Specimen Paper

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	
9	
TOTAL	

General Certificate of Secondary Education
Higher Tier

Physics

Unit Physics P3

Physics 3H

H

For this paper you must have:
- a ruler
- the Equations Sheet (enclosed).

You may use a calculator.

Time allowed
- 60 minutes

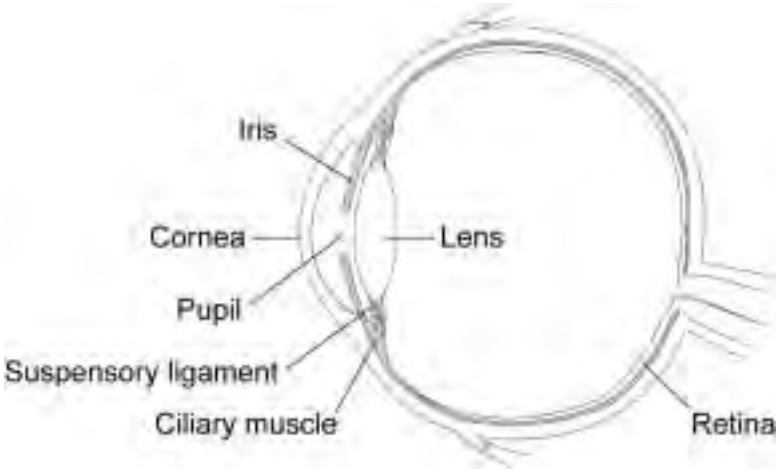
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 3 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

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

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

1 The diagram shows the cross-section of an eye.



1 (a) Use words from the box to complete the following sentence.

ciliary muscle	**cornea**	**iris**	**pupil**

The shape of the lens is changed by the ..... ,

this allows the lens together with the ..... to focus light

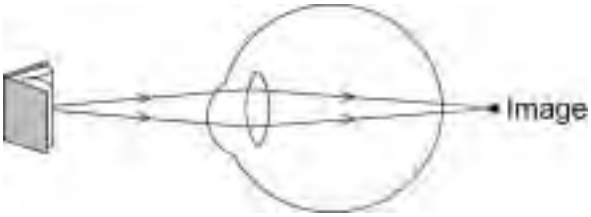
onto the retina.

(2 marks)

Do not write outside the box

1 (b) A man, as he gets older, needs to hold a book further from his eyes in order to be able to see the writing clearly.

The diagram shows that his eye lens is not able to focus light on the retina.



1 (b) (i) How has the 'near point' of the man's eyes changed as he has got older?

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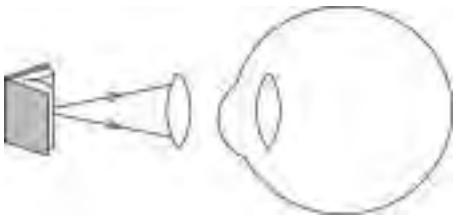
(1 mark)

1 (b) (ii) The problem can be solved by wearing reading glasses.

Complete the diagram below to show how the lens below is able to correct the man's vision.



(2 marks)

Question 1 continues on the next page

1 (c) Give **two** similarities between an eye and a camera.

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2 .....

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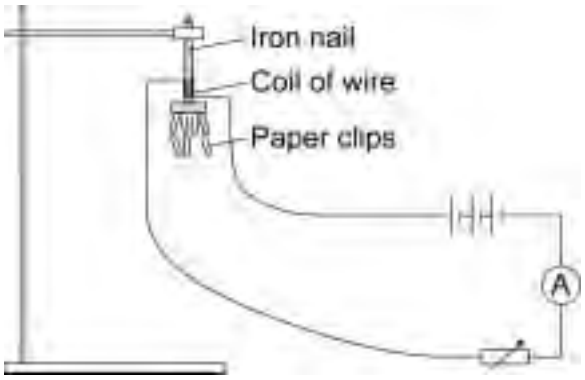
(2 marks)

7

2 The diagram shows the equipment used by a student to investigate the strength of five different electromagnets.



The stronger the electromagnet, the more paper clips it will hold.

2 (a) Why is it important that the paper clips used in the investigation are all the same size?

