

# High Demand

## Question Paper

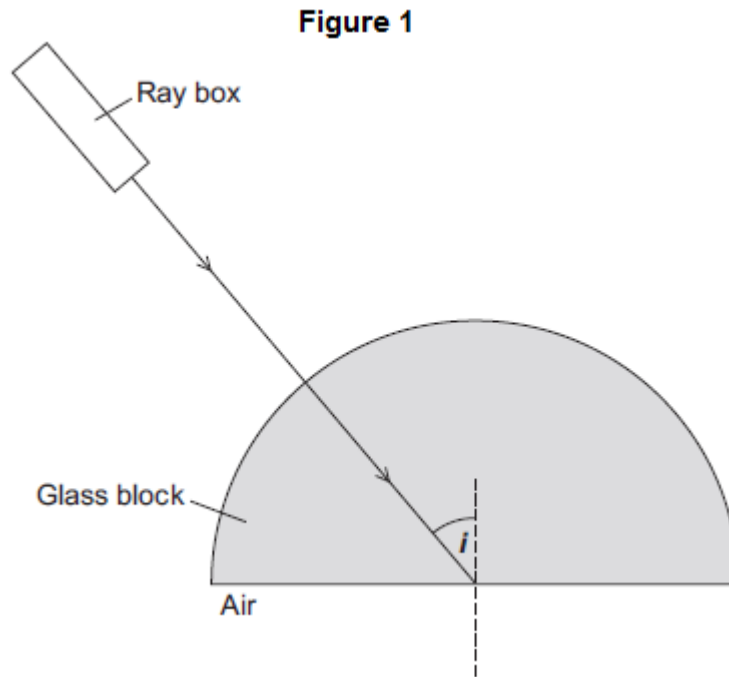
Level	GCSE
Subject	Physics
Exam Board	AQA
Unit	P3
Topic	High Demand
Difficulty Level	Gold Level
Booklet	Question Paper

**Time Allowed:** 53 minutes

**Score:** /53

**Percentage:** /100

**Q1.** **Figure 1** shows a ray of light travelling through a semicircular glass block. The angle of incidence is labelled  $i$ .



- (a) (i) The angle of incidence  $i$  equals the critical angle for the glass.

Complete **Figure 1** to show what happens to the ray of light at the glass-to-air boundary.

(1)

- (ii) The critical angle for the glass is  $41^\circ$ .

Calculate the refractive index of the glass.

Use the correct equation from the Physics Equations Sheet.

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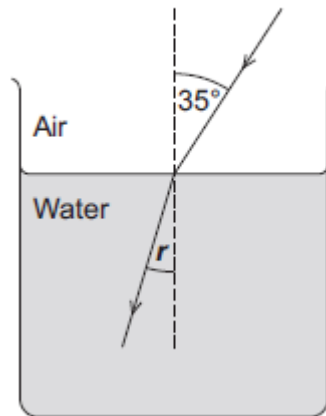
Refractive index = .....

(2)

- (b) **Figure 2** shows what happens to a ray of light as it meets the boundary between air

and water.

**Figure 2**



Not to scale

The refractive index of the water is 1.3.

Calculate the angle of refraction *r*.

Use the correct equation from the Physics Equations Sheet.

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Angle of refraction = ..... degrees

(3)  
(Total 6 marks)

**Q2.(a)** Human eyes and digital cameras both have parts with the same function.

Complete the missing parts in the table below.

Details of part	Part of eye	Part of digital camera
Refracts light to produce an image	Cornea and lens	Lens
Images are focused here	Retina	.....

Variable opening where light enters	.....	Aperture
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(2)

(b) Long sight is a defect of the human eye.

State **two** causes of long sight.

1 .....

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2 .....

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(2)

(c) Long sight can be corrected by wearing spectacles with converging (convex) lenses.

A lens in these spectacles has a power of +3.2 dioptres.

Calculate the focal length of this lens.

Use the correct equation from the Physics Equations Sheet.

