AQA GCSE Physics | 8463

SPECIFICATION POINT 4.6.2.5

Lenses (physics only)

Past-paper questions

Tier	**Foundation**
Question groups	**25**
Available paper years	**2003–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

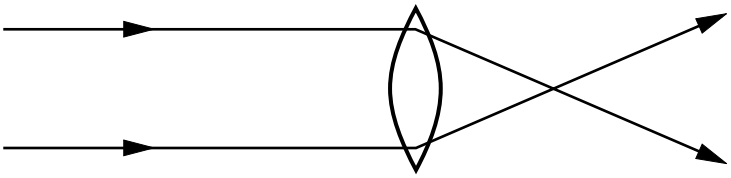
4.6.2.5 Lenses (physics only)

Question 01

June 2003 | 3451F | Original Q8 | Legacy

8 (a) The diagram shows how parallel rays of light pass through a convex lens.

(i) Mark the position of the focus.



(1 mark)

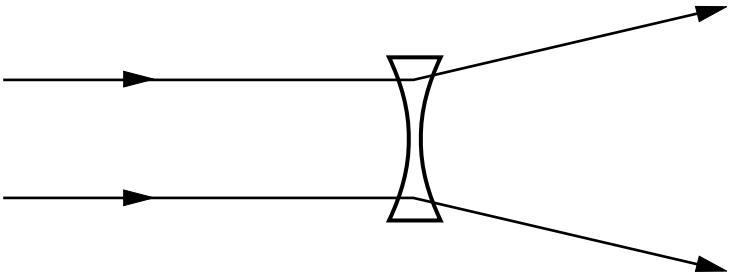
(ii) Is this a **converging** lens, a **diverging** lens, **both** or **neither**?

.....

(1 mark)

(b) The diagram shows how parallel rays of light pass through a concave lens.

(i) Mark the position of the focus.



(1 mark)

(ii) Is this a **converging** lens, a **diverging** lens, **both** or **neither**?

.....

(1 mark)

(c) Complete these sentences by crossing out the **two** lines in each box that are wrong.

In a camera, a [converging / diverging / parallel] lens is used to produce an image of an object on a [film / lens / screen]. The image is [larger than / smaller than / the same size as] the object.

The image is [further from / nearer to / the same distance from] the lens, compared to the distance of the object from the lens.

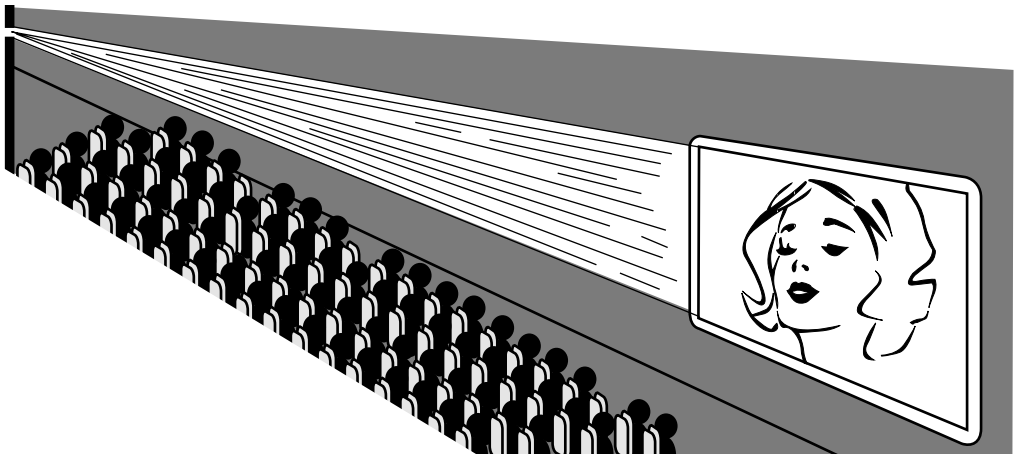
(4 marks)

4.6.2.5 Lenses (physics only)

Question 01 · continued

MARGIN BLANK

(d) In a cinema projector, a convex lens is used to produce a *magnified*, *real* image.



(i) What does *magnified* mean?

.....

.....

(1 mark)

(ii) What is a *real* image?

.....

.....

(1 mark)

(e) You are in a dark room. You have a box containing some lenses. Only **one** of them is a converging lens.

Describe how, by just feeling the lenses, you can pick out the converging lens.

.....

.....

.....

.....

(2 marks)

12

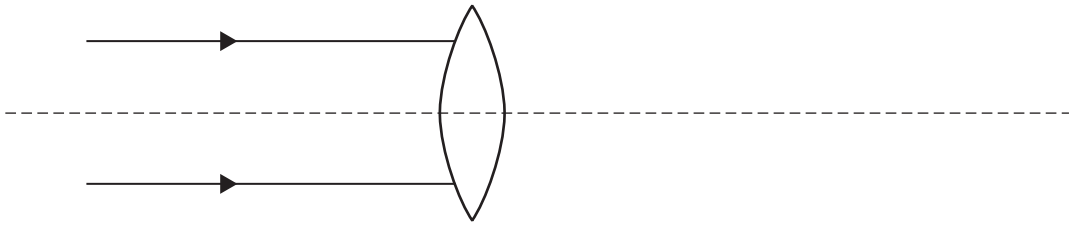
4.6.2.5 Lenses (physics only)

Question 02

June 2005 | 3451 | Original Q10 | Legacy

10 (a) The diagram shows two parallel rays of light, a lens and its axis.

(i) Complete the diagram to show what happens to the rays.



(2 marks)

(ii) Name the point where the rays come together.

.....

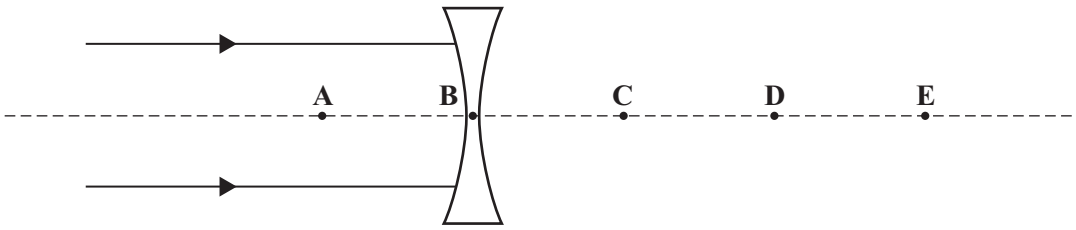
(1 mark)

(iii) What word can be used to describe this type of lens?

.....

(1 mark)

(b) The diagram shows two parallel rays of light, a lens and its axis.



(i) Which point **A**, **B**, **C**, **D** or **E** shows the focal point for this diagram? Point.....

(1 mark)

(ii) Explain your answer to part (b)(i).

.....

.....

(1 mark)

(iii) What word can be used to describe this type of lens?

.....

(1 mark)

4.6.2.5 Lenses (physics only)

Question 02 · continued

MARGIN BLANK

(c) Complete the following **three** sentences by crossing out the **two** lines in each box which are wrong.

In a camera a converging lens is used to produce an image on a

film lens screen

.

The image is

larger than smaller than the same size as

the object.

Compared to the distance of the image from the lens, the object is

further away from nearer to the same distance from

the lens.

(3 marks)

(d) Explain the difference between a *real* image and a *virtual* image.

.....

.....

.....

.....

.....

.....

(3 marks)

13

TURN OVER FOR THE NEXT QUESTION

4.6.2.5 Lenses (physics only)

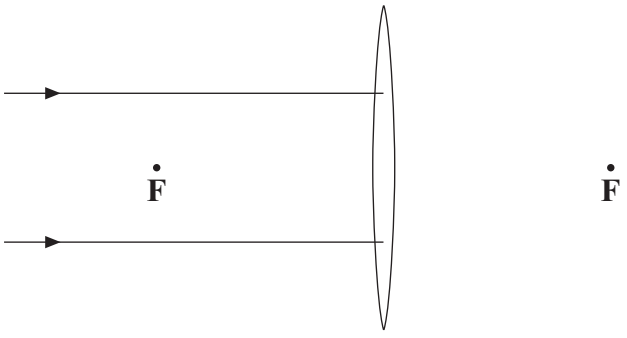
Question 03

June 2006 | 3451 | Original Q17 | Legacy

17 (a) **Diagram 1** shows parallel rays of light and a converging lens. The points, **F**, show the focus on each side of the lens.

Complete **Diagram 1** to show what happens to the rays of light. Use a ruler to do this.

Diagram 1

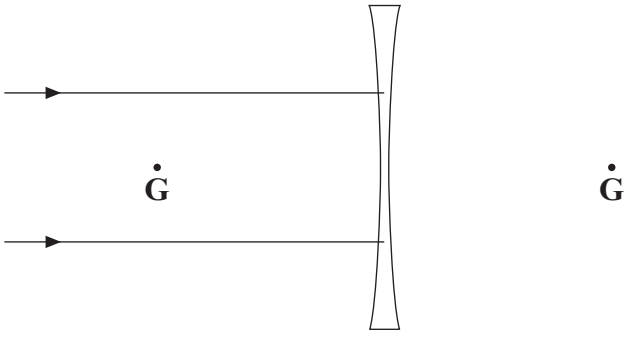


(2 marks)

(b) **Diagram 2** shows parallel rays of light and a diverging lens. The points, **G**, show the focus on each side of the lens.

Complete **Diagram 2** to show what happens to the rays of light. Use a ruler to do this.

Diagram 2



(2 marks)

(c) Use words from the box to complete the sentences.

image	**lens**	**object**

You may use each word once, more than once or not at all.

In a camera, a converging ..... is used to produce an

..... of an ..... on a film. The ..... is

smaller than the ..... and nearer to the ..... .

(3 marks)

4.6.2.5 Lenses (physics only)

Question 03 · continued

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(d) (i) What is the difference between a real image and a virtual image for a lens?

.....

.....

.....

.....

(2 marks)

(ii) Why does a real image, rather than a virtual image, need to be formed in a camera?

.....

.....

(1 mark)

10

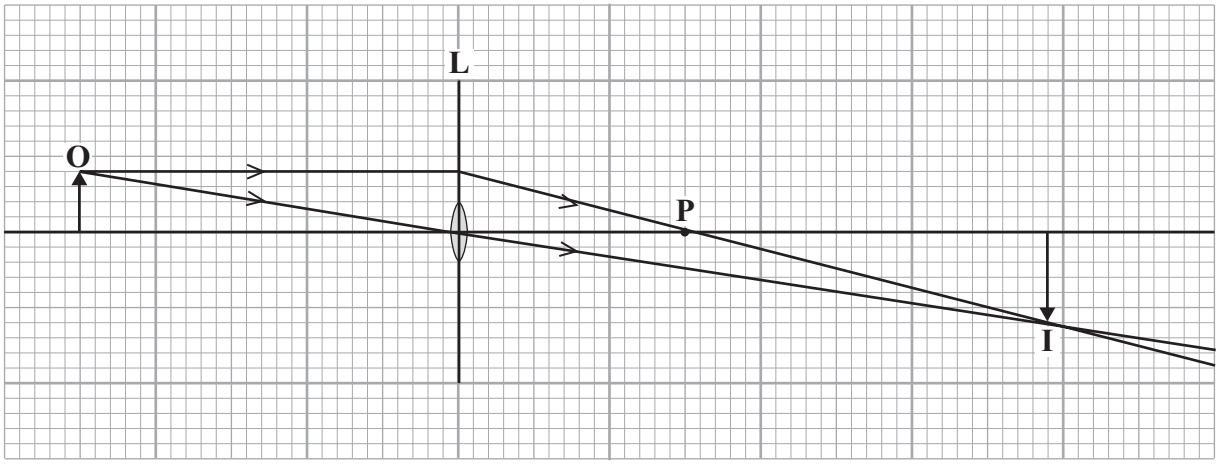
Turn over for the next question

4.6.2.5 Lenses (physics only)

Question 04

January 2008 | PHY3F | Original Q7 | Legacy

7 The ray diagram shows the position and size of the image, **I**, of an object, **O**, formed by a lens, **L**.



(a) What type of lens is shown in the ray diagram?

.....

(1 mark)

(b) Name the point labelled **P**.

.....

(1 mark)

(c) The ray diagram has been drawn to scale.

Use the equation in the box to calculate the magnification.

