Light – 2019 Nov IGCSE

1. 0625/31/O/N/19/No.6

Fig. 6.1 shows a mirror periscope. The periscope is used to view a golfer over the heads of other people. The periscope has two plane mirrors each at an angle of 45° to the vertical.

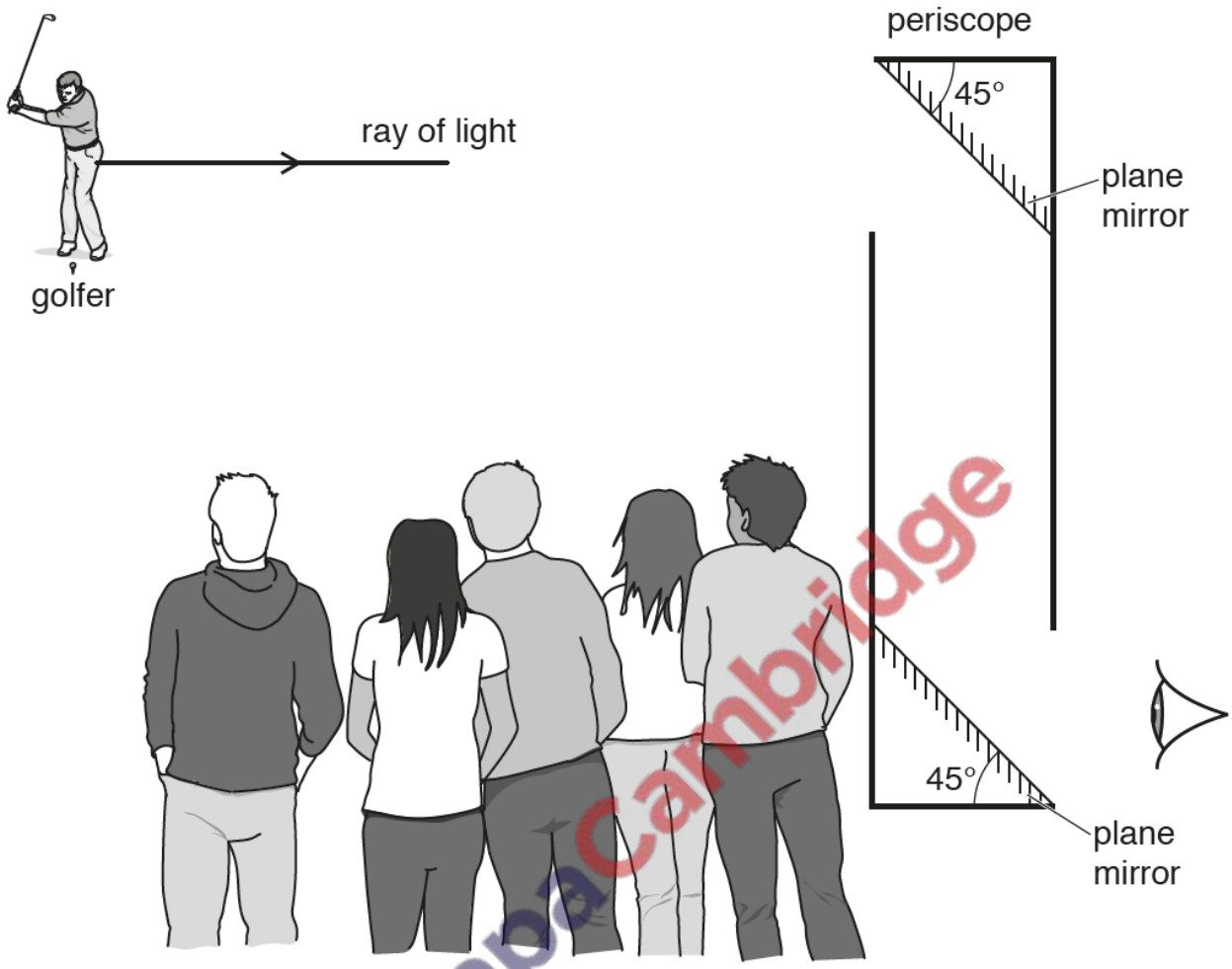

Fig. 6.1 (not to scale)

(a) (i) On Fig. 6.1:

1. Continue the ray of light from the golfer towards the upper mirror of the periscope
2. Draw and label the normal at the point where the ray strikes the mirror.

