OCR
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SPECIMEN

Advanced GCE

PHYSICS A

Unit G486: Practical Skills in Physics 2:
Quantitative Task

Specimen Task

For use from September 2008 to June 2009.

G486

All items required by teachers and candidates for this task are included in this pack.

INFORMATION FOR CANDIDATES

- Quantitative Task: Determining the capacitance of a capacitor.

INFORMATION FOR TEACHERS

- Mark scheme.
- Instructions for Teachers and Technicians.

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PHYSICS A

Unit G486: Practical Skills in Physics 2:
Quantitative Task

Specimen Task

For use from September 2008 to June 2009.
Candidates answer on this task sheet.

INSTRUCTIONS TO CANDIDATES

- Answer **all** parts of the task.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each part.
- The total number of marks for this task is **20.**

ADVICE TO CANDIDATES

- Read each part carefully and make sure you know what you have to do before starting your answer.

FOR TEACHER'S USE		
Part	**Max.**	**Mark**
TOTAL	**20**	

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

Introduction

In this experiment, you will investigate how the current in a circuit varies with time as a capacitor discharges through a resistor. You will then determine the capacitance of the capacitor.

What you have to do

You are expected to answer on the question paper in the spaces provided on pages 4-7, with the following headings:

- Planning and carrying out the experiment (1,2,3 below)
- Results (4,5 below)
- Analysing data (6,7 below)
- Interpreting the data (8 below)
- Conclusions (9 below)

Equipment provided:

5 V or 6 V power supply (or 6 V battery pack)

Microammeter (digital or analogue)

Voltmeter

Stopwatch

1000 μF capacitor

Resistor labelled R

Connecting leads

Procedure

1 Using the equipment provided, determine the resistance of the fixed resistor, *R*. Draw a circuit diagram to show how you carried out this measurement.

2 Using the equipment provided set up the circuit shown in Fig 1.1. The lead with an arrow on it (F) is a 'flying' lead and should not be connected. It is important to ensure the end of the capacitor marked '-' is connected to the negative terminal of the power supply.

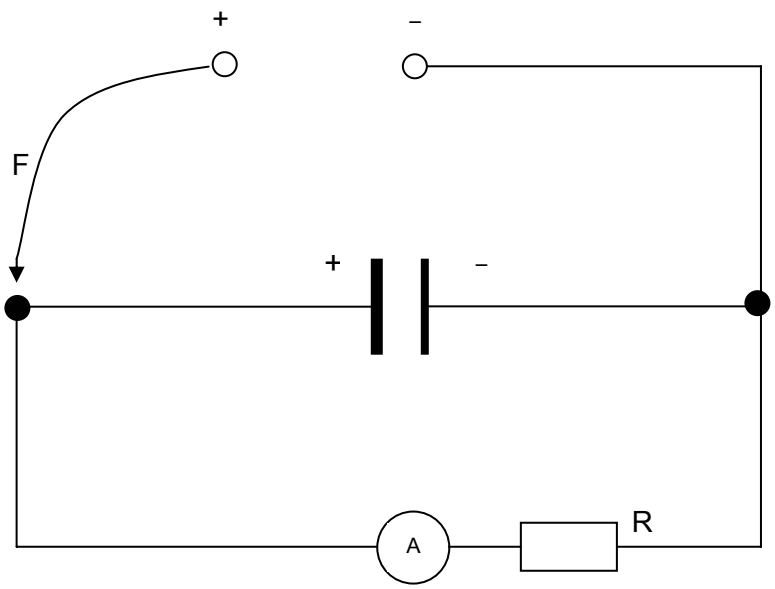


Fig 1.1

3 Connect F so that the capacitor is allowed to charge.

4 Disconnect F and start the stopwatch immediately. Record the current, *I*, at appropriate time intervals.

5 Record your results in a table. Include in your table values for ln *I*.

6 Plot a graph of ln *I* against time, *t* and draw the best straight line through the points.

7 Determine the gradient of the line.

8 The current *I* in the circuit decays exponentially with respect to time *t* and is given by the relationship

$$I = I_0 e^{-\frac{t}{CR}}.$$

Use this relationship and your graph to determine a value for the capacitance *C* with an appropriate unit.