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

Show clearly how you work out your answer.

.....

.....

Magnification = ...

(2 marks)

(d) How can you tell from this ray diagram that the image is a real image?

.....

.....

(1 mark)

5

4.6.2.5 Lenses (physics only)

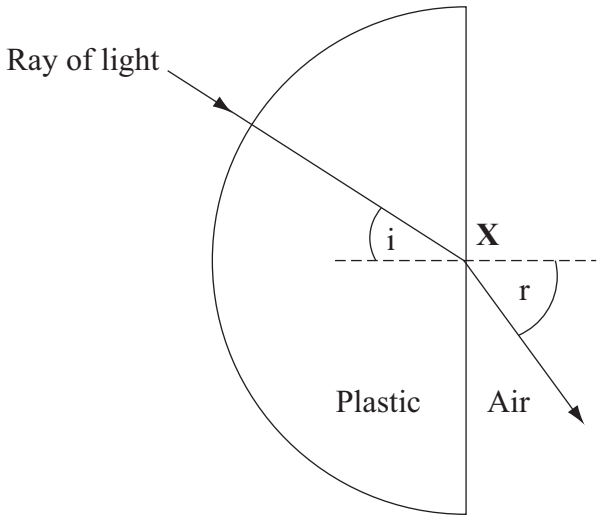
Question 05

June 2008 | PHY3F | Original Q6 | Legacy

6 (a) A student investigated the refraction of light as it passes out of a transparent plastic block.

She aimed a ray of light at point **X**. She marked the position of the ray as it passed through the transparent plastic block and into the air.

The angle ***i*** is the angle of incidence.



6 (a) (i) What is the name of angle **r**?

.....

(1 mark)

6 (a) (ii) What is the name of the dashed line?

.....

(1 mark)

4.6.2.5 Lenses (physics only)

Question 05 · continued

for mark

6 (b) A camera uses a lens to produce an image which falls on a light detector.



Name a light detecting device which may be used in a camera.

.....

(1 mark)

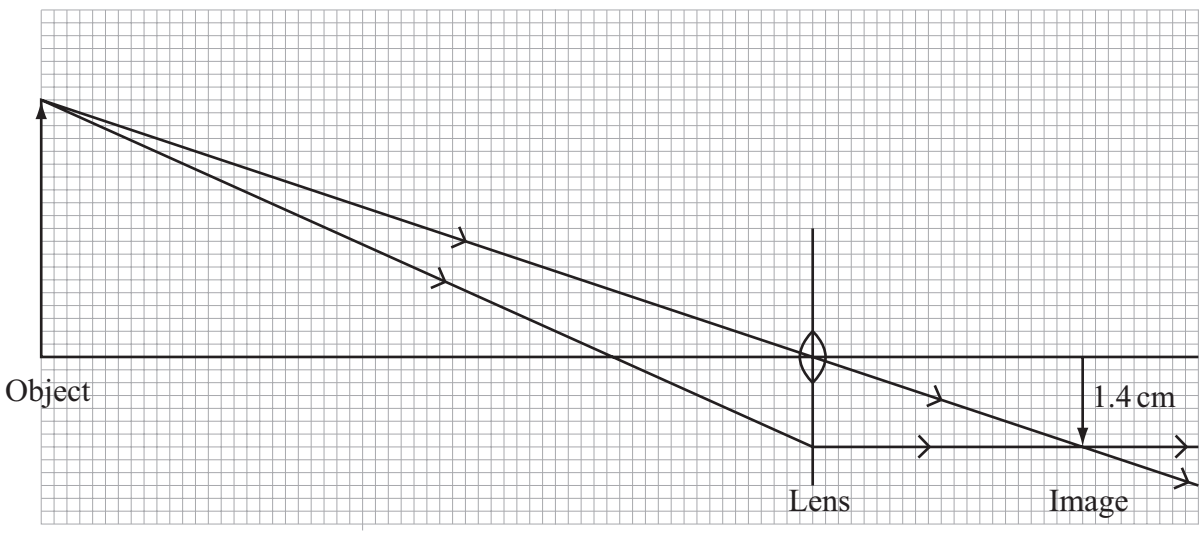
Question 6 continues on the next page

4.6.2.5 Lenses (physics only)

Question 05 · continued

for mark

6 (c) The diagram shows the position of an image formed in a camera.



6 (c) (i) What type of lens is shown in the diagram?

.....

(1 mark)

6 (c) (ii) Use the equation in the box to calculate the magnification.

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

Show clearly how you work out your answer.

.....

.....

Magnification = ... *(2 marks)*

6 (d) Why does the image formed in a camera have to be a real image?

.....

.....

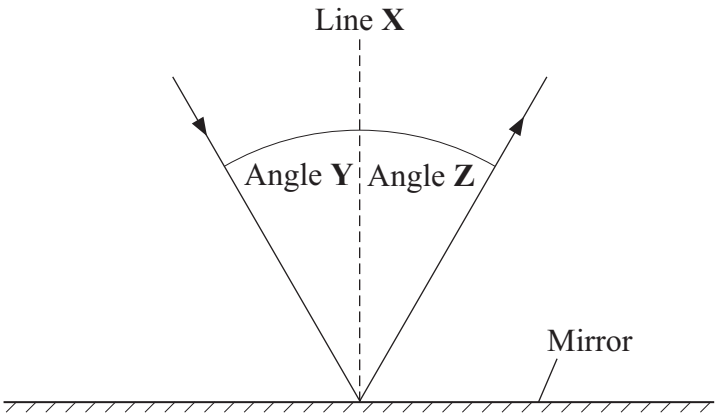
(1 mark)

7

4.6.2.5 Lenses (physics only)

Question 06

1 (a) The following diagram shows a ray of light which is reflected by a mirror.



1 (a) (i) Use **one** word from the box to complete the sentence.

concave	**convex**	**plane**

The mirror is a ..... mirror.

(1 mark)

1 (a) (ii) Complete the sentence.

Line **X** is a vertical line at right angles to the mirror and is called the

..... .

(1 mark)

4.6.2.5 Lenses (physics only)

Question 06 · continued

for mark

Complete the following sentences by drawing a ring around the correct line in each box.

1 (a) (iii) Angle **Y** is called the angle of

incidence
reflection
refraction

.

(1 mark)

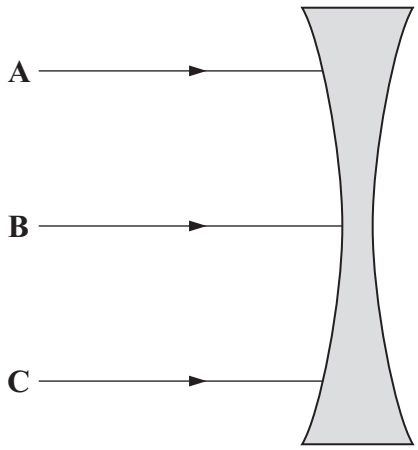
1 (a) (iv) If angle **Y** is doubled, then angle **Z** will

be halved
stay the same
be doubled

.

(1 mark)

1 (b) The following diagram shows the side view of a lens and three parallel rays of light, **A**, **B** and **C**.



1 (b) (i) Use **one** word from the box to complete the sentence.

converging	**diverging**	**plane**

The diagram shows a ..... lens.

(1 mark)

1 (b) (ii) Add to the diagram to show what will happen to **each** of the three rays of light, **A**, **B** and **C**.

(2 marks)

7

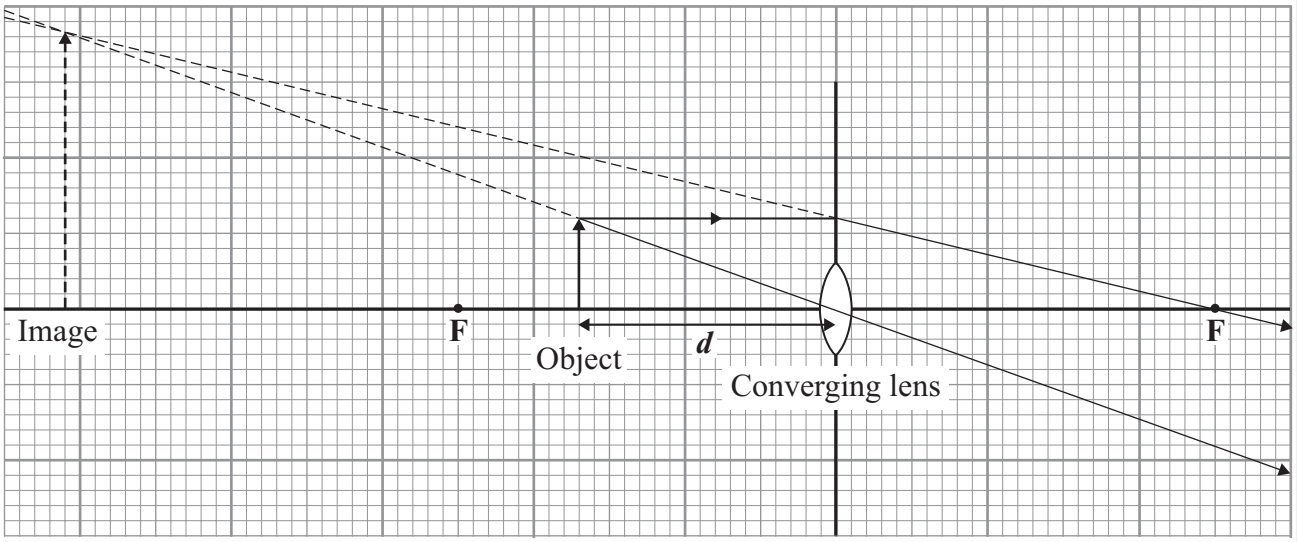
4.6.2.5 Lenses (physics only)

Question 07

January 2010 | PHY3F | Original Q8 | Legacy

8 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.



8 (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.

.....

.....

.....

Magnification = ...

(2 marks)

8 (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)

4.6.2.5 Lenses (physics only)

Question 07 · continued

for mark

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

.....

.....

(1 mark)

Question 8 continues on the next page

8 (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.

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

.....

.....

.....

.....

(2 marks)

8 (b) (ii) Write a correct conclusion.

.....

.....

(1 mark)

4.6.2.5 Lenses (physics only)

Question 07 · continued

for mark

8 (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)

8

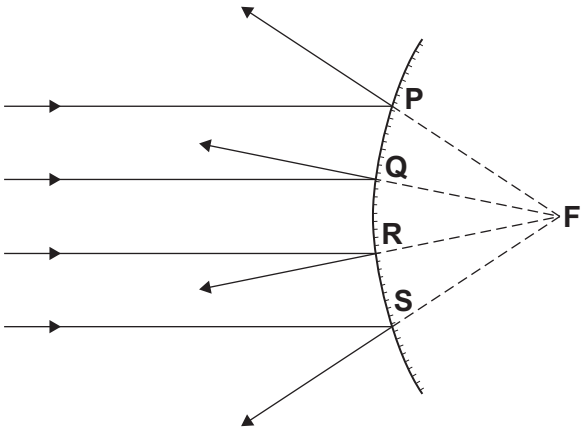
4.6.2.5 Lenses (physics only)

Question 08

June 2010 | PHY3F | Original Q5 | Legacy

5 (a) A student uses a ray box and a curved mirror.

The diagram shows the mirror and parallel rays of light from the ray box.



5 (a) (i) What type of mirror is shown in the diagram?

.....

(1 mark)

5 (a) (ii) What is point **F** called?

.....

(1 mark)

5 (a) (iii) What is the process that takes place at points **P**, **Q**, **R** and **S**?

