

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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5	
6	
7	
8	
TOTAL	



General Certificate of Secondary Education  
Foundation Tier  
January 2011

# Physics

# PHY3F

# F

Unit Physics P3

Written Paper

Wednesday 19 January 2011 9.00 am to 9.45 am

**For this paper you must have:**

- a ruler.
- You may use a calculator.

### Time allowed

- 45 minutes

### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

### Advice

- In all calculations, show clearly how you work out your answer.



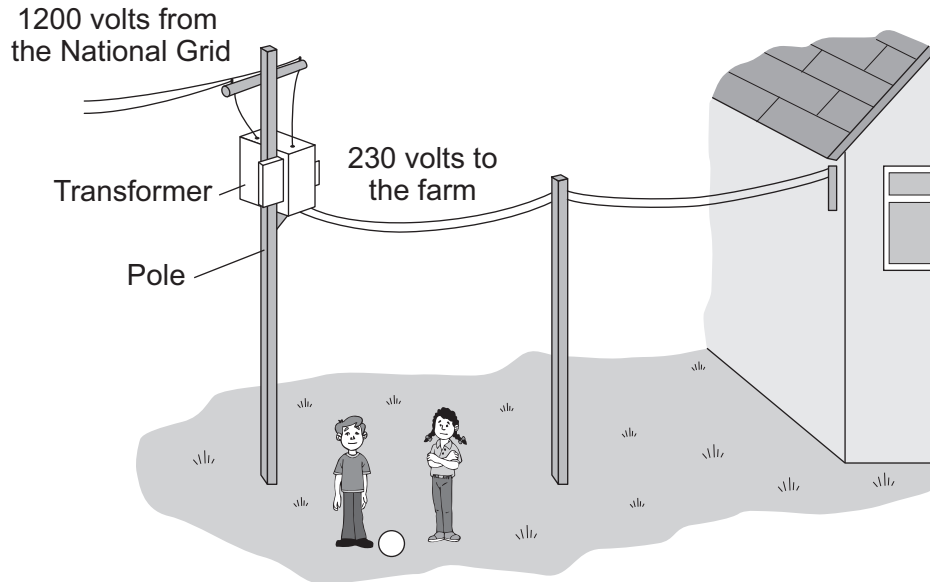
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# PHY3F

Answer **all** questions in the spaces provided.

- 1** The diagram shows part of the system used to supply a farm with electricity.



- 1 (a)** The core of the transformer is made of metal.

Complete the following sentence by drawing a ring around the correct word in the box.

The metal used for the core of the transformer is

copper.

iron.

steel.

(1 mark)

- 1 (b) (i)** What sort of transformer is shown in the diagram?

.....  
(1 mark)

- 1 (b) (ii)** Complete the following sentence by drawing a ring around the correct line in the box.

In this transformer, the number of turns on the secondary coil is

less than

the same as

greater than

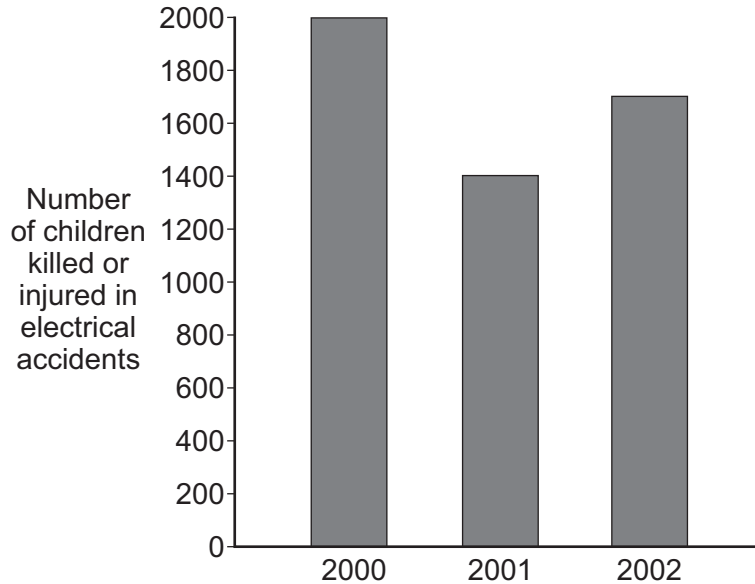
the number of turns on the primary coil.

