MARK SCHEME for the October/November 2014 series

5054 PHYSICS

5054/31   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, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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1   In (a), (b) and (c) penalise missing unit once only and incorrect precision once only.

    (a) sensible l, w and h with repeats seen <u>and</u> at least one measurement to the
        nearest mm or better <u>and</u> unit seen on one measurement in (a), (b) or (c)   B1

    (b) S_1 and S_2 measured with at least one measurement to the nearest mm or better
        <u>and</u> e in the range 5.0 cm to 10.0 cm with unit seen somewhere   B1

    (c) $e_N < e$ B1

    (d) correct substitution for M calculation and $130\,g \leqslant M \leqslant 170\,g$ B1

        ρ in range 0.45 to $0.95\,g/cm^3$ with unit <u>and</u> 2 or 3 significant figures   B1

        [5]

2   (a) correct normal and angle of incidence = 60°   B1

    (c) P_1 and P_2 labelled with one point within 2 cm of the block and the other beyond
        the side edge of the block or just above the Fig. 2.2 label   B1

    (d) correct construction inside the block and line L extended as L′   B1

        l and d measured correctly from approximately parallel lines with at least one
        measurement to the nearest mm and with unit seen on one of the quantities   B1
        $\dfrac{d}{l}$ in the range 0.40 to 0.45 (ignore unit if given)   B1

        [5]

        allow ecf from i = 30° with range 0.14 to 0.24

3   (a) h in the range 0.09 m to 0.18 m and s in the range 0.700 m to 0.900 m with at least
        one measurement to the nearest 0.001 m or better.   B1
        do **not** accept answer in cm unless m crossed out and replaced by cm

    (b) $M \approx 0.2\,kg$ and $0.05\,kg \leqslant m \leqslant 0.300\,kg$
        do **not** accept answers in g unless kg crossed out and replaced by g   B1

        t repeated with correct average and in the range 0.5 s to 2.5 s   B1

    (c) correct substitutions into the equations in (i) to (iv)   B1

        correct substitution giving positive F in the range 0.4 N to 1.2 N with unit   B1

        [5]

4   Preliminary Results

(a) **(i)** V_0 in the range 1.0 V to 2.2 V to 0.1 V or better with unit seen here or
in **(c)(ii)**   B1

   (ii), (iii) L in the range 98.5 cm to 100.5 cm and K calculated correctly to > one
significant figure (ignore unit)   B1

   [2]

(b) **(i)** V in the range 0.6 V to 1.5 V to 0.1 V or better with unit seen here or in **(a) (i)**
<u>and</u> V must be less than V_0 unless an incorrect value of V_0 is obtained   B1

   [1]

Table

(d)   table with units for V and l B1

   answer to **(c) (ii)** included in the table (same value)   B1

   at least 5 points evenly distributed, with correct trend, V increases as l increases   B1

   range of at least 70.0 cm used   B1

   [4]

Graph

(e)   axes labelled with units and correct orientation   B1
(allow ecf 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
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 straight line and fine points or crosses   B1

   [4]

   line thickness to be no greater than twice the thickness of the thickest lines on the
grid

Calculations

(f) straight line drawn on graph or tangent drawn to curve and values from the straight line or tangent must be used for the gradient calculation   M0

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

correct reading of the sides of the triangle from a sensible scale   A1

(g) (ii) correct substitution including R in range $5.0\,\Omega$ to $15.0\,\Omega$ M1

correct calculation giving X in the range $\frac{1}{6}R$ to $\frac{1}{2}R$ with unit and 2 or 3 significant figures   A1

[4]