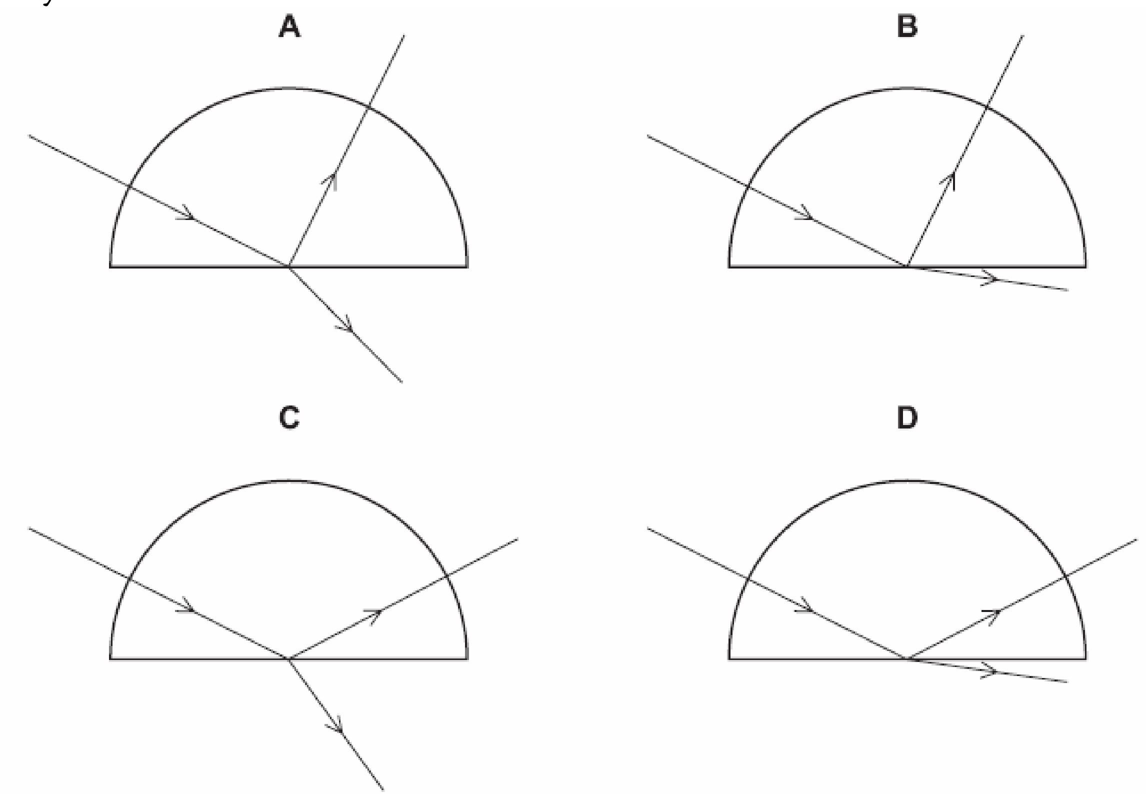
NAME: ....

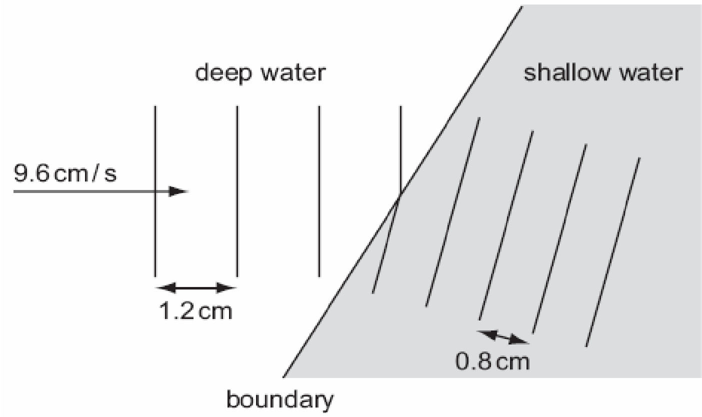
REFRACTION

1. A ray of red light enters a semi-circular glass block normal to the curved surface.

Which diagram correctly shows the partial reflection and refraction of the ray?