(1 mark)



**1 (c)** Transformers and other electrical equipment can be dangerous.

The following bar chart shows the numbers of children, aged 14 or under, killed or injured in electrical accidents in the UK in 2000, 2001 and 2002.



**1 (c) (i)** In which of these years were most children killed or injured in electrical accidents?

.....  
(1 mark)

**1 (c) (ii)** A newspaper claims that the number of children killed or injured by electrical accidents will increase in 2011.

Which of the following gives a reason why the information given in the graph does not support this claim.

Put a tick (✓) in the box next to your answer.

The pattern shows an upward trend.

The pattern shows a downward trend.

There is no pattern.

(1 mark)

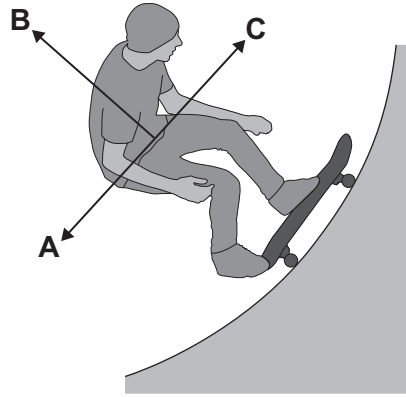
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Turn over ►



- 2 The drawing shows a skateboarder moving in a circular path.

- Centre of circular path



- 2 (a) (i) What is the name of the resultant force which allows the skateboarder to move in a circular path?

Draw a ring around your answer.

**centripetal force**

**gravitational force**

**weight**

(1 mark)

- 2 (a) (ii) In which direction, **A**, **B** or **C**, does this resultant force act on the skateboarder?

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

(1 mark)

- 2 (b) Another skateboarder has a smaller mass.

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

- 2 (b) (i) She uses the same part of the ramp at the same speed.

The force which allows her to move in a circular path will need

to	decrease.
	stay the same.
	increase.

(1 mark)



2 (b) (ii) If she goes faster, this resultant force will need to

decrease.
stay the same.
increase.

(1 mark)

2 (c) On their website, the managers of a skateboard park give the following information about some of the ramps where skateboarders move in a circular path.

Name of ramp	Inside radius of the ramp in metres
Bull pit	6
Dragon's den	11
Tiger cage	8
Witch's cauldron	7

A skateboarder uses each ramp at the same speed.

Name the ramp where the resultant force on the skateboarder will need to be the greatest.

.....

Explain the reason for your answer.

.....

.....

(2 marks)

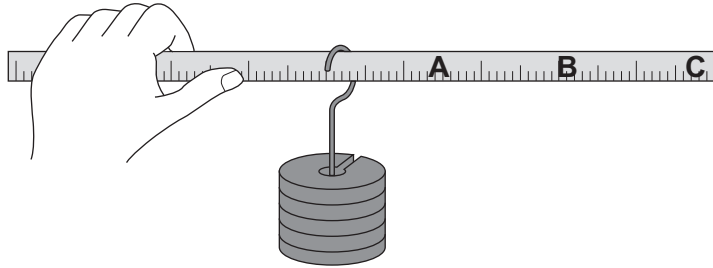
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- 3 (a)** A student holds a ruler at one end and slides a weight along the ruler.



At which point, **A**, **B** or **C**, will the turning effect of the weight feel greatest?

Write your answer, **A**, **B** or **C**, in the box. Point

(1 mark)

- 3 (b)** Complete the following sentence by drawing a ring around the correct word in the box.

The turning effect of a force is called the

axis

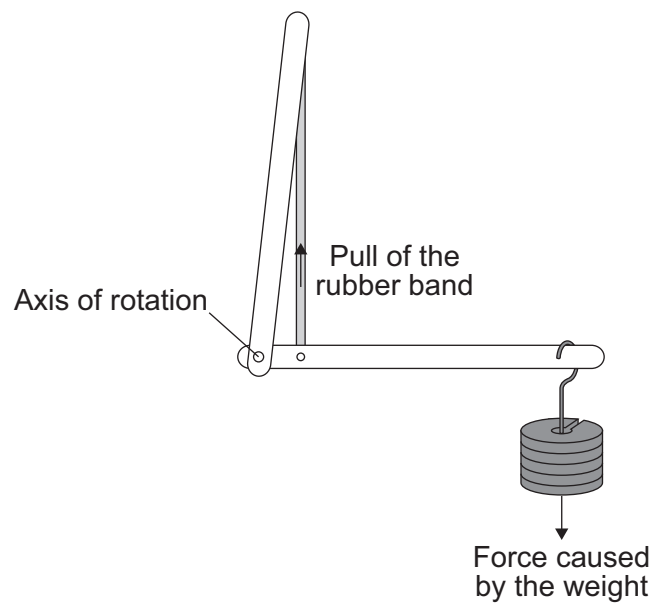
equilibrium

of the force.

moment

(1 mark)

- 3 (c)** In a human arm, the biceps muscle provides the force needed to hold the arm horizontal. A student uses a model in which a rubber band represents the biceps muscle.