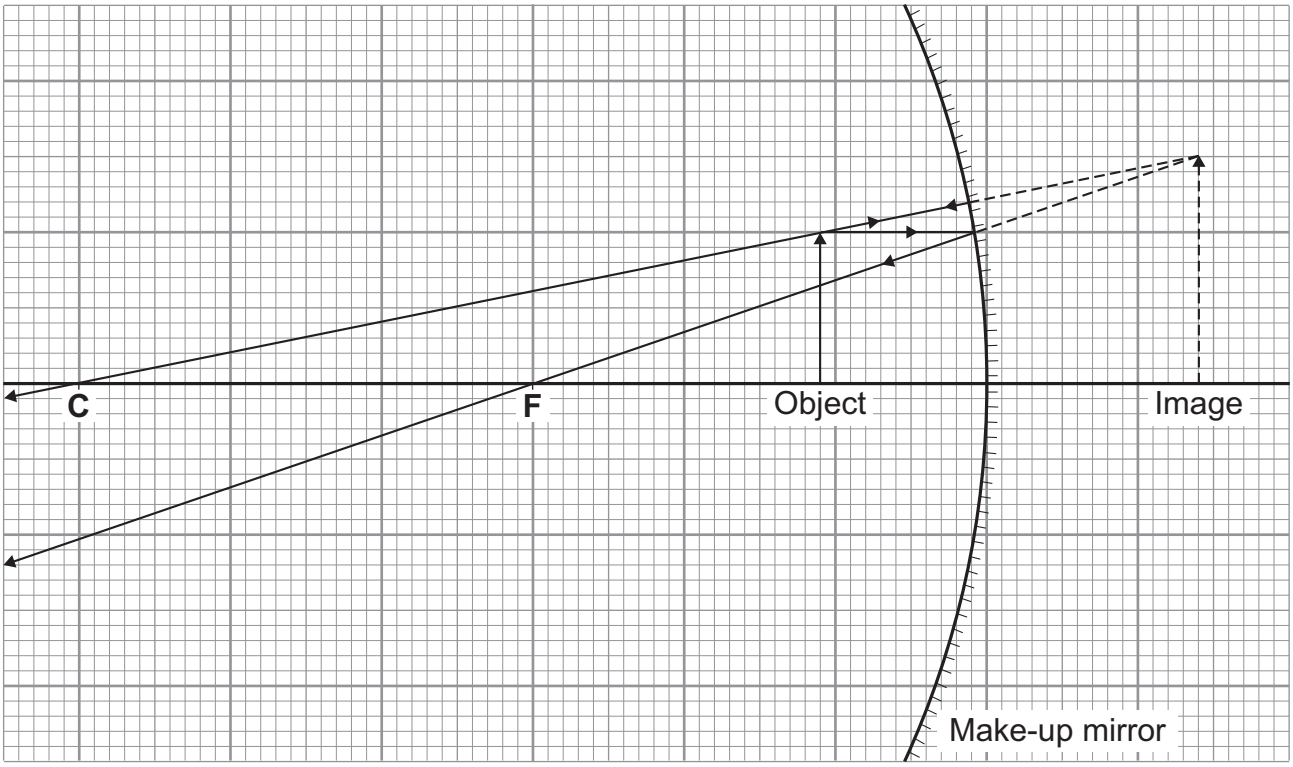
.....

(1 mark)

4.6.2.5 Lenses (physics only)

Question 08 · continued

5 (b) The diagram shows an object and its image in a curved make-up mirror.



5 (b) (i) What type of mirror is shown in the diagram?

.....

(1 mark)

5 (b) (ii) Use the equation in the box to calculate the magnification produced by the mirror.

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

Show clearly how you work out your answer.

.....

.....

Magnification = ...

(2 marks)

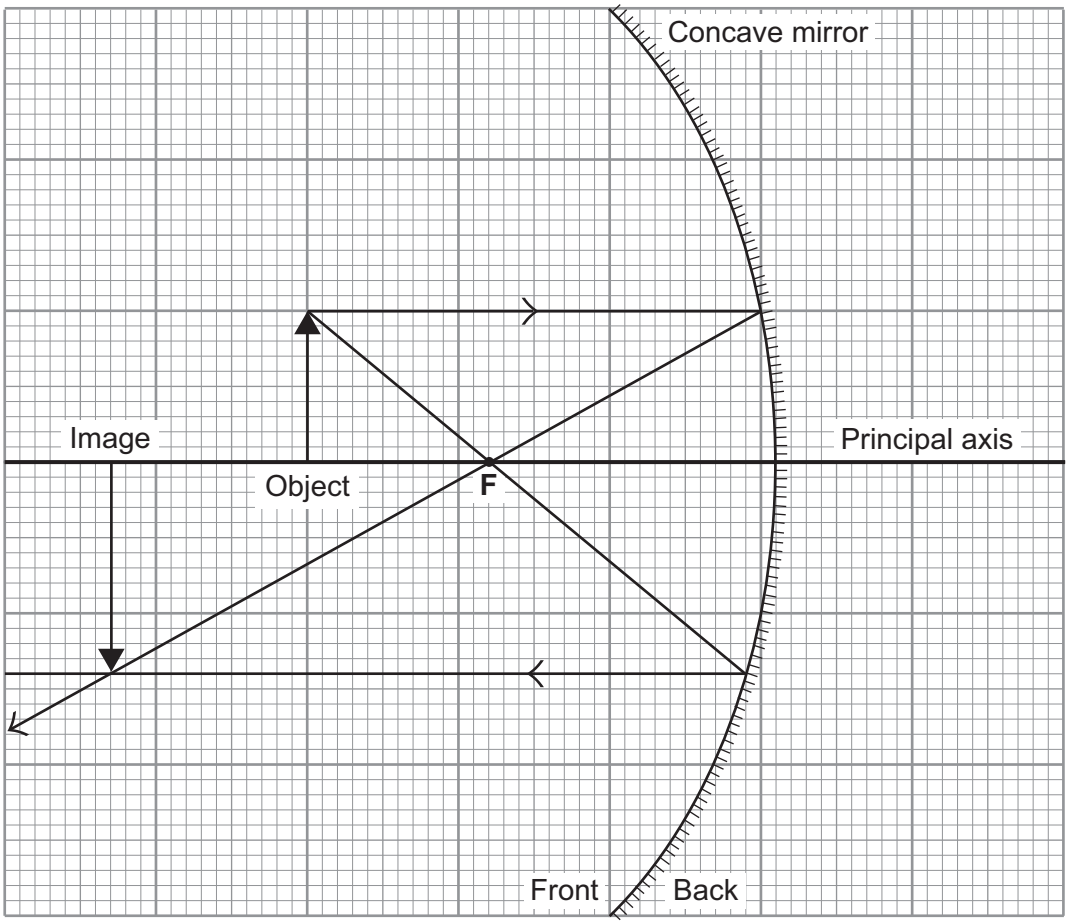
6

4.6.2.5 Lenses (physics only)

Question 09

January 2011 | PHY3F | Original Q5 | Legacy

5 The ray diagram shows the image formed by a concave mirror.



Use the equation in the box to calculate the magnification.

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

Show clearly how you work out your answer.

.....

.....

Magnification = ...

(2 marks)

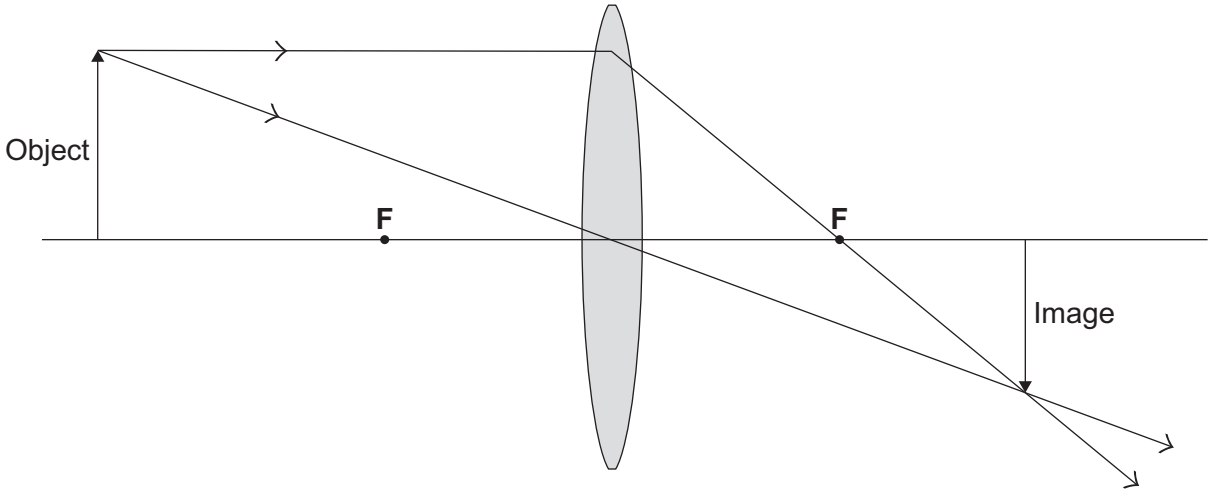
2

4.6.2.5 Lenses (physics only)

Question 10

January 2011 | PHY3F | Original Q7 | Legacy

7 The diagram shows a lens, the position of an object and the position of the image of the object.



7 (a) What type of lens is shown?

.....

(1 mark)

7 (b) What is the name of the points, **F**, shown each side of the lens?

.....

(1 mark)

7 (c) (i) The image is real and can be put on a screen.

How can you tell **from the diagram** that the image is real?

.....

.....

(1 mark)

7 (c) (ii) Draw a ring around a word in the box which describes the image produced by the lens.

inverted	**larger**	**upright**

(1 mark)

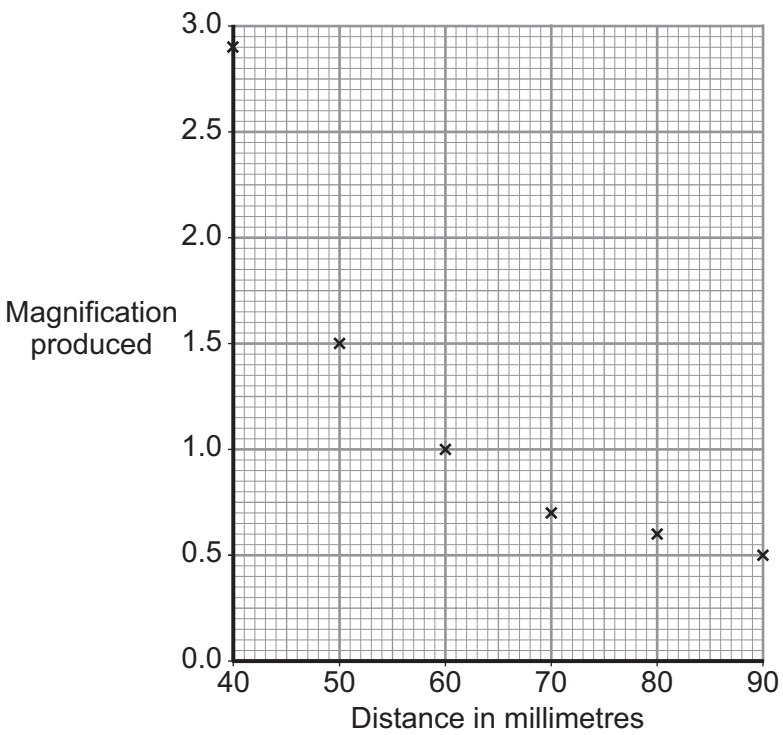
4.6.2.5 Lenses (physics only)

Question 10 · continued

7 (d) A student investigates the relationship between the distance from the object to the lens and the magnification produced by the lens.
The student's results are given in the table.
The student did not repeat any measurements.

Distance in millimetres	Height of object in millimetres	Height of image in millimetres	Magnification produced
40	20	58	2.9
50	20	30	1.5
60	20	20	1.0
70	20	14	0.7
80	20	12	0.6
90	20	10	0.5

The student plots the points for a graph of *magnification produced* against *distance*.



7 (d) (i) Draw a *line of best fit* for these points.

(1 mark)

4.6.2.5 Lenses (physics only)

Question 10 · continued

7 (d) (ii) Complete the following sentence by drawing a ring around the correct word in the box.

A line graph has been drawn because both variables are

described as being

categoric.
continuous.
discrete.

(1 mark)

7 (d) (iii) Describe the relationship between *magnification produced* and *distance*.

.....

.....

.....

