

Light

Question Paper 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Properties of Waves including Light and Sound
Sub-Topic	Light
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 1

Time Allowed: 57 minutes

Score: /47

Percentage: /100

- 1 (a) (i) A ray of light passes through a length of curved optical fibre.

Draw a diagram showing the fibre and the path of the ray of light.

[1]

- (ii) Describe one use of optical fibres in medicine. You may draw a diagram.

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

[3]

(b) Draw a straight line from each wave on the left to the most appropriate speed.

	90 m/s (9×10)
light in air	6000 m/s (6×10^3)
microwaves in a vacuum	100 000 m/s (1×10^5)
	1 000 000 m/s (1×10^6)
sound in steel	300 000 000 m/s (3×10^8)
	60 000 000 000 m/s (6×10^{10})

[3]

(c) The refractive index of a block of glass is 1.5.

Use your value for the speed of light from (b) to calculate the speed of light in this block.

speed = [2]

[Total: 9]

2 (a) Explain what is meant by

(i) *total internal reflection*,

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

(ii) *critical angle*.

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

(b) Fig. 7.1 shows a ray of light, travelling in air, incident on a glass prism.

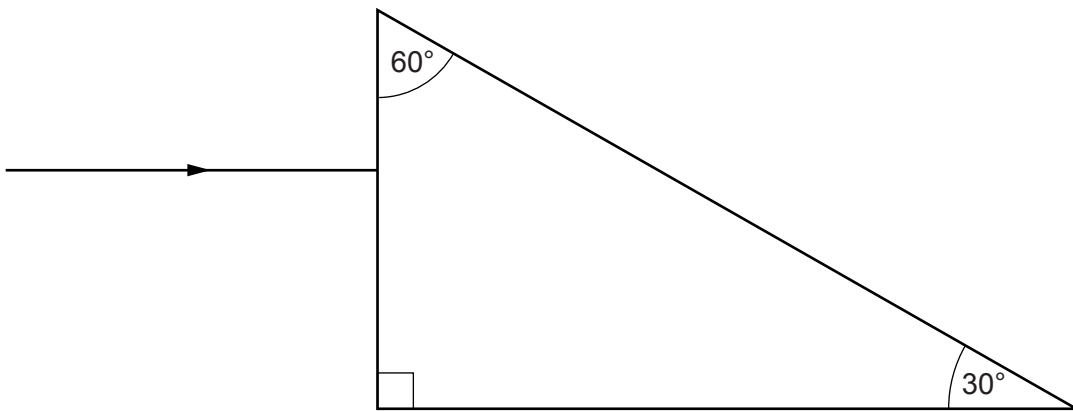


Fig. 7.1

(i) The speed of light in air is 3.0×10^8 m/s. Its speed in the glass is 2.0×10^8 m/s.

Calculate the refractive index of the glass.

refractive index =[2]

- (ii) Show that the critical angle for the glass-air boundary is 42° .

[1]

- (iii) On Fig. 7.1, draw carefully, without calculation, the continuation of the ray through the prism and into the air. [3]

[Total: 8]

- 3 (a) Fig. 7.1 represents an object O placed in front of a converging lens.

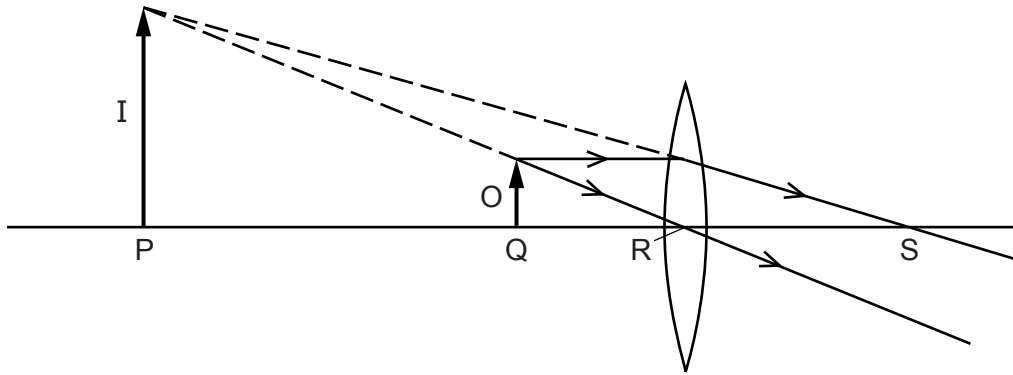


Fig. 7.1

- (i) State a full description of the image I.
 [2]
- (ii) Using the letters on Fig. 7.1, identify the focal length of the lens.
 [1]
- (iii) On Fig. 7.1, draw an eye suitably placed to view the image I. [1]
- (b) Fig. 7.2 shows an object O placed to the left of a converging lens. A principal focus of the lens is at the position marked F.