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

To hold the model arm horizontal, the pull from the rubber band will be

bigger than

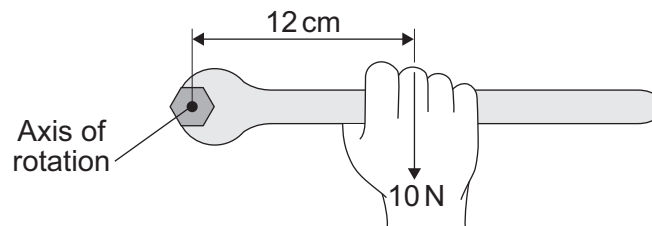
smaller than

the same as

the force caused by the weight.

(1 mark)

3 (d) The diagram shows a long spanner.



Use the equation in the box to calculate the moment, in Ncm, being produced.

moment = force × perpendicular distance from the line of action of the force to the axis of rotation

Show clearly how you work out your answer.

.....  
 .....

Moment = ..... Ncm  
 (2 marks)

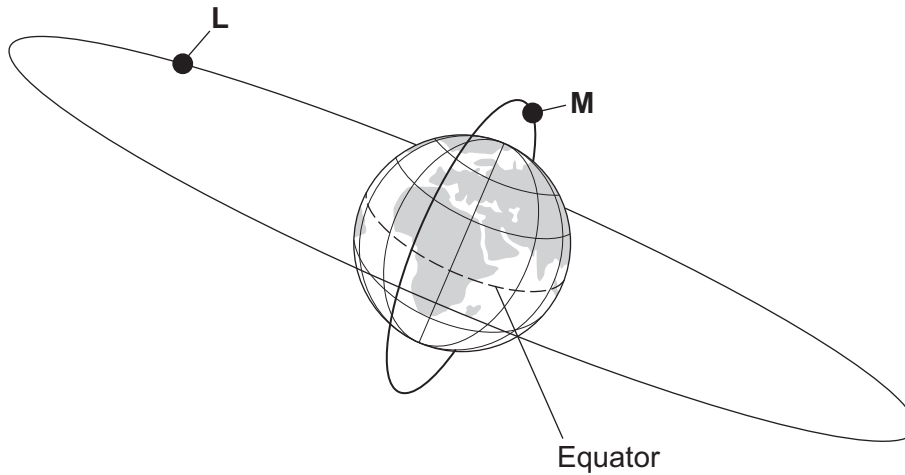
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- 4 The diagram, which is not to scale, shows two satellites, **L** and **M**, orbiting the Earth.



- 4 (a) Complete the following table.

Each letter, **L** or **M**, may be used once, more than once or not at all.

Statement about the satellite	Letter for the satellite
It is used as a monitoring satellite.	
It is a geostationary satellite.	
It takes 24 hours to complete its orbit.	

(2 marks)

- 4 (b) Complete the following sentence.

To stay in its present orbit around the Earth, each satellite must move at a particular .....

(1 mark)





4 (c) Thousands of satellites are now in orbit around the Earth. A student used the Internet to collect information about some of them.

Name of satellite	Average distance from the centre of the Earth in kilometres	Speed in kilometres per second	Time taken to orbit the Earth
The Moon	391 400	1.01	28 days
GEO	42 200	3.07	1 day
Navstar	26 600	3.87	12 hours
Lageos	12 300	5.70	3.8 hours
HST	7 000	7.56	97 mins
ISS	6 700	7.68	92 mins

4 (c) (i) The Moon takes a longer time than any of the other satellites to orbit the Earth.

Give **one** other way in which the Moon is different from the other satellites in the table.

.....  
.....

(1 mark)

4 (c) (ii) What conclusion on the relationship between the *average distance* and *speed* can the student come to on the basis of this data?

.....  
.....

(1 mark)

4 (c) (iii) What conclusion on the relationship between the *speed* and the *time taken to orbit the Earth* can the student come to on the basis of this data?

