Light – 2019 June

1. 0625/32/M/J/19/No.6

Fig. 6.1 shows a ray of light that is reflected by a mirror.

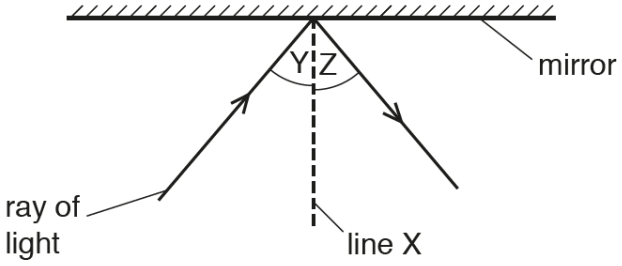

Fig. 6.1

(a) (i) State the name of line X shown on Fig. 6.1.

..... [1]

(ii) State the name of angle Y shown on Fig. 6.1.

..... [1]

(iii) A student moves the ray of light and doubles the size of angle Y. State the effect on angle Z.

..... [1]

(b) Fig. 6.2 shows a converging lens used to form an image I of an object O.

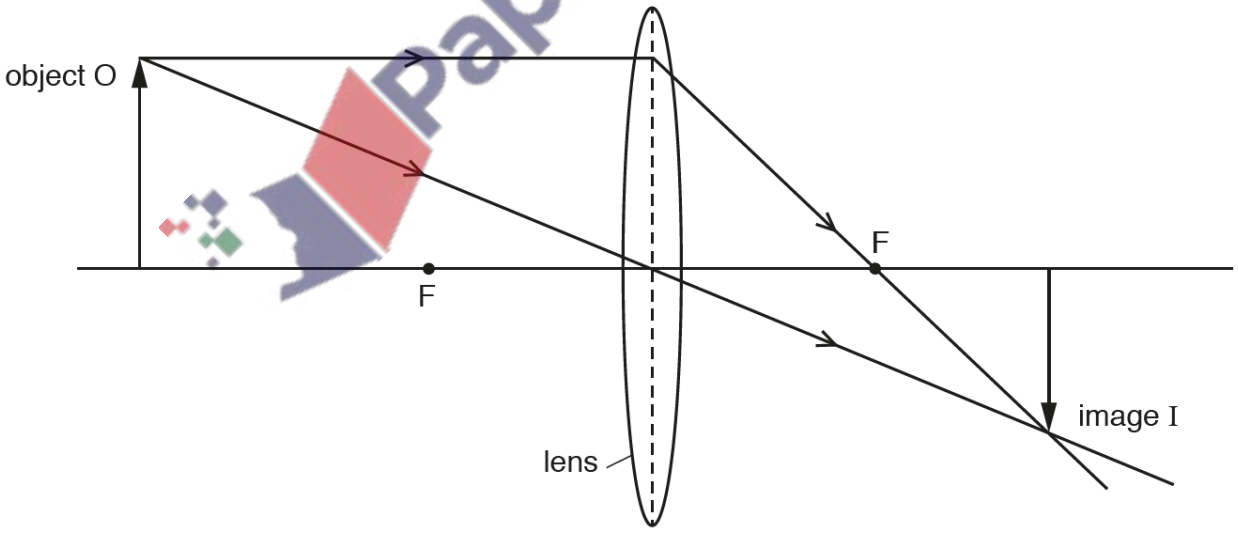

Fig. 6.2

(i) State the name of the points labelled F on Fig. 6.2.

..... [1]

(ii) Describe the nature of the image I.

.....

.....

..... [2]

[Total: 6]

2. 0625/33/M/J/19/No.8

(a) Fig. 8.1 shows an incomplete ray diagram of a converging lens forming an image of the object, O.

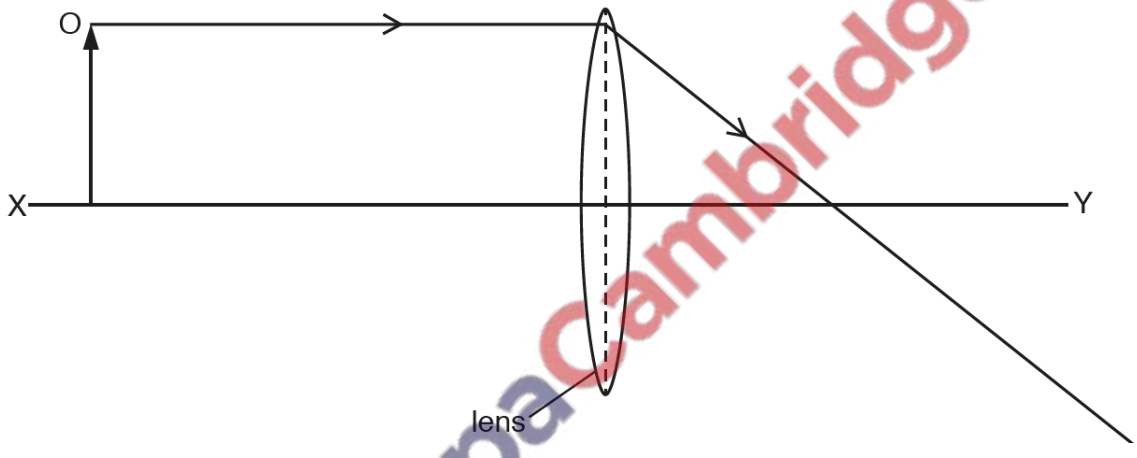

Fig. 8.1

(i) State the term given to the line XY.