2. A ripple tank is used to demonstrate refraction of plane water waves.



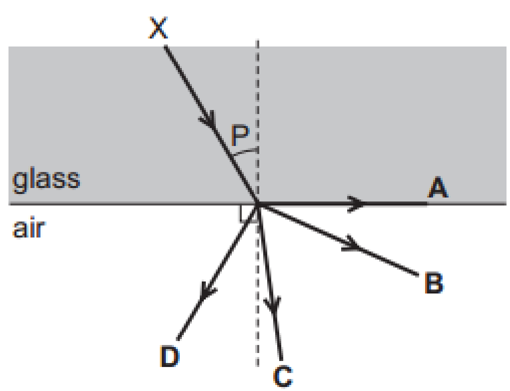
Waves in deep water have a wavelength of 1.2 cm and a speed of 9.6 cm / s. The wavelength of the waves in shallow water is 0.8 cm.

What is the speed of the waves in the shallow water?

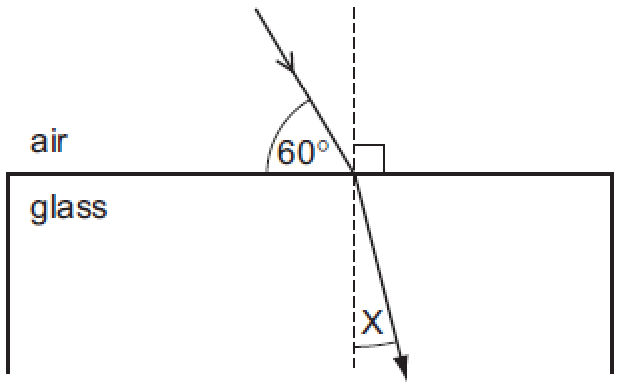
A 6.4 cm / s
B 8.0 cm / s
C 9.6 cm / s
D 14.4 cm / s

3. The diagram shows a ray of light travelling from X. Angle P is less than the critical angle.

In which direction does the ray continue?



4. A ray of light passes into a glass block of refractive index 1.5.



What is the value of the angle marked X?

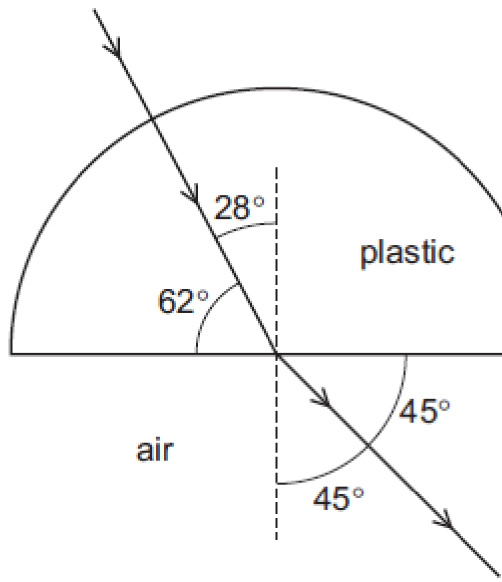
A. 19.5°

B. 25.0°

C. 35.3°

D. 48.6°

5. A semi-circular block is made from a plastic. A ray of light passes through it at the angles shown.



To two decimal places, what is the refractive index of the plastic?

[3m]

6. Fig. 6.1 shows a ray of white light from a ray-box passing into a glass prism.
A spectrum is formed between P and Q on the screen.

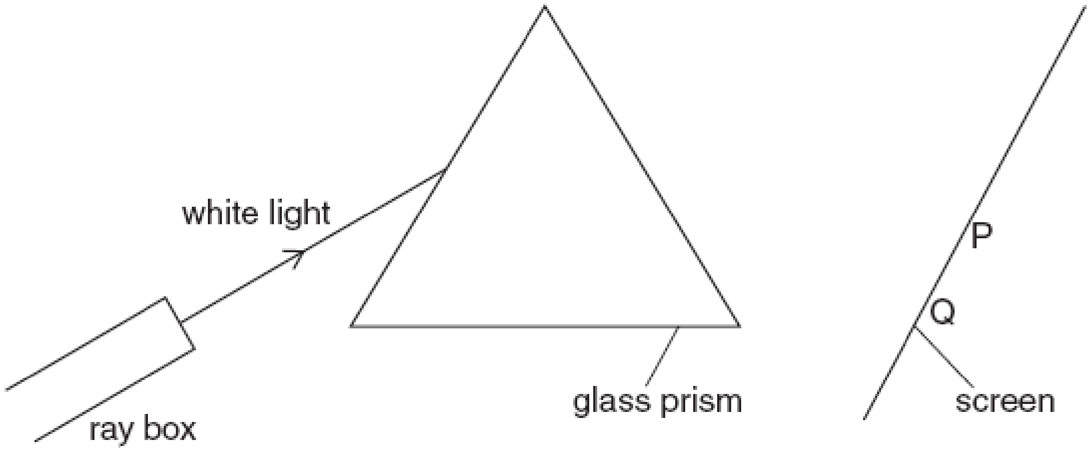


Fig. 6.1
(a) State the colour of the light at end P of the spectrum.

