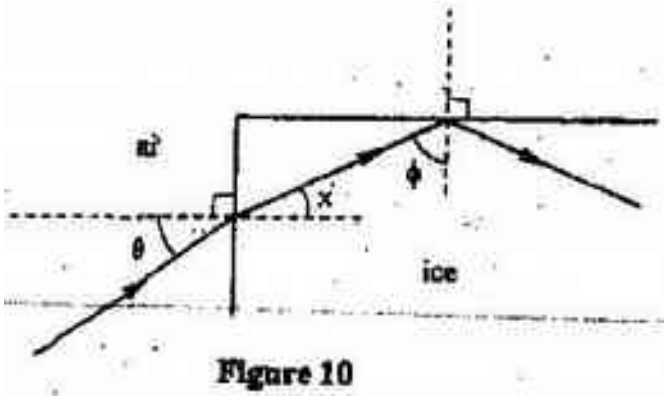

Figure 10

Determine

(i) Angle ɵ (2 marks)

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(ii) Angle x (1 mark)

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(iii) Angle θ, the greatest angle for which the total internal reflection is possible (2 marks)

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19. 2009 Q7 P2

Determine the speed of light in water given that the speed of light in air is 3.0 x10 ms and the refractive index of water is 1.33.

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20. 2009 Q16b P2

(b)A pin is placed at the bottom of beaker of depth 11.5cm.The beaker is then filled with kerosene. By using another pin on the side of the beaker and observing from the top, the distance of the image of the pin in the beaker is found to 3.5cm from the bottom. Determine the refractive index of kerosene.

(4 marks)

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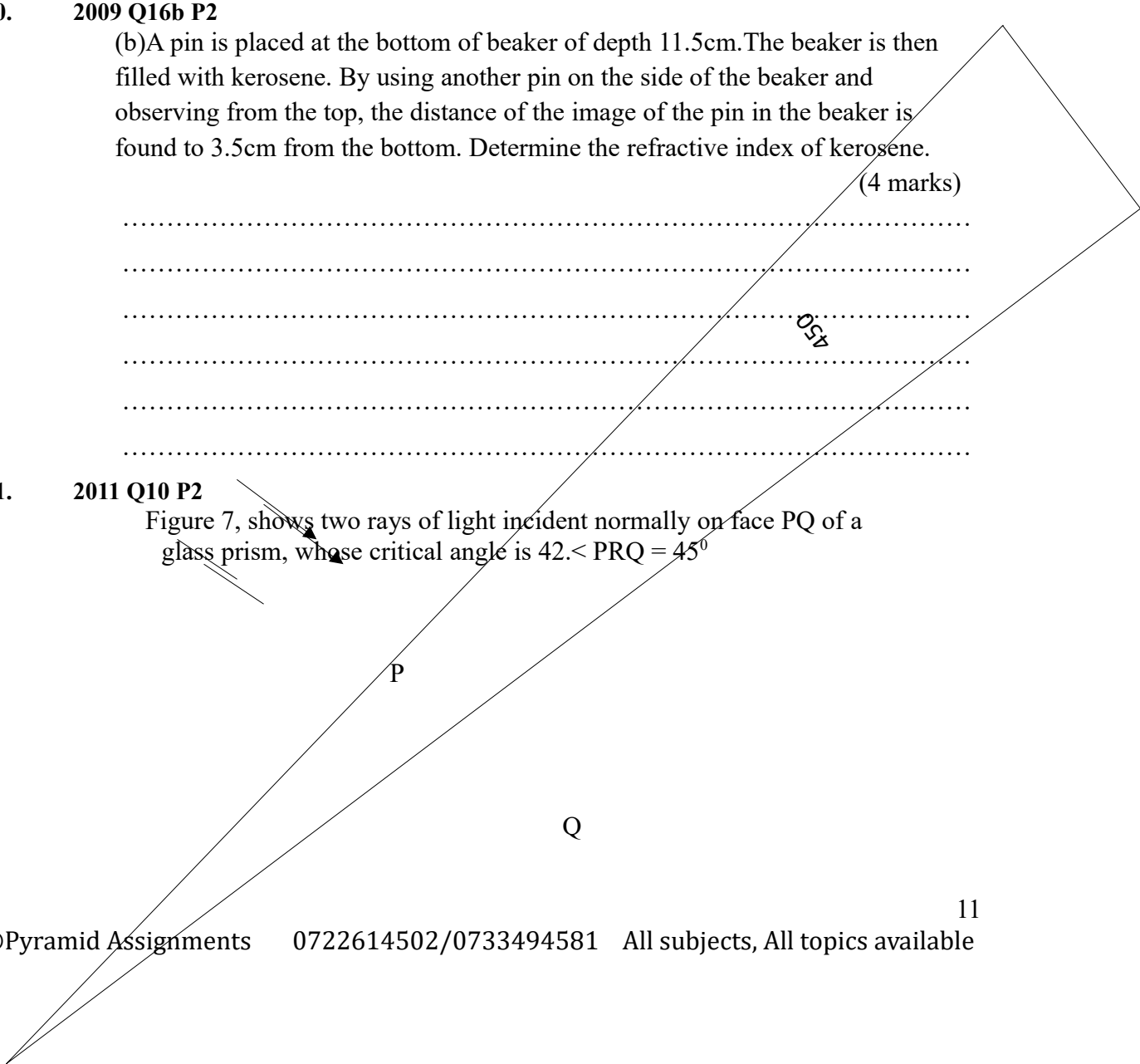
21. 2011 Q10 P2