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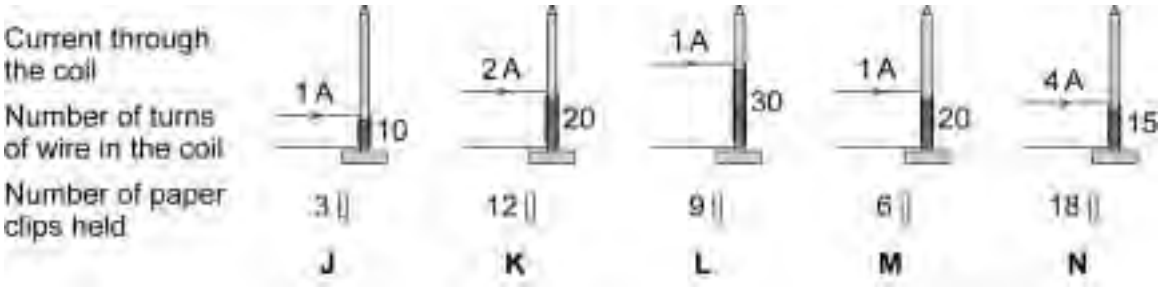
(1 mark)

2 (b) The five electromagnets, **J**, **K**, **L**, **M** and **N**, used by the student are shown below.

Each electromagnet was made by wrapping lengths of insulated wire around identical iron nails.



The student wants to find out how the strength of an electromagnet depends on the number of turns of wire in the coil.

Which electromagnets should the student compare in order to do this?

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(1 mark)

Turn over▶

2 (c) The student concluded:

'The strength of an electromagnet is always directly proportional to the number of turns on the coil.'

2 (c) (i) Explain how the data from the investigation supports the student's conclusion.

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(2 marks)

2 (c) (ii) The student makes one more electromagnet by winding 100 turns onto a nail.

Before testing the electromagnet, the student predicted the number of paper clips that the electromagnet would hold when the current is 1 amp.

How many paper clips should the student predict that the electromagnet would hold?

Show clearly how you work out your answer.

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Number of paper clips = ...

(2 marks)

Do not write outside the box

2 (c) (iii) When the student tested the electromagnet it held 20 paper clips.
This is not what the student predicted.

Explain what the student should do when new data does not seem to support the prediction that was made.

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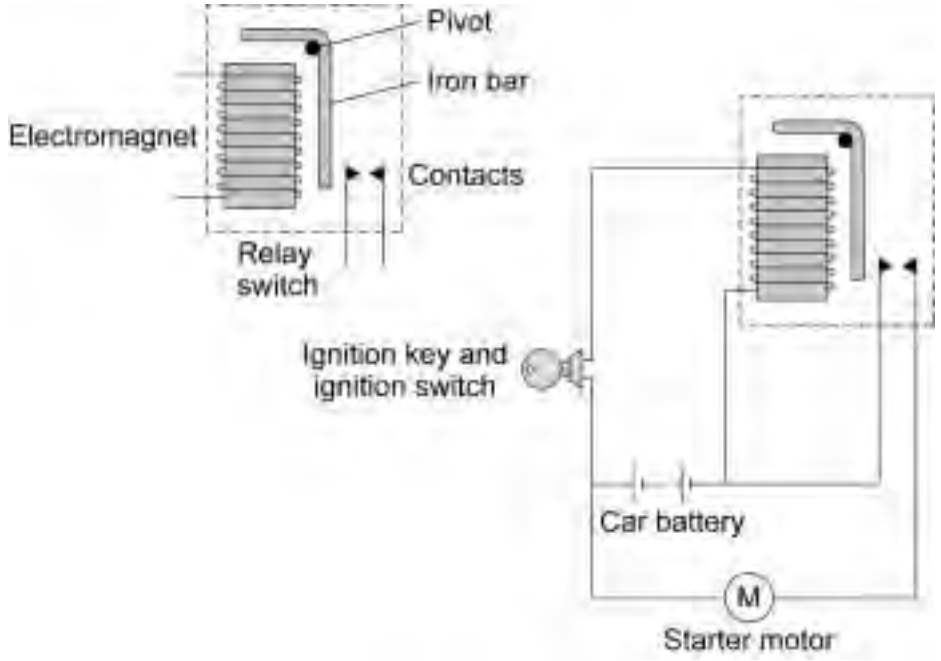
(3 marks)

9

Turn over for the next question

3 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagrams show a relay switch and how it is used in a car ignition circuit.



Turning the ignition key closes the ignition switch.
Explain how this causes the starter motor to operate.