(2 marks)

8

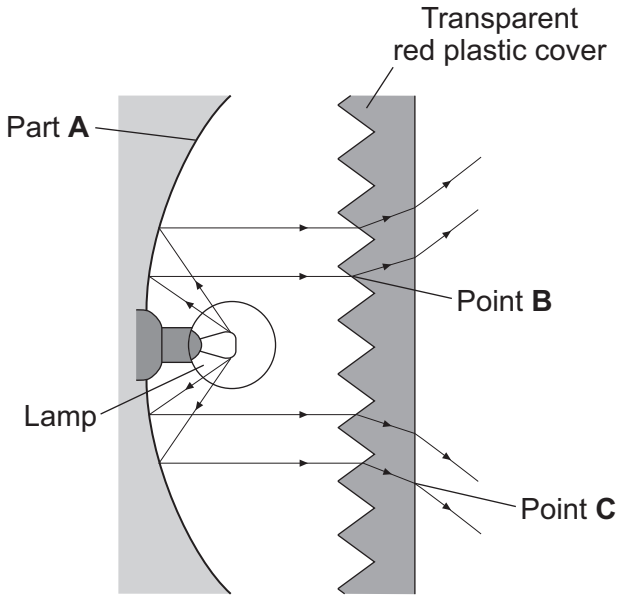
4.6.2.5 Lenses (physics only)

Question 11

June 2011 | PHY3F | Original Q6 | Legacy

6 At night, it is important that the lights of a car can be seen by other drivers but it is dangerous if these lights dazzle them.

The diagram shows a rear light of a car.



6 (a) (i) Name part **A**.

.....

(1 mark)

6 (a) (ii) Name the process which occurs at point **B** and at point **C**.

.....

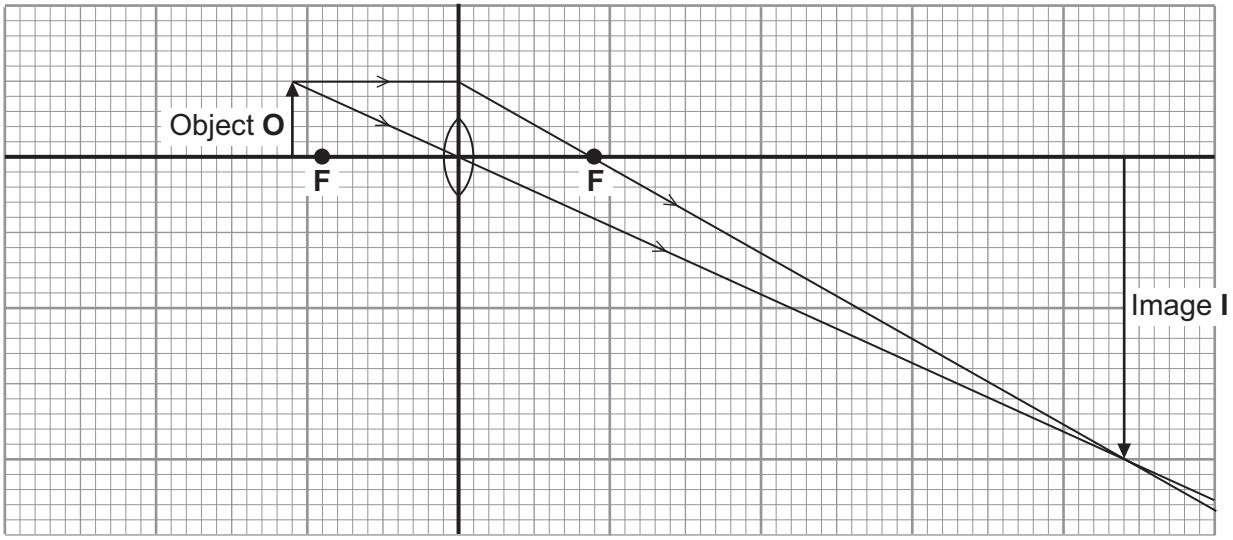
(1 mark)

4.6.2.5 Lenses (physics only)

Question 11 · continued

6 (b) A headlamp of a car contains a lens.

The ray diagram shows the position and size of the image, **I**, of an object, **O**, formed by a lens similar to the one inside a car headlamp.



6 (b) (i) What type of lens is shown in the ray diagram?

Draw a ring around your answer.

converging **diverging** **plane**

(1 mark)

6 (b) (ii) The ray diagram is drawn to scale.

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

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

Show clearly how you work out your answer.

.....

.....

Magnification = ...

(2 marks)

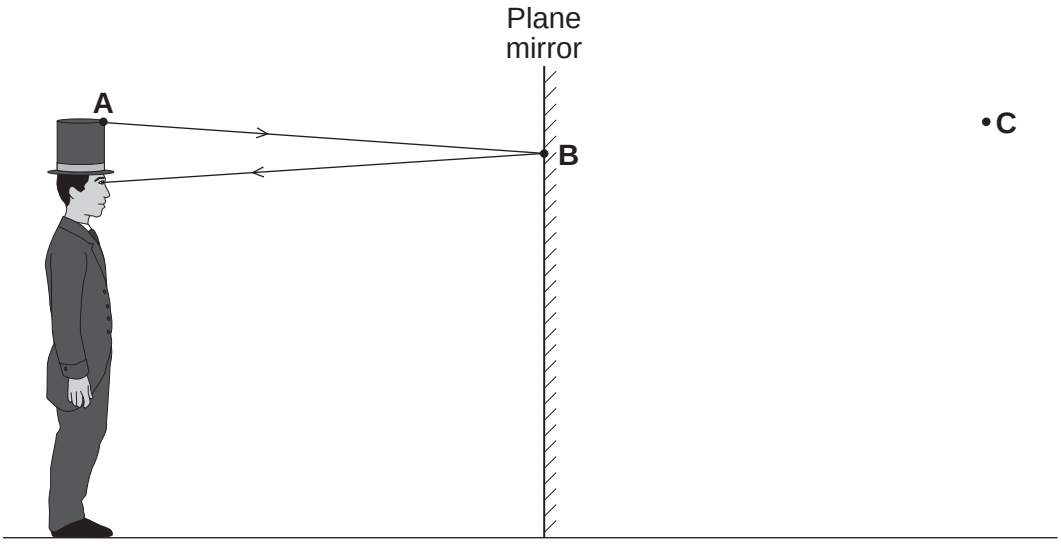
5

4.6.2.5 Lenses (physics only)

Question 12

June 2013 | PH1FP | Original Q3 | Legacy

3 A person can see an image of himself in a tall plane mirror.



The diagram shows how the person can see his hat.

3 (a) Which point, **A**, **B** or **C**, shows the position of the image of his hat?

Write the correct answer, **A**, **B** or **C**, in the box. ☐

(1 mark)

3 (b) On the diagram, use a ruler to draw a light ray to show how the person can see his shoe.

(3 marks)

3 (c) Which **one** of the words in the box is used to describe the image formed by a plane mirror?

Draw a ring around the correct answer.

imaginary	**real**	**virtual**

(1 mark)

5

4.6.2.5 Lenses (physics only)

Question 13

June 2013 | PH3FP | Original Q4 | Legacy

4 An event involved paddling a homemade raft down a fast-flowing river. The rafts were made using empty barrels.



4 (a) (i) Which **two** factors would most affect the raft's stability?

Tick (✓) the **two** correct factors.

The cost of the raft ☐

The width of the base of the raft ☐

The position of the centre of mass of the raft ☐

How streamlined the raft is ☐

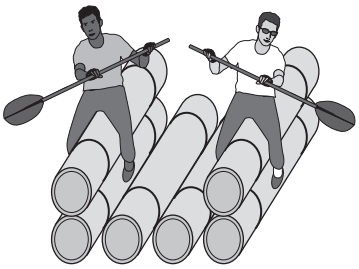
(2 marks)

4.6.2.5 Lenses (physics only)

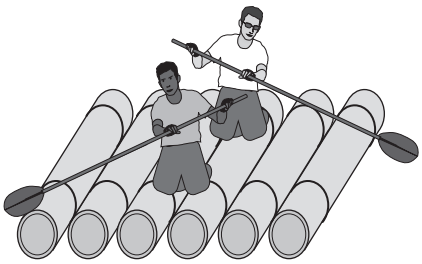
Question 13 · continued

4 (a) (ii) Here are three raft designs:

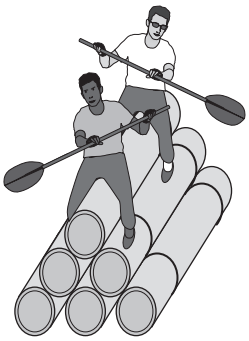
Design **A**



Design **B**



Design **C**



Which design of raft would be most stable?

Tick (✓) **one** box.

Design **A** ☐

Design **B** ☐

Design **C** ☐

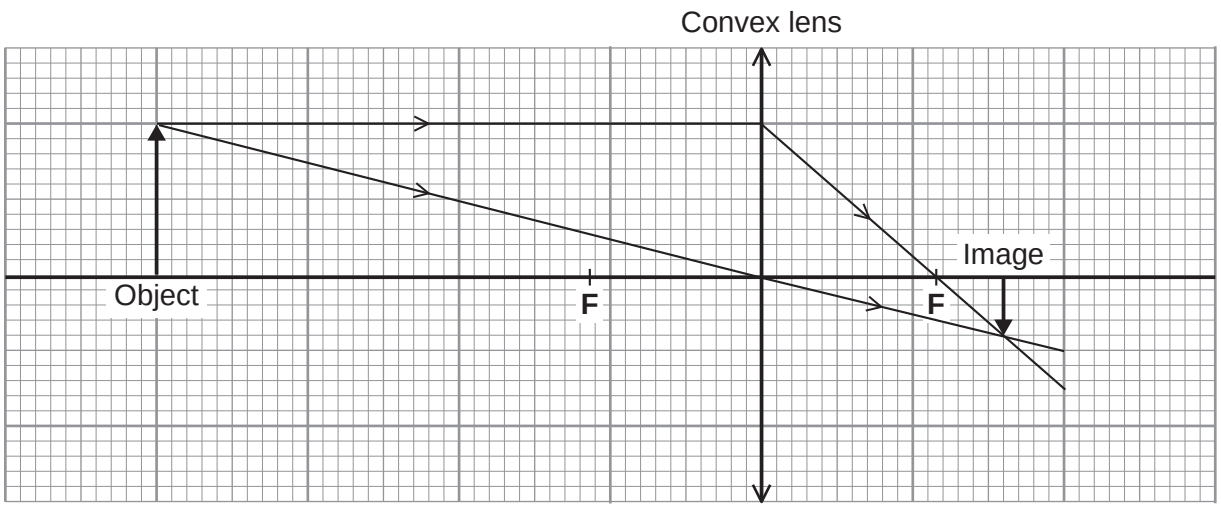
(1 mark)

Question 4 continues on the next page

4.6.2.5 Lenses (physics only)

Question 13 · continued

4 (b) A camera was used to take photographs of the rafts. The camera contains a convex (converging) lens. The ray diagram shows how the lens produces an image.



F = Principal focus

4 (b) (i) Which **two** words from the list describe the nature of the image?

Draw a ring around each of the **two** correct answers.

upright **magnified** **inverted** **virtual** **real**

(2 marks)

4 (b) (ii) Use information from the ray diagram to calculate the magnification of the image.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Magnification = ...

(2 marks)

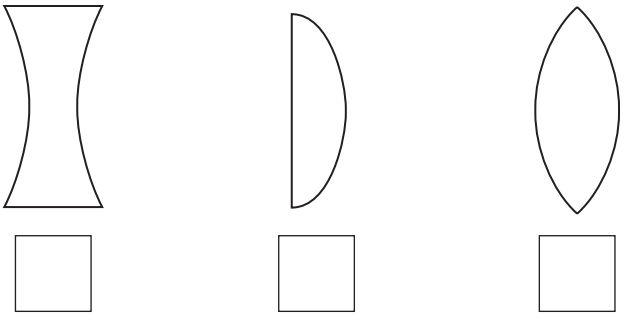
4.6.2.5 Lenses (physics only)

Question 13 · continued

4 (c) A different type of lens is a concave (diverging) lens.

Which diagram shows a concave (diverging) lens?

Tick (✓) **one** box.



