

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	



General Certificate of Secondary Education  
Higher Tier  
January 2011

# Physics

# PHY3H

# H

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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# PHY3H

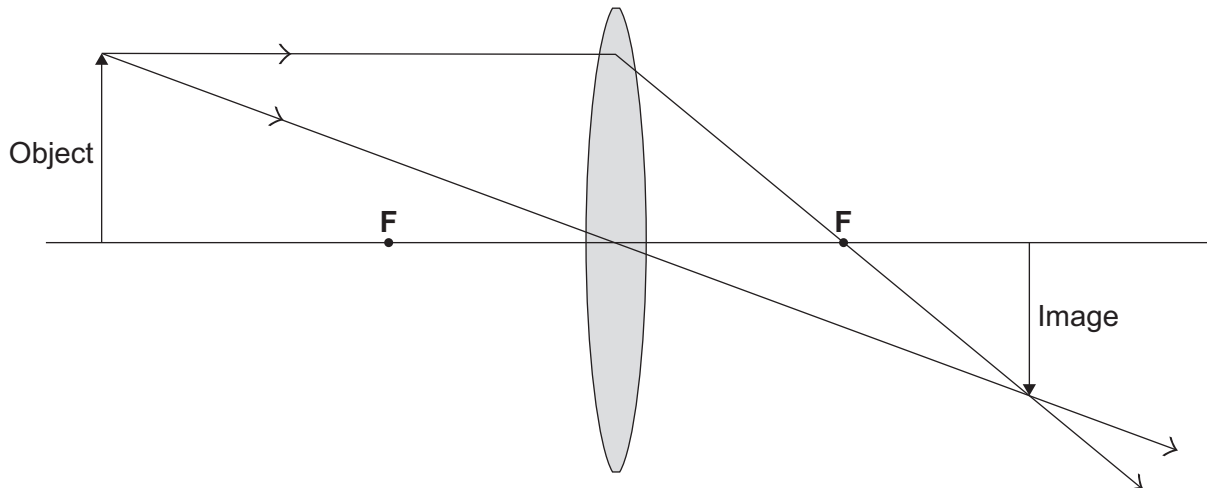
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Answer **all** questions in the spaces provided.

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



- 1 (a) What type of lens is shown?

.....  
(1 mark)

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

.....  
(1 mark)

- 1 (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)

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

inverted	larger	upright
----------	--------	---------

(1 mark)

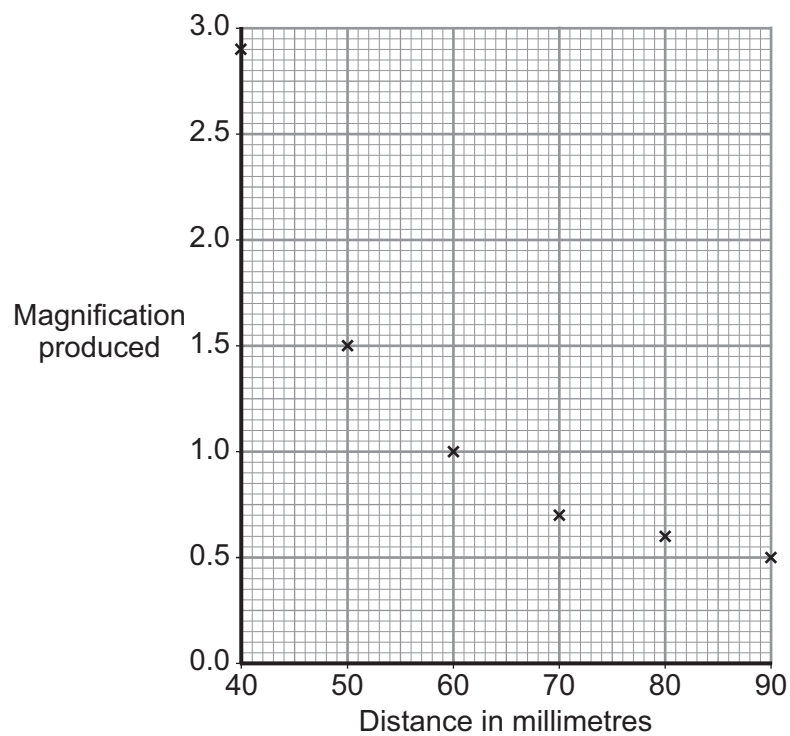
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- 1 (d)** A student investigates the relationship between the distance from the object to the lens and the magnification produced by the lens.  
The student's results are given in the table.  
The student did not repeat any measurements.