[1]

(ii) On Fig. 6.1, continue the ray of light after reflection at the upper mirror until it leaves the periscope. [1]

(iii) State the law of reflection used to deduce the position of the ray of light after striking the mirrors.

..... [1]

(b) Fig. 6.2 shows three rays of red light each entering a semi-circular glass block.

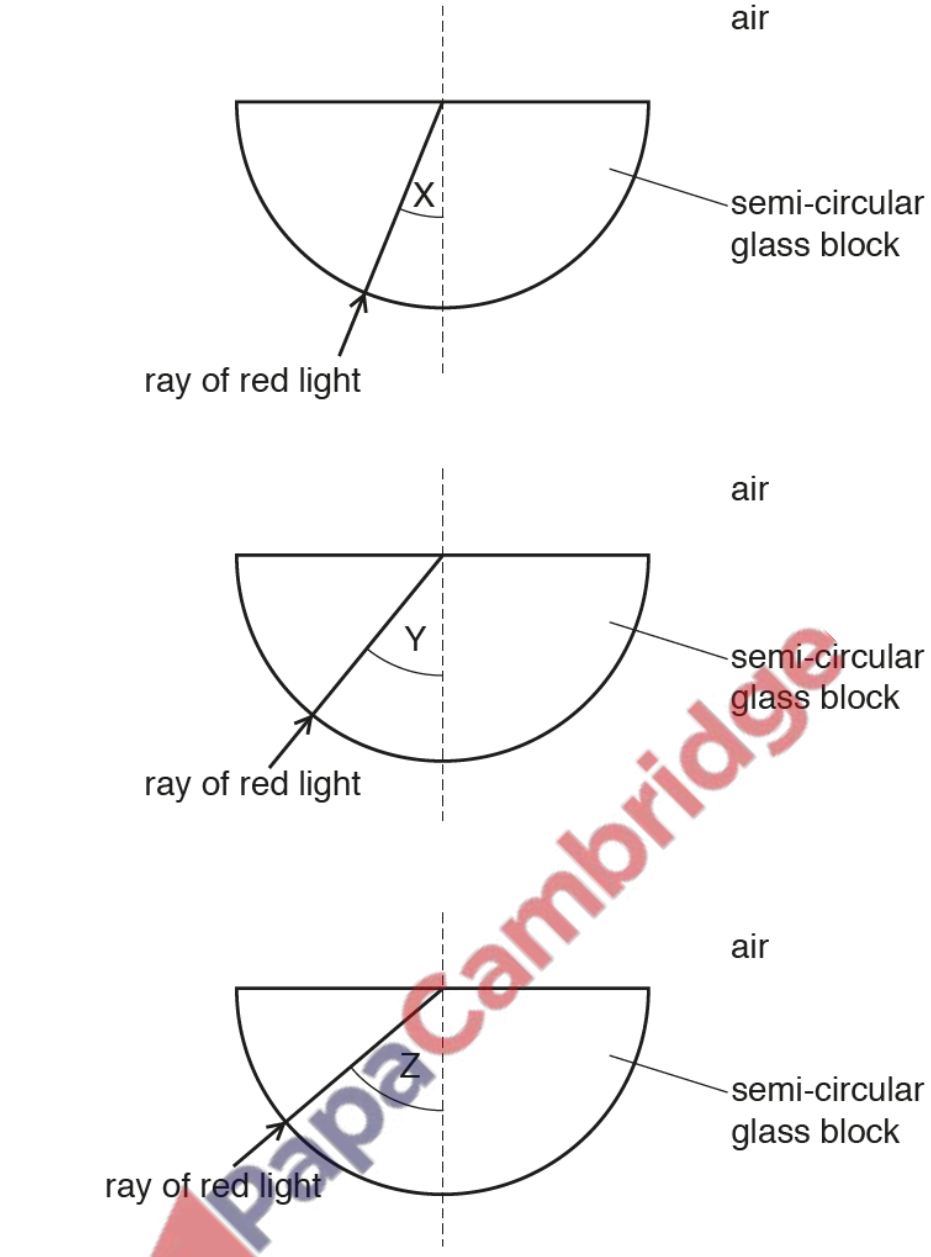

Fig. 6.2

Table 6.1

angle of incidence	description
X	less than the critical angle
Y	equal to the critical angle
Z	greater than the critical angle

Using the information in Table 6.1, draw on Fig. 6.2 to complete the path of each ray of red light. [3]

[Total: 6]

2. 0625/31/O/N/19/No.7

An object, OX, is placed in front of a converging lens.