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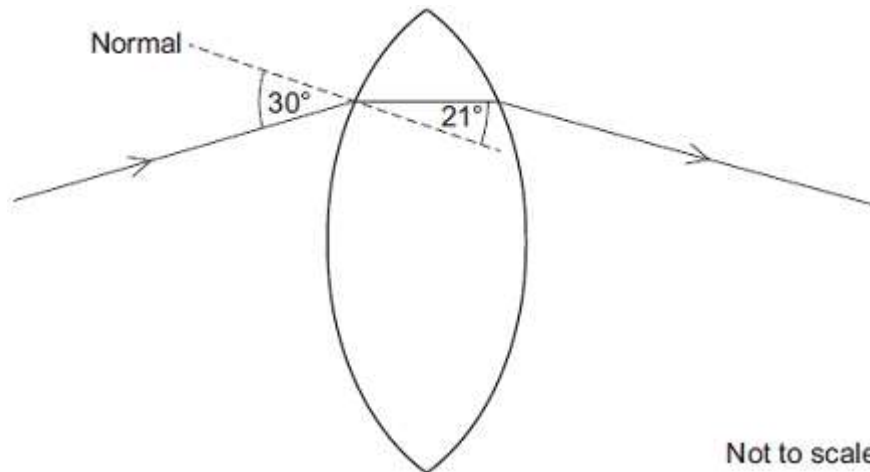
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Focal length = ..... metres

(2)

(d) The figure below shows a ray of light passing through a converging (convex) lens.



- (i) Use the information in the figure above to calculate the refractive index of the glass used to make the lens.

Use the correct equation from the Physics Equations Sheet.

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 .....  
 .....

Refractive index = .....

(3)

- (ii) Different lenses of the same power can be made using glass of a different refractive index.

State **one** advantage of making spectacles using lenses made from glass of a higher refractive index.

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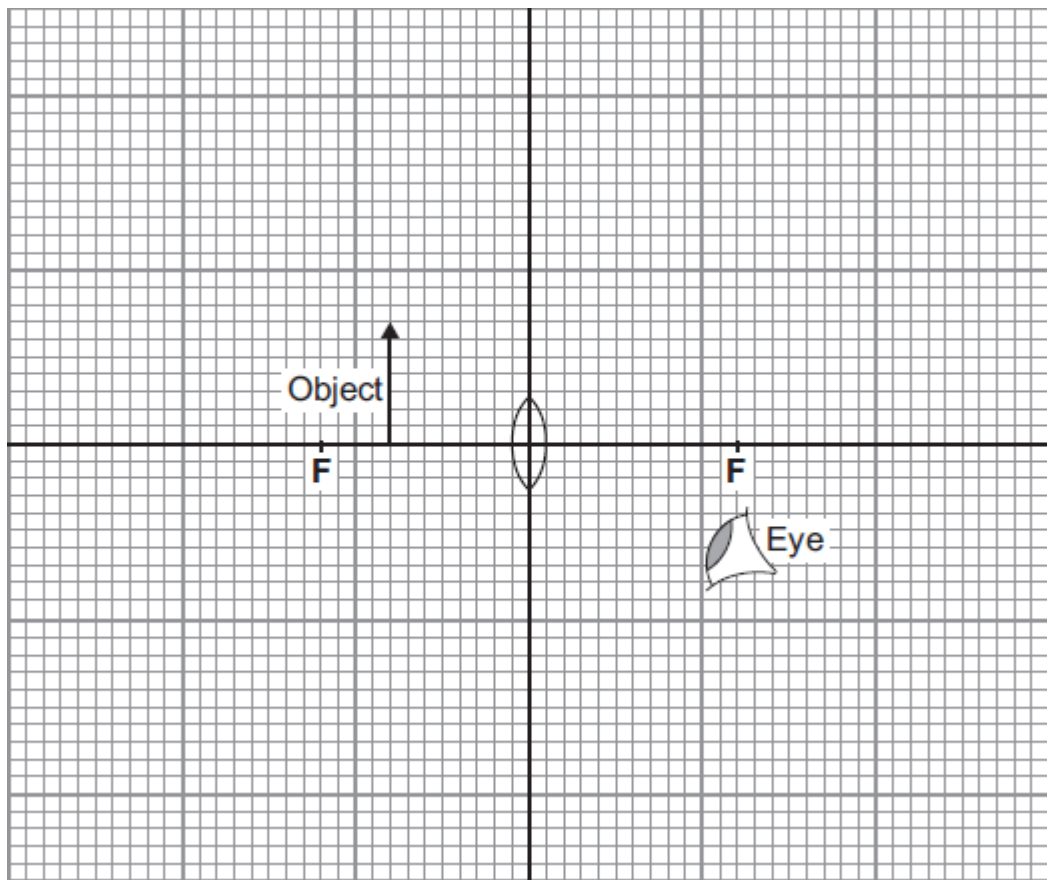
(1)

(Total 10 marks)

- Q3.** (a) The diagram shows a converging lens being used as a magnifying glass.

- (i) On the diagram, use a ruler to draw two rays from the top of the object which show how and where the image is formed. Represent the image by an arrow

drawn at the correct position.



(3)

- (ii) Use the equation in the box to calculate the magnification produced by the lens.

