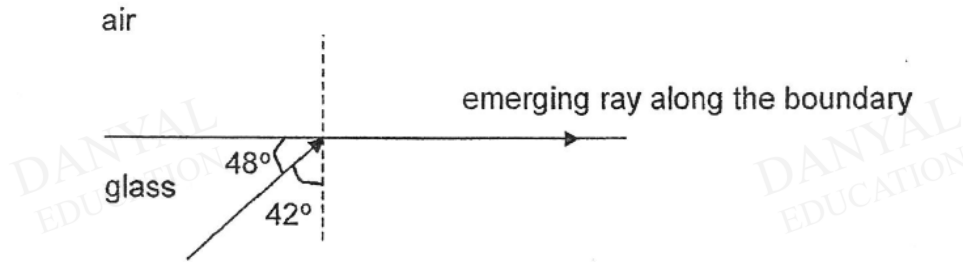


**O Level Combined Physics Structured**

**Light Test 4.0**

Q1

A light ray is travelling from a glass into air as shown in Fig. 6.1.



**Fig. 6.1**

a) Explain what is *critical angle*.

.....  
.....  
.....  
..... [2]

b) State the critical angle of the glass.

Critical angle = .....° [1]

c) What is the refractive index of the glass?

refractive index = ..... [2]

d) State the conditions required for total internal reflection to occur.

.....  
.....  
.....  
..... [2]

Q2

An object is placed 5.0 cm in front of a thin converging lens as shown in Fig. 7.1. The image formed is real, inverted and the same size as the object.

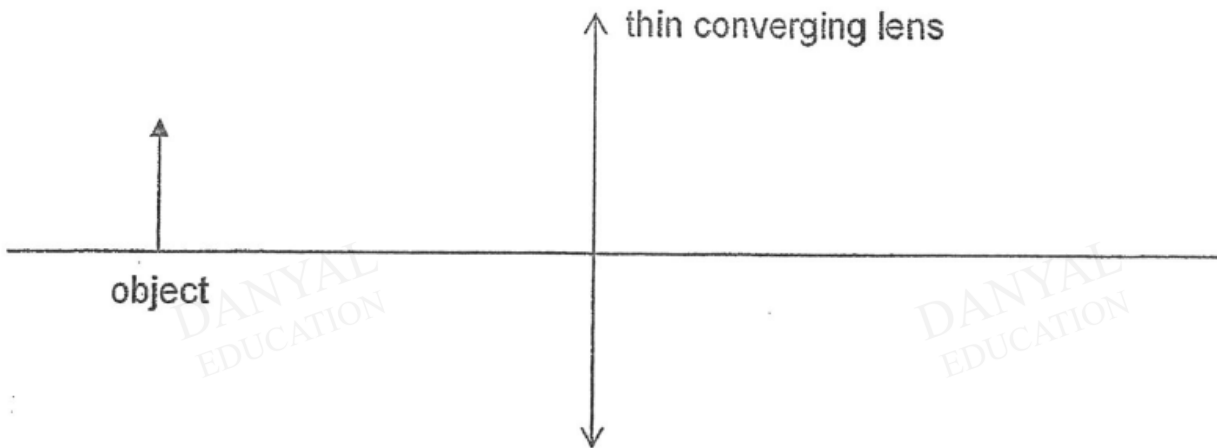


Fig 7.1 (drawn to scale)

a) On Fig 7.1, draw a ray diagram to determine the focal length of the lens.

focal length = ..... cm [3]

b) Describe the change in the focused image as the object is moved closer to the lens by 1 cm.

..... [1]

c) Describe fully the characteristics of the image produced when the object is placed at 2 cm away from the lens.

..... [1]

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EDUCATION

Q3

An object formed a magnified image on a screen after light was passed through the lens as shown in Fig. 7

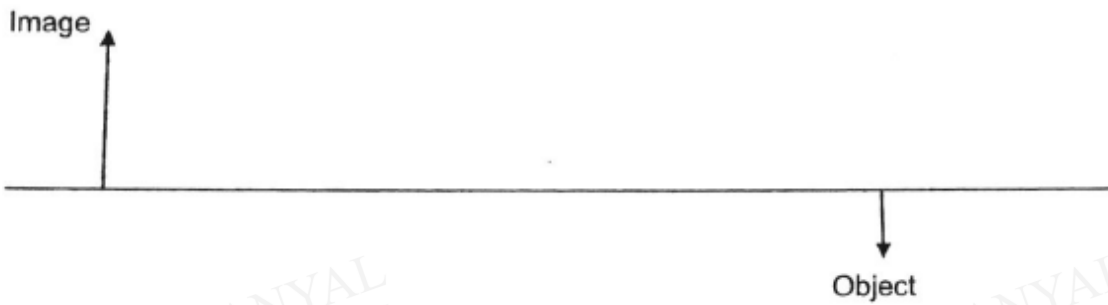


Fig. 7

(a) State 2 other characteristics of the image formed. [2]

.....  
.....