Fig. 7.1 shows a ray of light from the object passing through the lens.

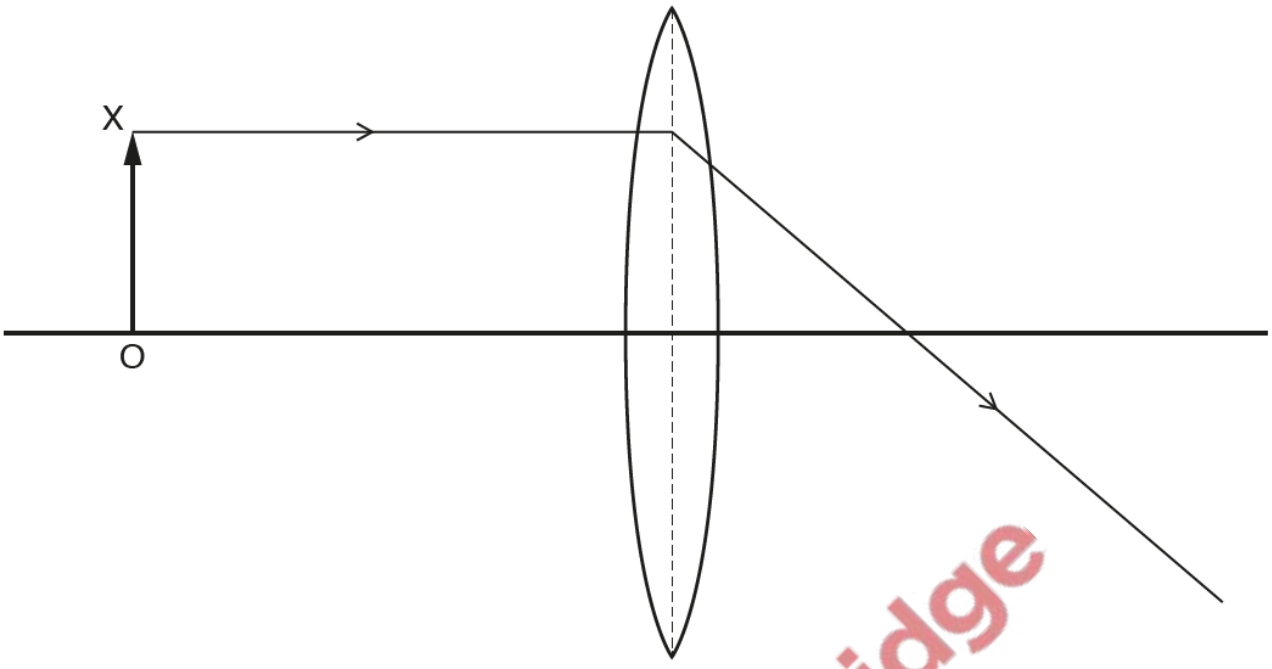

Fig. 7.1

(a) (i) The lens forms an image of object OX.

On Fig. 7.1, draw another ray from X to locate the position of the image. [1]

(ii) On Fig. 7.1, draw an arrow to represent the image of OX and label it I. [1]

(iii) On Fig. 7.1, mark a principal focus for the lens and label it F. [1]

(iv) On Fig. 7.1, measure and record the focal length of the lens.

focal length = ... cm [1]

(b) Describe the image I.

Choose words from the list. Tick (✓) **two** boxes.

- ☐ enlarged
- ☐ diminished
- ☐ same size
- ☐ inverted
- ☐ upright

[2]

[Total: 6]

3. 0625/32/O/N/19/No.8

Fig. 8.1 is a partially completed ray diagram.