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*.



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

(1 mark)



1 (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)

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

.....

.....

.....

(2 marks)

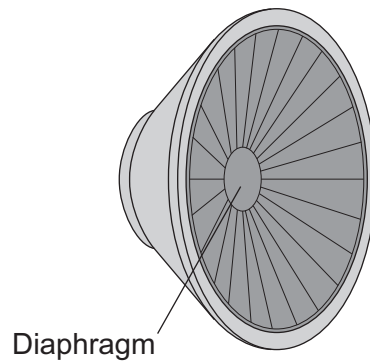
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- 2 The diaphragm of a loudspeaker moves in and out.

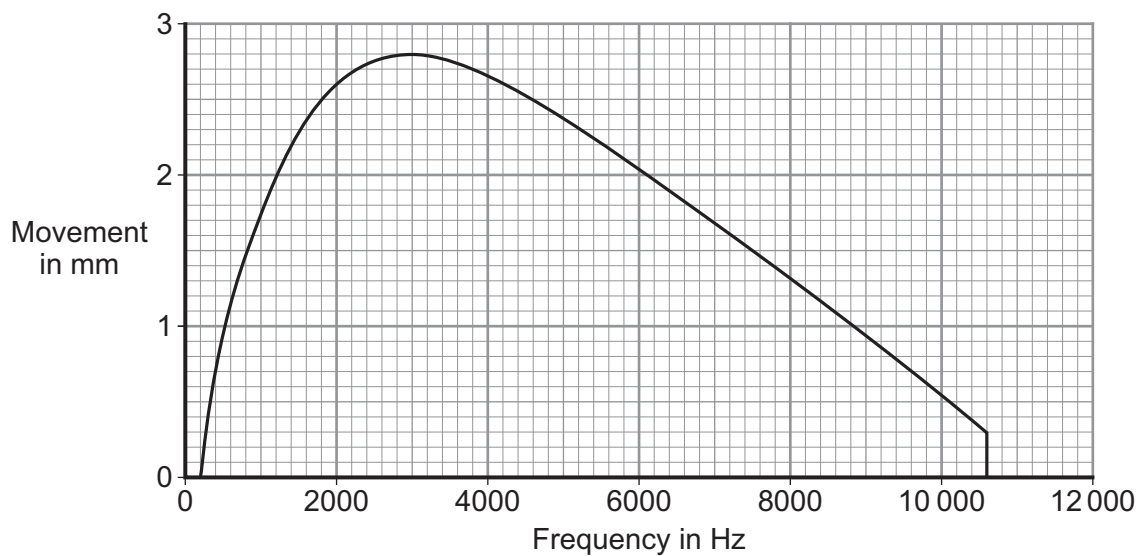


A team of scientists investigated loudspeakers.

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.



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

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



**2 (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)

**2 (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)

**2 (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)

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

.....  
.....

(1 mark)

7

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3 The drawing shows a plastic toy which can stand on its feet.

3 (a) (i) Draw an **X** on the diagram so that the centre of the **X** marks the likely position of the centre of mass of the toy.



(1 mark)

3 (a) (ii) Explain the reason for your choice in part (a)(i).

.....  
.....

(1 mark)

3 (b) Suggest **two** ways in which the design of the toy could be altered to make the toy more stable.

1 .....

.....

2 .....

.....

(2 marks)

4





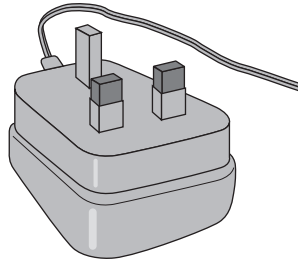
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4 (a) The drawing shows the plug for operating a radio from the mains.



This plug contains a transformer. There are 4600 turns on its primary coil and 200 turns on its secondary coil. The plug is used on the mains supply and has a potential difference (p.d.) of 230 V across its primary coil.

Use the equation in the box to calculate the p.d. across the secondary coil of the transformer.

$\frac{\text{p.d. across primary}}{\text{p.d. across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$
---

Show clearly how you work out your answer.

.....

.....

.....

.....

p.d. across secondary = ..... V  
(2 marks)

4 (b) The coils of the transformer are made of insulated wire.

Why is the wire insulated?

.....

.....

