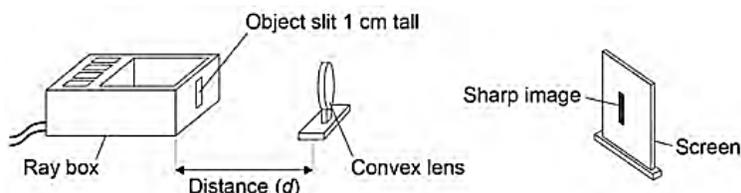# Lenses GCSE AQA Higher Physics Past Papers Questions

01.

A student investigated how the magnification produced by a convex lens varies with the distance (*d*) between the object and the lens.

The student used the apparatus shown in **Figure 7**.

Figure 7

1 The student measured the magnification produced by the lens by measuring the image height in centimetres.

Explain why the image height in centimetres was the same as the magnification.
[2 marks]

_____

_____

The data recorded by the student is given in **Table 1**.

Table 1

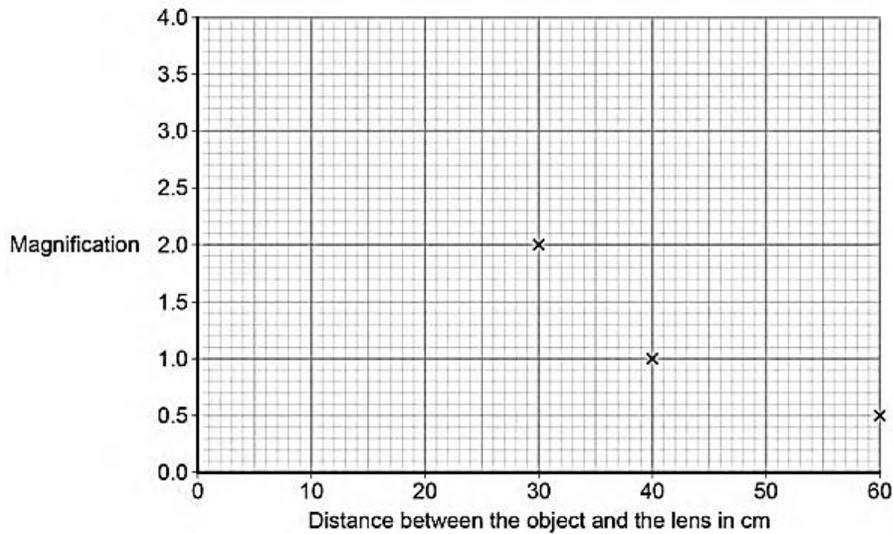| Distance between the object and the lens in cm	Magnification
25	4.0
30	2.0
40	1.0
50	0.7
60	0.5

2 It would be difficult to obtain accurate magnification values for distances greater than 60 cm.

Suggest **one** change that could be made so that accurate magnification values could be obtained for distances greater than 60 cm.
[1 mark]

_____

_____

The graph in **Figure 8** is incomplete.

Figure 8

3 Complete the graph in **Figure 8** by plotting the missing data and then drawing a line of best fit.

[2 marks]

4 How many times bigger is the image when the object is 35cm from the lens compared to when the object is 55 cm from the lens?

[2 marks]

_____

_____

_____

5 During the investigation the student also measured the distance between the lens and the image.

Table 2 gives both of the distances measured and the magnification.

Table 2

Distance between the lens and the image in cm	Distance between the lens and the object in cm	Magnification
100	25	4.0
60	30	2.0
40	40	1.0
33	50	0.7
30	60	0.5

Consider the data in **Table 2**.

