UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2007 question paper

5054 PHYSICS

5054/03 Paper 3 (Practical Test), maximum raw mark 30

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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 discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2007 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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General points

Where the mark scheme does not give specific instructions, apply the following penalties:

- Disregard of instructions leading to poor presentation or error –1
- Systematic error –1
- Supervisor's help;
  no penalty for correction of faulty apparatus.
  no marks to be awarded where the candidate is at fault in the section where he/she was helped. E.g. if told how to use the apparatus in **Question 2** then the one observation mark in **2 (a)** cannot be scored but subsequent marks can score.

Mark scheme code

B1 Independent mark.

M1 Method mark, if not given subsequent A mark falls (up to the next B, M or C mark).

A1 Answer mark, not awarded if an M mark immediately before it is not awarded.

C1 Compensation mark, given automatically if the answer is correct, i.e. working need not be seen if the answer is correct. Also given if the answer is wrong but the point is seen in the working.

1 **(a)** *d* recorded to the nearest mm or better with unit. B1

(b) Reasonable scientific diagram showing one of the following features:
Either scale shown on an end face of the block of wood.
Or good cross section showing the block resting with its top face horizontal or at an angle.
Or 3D diagram clearly showing the block as a cuboid. B1

(c) Two readings shown (ignore unit and precision). B1
(Expect these to be taken at the centres of each end face.)

A further two readings shown with a least one of the 4 readings to better than 5 mm precision with unit seen somewhere. B1

(d) *d* and d_S correctly averaged with ratio calculated correctly with no unit and value between 0.5 and 0.9. B1 [5]
(Do not allow answers left as fractions.)

2(a)-(c) Incident ray correct by eye with two object pins greater than 4.0 cm apart, positions being determined by running your finger along the line. B1

Locating pins in approximately the correct position and greater than 4.0 cm apart. B1
(Must be from reasonably correct diagram.)

(d)&(e) *r* measured correctly and in the range 33º to 37° from sensible diagram. B1

(f) *n* calculated correctly with no unit (ignore s.f.). M1

Value in the range 1.50 to 1.55 (for glass). A1 [5]
(1.48 to 1.53 for Perspex.)
(When rounded by examiner to 3 s.f.)

3 The right angle of the triangle should have been labelled B. In theory this would give a BX value of 6.7 cm. Allowing candidates to measure from the centre of the hole rather than the corner gives a value for BX in the range 5.9 cm to 7.0 cm. However some Supervisors have labelled the right angle A, which gives a theoretical BX of 9.6 cm. Allowing for measurements to the centre of the hole rather than the corner gives a range of 8.8 cm to 9.9 cm.
A third possibility is that the right angle is at C. This leads to a theoretical BX of 11.4 cm and a range of 10.6 cm to 11.7 cm.

3(b)&(c) Lines drawn from two holes. M1

At least one line to within 5 mm of the edge of the card. A1

All lines correctly drawn and crossing at the approximate position of the centre of mass. B1
(Must not be able to see a triangle at the crossing point.)

Expect BX in range 5.9 cm to 7.0 cm (but see above). B1

Either card should balance on a point at X (not finger).
Or card should balance on knife edge (e.g. rule) placed along any line.
Or hole through X, pin through the hole with the card in a vertical plane, no movement of the card when in two positions. B1 [5]

4 Circuit diagram

(a) Power supply, switch and resistor in series with (a gap)/(line between A and B)/(resistor between A and B) with voltmeter in parallel with the resistor (X). B1

Initial readings.

(b) V_0 in the range 1.8 to 3.6 V, recorded to 0.1 V or better. B1
(rounded to 2 s.f. by examiner.)
(Using re-chargeable cells and a low resistance voltmeter could result in a low terminal potential difference)

(c) *R* recorded. B1

Sensible *V* according to the table below which allows for run down rechargeable cells and fresh dry cells. B1
(Ignore missing units in sections **(b)** and **(c)**.)

R / kΩ	V / V
0.47	1.4 to 3.0
1.0	1.2 to 2.5
2.2	0.9 to 1.8

Table

(d) Table with units for *R* and *V*. B1

Three single values of R with sensible voltages (see table). B1
(Allow 0.47 kΩ from **(c)** if not tabulated here.)

Two series combinations with sensible voltages. B1

A further two series combinations with sensible voltages. B1

To be sensible, the voltage must fall or stay the same with increasing resistance.

Graph

(e) Axes labelled with unit and correct orientation. B1

Suitable scale which allows all the data to be plotted with the data occupying more than half page in both directions and scale is easy to follow; no 3's, 6's, 7's etc. B1
(Allow inclusion of 0.0 V)

All points that can be plotted using the available scale should be plotted. Check two points plotted correctly from an easy to follow scale, within the correct small square and within ½ small square of the correct position. Check the two points furthest from the line. If all points lie on the line check 0.47 kΩ and 3.67 kΩ. B1

Best fine line and fine points. B1

Comments and Calculations.

(f) **(i)** *R* read correctly from graph with unit.
(Allow e.c.f. wrong unit from table or graph.) B1

(ii) X = value from **(i)** and in the range 2.0 kΩ to 2.4 kΩ. B1

If the resistance values are the same, the voltage is shared equally between the two resistors. B1 [15]