..... [1]

(ii) On Fig. 8.1, indicate the position of one principal focus of the lens. Label the principal focus, F. [1]

(b) **(i)** On Fig. 8.1, draw a ray of light from the top of the object that passes through the lens to form the image. Use a ruler. [2]

(ii) On Fig. 8.1, draw the image formed by the lens. Label the image I. [1]

(iii) Choose words from the box that describe the image formed by the lens in Fig. 8.1.

diminished	enlarged	horizontal	inverted	same size	upright

Draw a ring around each correct word. [2]

[Total: 7]

3. 0625/41/M/J/19/No.6

Green light of frequency 5.7×10^{14} Hz is travelling in air at a speed of 3.0×10^{8} m/s. The light is incident on the surface of a transparent solid.

Fig. 6.1 shows the wavefronts and the direction of travel of the light in the air.

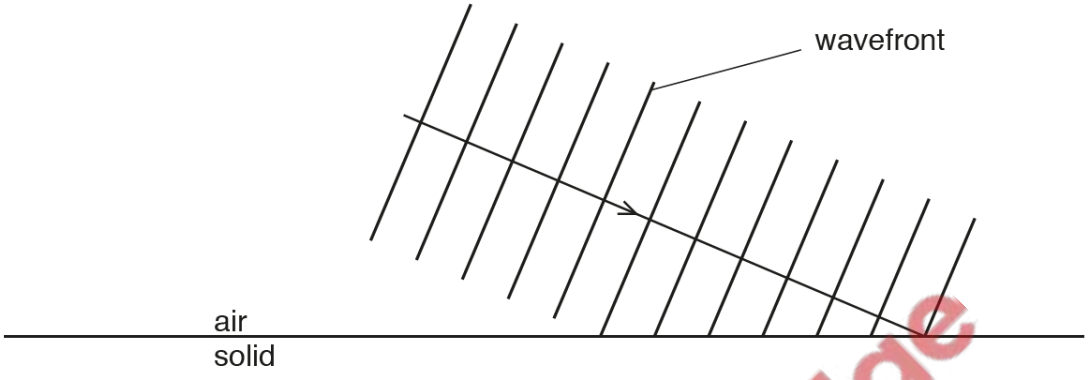

Fig. 6.1

The light travels more slowly in the transparent solid.

(a) Explain, in terms of the wavefronts, why the light changes direction as it enters the solid. You may draw on Fig. 6.1 as part of your answer.

.....

.....

.....

..... [3]

(b) The refractive index of the transparent solid is 1.3.

(i) The light is incident on the surface of the solid at an angle of incidence of 67°.

Calculate the angle of refraction of the light in the solid.

angle of refraction = ... [2]

(ii) Determine the wavelength of the green light in the transparent solid.

wavelength = ... [4]

[Total: 9]

4. 0625/42/M/J/19/No.7

(a) In Fig. 7.1, a converging lens projects a sharp image of an object O on to a screen.

Complete the paths of the two rays from the object to the screen.

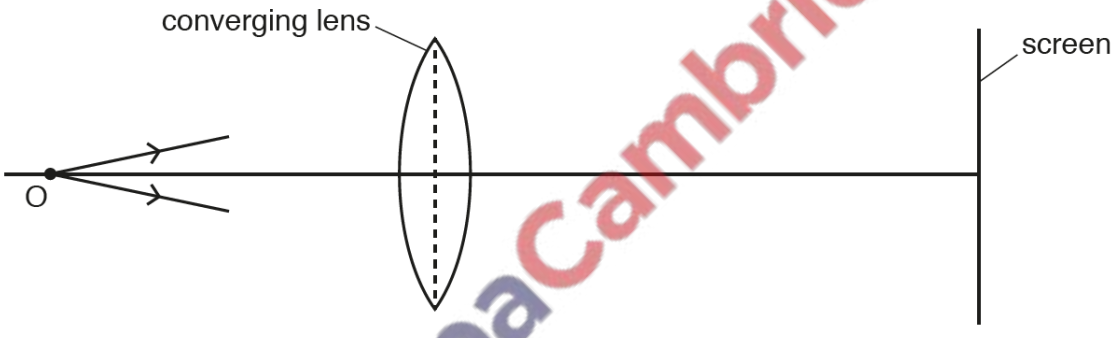

Fig. 7.1 [2]

(b) The converging lens in **(a)** is replaced with a thinner converging lens. The object O and the screen remain in the same positions as in **(a)**. The thinner converging lens has a longer focal length than the converging lens in **(a)**.