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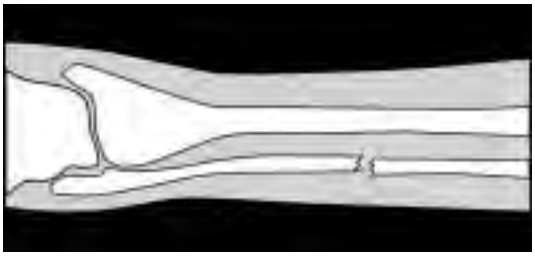
(6 marks)

6

Do not write outside the box

4 Both X-ray machines and CT scanners are used to produce images of the body.

4 (a) The diagram shows an X-ray photograph of a broken leg.



Before switching on the X-ray machine, the radiographer goes behind a screen.

Explain why the radiographer does this.

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(3 marks)

Question 4 continues on the next page

4 (b) The following is an extract from a newspaper article.

> **X-rays cause 700 new cancers each year in the UK**
>
> Each year there are about 125 000 new cancer cases in the UK, of which about 700 may be due to the use of X-rays to diagnose illness.

The article was reporting on a scientific research project first published in a medical journal.

What evidence would the scientists have collected to come to the conclusion that X-rays can cause cancer?

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(2 marks)

4 (c) Explain the advantage of a CT scan compared to an X-ray.

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(2 marks)

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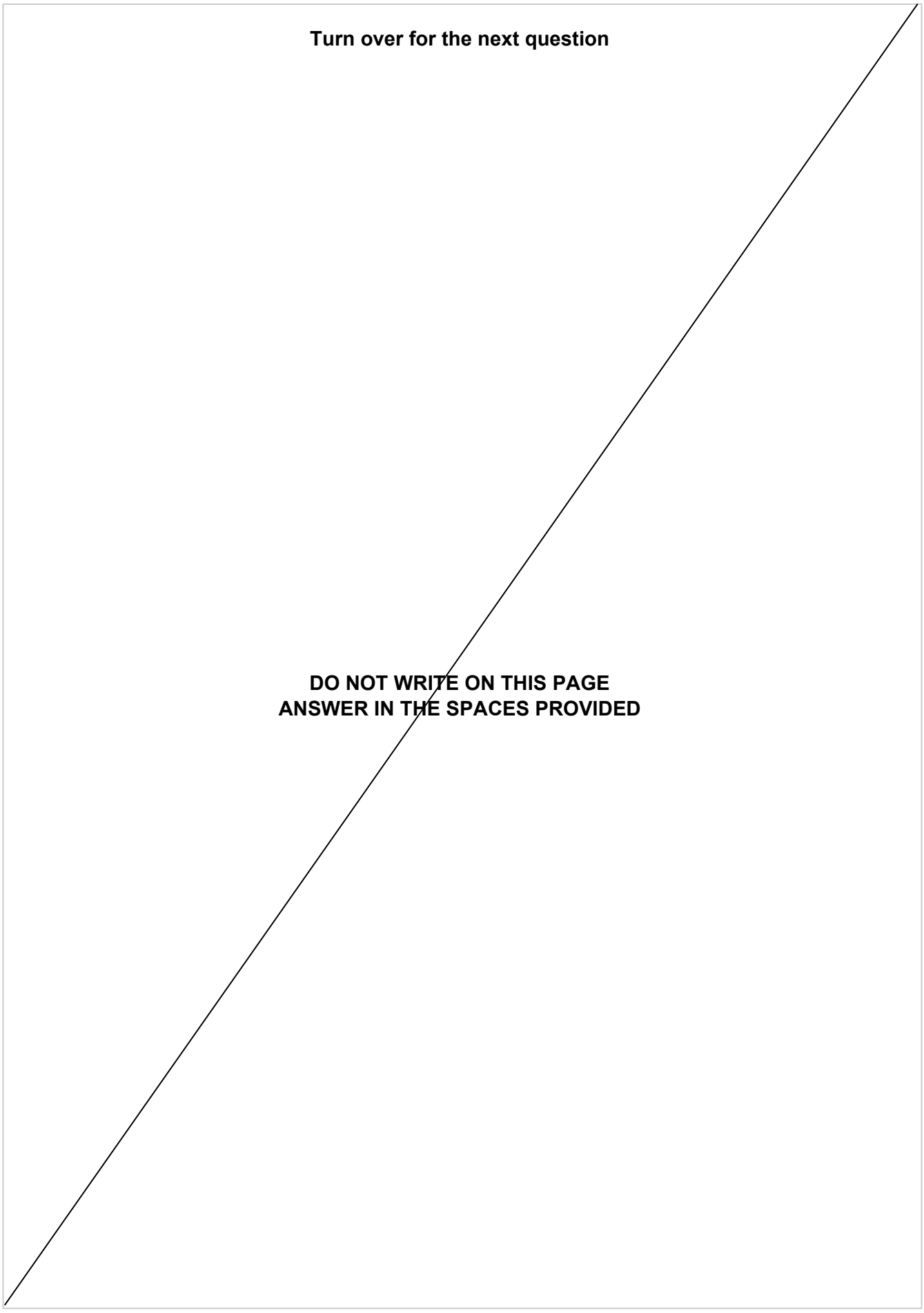
Turn over for the next question