(b) In Fig. 7, draw a ray to find the position of the lens and label it as L. [1]

(c) In Fig. 7, draw another ray to show the position of the focal point and label it as F. [1]

(d) State one change to the sharp image formed when the lens is shifted further away from the object. [1]

.....  
.....

Q4

Fig. 4.1 shows the image **I** of an object **O** produced by a converging lens **L**.

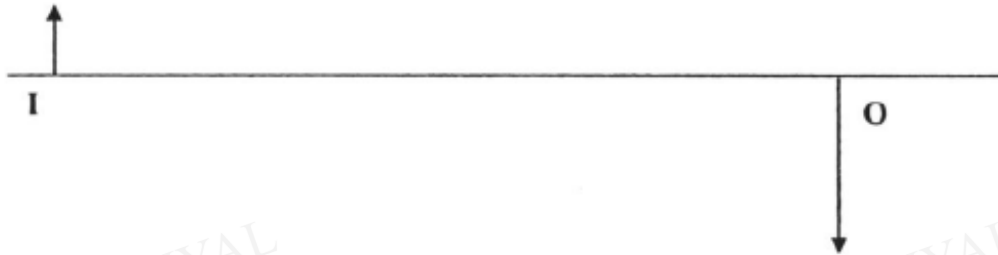


Fig. 4.1

- (a) Complete Fig. 4.1 to show two rays passing from the object to the image. [2]
- (b) Indicate on Fig. 4.1 the focal length of the lens and label it **L**. [1]
- (c) State the characteristics of the image formed. [2]
- .....
- .....
- (d) Name one use of this type of lens. [1]
- .....

Q5

Fig 5.1 shows a parabolic mirror. A parabolic mirror is a mirror that focuses parallel rays of light into a single focal point  $F$ .

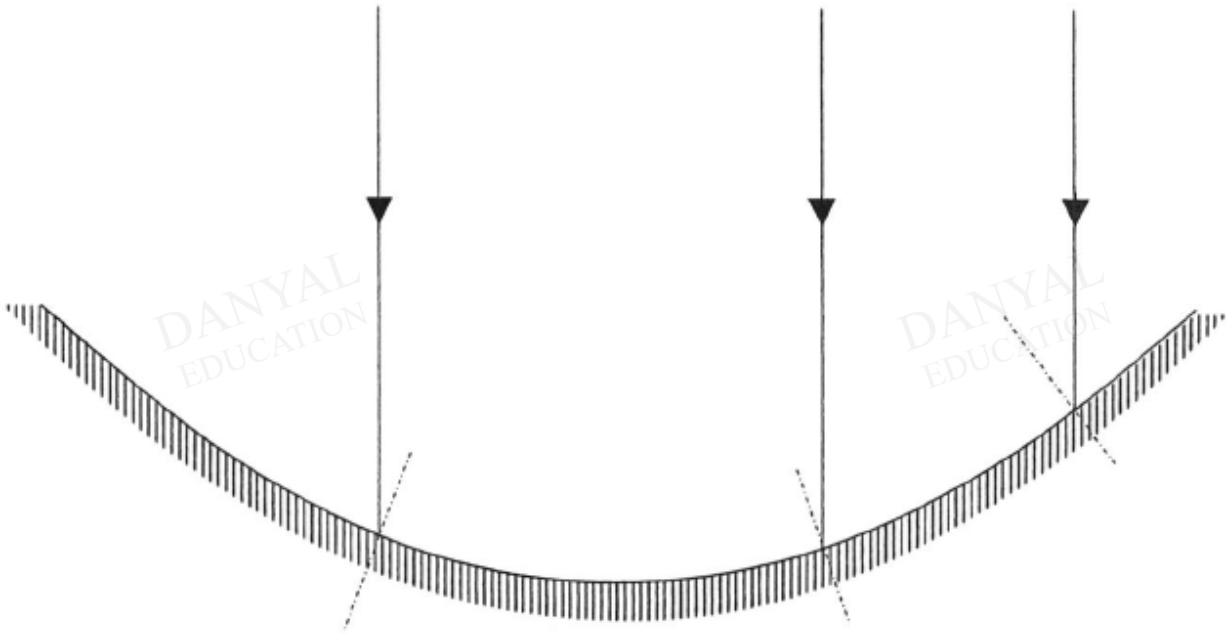


Fig 5.1

- (a) In Fig 5.1, complete the ray diagrams. Ensure that you mark out and label at least one set of
- the angle of incidence and,
  - the angle of reflection.
- [3]
- (b) Clearly label focal point  $F$  on Fig 5.1.
- [1]