9 Justify the number of significant figures for *C.*

[Total: 20]

Planning and carrying out the experiment

[5]

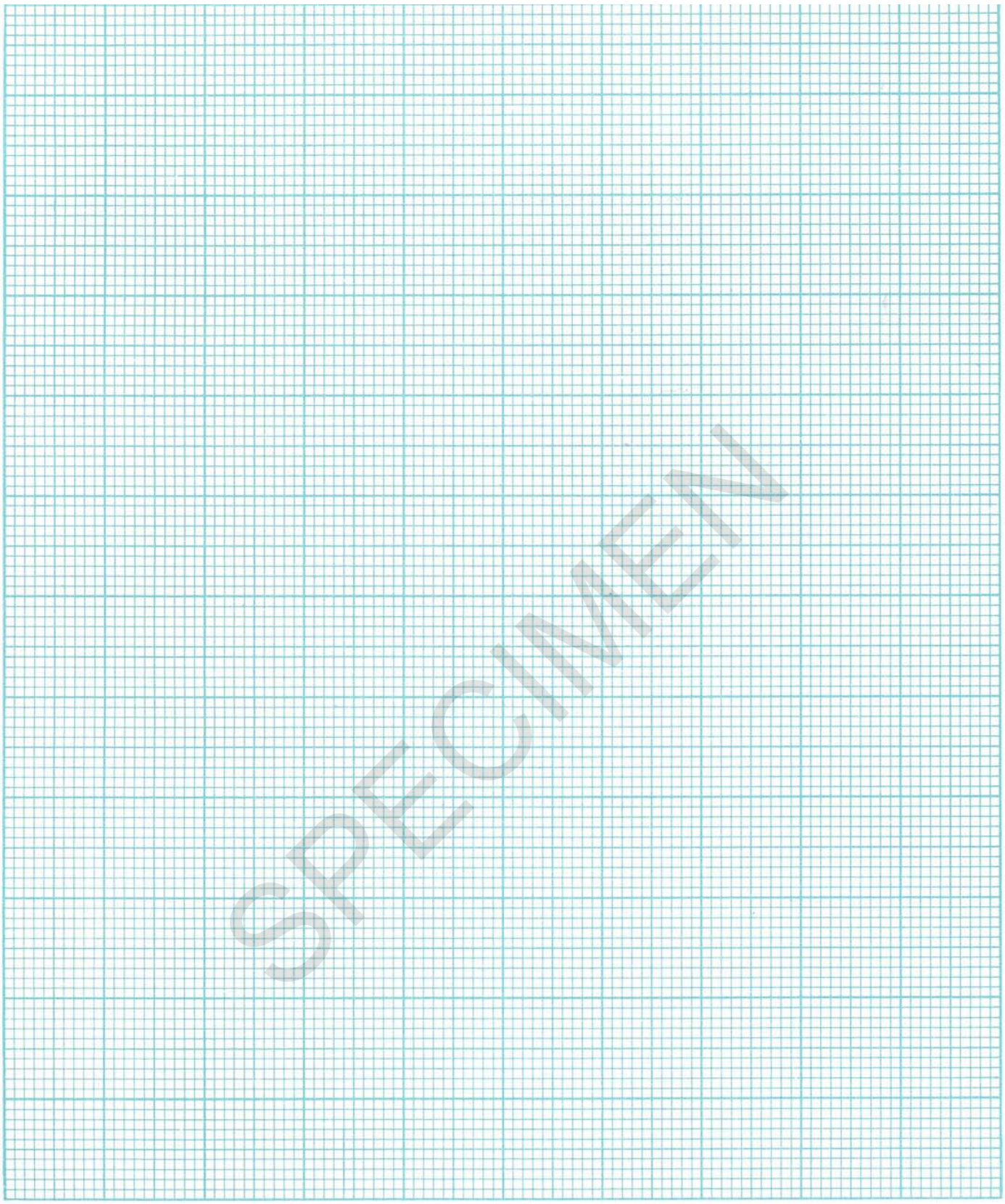
Results

[5]

Analysing Data

[5]

[Turn over



Interpreting the Data

[4]

Conclusions

[1]

[Total: 20]

END OF TASK

OCR RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

PHYSICS A G486 MS

Unit G486: Practical Skills in Physics 2: Quantitative Task

Specimen Mark Scheme

The maximum mark for this task is **20**.

For use from September 2008 to June 2009.