(1 mark)

8

Turn over for the next question

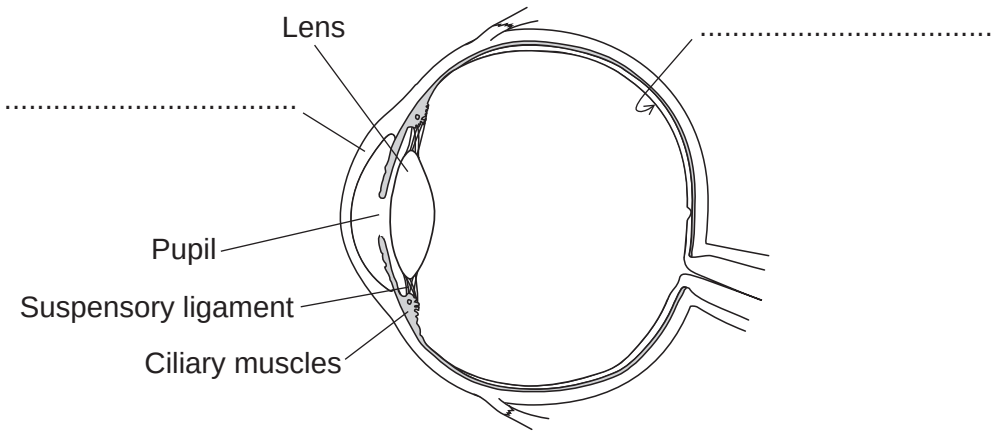
4.6.2.5 Lenses (physics only)

Question 14

June 2013 | PH3FP | Original Q7 | Legacy

7 (a) The diagram shows parts of the human eye.

Complete the missing labels.



(2 marks)

7 (b) Each part of the human eye has a function.

Complete the table below.

Part of the human eye	Function of the part
.....	Changes size to make sure the correct amount of light enters the eye.
Ciliary muscles	....
Lens	....

(3 marks)

4.6.2.5 Lenses (physics only)

Question 14 · continued

7 (c) The human eye can focus on near objects. The closest distance the eye can bring into sharp focus is called the near point.

A student measured the near point of four people of different ages. The table shows her data.

Age of human in years	Near point in millimetres
10	200
25	250
40	400
55	700

What can you conclude from the data in the table above?

.....

.....

.....

.....

(2 marks)

7 (d) Suggest how the data obtained by the student could be improved.

.....

.....

(1 mark)

7 (e) Spectacles are worn to correct vision. One of the lenses in a pair of spectacles has a focal length of 40 centimetres.

Calculate the power of the lens.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Power of lens = ... dioptres

(2 marks)

10

4.6.2.5 Lenses (physics only)

Question 15

June 2014 | PH3FP | Original Q3 | Legacy

3 (a) Digital cameras and human eyes both form images.

Complete **Table 2** by putting a tick in the correct column(s) to show if the parts are found in the digital camera or in the human eye or in both.

The first part has been completed for you.

[3 marks]

Table 2

Part	In a digital camera	In the human eye
Cornea		✓
Lens		
Pupil		
Charge-coupled device (CCD)		

Question 3 continues on the next page

4.6.2.5 Lenses (physics only)

Question 15 · continued

3 (b) Some humans are short-sighted.

Complete the following sentence.

[1 mark]

Short sight can be caused by the eyeball being too ..... .

3 (c) Spectacles can be worn to correct short sight.

Table 3 gives information about three different lenses that can be used in spectacles.

Table 3

	Lens feature		
	Material	**Mass in grams**	**Type**
Lens A	Plastic	5.0	Concave (diverging)
Lens B	Glass	6.0	Convex (converging)
Lens C	Glass	5.5	Convex (converging)

Which lens from **Table 3** would be used to correct short sight?

Draw a ring around the correct answer.

Lens A **Lens B** **Lens C**

Give the reason for your answer.

[2 marks]

.....

.....

4.6.2.5 Lenses (physics only)

Question 15 · continued

3 (d) Every lens has a focal length.

Which factor affects the focal length of a lens?

Tick (✓) **one** box.

[1 mark]

The colour of the lens ☐

The refractive index of the lens material ☐

The size of the object being viewed ☐

3 (e) A lens has a focal length of 0.25 metres.

Calculate the power of the lens.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Power of lens = ... dioptres

3 (f) Laser eye surgery can correct some types of eye defect.

Which of the following is another medical use for a laser?

Tick (✓) **one** box.

[1 mark]

Cauterising open blood vessels ☐

Detecting broken bones ☐

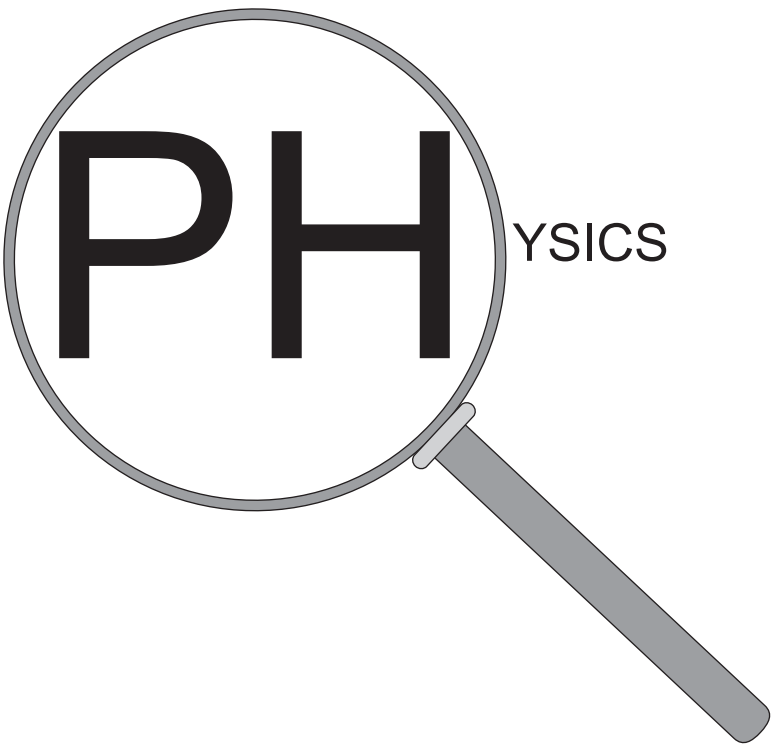
Imaging the lungs ☐

4.6.2.5 Lenses (physics only)

Question 15 · continued

3 (g) **Figure 5** shows a convex lens being used as a magnifying glass.

Figure 5



Not to scale

An object of height 14 mm is viewed through a magnifying glass.

The image height is 70 mm.

Calculate the magnification produced by the lens in the magnifying glass.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Magnification = ...

12

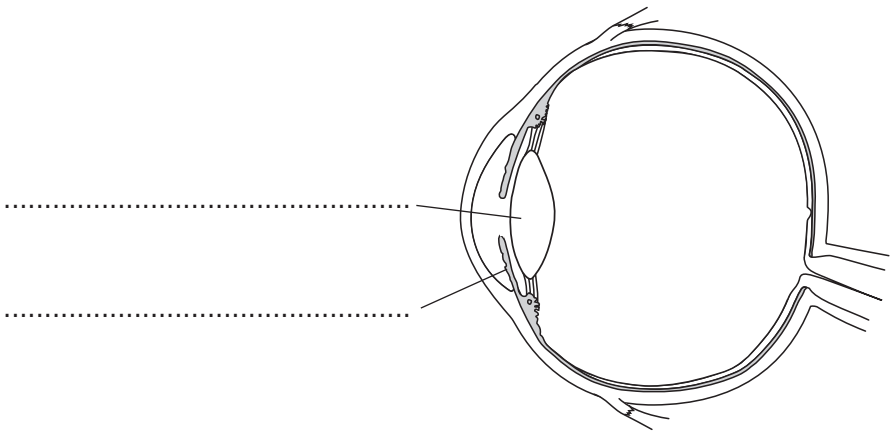
4.6.2.5 Lenses (physics only)

Question 16

June 2015 | PH3FP | Original Q3 | Legacy

3 **Figure 5** shows a diagram of a human eye.

Figure 5



3 (a) Use words from the box to label **Figure 5**.

[2 marks]

Cornea	**Iris**	**Lens**	**Pupil**

3 (b) Draw **one** line from each part of the eye to its correct function.

[2 marks]

Part of the eye	Function
Cornea	Changes light into electrical signals
Retina	Changes the direction of light entering the eye
	Changes the shape of the lens

4.6.2.5 Lenses (physics only)

Question 16 · continued

3 (c) Some people wear contact lenses to help them to see clearly.

A contact lens has a focal length of 0.2 metres.

Calculate the power of this contact lens.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

Power of the contact lens = ... dioptres

3 (d) Eye lens replacement is a surgical procedure that can help some people to see clearly.

In this procedure, the surgeon removes the eye lens and replaces it with an artificial lens.

Which statement gives the correct reason for carrying out the procedure?

[1 mark]

Tick (✓) **one** box.

The potential benefit of the procedure is greater than the risk. ☐

The procedure involves a recent medical development. ☐

The surgical procedure is totally safe. ☐

Question 3 continues on the next page

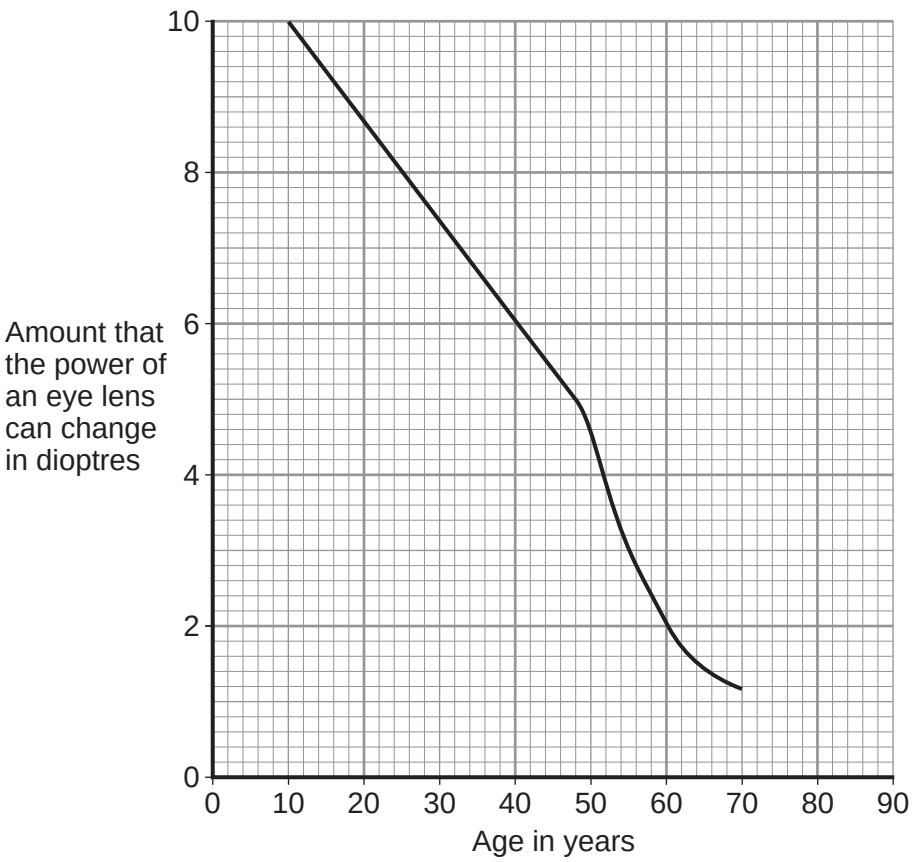
4.6.2.5 Lenses (physics only)

Question 16 · continued

3 (e) When a human eye changes focus from a distant object to a close object, the power of the eye lens changes.

Figure 6 shows how the amount that the power of an eye lens can change depends on age.

Figure 6



3 (e) (i) A person is 40 years old.

State the amount that the power of this person's eye lens is able to change.

[1 mark]

Change in power = ... dioptres

3 (e) (ii) Give **one** conclusion that can be made from **Figure 6**.

[1 mark]

.....

.....

4.6.2.5 Lenses (physics only)

Question 16 · continued

3 (e) (iii) Use **Figure 6** to estimate the amount that the power of the eye lens of an 80-year-old person is able to change.

[1 mark]

Tick (✓) **one** box.