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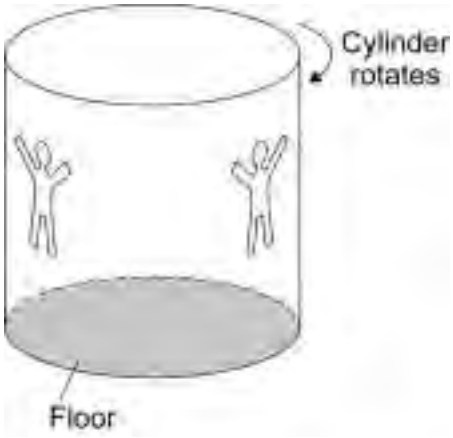
ANSWER IN THE SPACES PROVIDED

5 The fairground ride called 'The Rotor' is a large cylinder which rotates. When the cylinder reaches its maximum speed the floor drops away and the riders inside the cylinder are left against the cylinder wall.



5 (a) Explain how the cylinder is rotating at a constant speed but at the same time the riders inside the cylinder are accelerating.

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(3 marks)

5 (b) In which direction do the riders accelerate?

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(1 mark)

5 (c) What name is given to the resultant force that causes the riders to accelerate?

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(1 mark)

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5 (d) At the end of the ride the floor goes back into place and the cylinder slows down and stops.

How does the resultant force on the riders change as the cylinder slows down?

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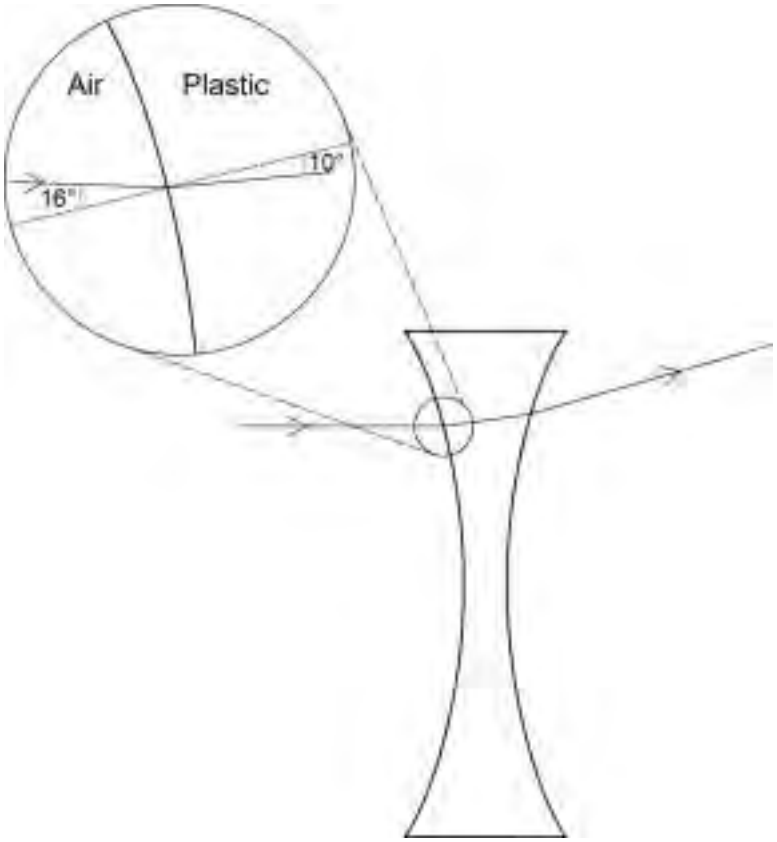
(1 mark)

6

Turn over for the next question

6 The diagram shows a ray of light passing through a diverging lens.



6 (a) Use the information in the diagram to calculate the refractive index of the plastic used to make the lens.