(1 mark)



**4 (c) (i)** What material is the core of a transformer made from?

.....  
(1 mark)

**4 (c) (ii)** Why is the core made from this material?

.....  
.....  
(1 mark)

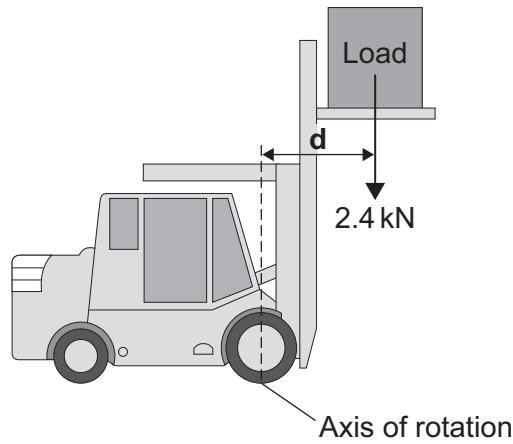
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- 5 The diagram shows a fork-lift truck with a load of 2.4 kN. The clockwise moment caused by this load is 2880 Nm.



- 5 (a) Use the equation in the box to calculate the distance **d**.

$\text{moment} = \text{force} \times \text{perpendicular distance from the line of action of the force to the axis of rotation}$
--

Show clearly how you work out the answer and give the unit.

.....

.....

.....

Distance **d** = .....  
(3 marks)



5 (b) This warning notice is in the driver's cab.

**Warning**  
**Maximum load 10.0 kN**  
**This load must not be exceeded**

Explain in terms of moments why the maximum load must not be exceeded.

.....

.....

.....

.....

.....

.....

.....

(2 marks)

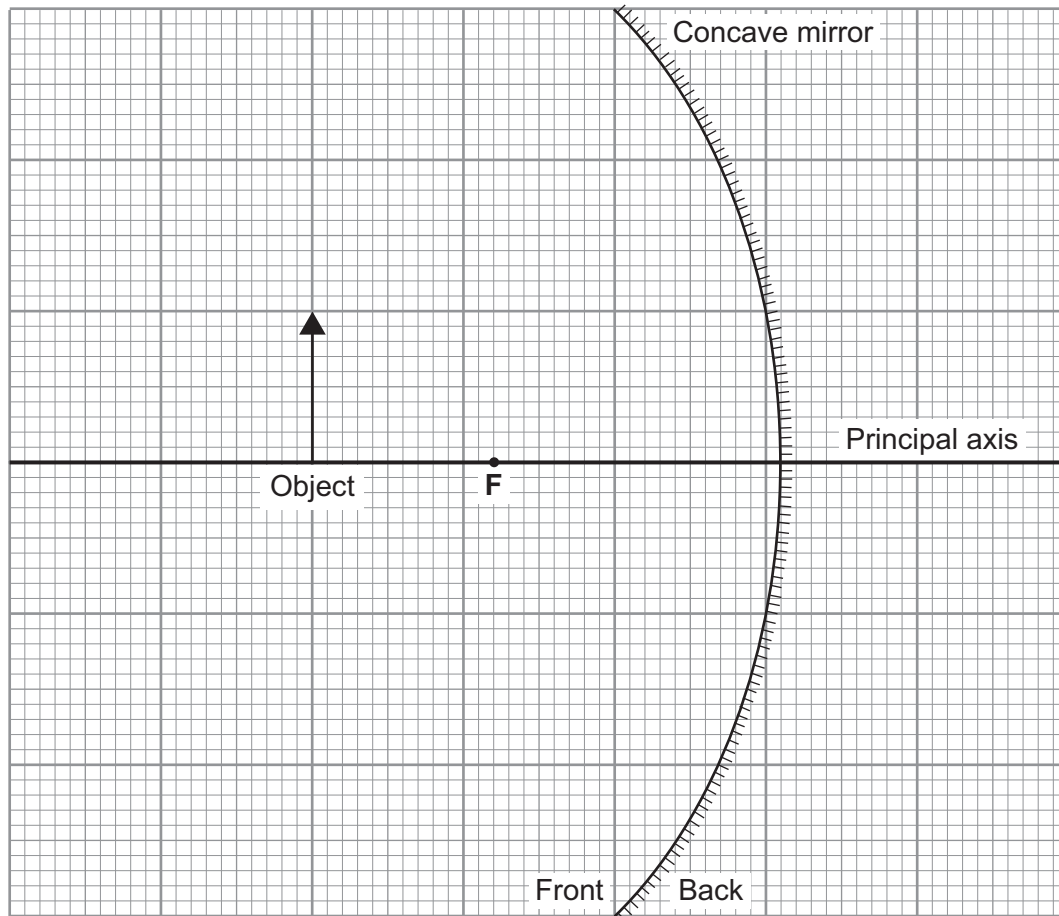
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- 6 The diagram shows an object in front of a concave mirror.  
Complete the diagram to show the position of the image.