$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

Show clearly how you work out your answer.

.....  
 .....

Magnification = .....

(2)

- (b) A camera also uses a converging lens to form an image.

Describe how the image formed by the lens in a camera is different from the image formed by a lens used as a magnifying glass.

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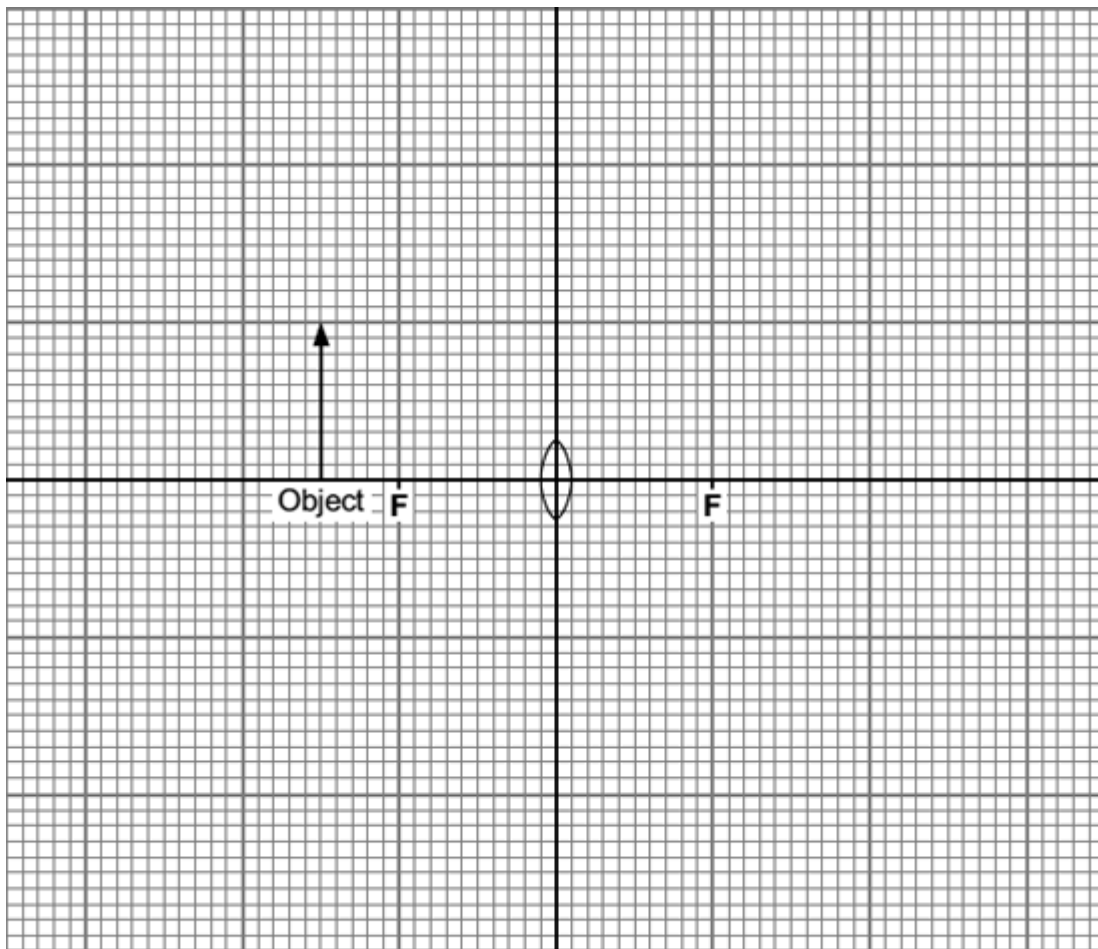
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(2)  
(Total 7 marks)

**Q4.** A student investigated how the nature of the image depends on the position of the object in front of a large converging lens.

The diagram shows one position for the object.

- (a) Use a ruler to complete a ray diagram to show how the image of the object is formed.



**Key:** F = principal focus

(4)

(b) Describe the nature of this image relative to the object.

