UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

MARK SCHEME for the November 2004 question paper

9702 PHYSICS

9702/05 **Paper 5 (Practical Test), maximum raw mark 30**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. This shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 9702 (Physics) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:		
		A	B	E
Component 5	30	24	22	15

The thresholds (minimum marks) for Grades C and D are normally set by dividing the mark range between the B and the E thresholds into three. For example, if the difference between the B and the E threshold is 24 marks, the C threshold is set 8 marks below the B threshold and the D threshold is set another 8 marks down. If dividing the interval by three results in a fraction of a mark, then the threshold is normally rounded down.

November 2004

GCE A LEVEL

MARK SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 9702/05

PHYSICS
Paper 5 (Practical Test)

UNIVERSITY of CAMBRIDGE
International Examinations

1 (b) (iii) Explanation of positioning of magnet **1**

(e.g. place eye level with top of coil/measure length of magnet outside coil)

(d) Readings **3**

6 sets then 3; 5 sets then 2; 4 sets then 1; 3 sets or less scores zero

Allow more than 6 sets without penalty.

Allow current values to be greater than 5 A.

Allow I = 0 to be one of the values in the table.

Any POT error then -1.

Write the number of readings as a ringed total by the table.

Minor help from the Supervisor, 1. Major help, then -2.

If help has been given then write SR at the top of the front page of the script, and give a brief explanation of the type of help that has been given by the table of results.

Repeated readings **1**

There must be at least two sets of readings for either *F* or *I*.

Allow all the readings to be identical.

Column headings **1**

Each column heading must contain a quantity and a unit.

There must be some distinguishing feature between the quantity and the unit.

Consistency of raw readings **1**

All the raw readings of *F* should be given to the same number of d.p.

All the raw readings of *I* should be given to the same number of d.p.

Expect to see values to one or two d.p. only. Clearly manufactured readings scores zero.

Graph Axes **1**

The axes must be labelled with the quantities plotted.

Ignore units on the axes.

The plotted points must occupy at least half the graph grid in both the *x* and *y* directions (i.e. 4 large squares in the *x*-direction and 6 large squares in the y-direction).

Do not allow more than 3 large squares between the labels on an axis.

Do not allow awkward scales (e.g. 3:10, 6:10 etc.).

Graph Plotting of points **1**

All the observations must be plotted.

Count the number of plots and ring this total on the grid.

Do not allow plots in the margin area.

Check one suspect plot. Circle this plot. Tick if correct. If incorrect, mark the correct position with a small cross and use an arrow to indicate where the plot should have been, and -1. Allow errors up to and including half a small square.

Only a drawn straight line through a linear trend is allowable for this mark. This mark can only be awarded for 5 or more plots on the grid. There must be a reasonable balance of points about the drawn line. Do not allow a line of thickness greater than half a small square.

Graph Line of best fit **1**

Only a drawn straight line through a linear trend is allowable for this mark

This mark can only be awarded for 5 or more plots on the grid.

There must be a reasonable balance of points about the drawn line.

Do not allow a line of thickness greater than half a small square.

Graph Quality of results **1**

Judge by scatter of points about the line of best fit.

Accept five good trend plots. Poor trend/no trend/wrong trend scores zero.

(e) (iii) Gradient **1**

Ignore any units given with the value.

Hypotenuse of Δ must be > half the length of line drawn.

Check the read-offs. Work to half a small square. $A\Delta/A\Delta$ gets zero.

Values taken from the table that lie on the line to within half a small square are acceptable.

y-intercept **1**

(f) k = gradient, W = y-intercept **1**

Graph of I vs F will not score this mark unless analysis is consistent.

Unit of k and unit of W *(i.e.* N A^{-1} and N respectively) **1**

SF in k **1**

Allow 2 of 3 sf only

(g) Deducting the weight of the magnet from F will give a straight line passing through the origin and therefore force of attraction is proportional to current. **2**

If the weight of the magnet is not taken into consideration, then score zero.

Statement that force of attraction is not directly proportional to current scores zero.

(h) (i) Value of I when F = 10 N **1**

Working must be checked.

(ii) Overheating problems with the coil when F = 10 N **1**

Do not allow answers such as 'large voltage cannot be obtained from the psu'

20 marks in total

Question 2

A1 Procedure OK (i.e. measure P and f; change P and repeat). **1**

This mark can be scored even if the method is unworkable.

A2 Diagram of workable arrangement **2**

Source of sound + pump (1 mark); microphone + CRO (1 mark)

Allow ½ if all apparatus is inside the bell jar.

Allow ½ if the container is open.

A3 Measurement of *P* **1**

(e.g. Bourdon gauge/pressure gauge/manometer/barometer). Must be shown correctly on the diagram.

B1 Correct measurements taken to find frequency using CRO **1**

Length of trace on screen + timebase setting

B2 Use of measurements to calculate frequency, or $f = 1/T$ **1**

B3 Maintain constant temperature whilst pressure is reduced **1**

OR maintain constant frequency as pressure is reduced

OR close tap before taking readings

C Safety precaution **1**

Safety screens/goggles

D1/2 Any further good design features **2**

Some of these might be:

Difficulty with detecting sounds of low intensity at low pressures

Use a signal generator connected to speaker

Vacuum grease the wires to the speaker

Allow time between readings for apparatus to warm up/cool down

Monitor temperature with thermometer during experiment

Avoid unwanted sounds/use soundproof room

Source of sound and microphone both inside the chamber

Increase *P* as well as decrease *P* to give wide spread of readings

10 marks in total

Summary of shorthand notation which may be used in annotating scripts:

SFP	Significant figure penalty
ECF	Error carried forward
AE	Arithmetical error
POT	Power of ten error
NV	Not valid
NR	Not relevant
NBL	Not best line
FO	False Origin
NGE	Not good enough
BOD	Benefit of the doubt
NA	Not allowed
SV	Supervisor's value
SR	Supervisor's report
OOR	Candidate's value is out of range
CON	Contradictory physics not to be credited
✓Δ	Used to show that the size of a triangle is appropriate (gradient calculation)
✓C	Used to show that the raw readings are consistent
✓SF	Used to show calculated quantities have been given to an appropriate number of significant figures
^	Piece of work missing (one mark penalty)
^^	Several pieces of work missing (more than one mark penalty)
↔	Scale can be doubled in the x-direction
↕	Scale can be doubled in the y-direction