

1(a). Fig. 22.1 shows a ray of red light from a laser entering a rectangular glass block from the air.

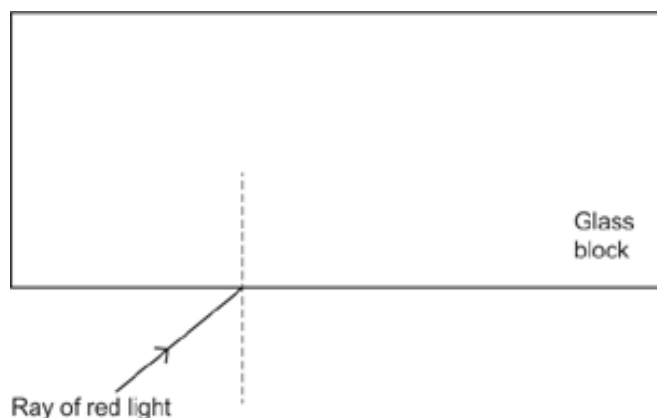


Fig. 22.1

When the red light enters the glass block from the air it will refract.

Draw the path of the refracted ray inside the glass block in Fig. 22.1.

[1]

(b). Explain why red light refracts as it enters the glass block.

[2]

(c). A student uses the red laser and glass block to investigate the relationship between the angle of incidence and angle of refraction for the glass.

The table shows the student's results.

Angle of incidence ($^{\circ}$)	Angle of refraction ($^{\circ}$)
22	14
34	22
48	30
55	33
62	36

- i. Describe a method the student could have used to investigate this relationship.

You can draw on Fig. 22.1 to help explain your answer.

[4]

- ii. The student concludes that the angle of incidence is directly proportional to the angle of refraction.

Show that the student is **incorrect**.

Use data from the table.

[2]

(d). The student replaces the red laser with a **green** laser and repeats the experiment for the same angles of incidence.

The student notices that the angles of refraction for the green light are all different from the angles of refraction for the red light.

Explain why the angles of refraction are different when light of a different colour is used.

[2]

(e). The student replaces the glass block with a glass lens and directs both the red and green lasers into the lens at the same time as shown in **Fig. 22.2**.

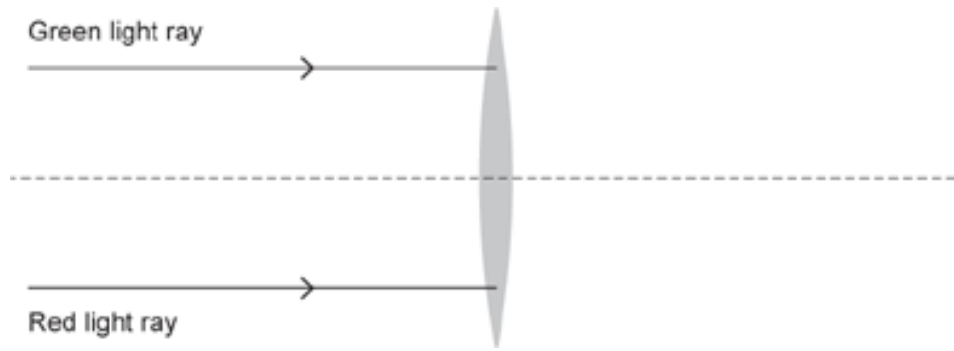


Fig. 22.2

Complete **Fig. 22.2** by continuing the paths of the red and green light rays.

[2]

2(a). A space mission in 1969 placed an object called a retroreflector on the surface of the Moon.

Fig. 18.1 shows the retroreflector.



Fig. 18.1

Laser light from the Earth is aimed at the retroreflector and reflects back to the Earth.

A student draws a simple model of a retroreflector using two plane mirrors at right angles to each other.

Fig. 18.2 shows the student's model.

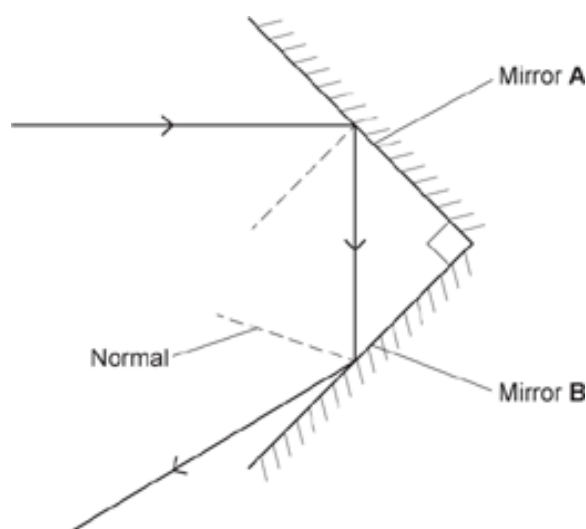


Fig. 18.2

Identify the **two** mistakes the student has made in Fig. 18.2.

Mistake 1

Mistake 2

[2]

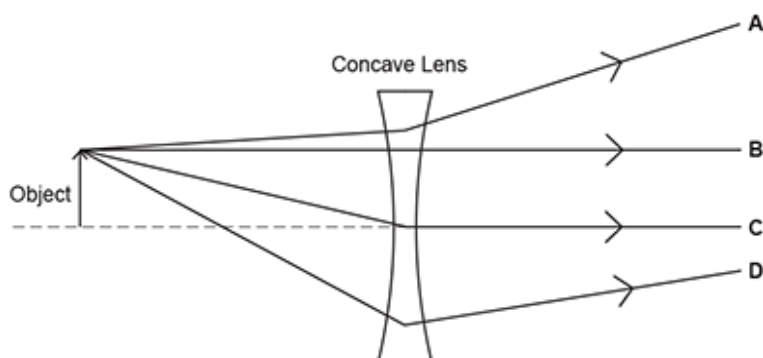
(b). The retroreflector was placed on a layer of dust on the surface of the Moon.

Since 1969, the efficiency of the retroreflector has decreased and it reflects less light back to the Earth.

Suggest why the retroreflector reflects less light.

[1]

3. The diagram shows four possible paths for a ray of light from an object passing through a concave lens.



Which letter shows the correct path of the ray?

Your answer ☐

[1]

4. A student investigates absorption of coloured light in a dark laboratory.

The student shines green light onto a blue object.

What colour does the object appear?

- A Black
- B Blue
- C Cyan
- D Green

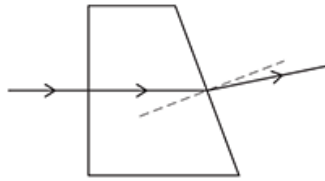
Your answer ☐

[1]

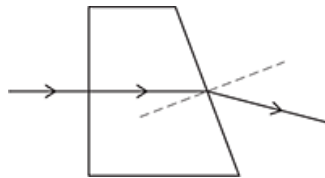
5. A student uses a ray box to shine a ray of light through a glass block.

Which diagram shows a correct path for the ray?

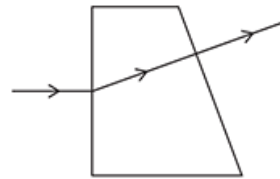
A



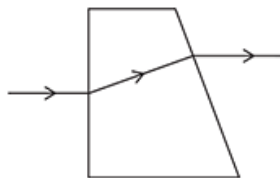
B



C



D



Your answer ☐

[1]

END OF QUESTION PAPER