Cambridge
O Level

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Cambridge Ordinary Level

PHYSICS **5054/31**

Paper 3 Practical Test **October/November 2016**

MARK SCHEME

Maximum Mark: 30

Published

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1 **(a)** **(i)** L_0 measured to the nearest mm or better and in the range 1.5 cm to 3.0 cm with consistent unit seen here or in **(a)(ii)**, **(a)(iii)**, **(b)(i)** or **(b)(ii)** B1

(ii)(iii) L_1 recorded to the nearest mm or better and e_1 calculated correctly with consistent unit seen here or in **(a)(i)**, **(b)(i)** or **(b)(ii)** B1

(b) $e_2 < e_1$. M1

(c) ρ calculated correctly to 2 / 3s.f. with unit A1

value in range 1.0 g / cm^3 to 2.0 g / cm^3 A1 [5]

2 **(a)** **(i)** bottom of the threads are separated by 30.0 cm so the top of the threads must be separated by the same distance *owtte* / vertical alignment with stands / doorframe etc B1

(ii) ensure that the half-metre rule is horizontal by measuring the height above the bench at each end and finding that they are the same.
or aligning with a horizontal line in the room, e.g. windowsill / top of door B1

(b) t in the range 8 s to 16 s with unit seen somewhere in **(b)** and using at least one repeat measurement with correct average B1

T calculated correctly to 2 / 3 s.f. with unit seen somewhere B1

T in the range 1.0 s to 1.4 s, when rounded B1 [5]

3 **(a)** V_1 in the range 0.55 V to 0.90 V to 0.01 V or better with unit seen here or in **(c)**
and I_1 in the range 0.30 A to 0.50 A to 0.01 A or better with unit seen here or in **(c)** B1

(b) correct calculation of R_1 in the range 1.0 Ω to 3.0 Ω with unit seen here or in **(d)** B1

(c) $V_2 < V_1$ and in the range 0.55 V to 0.90 V to 0.01 V or better with unit seen here or in **(a)**
and $I_2 < I_1$ and in the range 0.14 A to 0.27 A to 0.01 A or better with unit seen here or in **(a)** B1

(d) correct calculation of R_2 with $R_2 > R_1$ with unit seen here or in **(b)** B1

(e) when the current decreases, the voltage across the diode decreases (slightly) and the resistance of the diode increases or vice versa **and**
comment consistent with results B1 [5]

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4 Preliminary results

(a) (i) Approached the formation of the sharp image on the screen from both directions. B1

(ii) u_S in the range 79.0 cm to 84.0 cm. M1

Repeated measurements, correctly averaged with unit seen here or in **(b)(i)** A1

(b) (i) u_L in the range 16.0 cm to 21.0 cm with unit seen here or in **(a)(ii)**. B1

(ii) d and y calculated correctly (ignore units and s.f.) B1 [5]

(c) Table

column headings for D, u_S, u_L, d *and* y and units for D, d and y and results from **(a)(ii)** and **(b)** included B1

correct calculation of d and y B1

D values in the range 65.0 cm $\leqslant D \leqslant$ 95.0 cm B1

at least 5 results showing correct trend, y increases as D increases B1 [4]

(d) Graph

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

suitable scale, not based on 3, 6, 7 etc. with plotted data occupying $\geqslant$ half the page in both directions.
(allow origin, if present, to be included) B1

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
(points must be within ½ small square of the correct position) B1

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

(e) Calculations

use of two points that are on the straight line or two points on a tangent drawn to the curve. M0

(i) use of a triangle that uses more than half the drawn line to calculate the gradient A1

(ii) f in the range 13 (cm) to 17 (cm). (Ignore s.f. and unit) A1 [2]

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