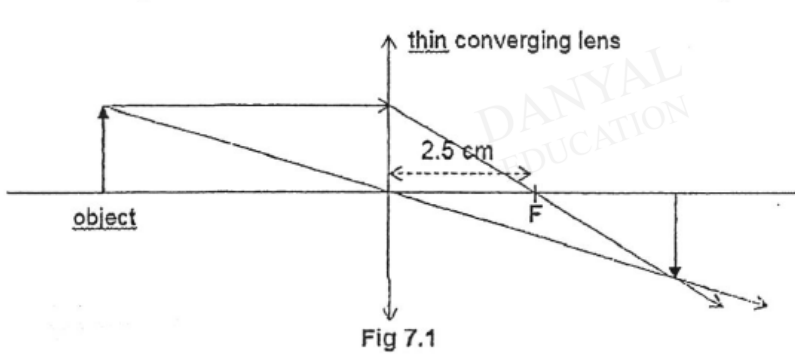
**Answers**

**Light Test 4.0**

Q1

|   |  |          |
|---|--|----------|
| a | The angle of incidence which produces an angle of refraction of 90 degree [1] when the light passes from a denser medium to a less dense medium [1]. | A1<br>A1 |
| b | 42 deg.  | A1       |
| c | $n = 1/\sin c$<br>= 1.49   | M1<br>A1 |
| d | Light must be travelling from a denser medium to a less dense medium.<br>Angle of incidence must be greater than the critical angle.                 | A1<br>A1 |

Q2

|   |   |   |
|---|---|---|
| a |  <p>Fig 7.1</p> <p>Image is at 5 cm away from lens.<br/>                 Two light rays to complete the ray diagram. (1m awarded to each light ray drawn correctly. -0.5m overall if no arrows for light rays)<br/> <math>f = 2.5</math> cm (allows for 2.6 cm)</p> | M2 (awarded regardless of focal length accuracy)<br>-0.5m if no arrows for the light rays<br>A1 |
| b | The focused image becomes larger.   | A1  |
| c | Virtual, upright, magnified   | A1  |

Q3

An object formed a magnified image on a screen after light was passed through the lens as shown in Fig. 7

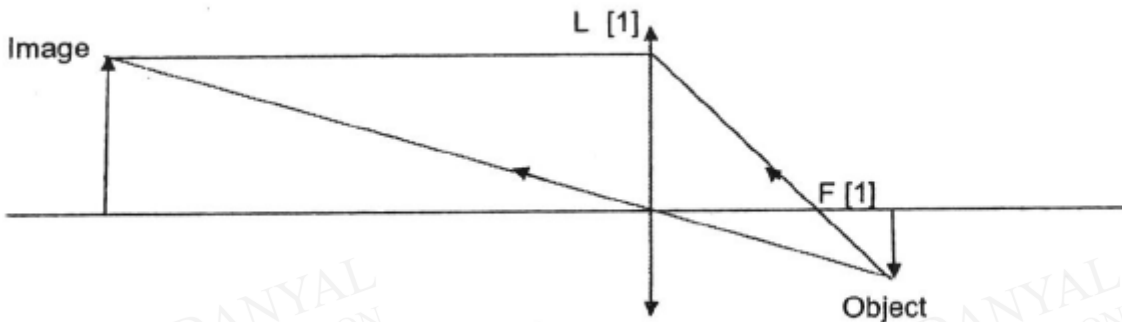


Fig. 7

(a) State 2 other characteristics of the image formed. [2]  
**Inverted and real . Do not accept magnified as question already stated.**

.....  
.....

(b) In Fig. 7, draw a ray to find the position of the lens and labelled it as L. [1]

(c) In Fig. 7, draw another ray to show the position of the focal point and labelled it as F. [1]

(d) State one change to the sharp image formed when the lens is shifted further away from the object. [1]  
**The image formed will be smaller OR image is nearer to lens**

.....  
.....