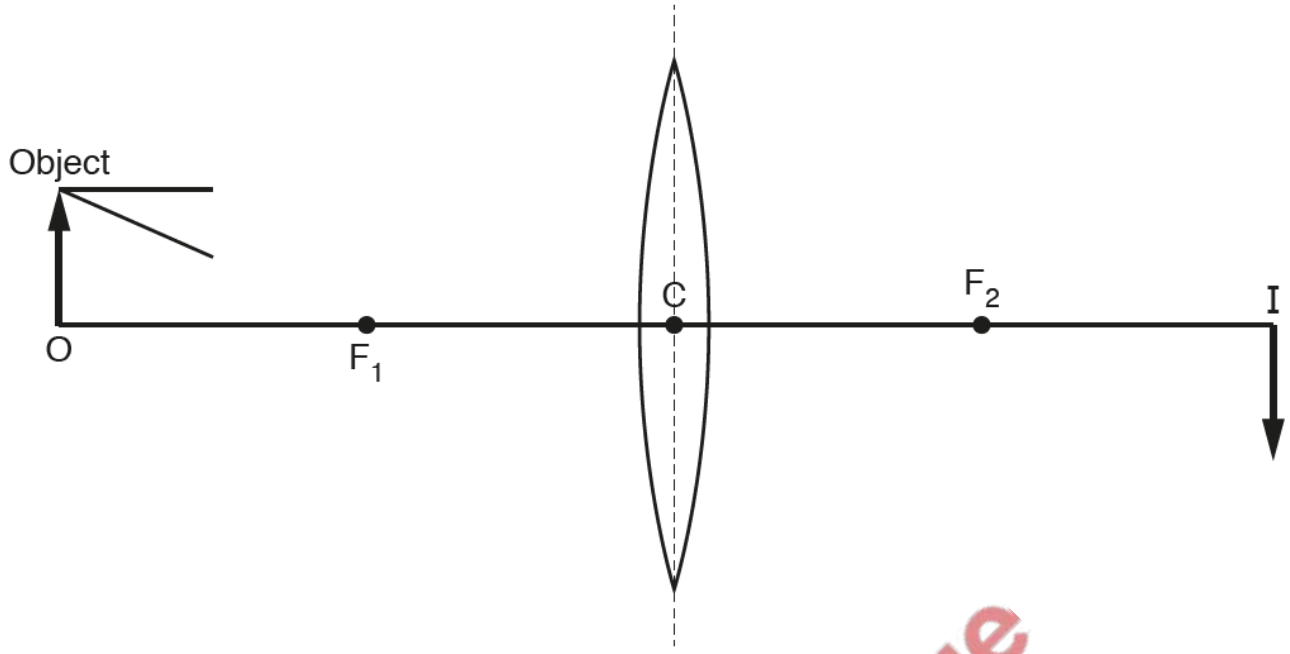

Fig. 8.1

The object is at O and its image is at I.

(a) Which distance is the focal length of the lens? Tick **one** box.

- ☐ C to F_1
- ☐ O to C
- ☐ F_2 to I
- ☐ O to I

[1

(b) On Fig. 8.1, extend the **two** rays from the arrowhead on the object until both reach the position of the image. [3

(c) The object is moved a small distance **away** from the lens. State the effect, if any, this has on the position and size of the image.

position .....

size .....

[2

[Total: 6

4. 0625/33/O/N/19/No.8

Fig. 8.1 shows a ray of light travelling through a glass block and then reflecting from a mirror.