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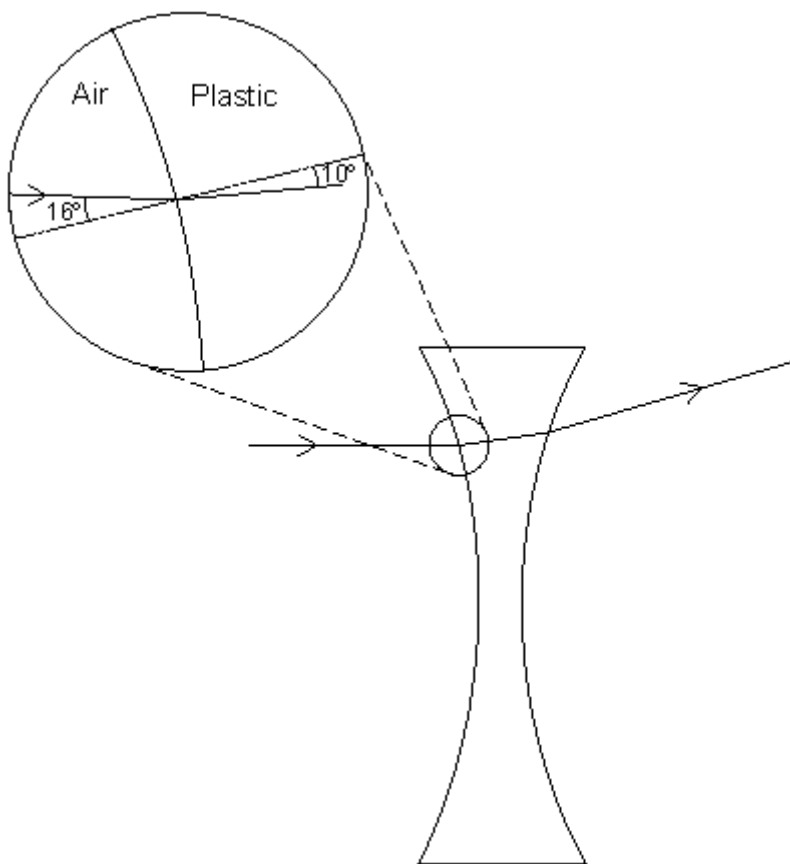
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(2)  
(Total 6 marks)



**Q5.** The diagram shows a ray of light passing through a diverging lens.



- (a) Use the information in the diagram to calculate the refractive index of the plastic used to make the lens.

Write down the equation you use, and then show clearly how you work out your answer.

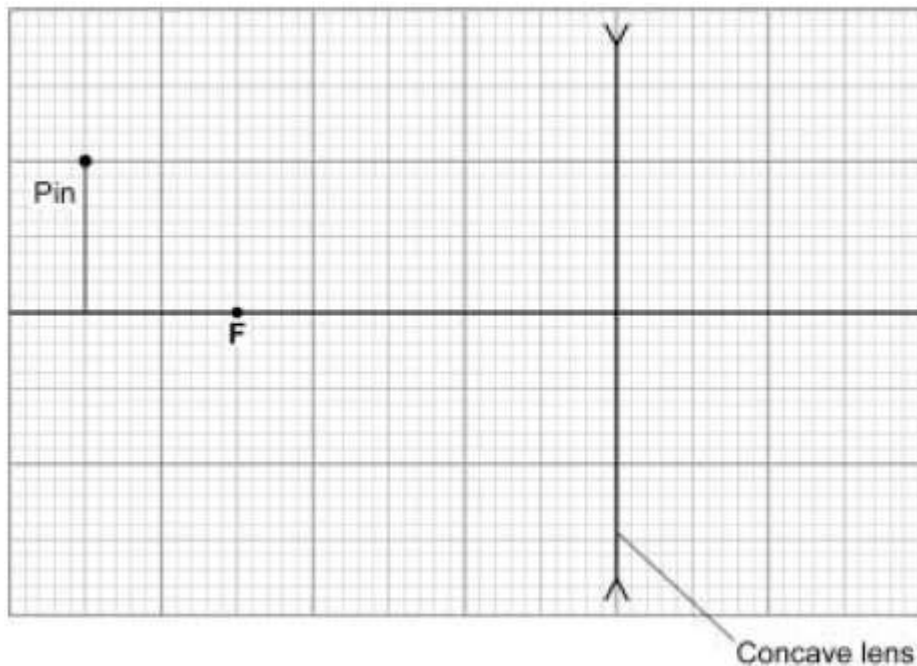
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Refractive index = .....

(2)

- (b) The focal length of the lens is 5 cm. A student looking through the lens sees the image of a pin.

Complete the ray diagram below to show how the image of the pin is formed.



(3)  
(Total 5 marks)

- Q6.** (a) The diagram shows a lens used as a magnifying glass. The position of the eye is shown and the size and position of an object standing at point **O**.

- (i) What type of lens is shown in the diagram?

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(1)

- (ii) Two points are marked as **F**. What are these points?