.....  
.....

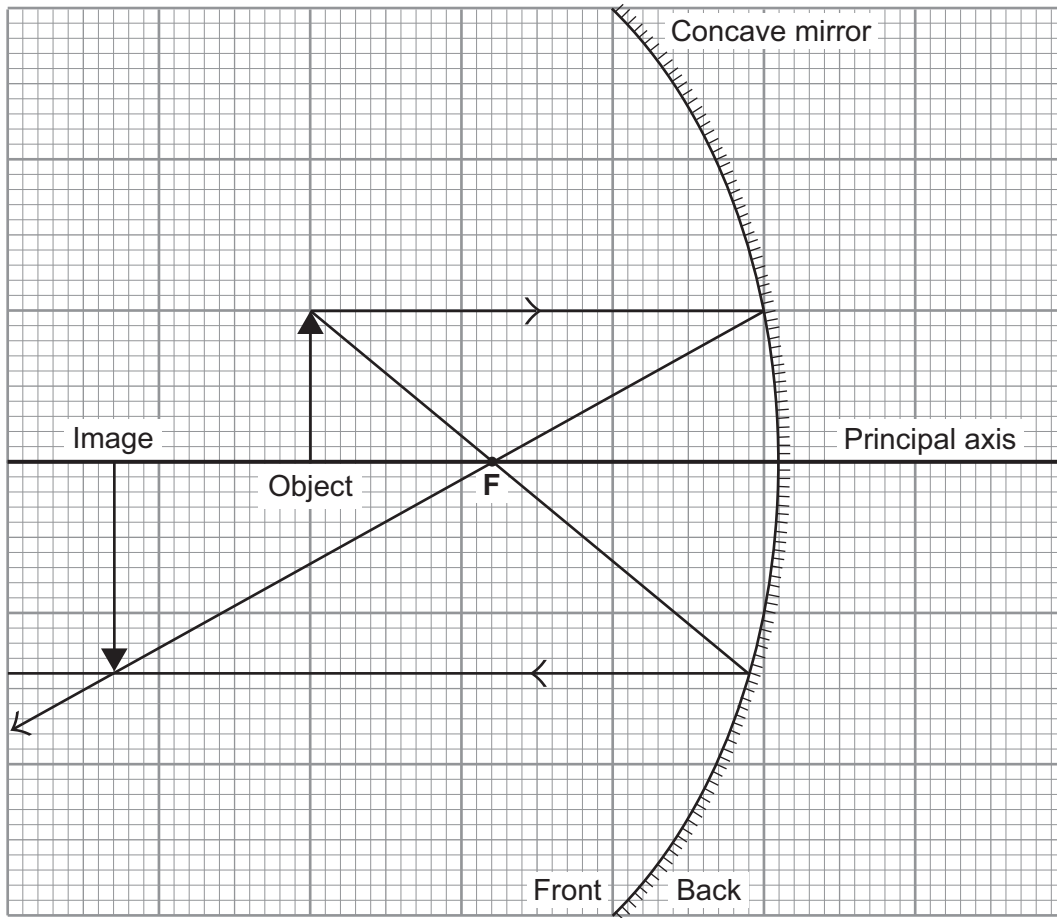
(1 mark)

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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)

<b>2</b>



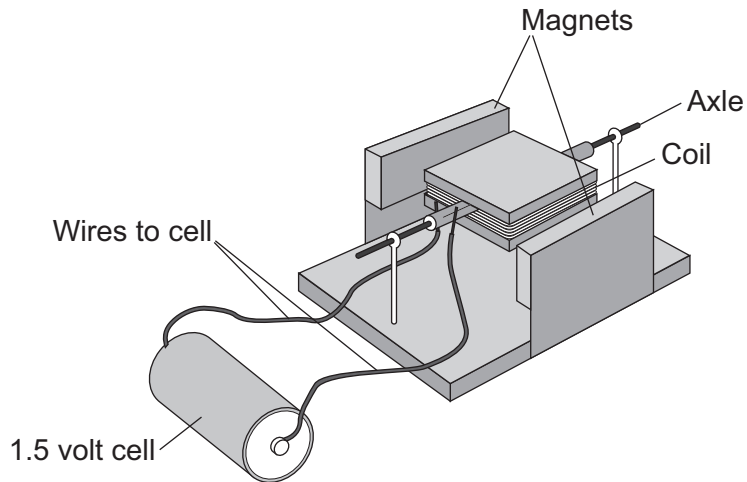
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ANSWER IN THE SPACES PROVIDED**

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- 6 (a)** Complete the description of the device shown below by drawing a ring around the correct line in each box.