Complete the paths of the two rays from the object to the screen in Fig. 7.2.

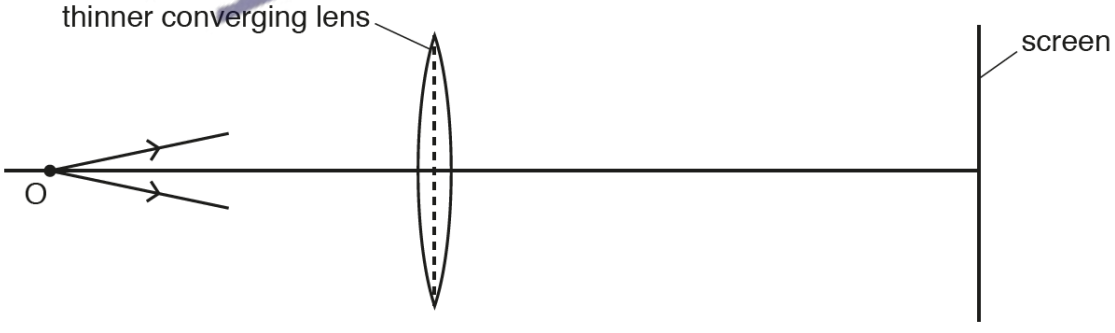

Fig. 7.2 [2]

(c) A converging lens is used as a magnifying glass.
The focal length of the lens is 10 cm.

(i) Describe the position of the object in relation to the lens.

.....

..... [1]

(ii) Describe the position of the image in relation to the lens and the object.

.....

..... [1]

(iii) Give three properties of the image formed by a magnifying glass.

.....

.....

..... [2]

[Total: 8]

5. 0625/43/M/J/19/No.7

Fig. 7.1 shows light approaching a boundary between two materials at speed *v*. The speed of the light after crossing the boundary is 1.3*v*.

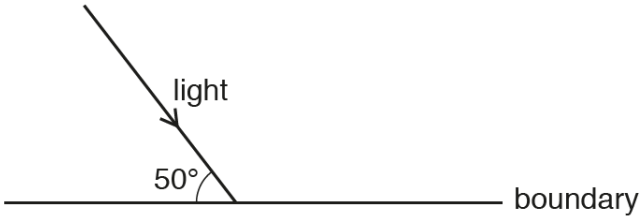

Fig. 7.1

(a) Determine the angle of incidence.

angle of incidence = ... [1]

(b) Calculate the angle of refraction.

angle of refraction = ... [3]

[Total: 4]

6. 0625/42/F/M/19/No.8

Fig. 8.1 shows parallel wavefronts of a light wave in ice. The wavefronts are incident on a boundary with air.

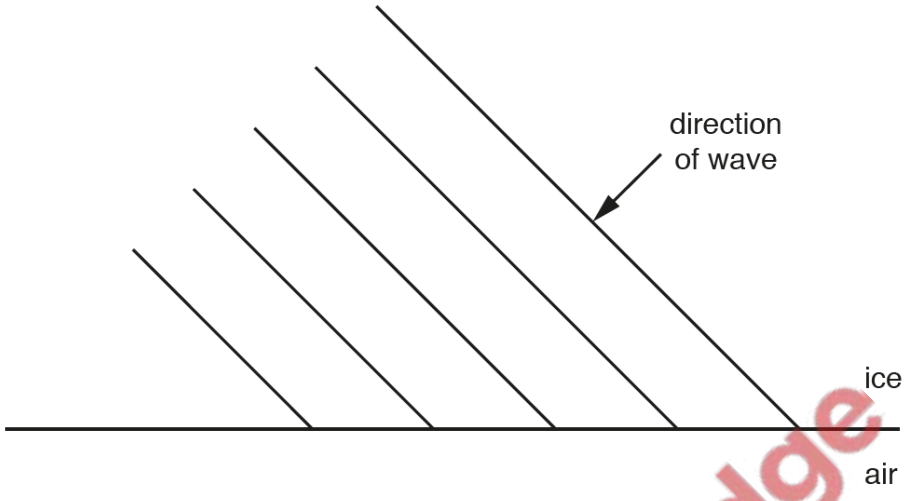

Fig. 8.1

The speed of the light wave in air is 3.0×10^8 m/s. The refractive index of the ice is 1.3.

(a) On Fig. 8.1:

(i) draw the wavefronts of the wave that passes into the air [3]

(ii) draw arrows to show the direction of travel of the refracted wave [1]

(iii) label the angle of incidence *i* and the angle of refraction *r*. [1]

(b) Calculate the speed of the light wave in the ice.

speed = ... [2]

[Total: 7]