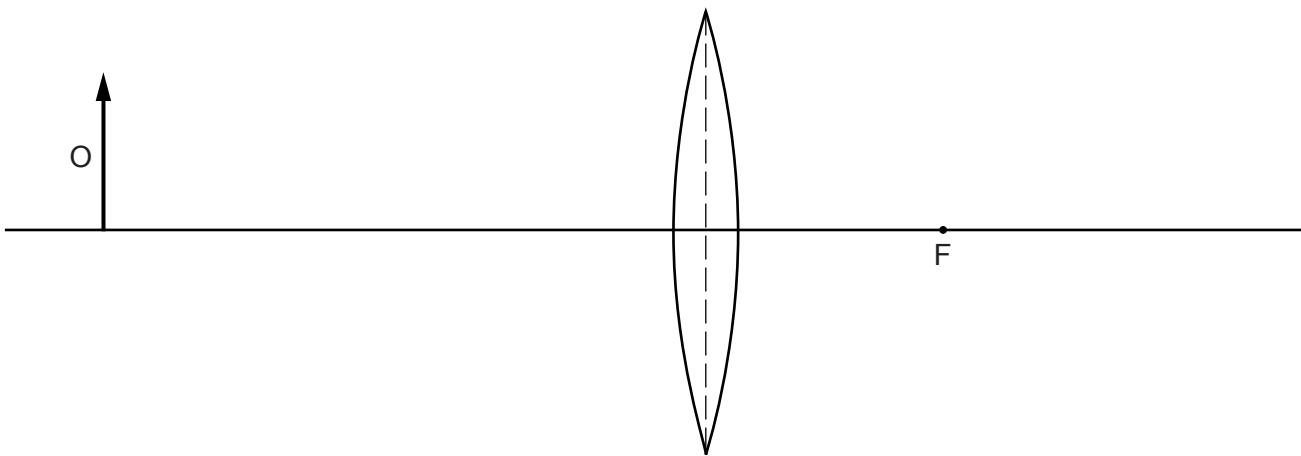


Fig. 7.2

- (i) On Fig. 7.2, draw two rays to locate the image of object O. Draw the image.
 (ii) On Fig. 7.2, draw one other ray from the upper tip of O to the image.

[4]

[Total: 8]

4 The refractive index n of glass in air is 1.5.

(a) (i) State the equation that relates the speed of light in air v_a , the speed of light in glass v_g and n .

.....[1]

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

Calculate the speed of light in glass.

speed =[1]

(b) Light travelling in glass strikes the edge of the glass. Fig. 6.1 shows a ray of light at an angle of 41° to the normal.

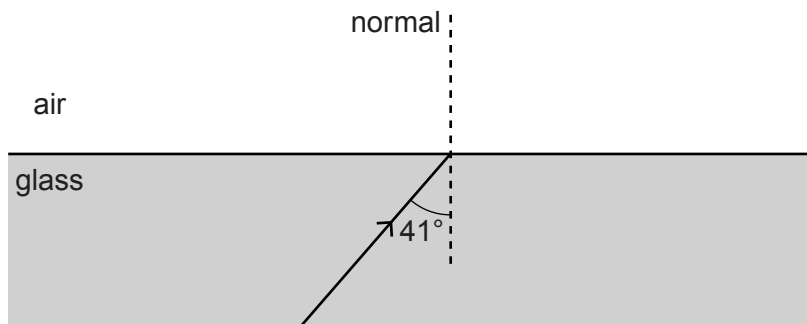


Fig. 6.1

(i) The light passes from the glass into the air.

Calculate the angle that the ray makes with the normal in the air.

angle =[2]

(ii) State what happens to light that strikes the edge of the glass at an angle to the normal much larger than 41° .

.....[1]

(c) Describe one example of how optical fibres are used in medicine.

.....

.....

.....

.....[2]

[Total: 7]

5 A glass, converging lens is used as a magnifying glass to observe a red ant.

(a) Fig. 6.1 shows the lens, the principal axis, and the two principal focuses F_1 and F_2 .