[1]
(b) State whether the value of each of these properties for blue light is greater than, equal to or less than the value for red light.

(i) Speed in a vacuum.. [1]

(ii) Wavelength.. [1]

(c) Fig. 6.2 shows the ray passing through a red filter before it reaches the prism.

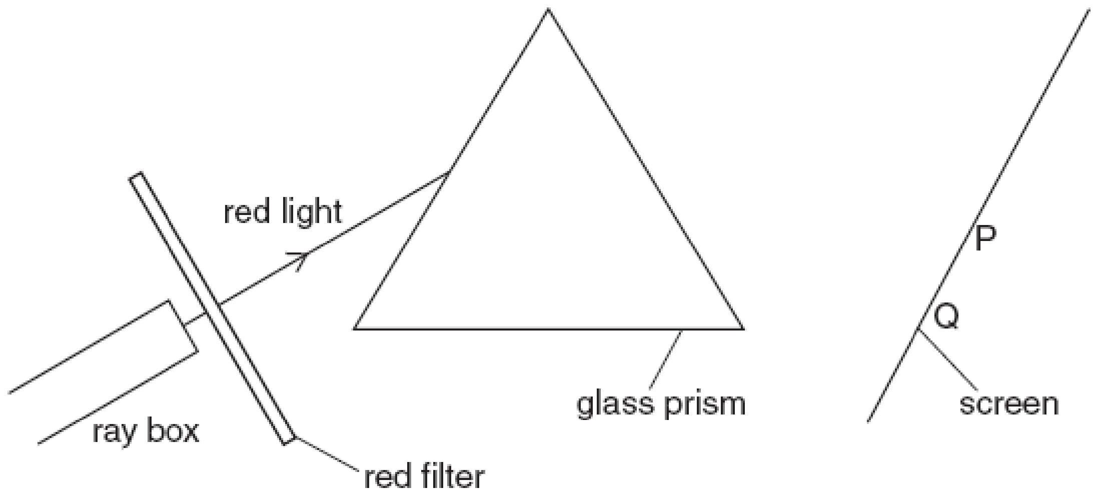
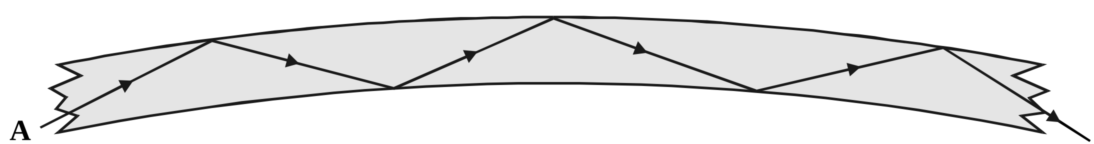


Fig. 6.2

Complete Fig. 6.2 to show the ray of red light passing through and emerging from the prism. [2]

7. (a) The diagram shows the passage of light beam A travelling down an optical fibre.

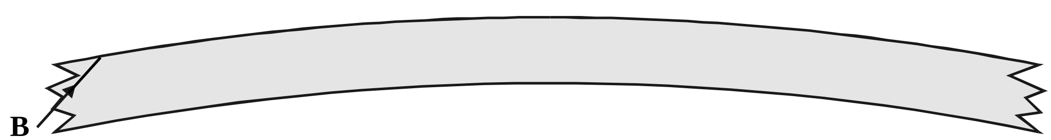


(i) State the name of the process that takes place as the light **A** beam travels down the optical fibre.

....

(1)

(ii) Complete the diagram to show the passage of the light beam **B** down the same optical fibre.



(1)

(iii) Suggest why beam **B** will take slightly longer to travel down the fibre than beam **A**.

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

(2)

(b) Optical fibres are used to carry information. The information is carried by the light beam in the form of a digital signal.

(i) Draw a diagram to show what is meant by a digital signal.

(1)

(ii) The signal from a microphone is an analogue signal. How does an analogue signal differ from a digital signal?

……………………………………………………………………………

……………………………………………………………………………

(1)

(c) When signals are sent through optical fibres they lose energy.

(i) State what happens to the brightness of the light beam as it loses energy.