Figure 7, shows two rays of light incident normally on face PQ of a glass prism, whose critical angle is 42.< PRQ = 45^0



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Complete the diagram to show the paths of two rays as they pass through the prism. (3 marks)

22. 2012 Q5 P2

Figure 5, shows an object O at he bottom of a beaker full of a liquid. An observer above the beaker sees its image at point X inside the liquid. Determine the reflective index of the liquid (3 marks)

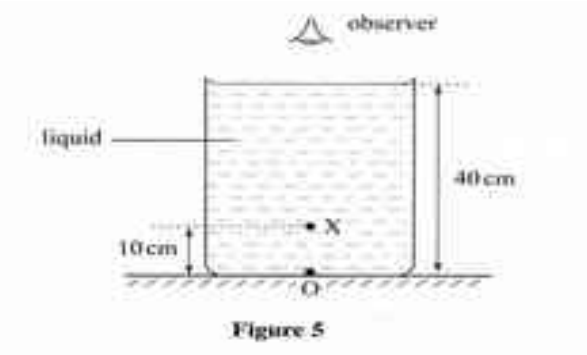

Figure 5

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23. 2012 Q10 P2

Figure 9, shows the cross section of an optical fibre made of two types of glass, A and B. The refractive index of B is lower than that of A.

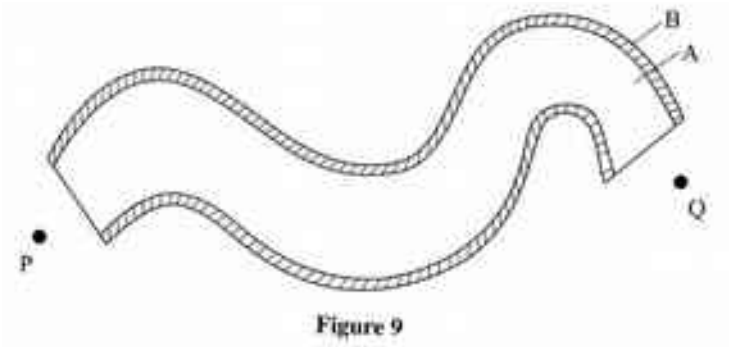

Figure 9

A ray of light enters the optical fibre at P and emerges from Q

i. Sketch the path of the ray through the fibre (1 mark)

ii. State the reason why light travels through the fibre as in (i) above (1 mark)

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