Q4

Fig. 4.1 shows the image **I** of an object **O** produced by a converging lens **L**.

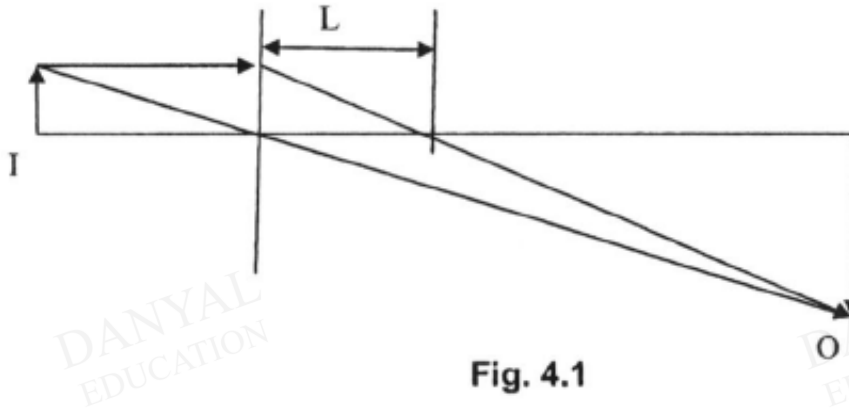


Fig. 4.1

(a) Complete Fig. 4.1 to show two rays passing from the object to the image. [2]

(b) Indicate on Fig. 4.1 the focal length of the lens and label it **L**. [1]

(c) State the characteristics of the image formed. [2]

**Inverted, real, diminished**

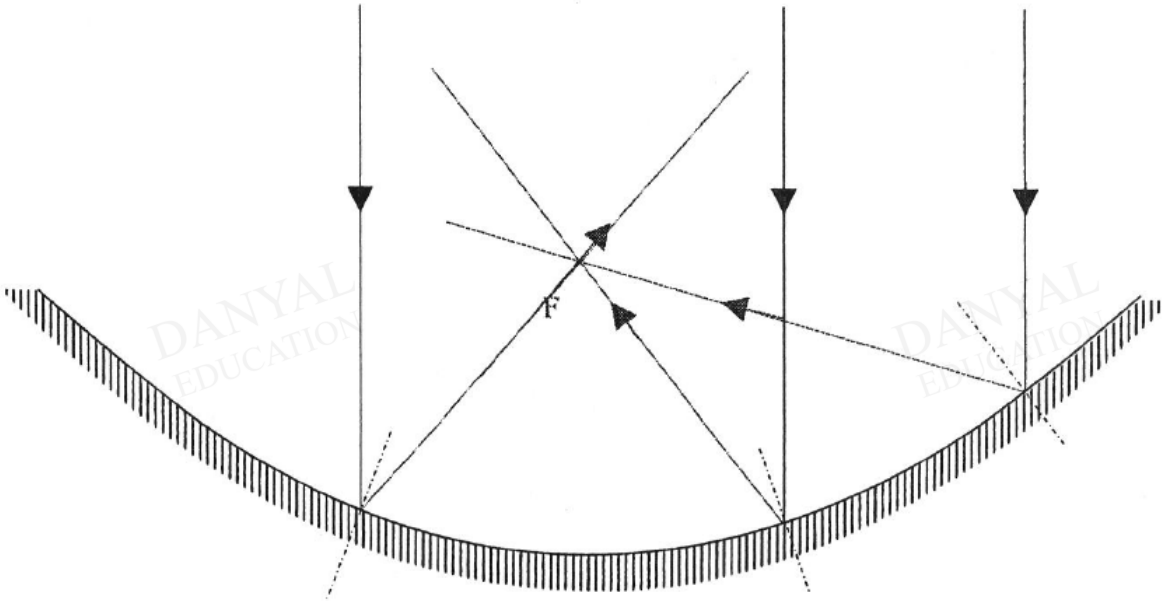
(d) Name one use of this type of lens. [1]

**Camera / Eye**



Q5

Fig 5.1 shows a parabolic mirror. A parabolic mirror is a mirror that focuses parallel rays of light into a single focal point  $F$ .



**Fig 5.1**

- (a) In Fig 4.1, complete the ray diagrams. Ensure that you mark out and [3]  
label at least one set of  
i. the angle of incidence and,  
ii the angle of reflection.

(1 mark for correct lines  
1 mark for arrow heads  
1 mark for correct pair of  $i$  &  $r$ )