....

(1)

(ii) State **one** disadvantage of losing energy as the light beam travels through the optical fibre.

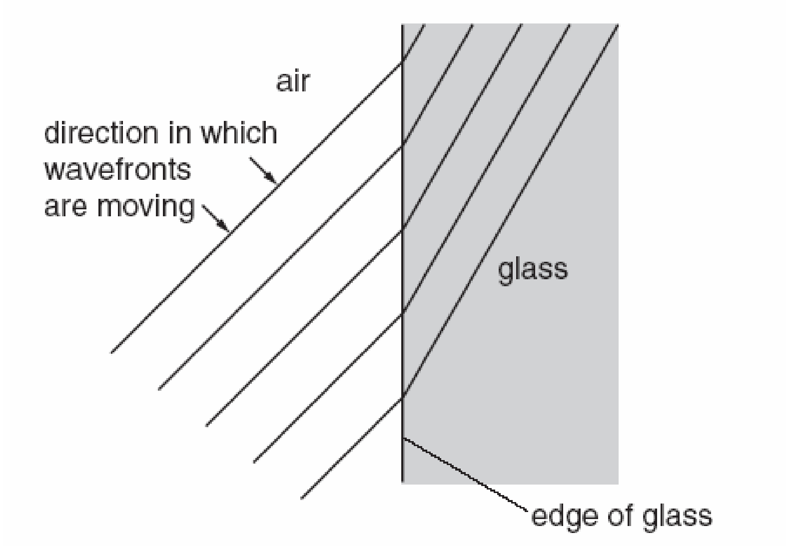
....

....

(1)

(Total 8 marks)

8. The figure below shows wavefronts of light crossing the edge of a glass block from air into glass.



(a) On the figure:

(i) draw in an incident ray, a normal and a refracted ray that meet at the same point on the edge of the glass block,

(ii) label the angle of incidence and the angle of refraction,

(iii) measure the two angles and record their values.

Angle of incidence = ...

Angle of refraction = ...

[4]

(b) Calculate the refractive index of the glass.

Refractive index = ...[3]

[Total 7m]

9. Fig. 7.1 and Fig. 7.2 show wavefronts of light approaching a plane mirror and a rectangular glass block, respectively.

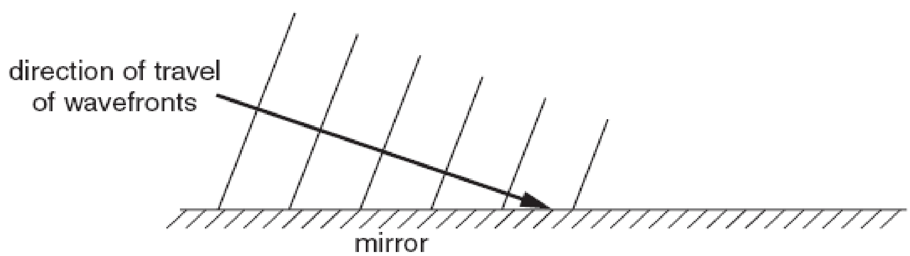


Fig. 7.1

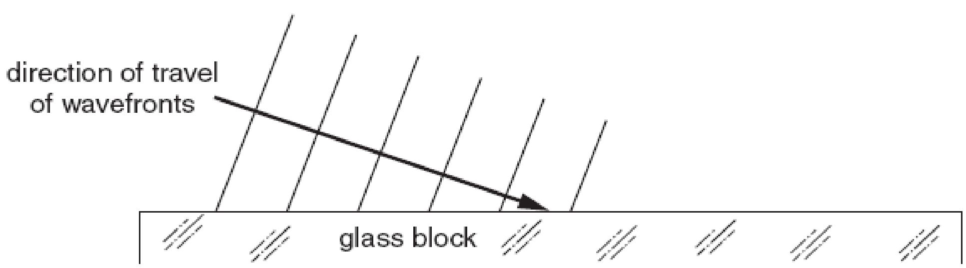


Fig. 7.2

(a) On Fig. 7.1 and on Fig. 7.2 draw wavefronts to show what happens after the waves
strike the surface. [4]
(b) In Fig. 7.2, the waves approaching the block have a speed of 3.0×10^8 m/s and an angle
of incidence of 70°. The refractive index of the glass of the block is 1.5.
(i) Calculate the speed of light waves in the block.

Speed = ... [2]

(ii) Calculate the angle of refraction in the block.

Angle =.. [2]

[Total: 8]