(3 marks)

3



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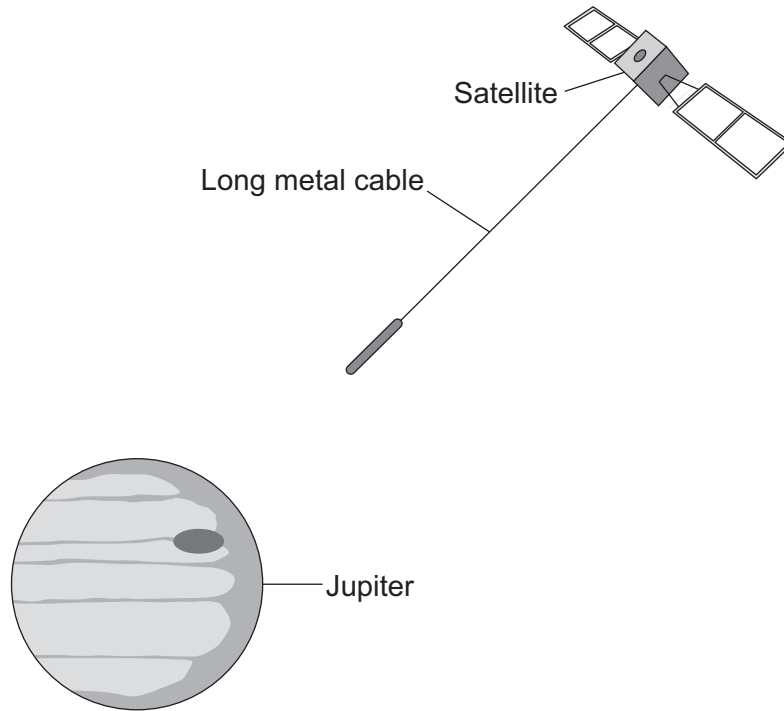
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7 Jupiter has a magnetic field which is more powerful than the magnetic field of any other planet in the Solar System.

Some scientists have suggested that, in the future, a long metal cable could hang from a satellite which orbits Jupiter. The cable would be part of a complete circuit. This arrangement would produce electricity for the satellite.



7 (a) (i) What is the name of the effect that would produce electricity for the satellite?

.....  
(1 mark)

7 (a) (ii) Describe how a potential difference is produced across the ends of the metal cable.

.....  
.....  
.....  
.....  
(2 marks)





7 (a) (iii) Why will the potential difference produce an electric current?

.....  
.....

(1 mark)

7 (b) Other satellites in the Solar System could use the same effect to produce electricity in a similar way.

Suggest **two** reasons why the potential difference produced for another satellite might be **smaller** than the potential difference for the satellite in the diagram.

1 .....

.....

2 .....

.....

(2 marks)

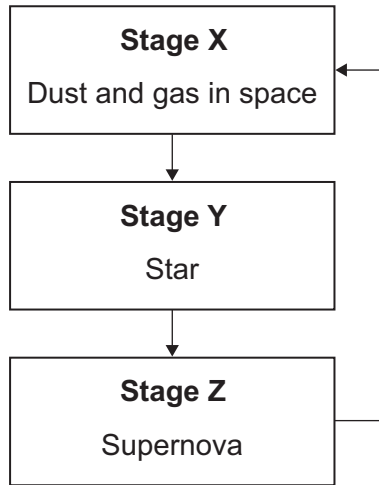
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8 The flowchart shows a simple version of the life cycle of a star that is much more massive than the Sun.



8 (a) What causes the change from **Stage X** to **Stage Y**?

.....  
(1 mark)

8 (b) For most of its time in **Stage Y**, the star is stable.

Explain why the star remains stable.

.....  
.....  
.....  
.....  
(2 marks)

8 (c) (i) Explain how a star is able to produce energy in **Stage Y**.

.....  
.....  
.....  
.....  
(2 marks)



**8 (c) (ii)** Why is a star in **Stage Y** able to give out energy for millions of years?

.....  
.....  
(1 mark)

**8 (d)** What happens to the elements produced in a supernova?

.....  
.....  
(1 mark)

7

**END OF QUESTIONS**



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