Give a second way that the student could have determined the magnification of the object.
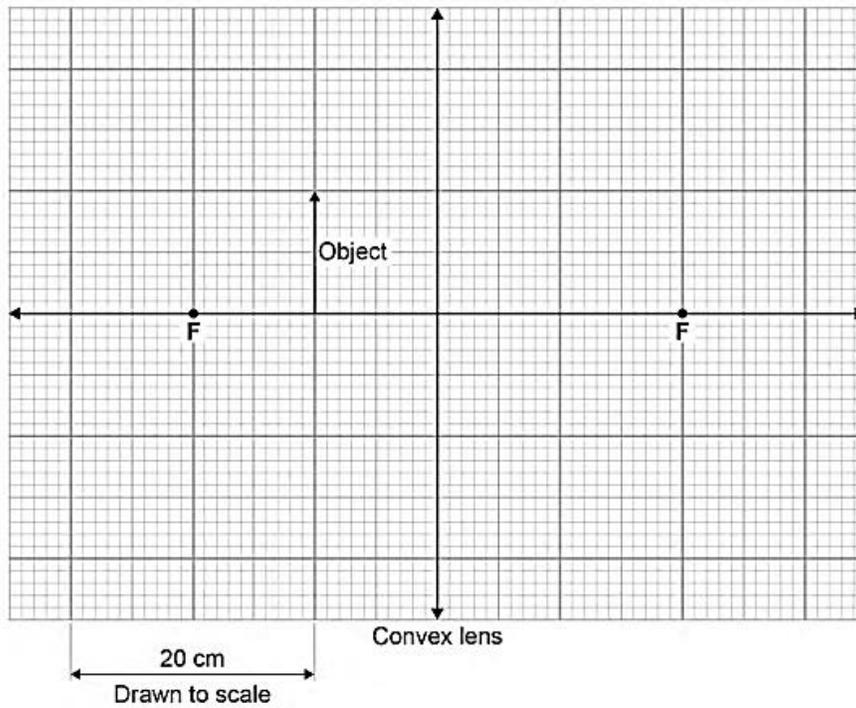
Justify your answer with a calculation.

[2 marks]

_____

_____

_____

_____

_____

6 Complete the ray diagram in **Figure 9** to show how the convex lens produces the image of a close object.
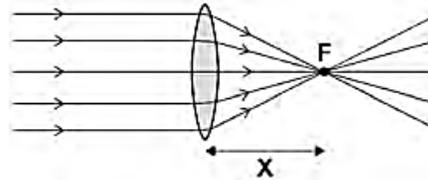
Use an arrow to represent the image.

[3 marks]

Figure 9

Convex lens

20 cm
Drawn to scale

02. **1** **Figure 1** shows parallel rays of light being refracted by a convex lens.

Figure 1

What is distance '**X**' called?

[1 mark]

_____

2 Lenses can be used to form the image of an object.

Complete the ray diagram in **Figure 2** to show how a **convex** lens forms the image of the object.

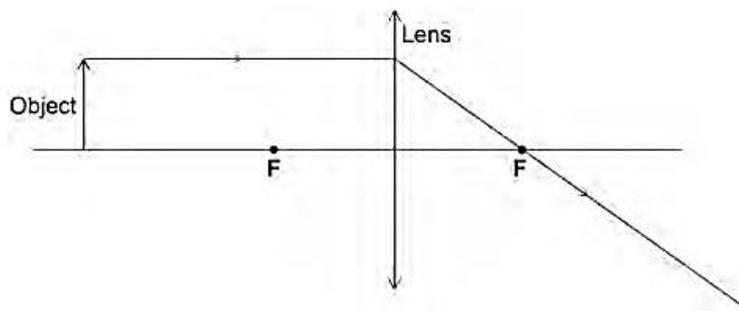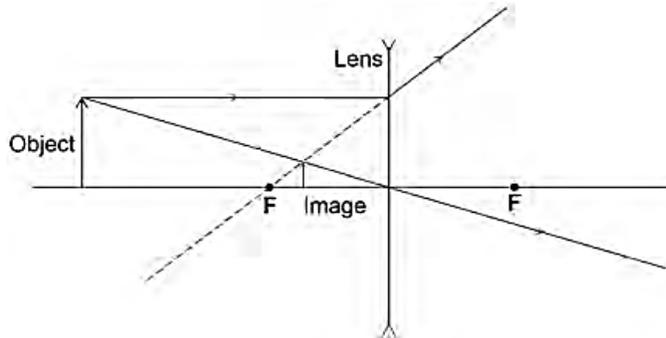Use an arrow to represent the image.

[2 marks]

Figure 2

Figure 3 shows how a **concave** lens forms the image of an object.

Figure 3

3 Give **one** similarity and **one** difference between the image formed by the convex lens and the image formed by the concave lens.

[2 marks]

Similarity _____

_____

Difference _____

4 A person uses a lens to read the letters on the back of a coin.

The image height of the letters on the coin is 9.0 mm

The magnification produced by the lens is 6.0

Calculate the height of the letters on the coin.

Use the Physics Equations sheet.

[3 marks]

_____

_____

_____

_____

Height = _____ mm

8

03.

A door is fitted with a security lens and a lock.

