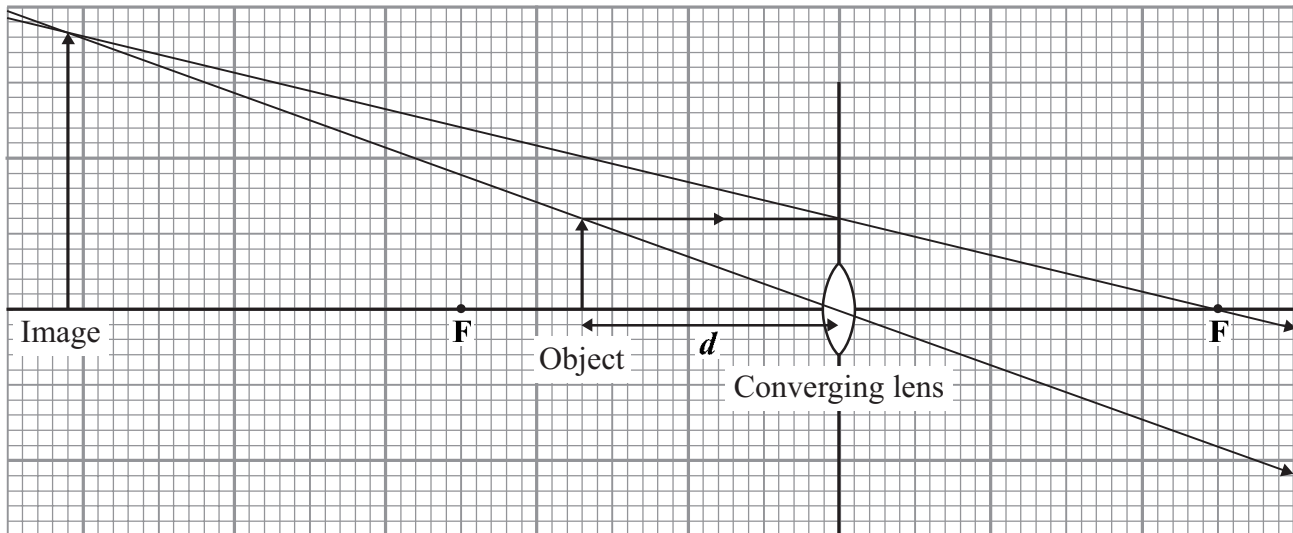


- 2 A student investigates how the magnification of an object changes at different distances from a converging lens.

The diagram shows an object at distance d from a converging lens.



- 2 (a) (i) The height of the object and the height of its image are drawn to scale.

Use the equation in the box to calculate the magnification produced by the lens shown in the diagram.

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

Show clearly how you work out your answer.

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Magnification = (2 marks)

- 2 (a) (ii) The points **F** are at equal distances on either side of the centre of the lens.

State the name of these points.

..... (1 mark)



2 (a) (iii) Explain how you can tell, **from the diagram**, that the image is virtual.

.....
.....

(1 mark)

Question 2 continues on the next page

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- 2 (b) The student now uses a different converging lens. He places the object between the lens and point **F** on the left.

The table shows the set of results that he gets for the distance d and for the magnification produced.

| Distance d measured in cm | Magnification |
|--------------------------------|---------------|
| 5 | 1.2 |
| 10 | 1.5 |
| 15 | 2.0 |
| 20 | 3.0 |
| 25 | 6.0 |

His friend looks at the table and observes that when the distance doubles from 10 cm to 20 cm, the magnification doubles from 1.5 to 3.0.

His friend's conclusion is that:

The magnification is directly proportional to the distance of the object from the lens.

His friend's observation is correct but his friend's conclusion is **not** correct.

- 2 (b) (i) Explain, with an example, why his friend's conclusion is **not** correct.

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(2 marks)

- 2 (b) (ii) Write a correct conclusion.

.....

.....

(1 mark)



- 2 (b) (iii) The maximum range of measurements for d is from the centre of the lens to F on the left.

The student **cannot** make a correct conclusion outside this range.

Explain why.

.....
.....

(1 mark)

| |
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| |
| 8 |

Turn over for the next question

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