CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2013 series

5054 PHYSICS

5054/31 Paper 3 (Practical Test), maximum raw mark 30

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Section A

1 (a) l, w and T all sensible (73 mm < l < 79 mm, 22 mm < w < 28 mm and 9 mm < T < 16 mm) measured to the nearest mm with unit seen somewhere. B1

Measurements of l, w and T all repeated. B1

(b) M with unit and correct calculation of density with unit. B1
M to be in one of the ranges below, depending on the thickness of the stack.

T / mm	Minimum M / g	Maximum M / g
10	43	51
11	49	55
12	52	60
13	57	65
14	60	69
15	64	76

(c) (ii) Number of slides correctly calculated from M / m and from T / t with working clear. M1
(Allow non-integer values)

(iii) Possible comments, for example:

Values should be integers so all slides not identical if ratios are not integers /
Ratios should give same answer even if slides are not identical (because mass proportional to thickness) /
Not integers because of errors in the measurements /
Are integers, so slides in the stack are the same as the single slide /
Tape does not have the same effect on the mass and the thickness. A1 [5]

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2 **(a)** Normal and angle of incidence of 40º correct by eye. B1

(b) **(ii)** Approximately correct position for the reflected ray with one mark within 5.0 cm of the line indicating the column "For examiners use only" and the other mark within 2.0 cm of the front of the mirror (both measured along the ray). B1

(c) **(ii)** New position of the front of the mirror marked on diagram. B1

(iii) Approximately correct position for the new reflected ray about 10º below the horizontal (allow up to about 20º below by eye). B1

(Allow error carried forward for i = 50º, new reflected ray should be approximately horizontal (or vertical if L drawn on the left hand side of the normal).)

(v) θ = 36° to 44° from correct diagram. B1 [5]

3 **(a)** Circuit diagram showing power supply, resistor and capacitor in series. B1

Switch in parallel with the capacitor and voltmeter in parallel with the resistor. B1

(b) V_0 in the range 2.2 V to 3.5 V with unit seen somewhere and $0.5V_0$ calculated correctly. B1

(c) t in the range 20 (s) to 45 (s) M1

from repeat measurements with correct average and unit seen somewhere. A1 [5]

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Section B

4 Preliminary Results

(a) l in the range 1.5 cm to 3.0 cm, measured to the nearest mm with unit. B1

(b) $p > y$ with units seen somewhere in **(b)**. B1

$L < p$ with at least 2 measurements to the nearest mm. B1
(Apply units penalty once only in **(a)** and **(b)**)

(c) **(i)** Correct x. M1

(ii) Correct calculation of F in the range 0.39 N to 0.59 N with unit. A1 [5]

Table

(d) Table with units for M, y, p, L, x and F. B1

y, p, L and x increase as M increases for all readings with a minimum of 4 readings. B1

A minimum of two correct F values. B1

A minimum of four correct F values. B1 [4]

Correct F values are in the ranges specified below for each M.

M / g	Minimum F / N	Maximum F / N
100	0.44	0.54
200	0.88	1.08
300	1.32	1.62
400	1.76	2.16
500	2.20	2.70
600	2.64	3.24

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Graph

(e) Axes labelled with units and correct orientation. B1
(Allow e.c.f. from wrong unit in table but not no units.)

Suitable scale, not based on 3, 6, 7 etc. with plotted data occupying ≥ half the page in both directions. B1
(Allow the graph to start at the origin.)

Two points plotted correctly – check the two points furthest from the line.
This mark can only be scored if the scale is easy to follow. B1
(Points must be within ½ small square of the correct position.)

Best fit fine line and fine points or crosses. B1 [4]
(Line thickness to be no greater than the thickest lines on the grid.)

Calculations

(f) Straight line drawn on graph or tangent drawn to curve. M0

Use of a triangle that uses more than half the drawn line. A1

Correct calculation, 2/3 s.f. and in range 4.4×10^{-3} to 5.4×10^{-3} ($N\,g^{-1}$) (ignore unit). A1 [2]

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