2 dioptres ☐

1 dioptre ☐

0 dioptres ☐

10

Turn over for the next question

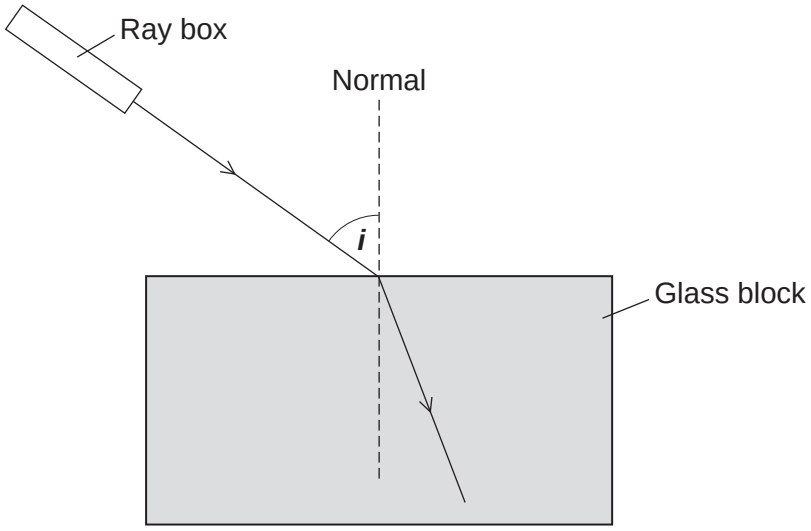
4.6.2.5 Lenses (physics only)

Question 17

June 2015 | PH3FP | Original Q5 | Legacy

5 (a) **Figure 8** shows a ray of light entering a glass block.

Figure 8



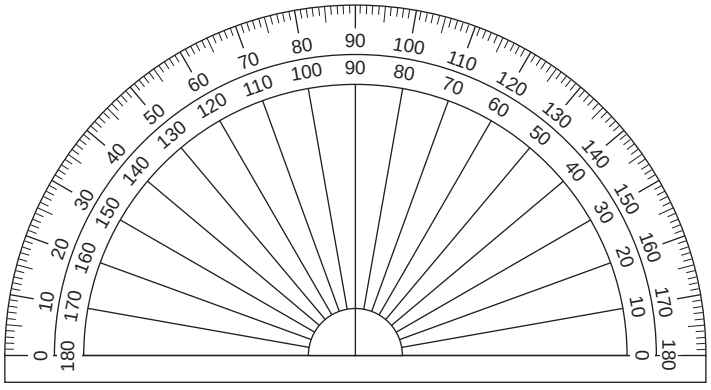
5 (a) (i) The angle of incidence in **Figure 8** is labelled with the letter ***i***.

On **Figure 8**, use the letter ***r*** to label the angle of refraction.

[1 mark]

5 (a) (ii) **Figure 9** shows the protractor used to measure angles ***i*** and ***r***.

Figure 9



What is the resolution of the protractor?

[1 mark]

Tick (✓) **one** box.

1 degree ☐ 5 degrees ☐ 10 degrees ☐

4.6.2.5 Lenses (physics only)

Question 17 · continued

5 (a) (iii) **Table 1** shows calculated values for angle ***i*** and angle ***r*** from an investigation.

Table 1

Calculated values
sin ***i*** = 0.80
sin ***r*** = 0.50

Use the values from **Table 1** to calculate the refractive index of the glass.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

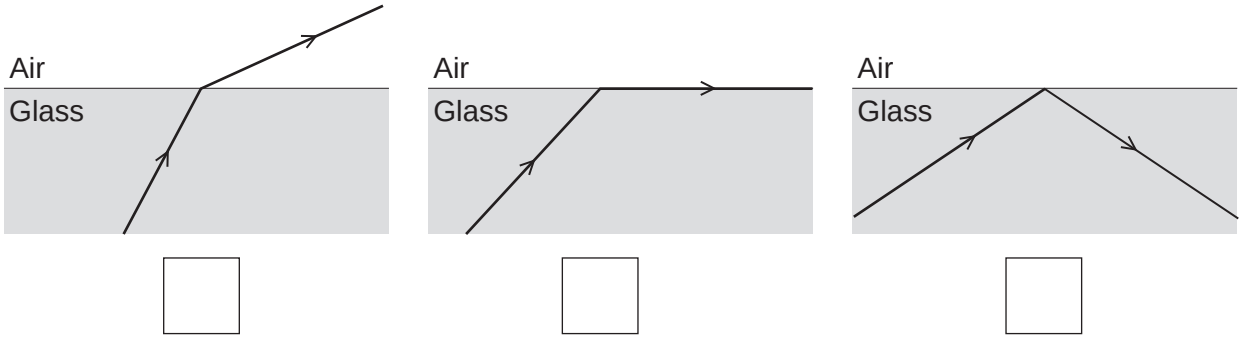
Refractive index = ...

5 (b) The diagrams below show a ray of light moving through glass.

Which diagram correctly shows what happens when the ray of light strikes the surface of the glass at the critical angle?

[1 mark]

Tick (✓) **one** box.



☐ ☐ ☐

Question 5 continues on the next page

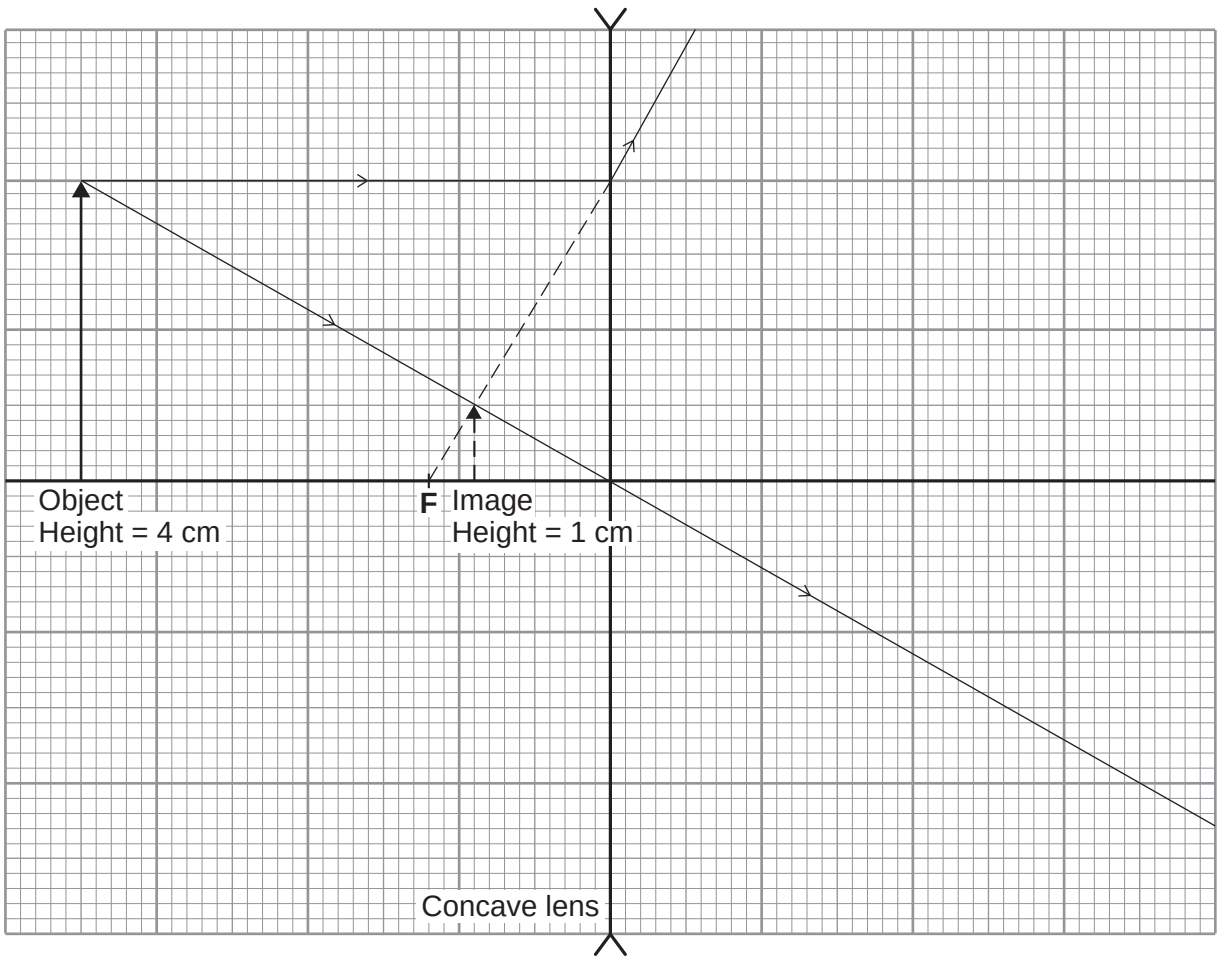
4.6.2.5 Lenses (physics only)

Question 17 · continued

5 (c) A concave (diverging) lens is fitted into a door to make a security spyhole.

Figure 10 shows how this lens produces an image.

Figure 10



5 (c) (i) State **one** word to describe the nature of the image in **Figure 10**.

[1 mark]

.....

4.6.2.5 Lenses (physics only)

Question 17 · continued

5 (c) (ii) Use data from **Figure 10** to calculate the magnification of the image.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Magnification = ...

5 (c) (iii) What is another use for a concave lens?

[1 mark]

Tick (✓) **one** box.

A magnifying glass ☐

Correcting short sight ☐

To focus an image in a camera ☐

9

4.6.2.5 Lenses (physics only)

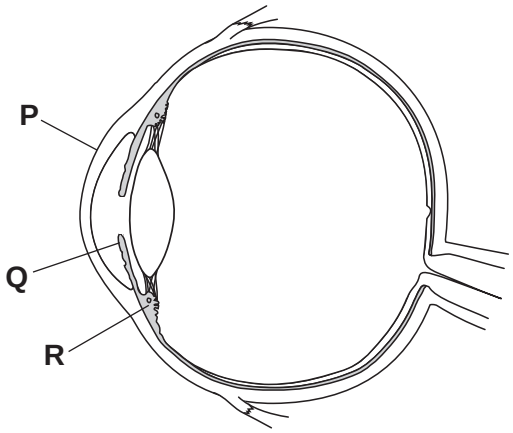
Question 18

June 2016 | PH3FP | Original Q1 | Legacy

1 **Figure 1** is a diagram of a human eye.

Three of the parts of the eye are labelled **P**, **Q** and **R**.

Figure 1



1 (a) Draw **one** line from each box, **P**, **Q** and **R**, to the correct part of the eye.

[3 marks]

Label	Part of the eye
P	Ciliary muscles
Q	Cornea
R	Iris
	Retina

1 (b) What is the function of the pupil?

[1 mark]

_____

_____

4.6.2.5 Lenses (physics only)

Question 18 · continued

1 (c) As people get older, the near point of their vision changes.

What does 'the near point' mean?

[1 mark]

Tick (✓) **one** box.

- The closest distance to the eye that an object can be clearly seen ☐
- The distance between the front and back of the eyeball ☐
- The focal length of the lens in the eye ☐

1 (d) How does the eye change in order to focus on objects at different distances?

[1 mark]

Tick (✓) **one** box.

- The distance between the lens and the retina changes ☐
- The eyeball changes shape ☐
- The lens changes shape ☐

1 (e) In laser eye surgery, the cornea is reshaped to help improve a person's vision.

Complete the following sentence.

[1 mark]

Surgeons use the _____ transferred by the light from a laser to cut and reshape the cornea.

1 (f) Lasers were tested on animals before they were used in surgery on people.

Suggest why some people disagree with testing lasers on animals.

[1 mark]

_____

_____

8

4.6.2.5 Lenses (physics only)

Question 19

June 2017 | PH3FP | Original Q5 | Legacy

5 A student investigates how a lens forms an image of a light bulb.

The image is formed on a screen.

Figure 8 shows the apparatus used.

Figure 8



5 (a) (i) Name the process that occurs at the lens to make an image form on the screen.

[1 mark]

_____

5 (a) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

real	**upright**	**virtual**

Light arriving on the screen forms an image which is _____ .

5 (a) (iii) The student places an object 2.0 cm tall near to the lens. The image formed on the screen is 3.0 cm tall.