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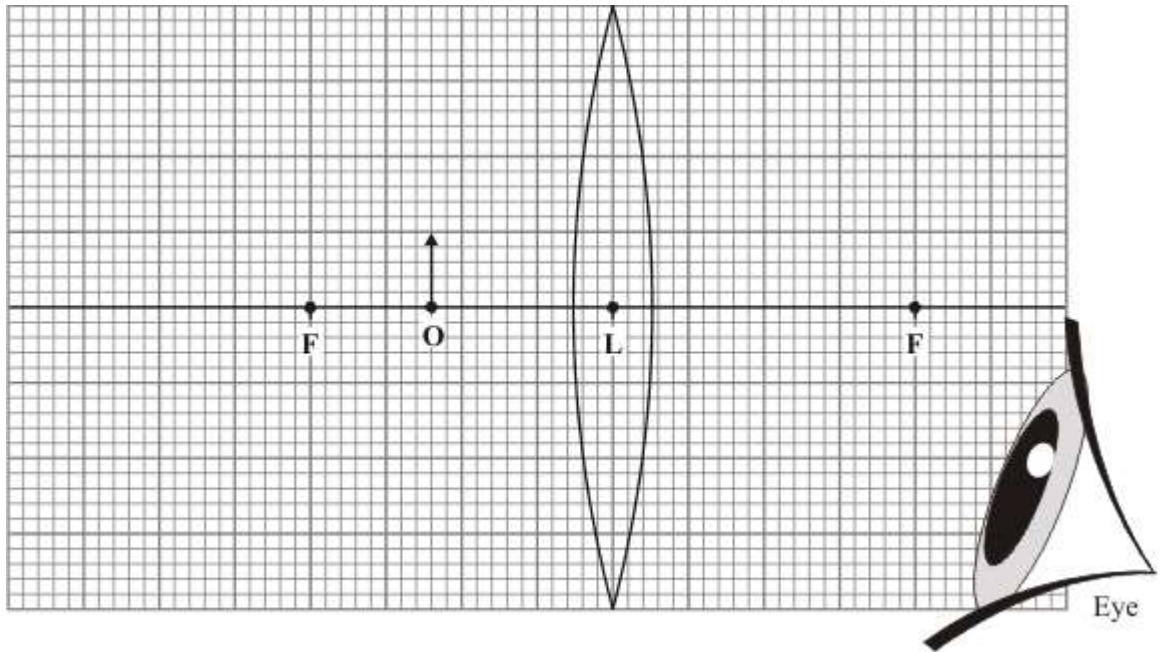
(1)

- (iii) What is the name of the straight line which goes through the point **F**, through the point **L** at the centre of the lens, and through the point **F** on the other side?

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(1)

- (iv) On the diagram, use a ruler to construct accurately the position of the image. You should show how you construct your ray diagram and how light appears to come from this image to enter the eye.



(5)

- (v) The image is *virtual*. What is a *virtual* image?

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 .....

(1)

- (b) The lens shown in the diagram in part (a)(iv) can be used in a camera to produce a *real* image.

Explain why a *real* image must be produced in a camera and how the object and

the lens are positioned to produce a *real* image which is **smaller** than the object.

Do **not** draw a ray diagram as part of your answer.

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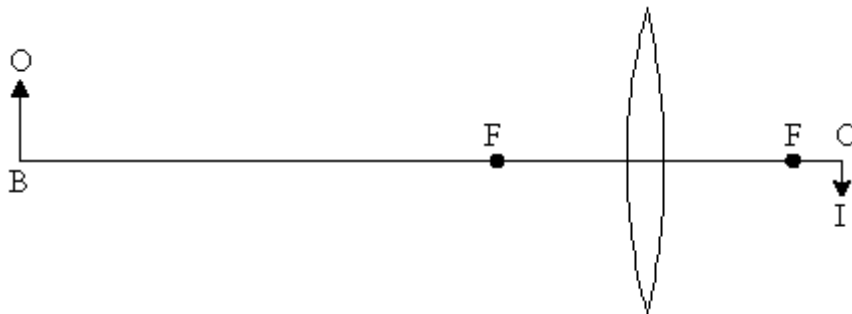
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(3)  
(Total 12 marks)

**Q7.** The diagram shows the image IC formed by a lens, of an object OB a long way from it. The points F mark the focal points of the lens.



(a) Describe, either by writing below or drawing on the diagram, how the size and position of the image changes:

(i) when the object OB is moved towards the focal point F.

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- (ii) when the object OB is moved past F to a point nearer the lens than the focal point.

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(4)

- (b) Explain how a converging lens in a camera is used to produce sharp images on the film when the object is a long distance away from the camera, and when it is close to the camera.

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(3)

(Total 7 marks)