



**Cambridge International Examinations**  
Cambridge Ordinary Level

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**PHYSICS**

**5054/31**

Paper 3 Practical Test

**October/November 2016**

MARK SCHEME

Maximum Mark: 30

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**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)  $\rho$  calculated correctly to 2/3s.f. with unit A1  
value in range  $1.0 \text{ g/cm}^3$  to  $2.0 \text{ g/cm}^3$  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  $1.0 \Omega$  to  $3.0 \Omega$  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  $65.0 \text{ cm} \leq D \leq 95.0 \text{ cm}$  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  $\geq$  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  $\frac{1}{2}$  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]