- 6 (a) (i)** The device is being used as

an electric motor.  
a generator.  
a transformer.

(1 mark)

- 6 (a) (ii)** The coil needs a flick to get started. Then one side of the coil is pushed by the

cell  
coil  
force

and the other side is pulled, so that the coil spins.

(1 mark)



**6 (b)** Suggest **two** changes to the device, each one of which would make the coil spin faster.

1 .....

.....

2 .....

.....

(2 marks)

**6 (c)** Suggest **two** changes to the device, each one of which would make the coil spin in the opposite direction.

1 .....

.....

2 .....

.....

(2 marks)

6

**Turn over for the next question**

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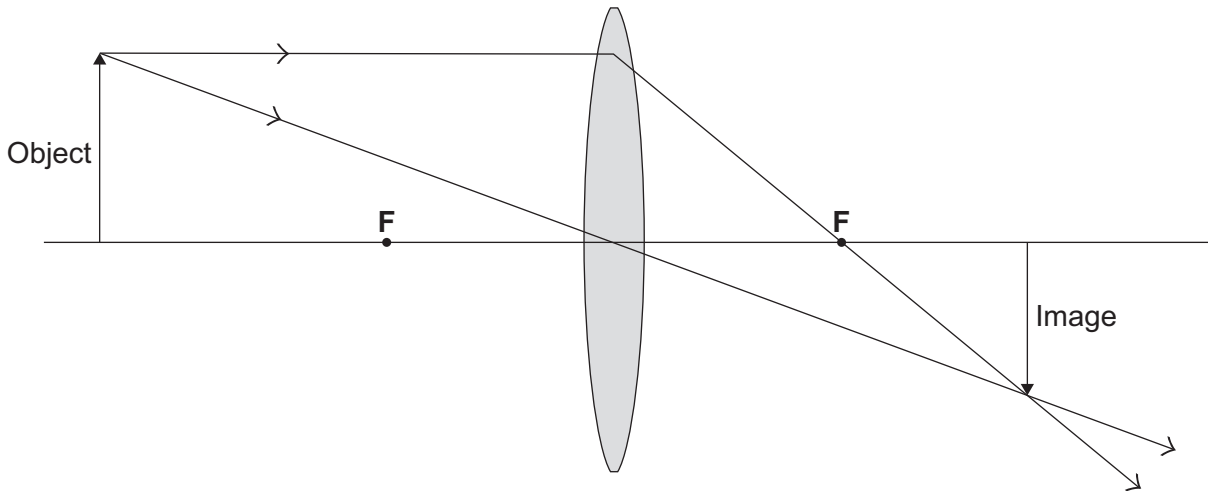


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7 The diagram shows a lens, the position of an object and the position of the image of the object.



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)

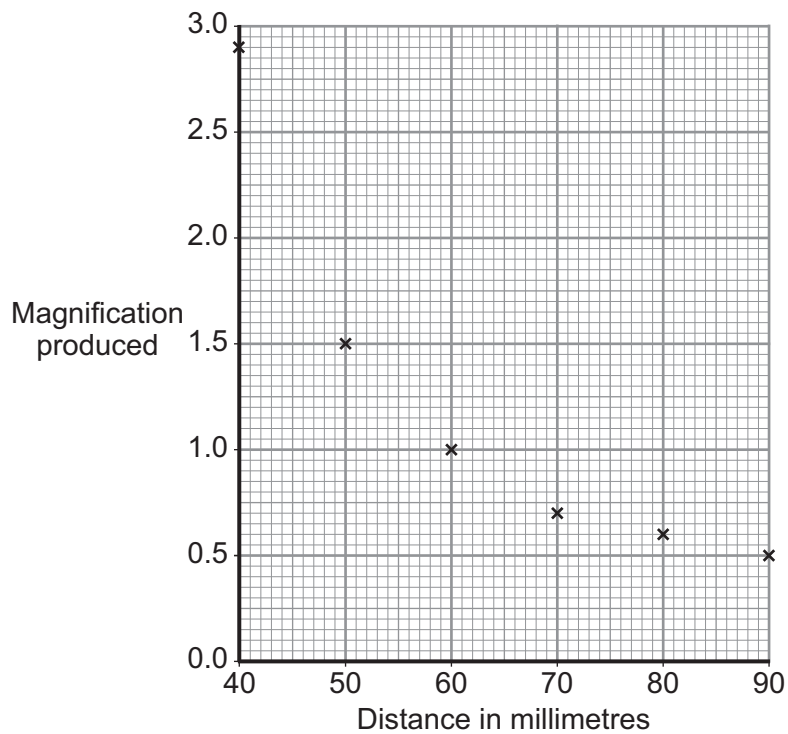
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- 7 (d)** A student investigates the relationship between the distance from the object to the lens and the magnification produced by the lens.  
The student's results are given in the table.  
The student did not repeat any measurements.