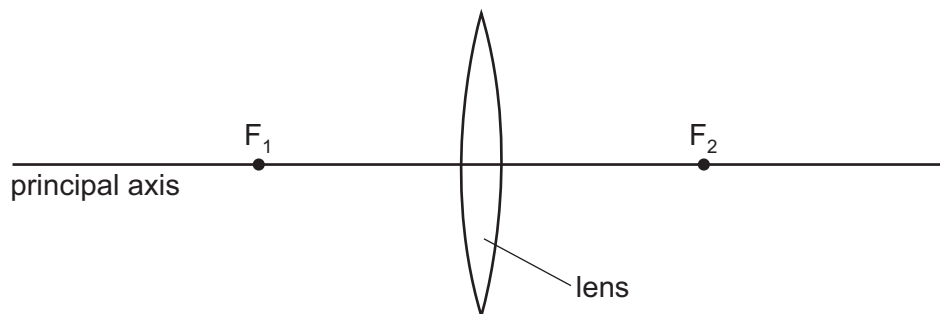


Fig. 6.1

- (i) 1. On Fig. 6.1, mark a point on the principal axis, labelled A, to indicate a suitable position for the ant.
2. On Fig. 6.1, mark a point on the principal axis, labelled E, to indicate a suitable position for the observer's eye.

[1]

(ii) Tick **one** of the boxes to indicate where, on the principal axis, the image of the ant is located.

- to the left of F_1
- between F_1 and the lens
- within the lens
- between the lens and F_2
- to the right of F_2

[1]

(iii) Underline **two** words in the list that describe the image produced by the magnifying glass.

diminished inverted real upright virtual

[2]

(b) (i) The red light from the ant passes into the lens.

As the light enters the lens, state what happens to

1. its wavelength,

.....[1]

2. its frequency.

.....[1]

(ii) State how the wavelength of violet light in air differs from the wavelength of red light in air.

.....[1]

[Total: 7]

- 6 (a) Fig. 7.1 shows a convex lens being used to produce an image of an object.

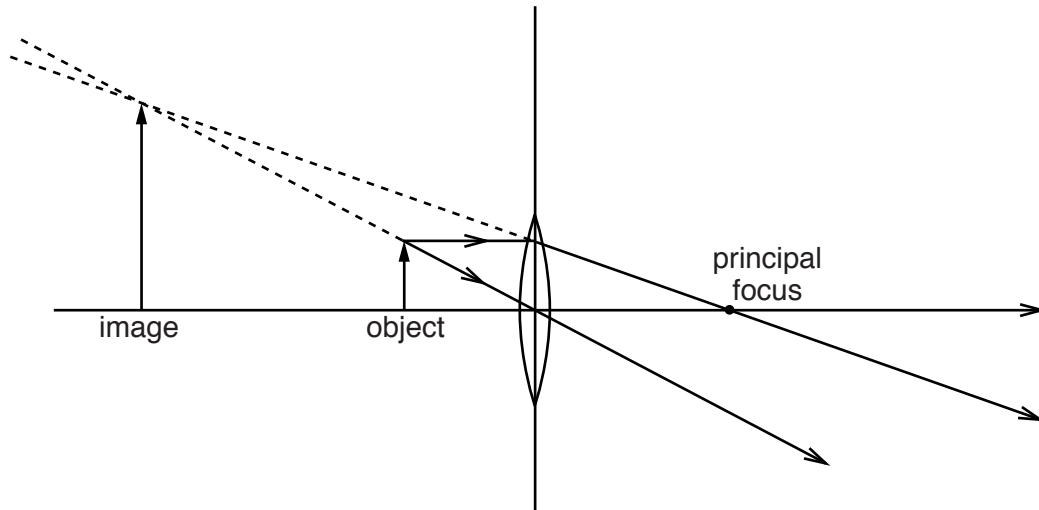


Fig. 7.1

- (i) Place **three** ticks in the table that describe this image.

can only be formed on a screen	
diminished	
enlarged	
inverted	
real	
same size	
upright	
virtual	

[3]

- (ii) On Fig. 7.1, mark a letter E to indicate a possible position for an eye to be placed to observe this image. [1]

- (iii) State an application in which a convex lens is used in this way.

.....[1]

- (b) In the space below, draw a ray diagram to locate the image of an object of height 1.0 cm placed 5.0 cm from a convex lens of focal length 2.0 cm. Draw your diagram full size. You are advised to locate the lens roughly in the centre of the space. Label the image.

[3]

[Total: 8]