UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

3210389014

PHYSICS **9702/51**

Paper 5 Planning, Analysis and Evaluation **October/November 2011**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **8** printed pages.

DC (SJF/DJ) 34176/3

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[Turn over

1 A current-carrying coil produces a magnetic field.

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It is suggested that the strength B of the magnetic field at the centre of a flat circular coil is inversely proportional to the radius r of the coil.

Design a laboratory experiment that uses a Hall probe to test the relationship between B and r. You should draw a diagram, on page 3, showing the arrangement of your equipment. In your account you should pay particular attention to

(a) the procedure to be followed,

(b) the measurements to be taken,

(c) the control of variables,

(d) the analysis of the data,

(e) the safety precautions to be taken.

[15]

Diagram

For Examiner's Use

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For Examiner's Use

For Examiner's Use	Defining the problem	Methods of data collection	Method of analysis	Safety considerations	Additional detail

2 A scientist is observing some of the moons orbiting the planet Jupiter.

Fig. 2.1

For six different moons, the scientist records the distance *r* from the centre of Jupiter and the period *T* of the orbit.

Question 2 continues on the next page.

It is suggested that T and r are related by the equation

$$T^2 = kr^3$$

where k is a constant.

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(a) A graph is plotted of lg T on the y-axis against lg r on the x-axis. Determine the value of the gradient and express the y-intercept in terms of k.

gradient = ...

y-intercept = ... [1]

(b) Values of r and T are given in Fig. 2.2.

$r\,/\,10^6\,\text{m}$	$T\,/\,10^3\,\text{s}$	lg (r/m)	lg (T/s)
129	24 ± 4		
181	42 ± 4		
422	154 ± 8		
671	304 ± 8		
1070	590 ± 15		
1880	1420 ± 15		

Fig. 2.2

Calculate and record values of lg (r/m) and lg (T/s) in Fig. 2.2. Include the absolute uncertainties in lg (T/s). [3]

(c) **(i)** Plot a graph of lg (T/s) against lg (r/m). Include error bars for lg (T/s). [2]

(ii) Draw the straight line of best fit and a worst acceptable straight line on your graph. Both lines should be clearly labelled. [2]

(iii) Determine the gradient of the line of best fit. Include the uncertainty in your answer.

gradient = ... [2]

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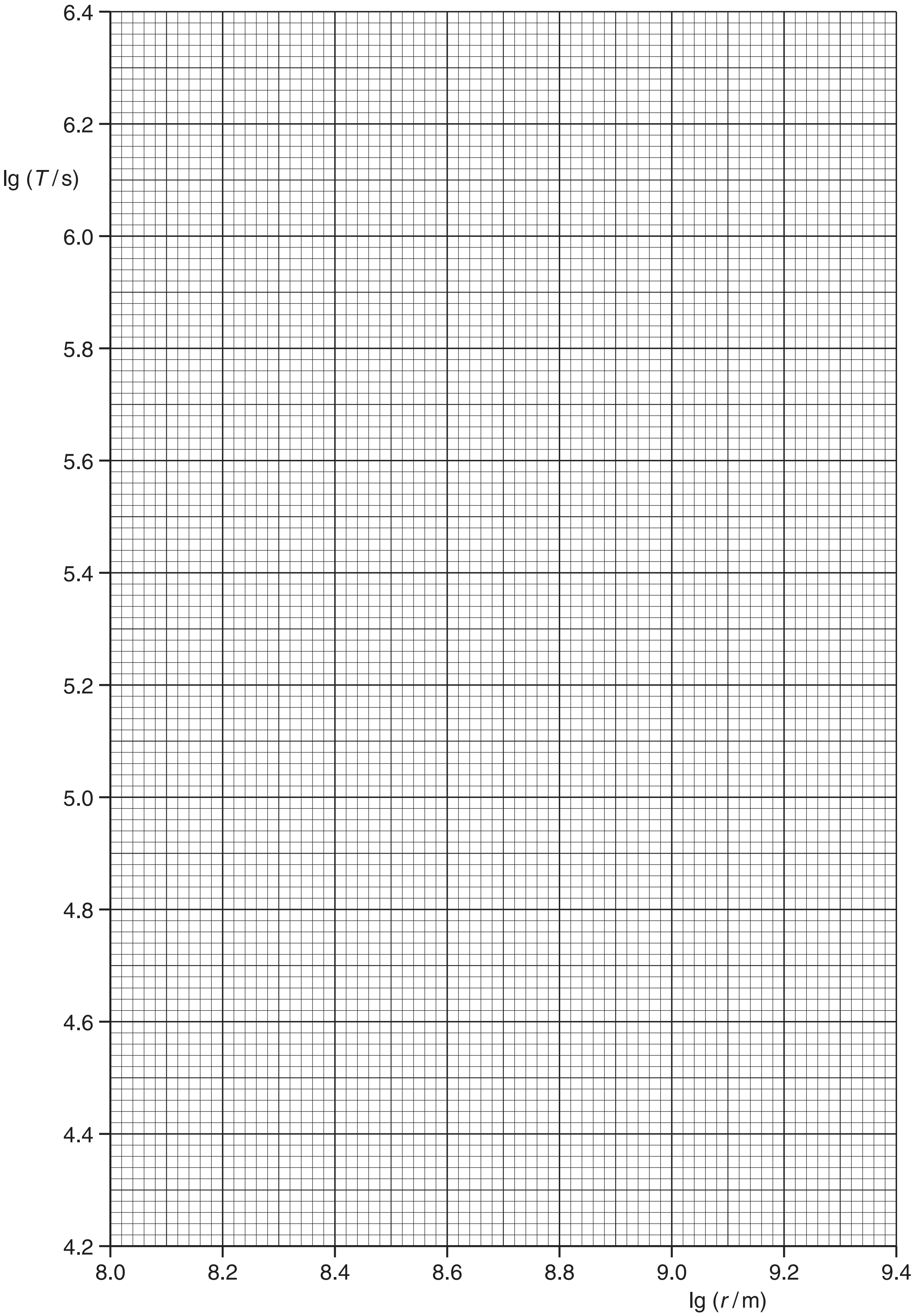

[Turn over

(iv) Determine the y-intercept of the line of best fit. Include the uncertainty in your answer.

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y-intercept = ... [2]

(d) The constant k is given by

$$k = \frac{4\pi^2}{GM}$$

where the universal gravitational constant $G = 6.67 \times 10^{-11}\,\mathrm{N\,m^2\,kg^{-2}}$ and M is the mass of Jupiter.

(i) Using your answer to **(c)(iv),** determine the value of k. Include the uncertainty in your answer.

k = ... $\mathrm{kg\,N^{-1}\,m^{-2}}$ [2]

(ii) Determine the value of M.

M = ...kg [1]