Calculate the magnification of the image.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

Magnification = _____

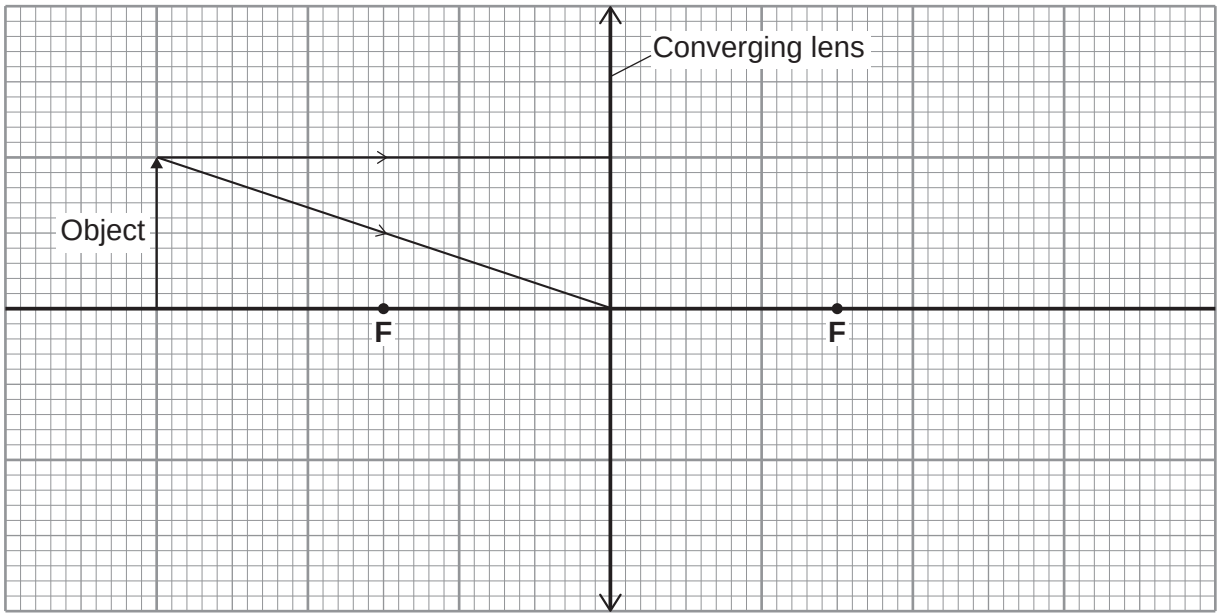
4.6.2.5 Lenses (physics only)

Question 19 · continued

5 (b) **Figure 9** shows a ray diagram of a converging (convex) lens with an object.

The diagram shows two rays of light leaving the object and reaching the lens.

Figure 9



5 (b) (i) Complete **Figure 9** to show how these two rays form an image.

[2 marks]

5 (b) (ii) Mark the position of the image with an arrow.

[1 mark]

5 (b) (iii) State the name of the two points labelled **F** on **Figure 9**.

[1 mark]

Question 5 continues on the next page

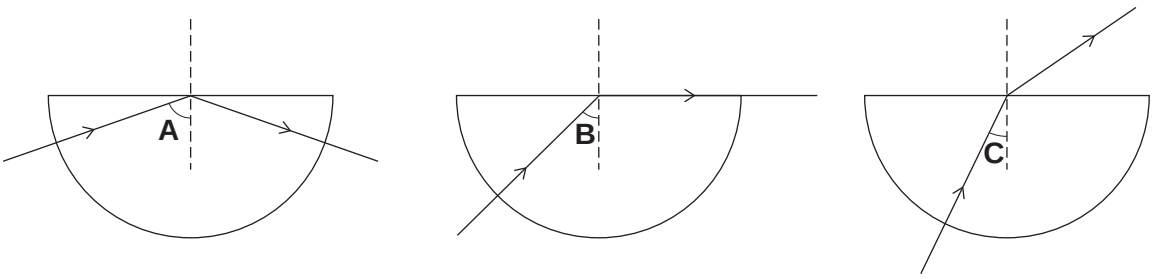
4.6.2.5 Lenses (physics only)

Question 19 · continued

5 (c) Another student investigates how light travels in a semi-circular glass block.

The student shines a ray of light into a semi-circular glass block from three different directions as shown in **Figure 10**.

Figure 10



X **Y** **Z**

5 (c) (i) Which diagram, **X**, **Y** or **Z**, shows total internal reflection of the light?

[1 mark]

Diagram _____

5 (c) (ii) Which angle, **A**, **B** or **C**, is the critical angle of the light in the block?

[1 mark]

Angle _____

10

4.6.2.5 Lenses (physics only)

Question 20

June 2017 | PH3FP | Original Q8 | Legacy

8 (a) Glasses may be used to correct defects of vision. Some glasses have been designed with lenses that can be adjusted to give different focal lengths.

Suggest **one** advantage of using adjustable lenses in glasses.

[1 mark]

8 (b) **In this question you will gain marks for using good English, organising information clearly and using scientific words correctly.**

Explain how the human eye forms an image.

Your explanation should include:

- how a normal eye causes light from objects at different distances to form an image
- why long sight and short sight cause blurred images.

Do **not** include diagrams in your answer.

[6 marks]

Extra space

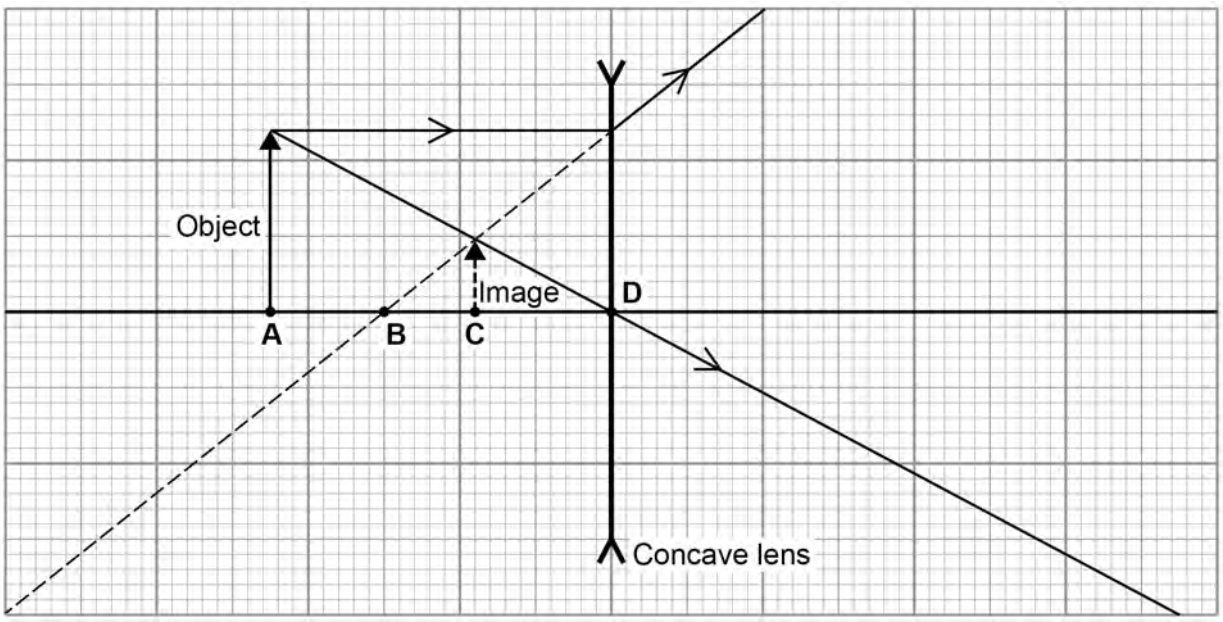
4.6.2.5 Lenses (physics only)

Question 21

June 2018 | 8463/2F | Original Q2

0 2 **Figure 1** shows how a concave lens forms an image of an object.

Figure 1



0 2 . 1 Which point on **Figure 1** marks the position of the principal focus of the lens?

Tick **one** box.

[1 mark]

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 2 Which **two** words describe the image?

Tick **two** boxes.

[2 marks]

Enlarged ☐

Inverted ☐

Real ☐

Upright ☐

Virtual ☐

4.6.2.5 Lenses (physics only)

Question 21 · continued

0 2 . 3 Calculate the magnification produced by the lens.

Use the equation:

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

[4 marks]

Magnification = _____

0 2 . 4 Complete the sentence.

Choose an answer from the box.

[1 mark]

decrease	**increase**	**not change**

As the object is moved further away from the lens, the size of the image will _____.

8

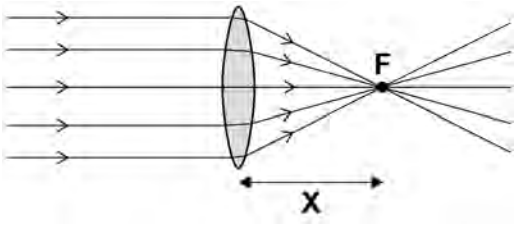
4.6.2.5 Lenses (physics only)

Question 22

June 2019 | 8463/2F | Original Q8

0 8 . 1 **Figure 20** shows parallel rays of light being refracted by a convex lens.

Figure 20



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

[1 mark]

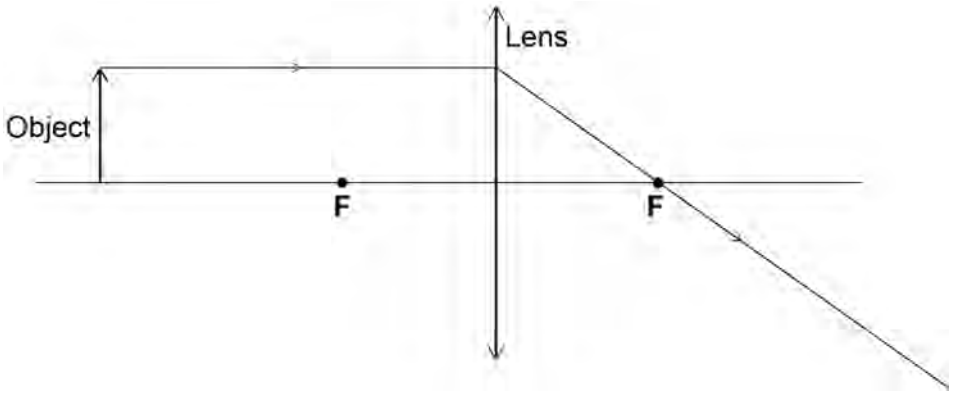
0 8 . 2 Lenses can be used to form the image of an object.

Complete the ray diagram in **Figure 21** to show how a **convex** lens forms the image of the object.

Use an arrow to represent the image.

[2 marks]

Figure 21

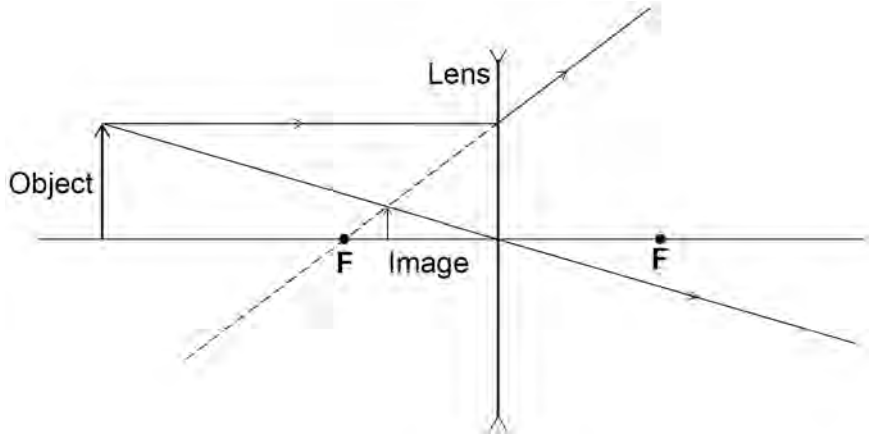


4.6.2.5 Lenses (physics only)

Question 22 · continued

Figure 22 shows how a **concave** lens forms the image of an object.