Write down the equation you use, and then show clearly how you work out your answer.

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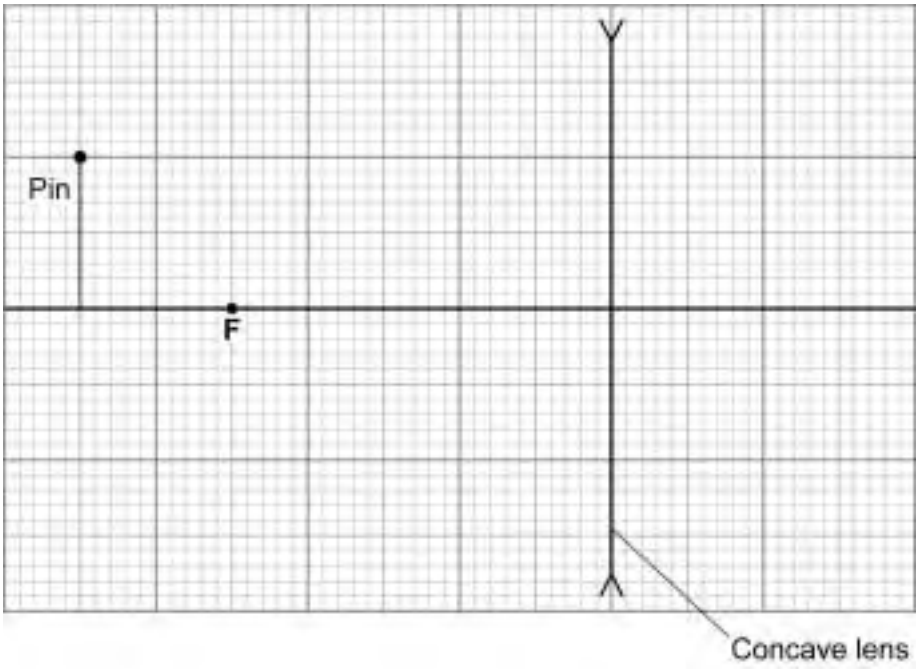
Refractive index = ...

(2 marks)

Do not write outside the box

6 (b) The focal length of the lens is 5 cm. A student looking through the lens sees the image of a pin.

Complete the ray diagram below to show how the image of the pin is formed.



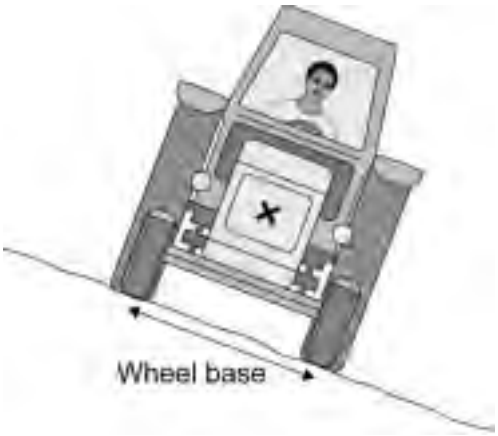
(3 marks)

5

Turn over for the next question

7 Tractors are often used on sloping fields, so stability is important in their design.

On the diagram, the centre of the **X** marks the *centre of mass* of the tractor.



7 (a) What is meant by the term *centre of mass*?

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(1 mark)

7 (b) Explain how the design of the tractor could be changed in order to increase the tractor's stability.

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(2 marks)

7 (c) Explain why the tractor does not topple over. You may add to the diagram to help your explanation.

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(3 marks)

6

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Turn over for the next question