	Answer	Max Mark
A2	**Strand A: Quality 2**	
1	Sets up circuit in Fig 1.1 and draws appropriate circuit diagram to determine the resistance *R* without help.	**[2]**
2	Carries out appropriate measurements and repeats the experiment without help	**[2]**
3	Chooses appropriate scales on the meters and uses a large range of values for *t* e.g. >70 s.	**[1]**
B2	**Strand B: Quality 2**	
1	Makes and records at least eight sets of observations.; Records results for *I* and *t* consistently. *t* must be to the nearest second *I* must be to the same number of decimal places.	**[2]**
2	Records the values of ln *I*.	**[1]**
3	Determines the resistance *R* correctly and to an appropriate number of significant figures e.g: the resistance should be given to 2 or 3 sf; ln *I* is recorded to an appropriate number of significant figures e.g. 3 dp.	**[1]**
C1	**Strand C: Quality 1**	
1	Plots graph of ln *I* against *t* . Labels axes, uses sensible scales and points occupy more than half the graph paper in each direction.	**[2]**
2	Points plotted correctly; Best fit straight line drawn.	**[2]**
3	The gradient is correctly determined. Where appropriate, ICT is used to find to analyse the data (e.g: finding the gradient of the line graph).	**[1]**
C2	**Strand C: Quality 2**	
1	Recognises that the gradient of the line being equal $(CR)^{-1}$ and determines a suitable value for *C*	**[2]**
2	The capacitance *C* is given to an appropriate number of significant figures and with correct unit	**[2]**
3	Justifies the use of significant figures.	**[1]**
	Total	**[20]**

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

PHYSICS A G486 MS

Unit G486: Practical Skills in Physics 2: Quantitative Task

Instructions for Teachers and Technicians

For use from September 2008 to June 2009.

This document consists of **3** printed pages and **1** blank page.

There is no time limit for this task, but it is expected that it can be completed within one timetabled lesson.

It is assumed that you will have completed the teaching of the above module before setting your students this task. This module has links to other modules which contain related learning experiences – please refer to your specification.

Candidates may attempt more than one quantitative task with the best mark from this type of task being used to make up the overall mark for Unit G486.

Preparing for the assessment

It is expected that before candidates attempt Practical Skills in Physics 2 (Unit G486) they will have had some general preparation in their lessons. They will be assessed on a number of qualities such as demonstration of skilful and safe practical techniques using suitable quantitative methods, the ability to make and record valid observations, and the ability to organise results suitably. It is therefore essential that they should have some advance practice in these areas so that they can maximise their attainment.

Preparing candidates

At the start of the task the candidates should be given the task sheet.

Candidates must work on the task individually under controlled conditions with the completed task being submitted to the teacher at the end of the lesson. Completed tasks should be kept under secure conditions until results are issued by OCR.

Candidates should not be given the opportunity to redraft their work, as this is likely to require an input of specific advice. If a teacher feels that a candidate has under-performed, the candidate may be given an alternative task. In such cases it is essential that the candidate be given detailed feedback on the completed assessment before undertaking another Quantitative Task. Candidates are permitted to take each task **once** only.

Assessing the candidate's work

The mark scheme supplied with this pack should be used to determine a candidate's mark out of a total of 20 marks. The cover sheet for the task contains a grid for ease of recording marks. To aid moderators it is preferable that teachers mark work using red ink, including any appropriate annotations to support the award of marks.

Notes to assist teachers with this task

Teachers must trial the task before candidates are given it, to ensure that the apparatus, materials, chemicals etc provided by the centre are appropriate. The teacher carrying out the trial must complete a candidate's task sheet showing the results attained, and retain this, clearly labelled, so that it can be provided to the moderator when requested.

Health and Safety

Attention is drawn to Appendix E of the specification.

NOTES FOR TEACHERS

Introduction

This task assumes that pupils are able to:

- Set up circuits
- Use a voltmeter and an ammeter
- Are aware of capacitors
- Use logarithmic plots to test exponential functions

Pupils will be required to perform an experiment to investigate how the current in an electrical circuit changes with the length of a piece of resistance wire.

Apparatus requirements (per pupil):

5 V or 6 V power supply (or 6 V battery pack)

Microammeter (digital or analogue) able to measure to 100 μA

Voltmeter (0-10 V)

Stopwatch

1000 μF capacitor

Resistor labelled R (68 kΩ)

Connecting leads

Notes

The equipment should be laid out on the bench ready for the candidates to use and should **not** be assembled prior to use by the candidates.

Teachers should be vigilant to ensure that the circuit is set up correctly. Any help given should be recorded.

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