Figure 22



0 8 . 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 _____

_____

0 8 . 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

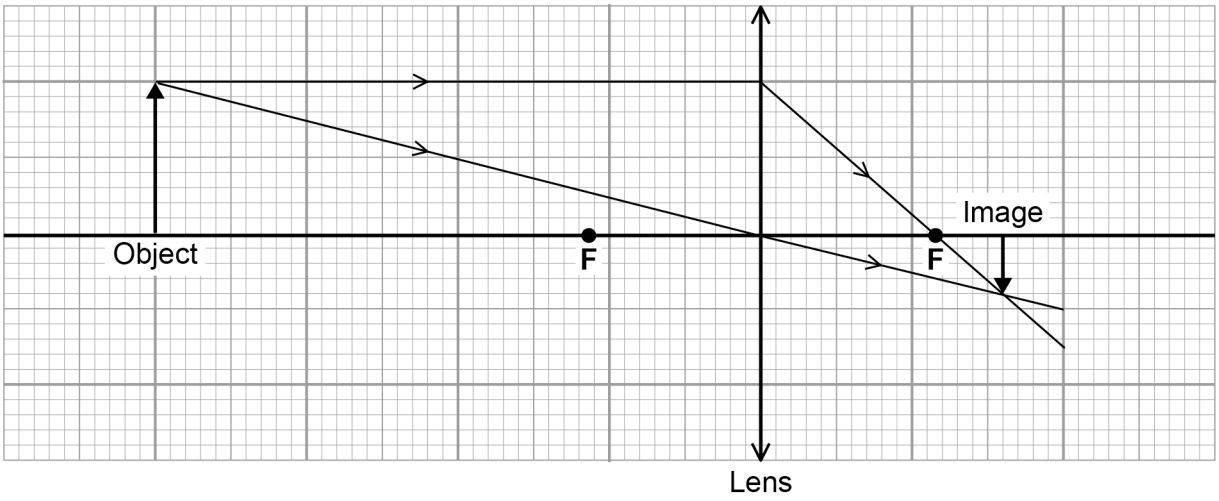
4.6.2.5 Lenses (physics only)

Question 23

November 2021 | 8463/2F | Original Q5

0 5 **Figure 14** shows how a lens forms an image of an object.

Figure 14



0 5 . 1 What type of lens is represented in **Figure 14**?

[1 mark]

Tick (✓) **one** box.

Concave ☐

Convex ☐

Diverging ☐

0 5 . 2 Measure the image height and the object height in **Figure 14**.

[1 mark]

Image height = _____ cm

Object height = _____ cm

4.6.2.5 Lenses (physics only)

Question 23 · continued

0 5 . 3 Calculate the magnification produced by the lens.

Use the equation:

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

[2 marks]

Magnification = _____

0 5 . 4 Which **two** words describe the image in **Figure 14**?

[2 marks]

Tick (✓) **two** boxes.

- Enlarged ☐
- Inverted ☐
- Real ☐
- Upright ☐
- Virtual ☐

Question 5 continues on the next page

4.6.2.5 Lenses (physics only)

Question 23 · continued

0 5 . 5 The object was blue.

A student looked at the blue object through a green filter.

Complete the sentences.

Choose answers from the box.

[2 marks]

black	**blue**	**green**	**red**	**white**

Looking at the blue object through a green filter makes the object appear

_____ .

This is because the green filter only transmits the light that is _____ .

8

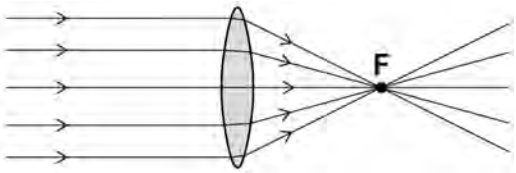
4.6.2.5 Lenses (physics only)

Question 24

0 8 Lenses can be used to form an image of an object.

0 8 . 1 **Figure 20** shows parallel rays of light being refracted by a **convex** lens.

Figure 20



What is the position marked '**F**' called?

[1 mark]

Tick (✓) **one** box.

Focal length ☐

Focus point ☐

Principal focus ☐

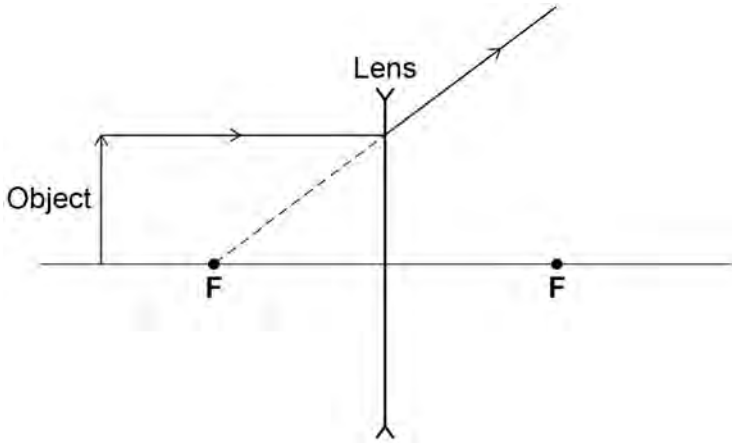
Question 24 · continued

0 8 . 2 Complete the ray diagram in **Figure 21** to show how a **concave** lens forms the image of the object.

Use an arrow to represent the image.

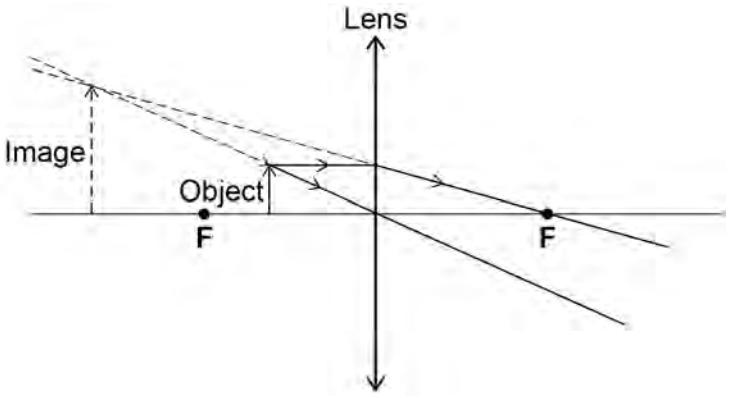
[2 marks]

Figure 21



0 8 . 3 **Figure 22** shows how a **convex** lens can be used to form a magnified image of an object.

Figure 22



Give **two** ways that the image formed by the convex lens in **Figure 22** is similar to the image formed by the concave lens.

[2 marks]

1 _____

2 _____

4.6.2.5 Lenses (physics only)

Question 24 · continued

June 2023 | 8463/2F | Original Q8

0 8 . 4 A convex lens is used as a magnifying glass to identify a symbol on the back of a silver spoon.

The symbol has an actual height of 1.6 mm.

The magnification produced by the lens is 3.5

Calculate the image height of the symbol when viewed through the magnifying glass.

Use the Physics Equations Sheet.

[3 marks]

Image height = _____ mm

8

4.6.2.5 Lenses (physics only)

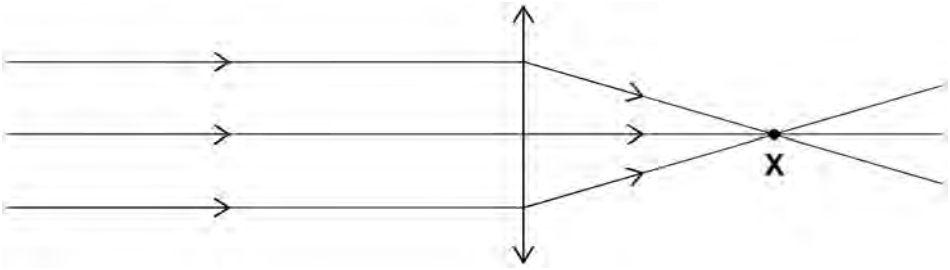
Question 25

June 2025 | 8463/2F | Original Q5

0 5 Some people wear glasses when they are reading.

Figure 6 shows parallel rays of light passing through a convex lens from a pair of reading glasses.

Figure 6



0 5 . 1 What name is given to point **X** in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

- Focal length ☐
- Principal axis ☐
- Principal focus ☐

0 5 . 2 Light changes direction as it enters the lens.

What is the name of this process?

[1 mark]

Tick (✓) **one** box.

- Emission ☐
- Reflection ☐
- Refraction ☐

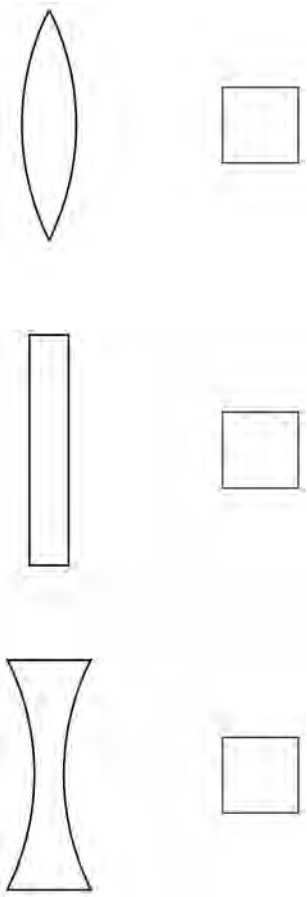
4.6.2.5 Lenses (physics only)

Question 25 · continued

0 5 . 3 Which of the following is the shape of a convex lens?

[1 mark]

Tick (✓) **one** box.



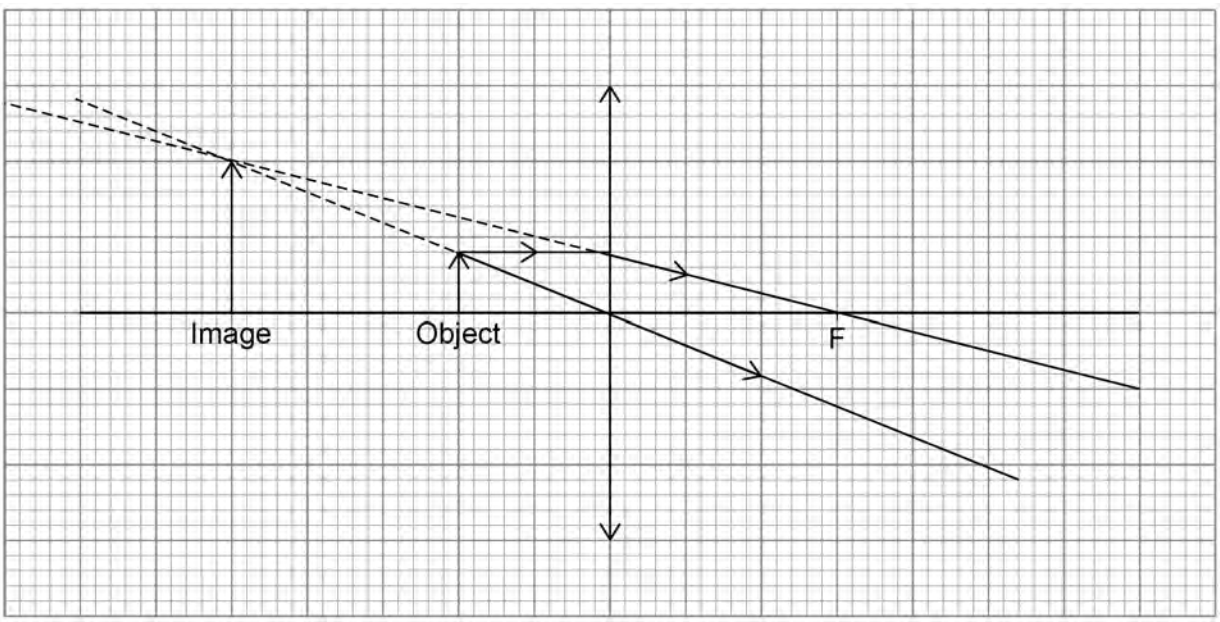
Question 5 continues on the next page

4.6.2.5 Lenses (physics only)

Question 25 · continued

Figure 7 shows a lens forming a magnified image of an object.

Figure 7



0 5 . 4 Measure the image height **and** the object height in **Figure 7**.

[1 mark]

Image height = _____ cm

Object height = _____ cm

0 5 . 5 Calculate the magnification produced by the lens.

Use your answers to Question **05.4** and the equation:

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

[2 marks]

_____

_____

_____

Magnification = _____

4.6.2.5 Lenses (physics only)

Question 25 · continued

0 5 . 6 Why does magnification have no unit?

[1 mark]

Tick (✓) **one** box.

Magnification is a height. ☐

Magnification is a power. ☐

Magnification is a ratio. ☐

0 5 . 7 Some reading glasses contain lenses made from blue glass.

The blue glass acts as a filter.

Describe what happens to white light incident on colourless glass **and** white light incident on blue glass.

[3 marks]

Colourless glass _____

_____

_____

Blue glass _____

_____

_____

10