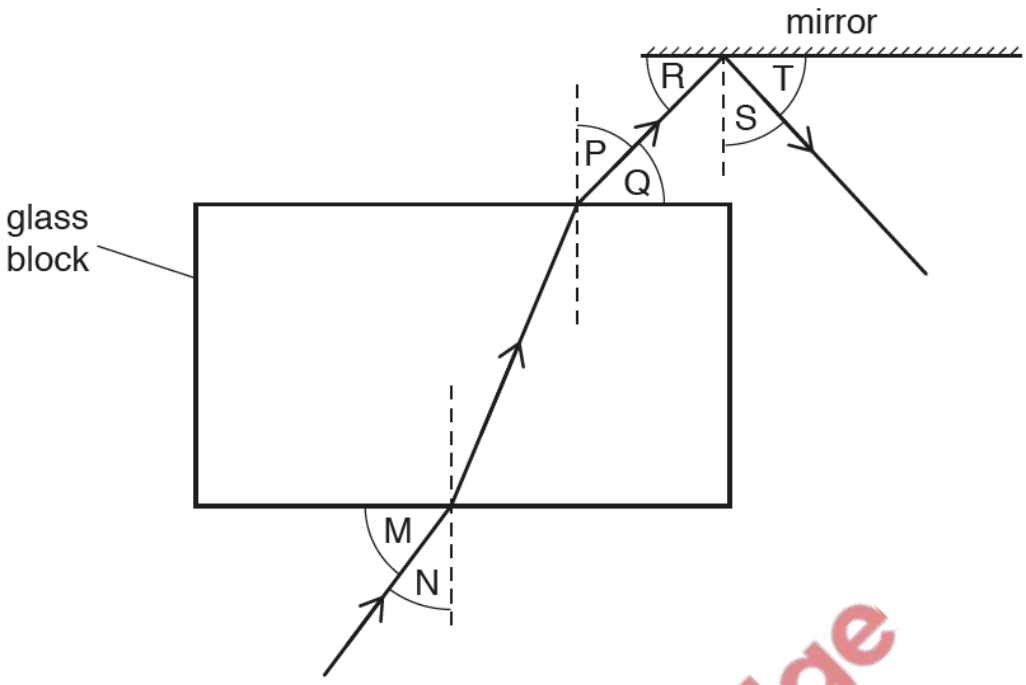

Fig. 8.1

(a) State the term used for the dashed lines drawn in Fig. 8.1.

.....

(b) Use Fig. 8.1 to identify the three angles in the list. Place the correct letter in the box to indicat each angle.

☐ angle of incidence

☐ angle of reflection

☐ angle of refraction

(c) The ray of light in Fig. 8.1 changes direction as it enters the glass block. State the name o this effect and explain why it happens.

name of effect .....

explanation .....

.....

.....

[Total: 6

5. 0625/41/O/N/19/No.8

Fig. 8.1 shows a ray of red light incident on one side of a glass prism in air.

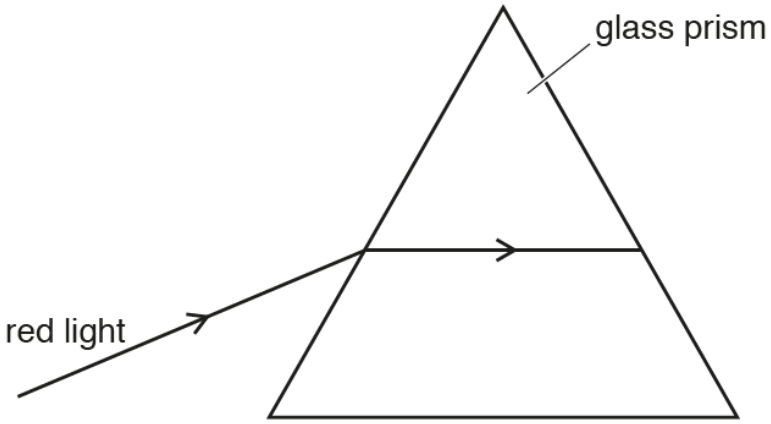

Fig. 8.1

For red light, the refractive index of glass is n_R.

(a) The angle of incidence is 53° and the angle of refraction in the glass is 30°.

(i) Calculate n_R.

n_R = ... [2]

(ii) On Fig. 8.1, sketch a line to indicate the path of the red light when it emerges from the glass prism. Label this path R. [1]

(iii) Explain why the quantity *refractive index* does not have a unit.

.....

..... [1]

(b) For violet light, the refractive index n_V of glass is slightly larger than n_R.

(i) A ray of violet light is incident on the prism along the same path as the ray of red light.

On Fig. 8.1, sketch a line to indicate the path of the violet light in the prism and when it emerges into the air. Label this path V. [1]

(ii) When a ray of white light is incident on the prism, dispersion produces a continuous spectrum of coloured light.

State how the speed of light in glass depends on its frequency. Explain how this is shown by the dispersion of white light in the prism.

statement .....

explanation .....

.....

[3]

[Total: 8]

6. 0625/42/O/N/19/No.6

(a) Fig. 6.1 shows an empty container and an observer's eye. There is a small coin at position O. The observer is unable to see the coin.