The security lens allows a person to see a visitor before opening the door.
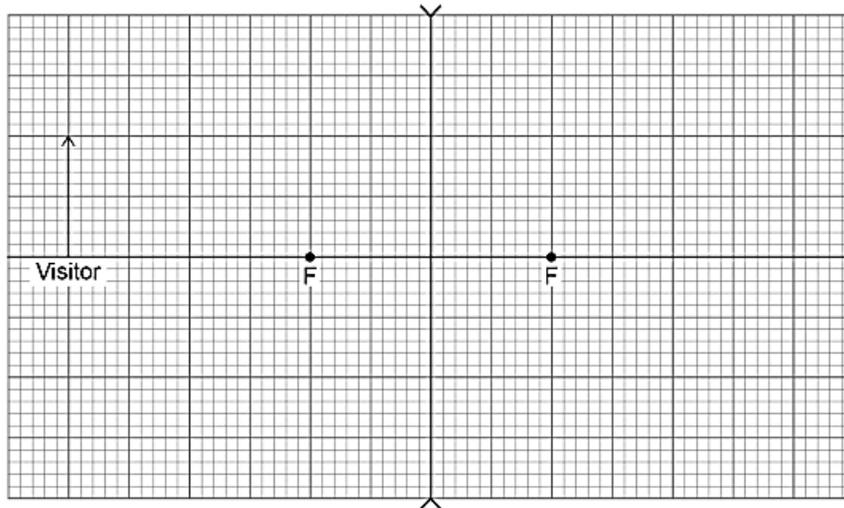
The security lens is concave.

1 **Figure 5** is an incomplete ray diagram representing a visitor standing near the security lens.

Complete **Figure 5** to show how an image of the visitor is formed by the concave lens.

Draw an arrow to represent the image.

[3 marks]

Figure 5

2 The visitor moves further away from the security lens in the door.

How does the size of the image change?

[1 mark]

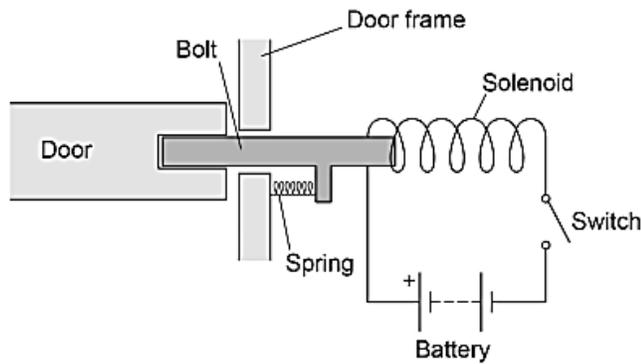Tick (✓) **one** box.

Decreases ☐

Increases ☐

Stays the same ☐

Figure 6 shows a diagram of the lock. The door unlocks when the switch is closed.

Figure 6

3 Which material should the bolt be made from?

[1 mark]

Tick (✓) **one** box.

Aluminium ☐

Brass ☐

Copper ☐

Iron ☐

4 Explain why the door unlocks when the switch is closed.

[3 marks]

_____

_____

_____

_____

_____

_____

5 When the door unlocks, a force of 2.88 N is applied to the spring.

The spring extends by 1.50 cm.

Calculate the spring constant of the spring.

[4 marks]

_____

_____

_____

_____

_____

Spring constant = _____ N/m

6 Give **two** ways the resultant force on the bolt could be increased.
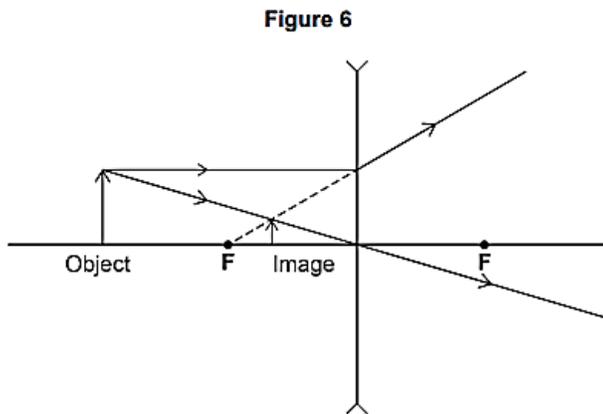
[2 marks]

1 _____

_____

2 _____

_____

14

04. Lenses are used to form images of objects.

1 **Figure 6** shows how a concave lens forms an image of an object.

Figure 6

The image of the object in **Figure 6** is upright.