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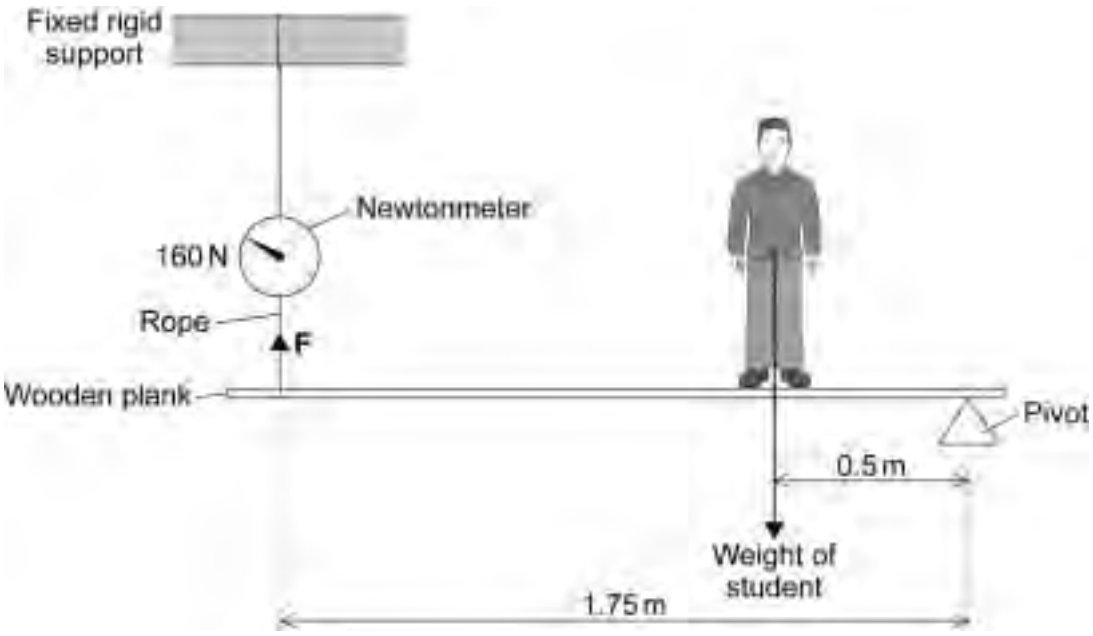
ANSWER IN THE SPACES PROVIDED

8 A student wants to weigh himself but the only balance available is a newtonmeter that measures up to 200 newtons.
The diagram shows how the student solved the problem using moments.



8 (a) Use the information in the diagram to calculate the weight of the student given by this method.

Write down the equations you use, and then show clearly how you work out your answer and give the unit.

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Weight = ...

(5 marks)

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8 (b) Even though all the measurements are accurate the student's weight obtained by this method is inaccurate.

Explain why.

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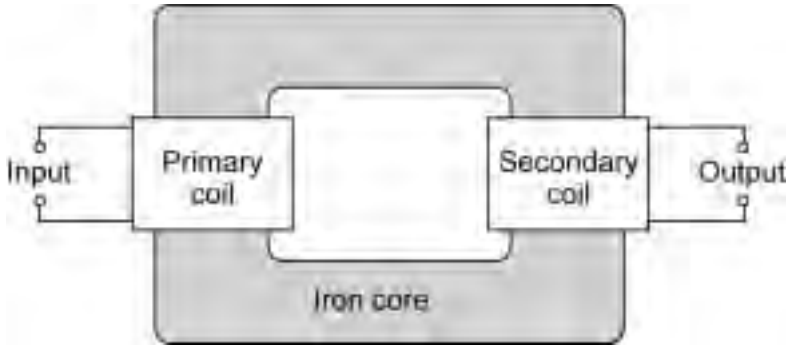
(2 marks)

7

Turn over for the next question

9 The diagram shows the basic structure of a transformer.



9 (a) Explain how a transformer works.

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(5 marks)

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9 (b) A transformer is used to change the 230 volt mains electricity supply to the 12 volts needed to operate a low voltage halogen lamp. The current through the halogen lamp is 4 amps.

Calculate the current drawn by the transformer from the mains electricity supply.

Assume that the transformer is 100 % efficient.

Write down the equation you use, and then show clearly how you work out your answer.

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Current = ... amps

(2 marks)

7

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

GCSE Physics Equations Sheet

Unit 3H

$s = v \times t$	s distance v speed t time
$\text{refractive index} = \frac{\sin i}{\sin r}$	i angle of incidence r angle of refraction
$\text{magnification} = \frac{\text{image height}}{\text{object height}}$	
$P = \frac{1}{f}$	P power f focal length
$\text{refractive index} = \frac{1}{\sin c}$	c critical angle
$T = \frac{1}{f}$	T periodic time f frequency
$M = F \times d$	M moment of the force F force d perpendicular distance from the line of action of the force to the pivot
$P = \frac{F}{A}$	P pressure F force A cross-sectional area
$\frac{V_p}{V_s} = \frac{n_p}{n_s}$	V_p potential difference across the primary coil V_s potential difference across the secondary coil n_p number of turns on the primary coil n_s number of turns on the secondary coil
$V_p \times I_p = V_s \times I_s$	V_p potential difference across the primary coil I_p current in the primary coil V_s potential difference across the secondary coil I_s current in the secondary coil