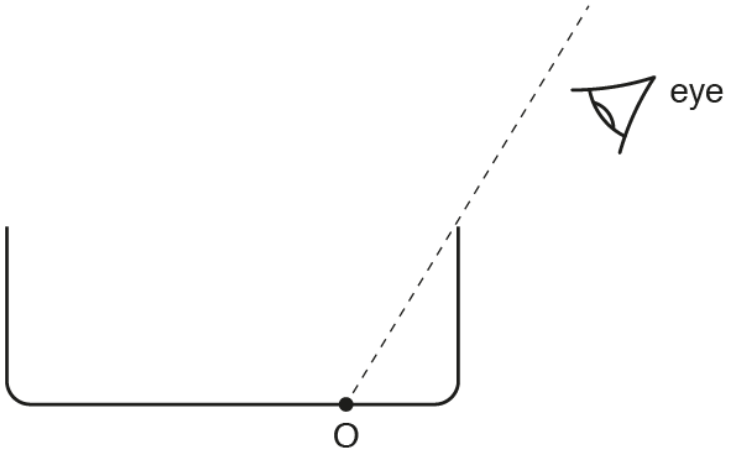

Fig. 6.1

The observer and the coin stay in the same position and the container is filled with water. The observer can now see the coin.

(i) Explain why the coin can be seen by the observer.

.....

..... [2]

(ii) State the name of the wave process which occurs as the light passes from the water into the air.

..... [1]

(iii) Explain why the image of the coin is a virtual image.

..... [1]

(b) State the speed of light in air.

..... [1]

(c) The refractive index of water is 1.3.

Calculate the speed of light in water.

speed of light in water = ... [3]

[Total: 8]

7. 0625/43/O/N/19/No.7

(a) Fig. 7.1 shows the position of a converging lens, its principal axis and an object O.

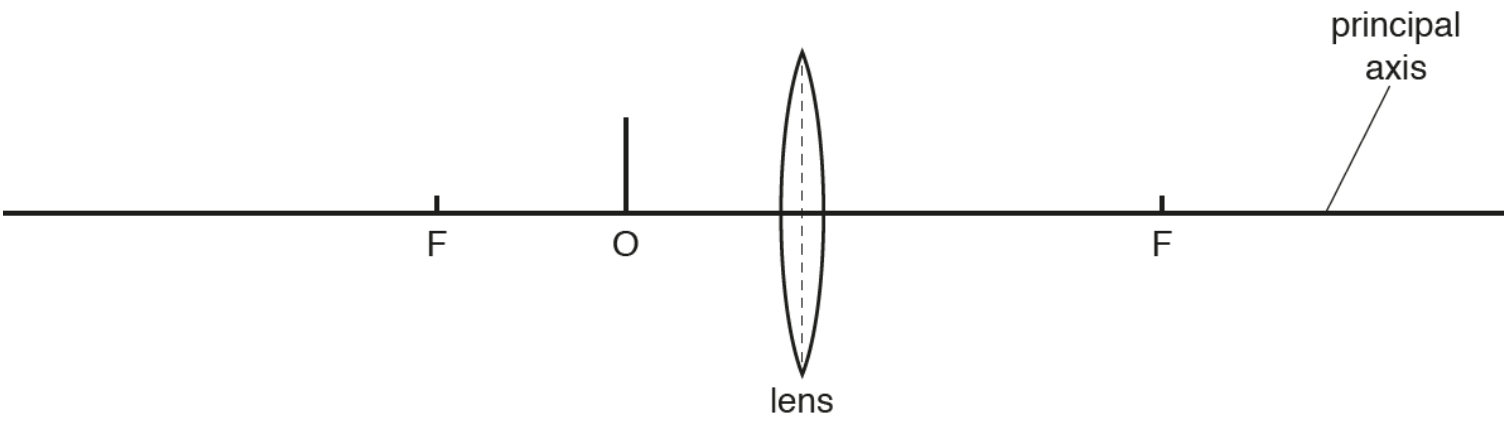

Fig. 7.1

Each principal focus of the lens is labelled F.

On Fig. 7.1, draw a ray diagram to locate the position of the image formed by the lens.

Label the image I. [3

(b) Describe the nature of the image I.

..... [2

(c) Images formed by lenses sometimes have coloured edges.

Suggest a reason for this.

.....

..... [1

[Total: 6