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)





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)

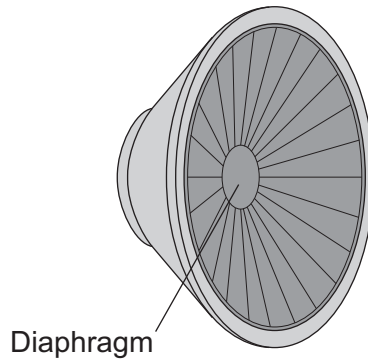
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8 The diaphragm of a loudspeaker moves in and out.

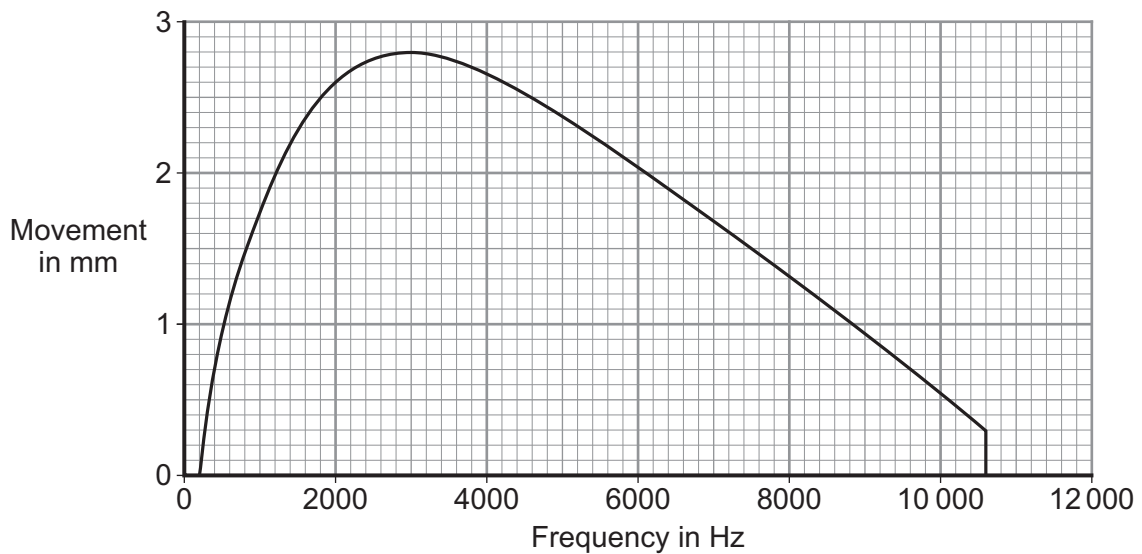


A team of scientists investigated loudspeakers.

The scientists measured the size of the movement of the diaphragm for signals of different frequencies.

They kept all the other variables constant.

The graph shows the average results for a large number of tests on one of the loudspeakers.



8 (a) What is the frequency of the highest pitched sound which this loudspeaker produces?

Frequency = ..... Hz  
(1 mark)



**8 (b)** The greater the movement of the diaphragm, the greater the amplitude of the sound produced.

What is the frequency of the loudest sound which this loudspeaker produces?

Show clearly on the graph how you get to your answer and then complete this answer space.

Frequency = ..... Hz  
(2 marks)

**8 (c)** Can this loudspeaker produce the full range of sound which most people can hear?

Put a tick (✓) in the box next to your answer.

Yes  No

Explain the reason for your answer.

.....  
.....  
.....  
.....

(2 marks)

**8 (d)** Use **one** word to complete the sentence.

Repeating tests a large number of times and taking the average of the results improves the .....

(1 mark)

**8 (e)** Why did the scientists keep all the other variables constant?

.....  
.....

(1 mark)

7

**END OF QUESTIONS**



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