Give **two** other words that describe the image.
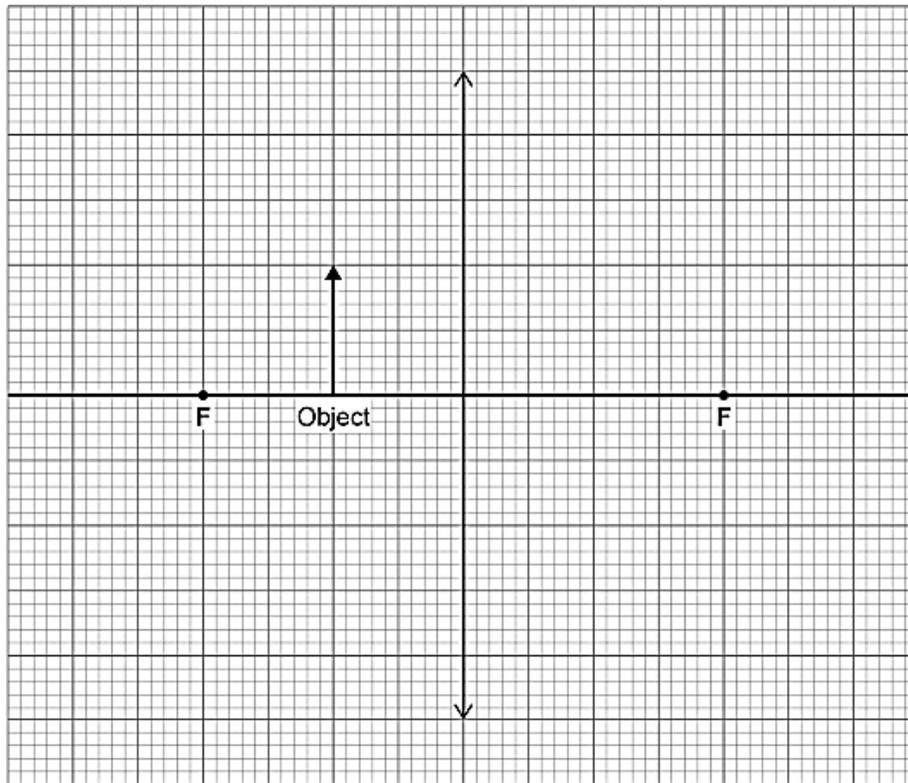
[1 mark]

1 _____

2 _____

2 **Figure 7** shows an object near to a **convex** lens.

Complete the ray diagram to show how the image is formed.

Use an arrow to represent the image.
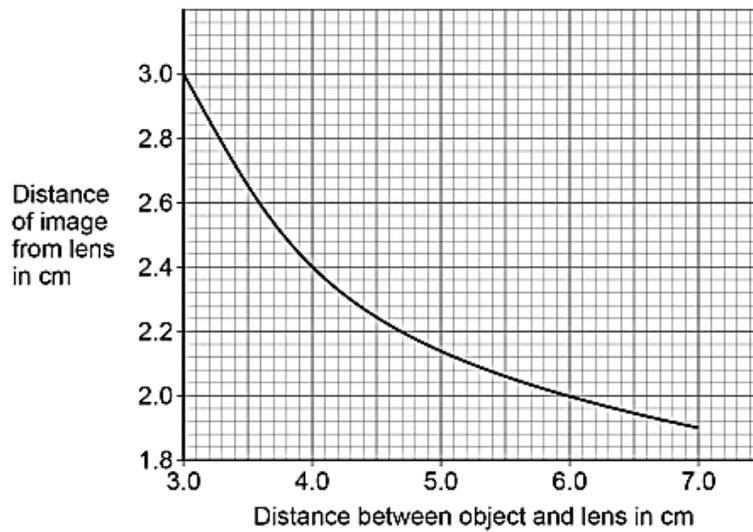
[3 marks]

Figure 7

The position of an image formed by a convex lens varies with the distance between the object and the lens.

Figure 8 shows the results of a student's investigation using a convex lens.

Figure 8

3 Describe how the distance of the image from the lens decreases as the distance between the object and the lens increases.

[1 mark]

_____

_____

4 The student measured the distance from the image to the lens four times.

The distance between the object and the lens did not change.

The 4 measurements from the image to the lens were:

| 1.9 cm | 1.7 cm | 2.2 cm | 1.4 cm |

Calculate the uncertainty in the measurements.

[2 marks]
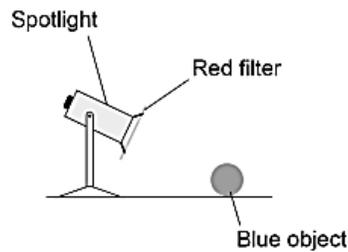
_____

_____

_____

Uncertainty = ± _____ cm

5 **Figure 9** shows a spotlight containing a convex lens.

A red filter is placed in front of the spotlight.

The spotlight is directed at a blue object.

Figure 9

Explain why the blue object appears black.

[3 marks]

_____

_____

_____

_____

_____

_____

10