UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

5054 PHYSICS

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

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UNIVERSITY of CAMBRIDGE
International Examinations

1 **(a)** Position of the centre of mass of the rule in the range 48.0 cm to 52.0 cm measured to the nearest mm or 0.1 mm with unit. B1 [1]

(b) **(i)** x < 50.0 cm, measured to nearest mm or 0.1 mm with unit. B1

y < x measured to the nearest mm or 0.1 mm with unit. B1

(Penalise unit error once only and precision error once only in **(a)** and **(b)**)

(ii) Take readings either side of the mass and average /
Use the slot in the mass to act as a guide as to the location of the centre of the mass /
Measure diameter and halve it. Add to reading at LHS of mass or subtract from reading at RHS. B1

(iii) Correct calculation with value 40.0 ± 3.0 g to 2/3 s.f. and unit. B1 [4]

[Total: 5]

2 **(a)** **(i)** t_1 value in range 5 s to 35 s with unit seen here or in **(a)(ii)** or **(b)**. B1

(ii) Correct calculation of T_1 with unit seen here or in **(a)(i)** or **(b)**. B1 [2]

(b) t_2 and T_2 found correctly with $T_2 < T_1$, with unit seen somewhere in **(a)** or **(b)** and a repeat here or in **(a)(i)**. B1 [1]

(In **(a)** and **(b)**, penalise units once only.)

(c) Correct calculation of ratio with value in the range 0.70 to 1.00 and no unit. M1

Ratio in range 0.80 to 0.9 and 2/3 s.f. A1 [2]

[Total: 5]

3 **(a)** Sensible value of θ_1 measured to the nearest °C or better with unit. B1 [1]

(b) **(i)** θ_2 > 70 °C measured to the nearest °C or better with unit. B1

(ii) Sensible value of θ_3 measured to the nearest °C or better with unit and 2.0 °C to 8.0 °C higher than θ_1. B1 [2]

(In **(a)** and **(b)**, penalise missing or wrong unit once only.)

(c) Correct calculation and c_M in the range 0.20 to 0.60 (J / (g °C)). M1
(Ignore minor substitution errors.)

c_M in the range 0.30 to 0.50 J / (g °C) with unit. A1 [2]

[Total: 5]

4 Preliminary Results

(a) *L* recorded and in range 9.8 cm to 10.2 cm with unit and *V* in the range 0.02 V to 0.20 V. B1

I in the range 80 mA to 220 mA, to the nearest 10 mA or better with unit. B1 [2]

(b) Correct calculation of *R* with unit. B1 [1]
(Expect 0.2 Ω to 1.0 Ω unless ecf from current)

Table

(c) Table with units for *L*, *V*, *I* and *R*. B1

Range of *L* up to at least 80.0 cm. B1

Even distribution of points. B1

4 good values of *V* and *I*. Expect *V* increases as *L* increases and *I* remains approximately constant. B1

8 good values of *V* and *I*. Expect *V* increases as *L* increases and *I* remains approximately constant. B1 [5]

(Incorrect calculations of *R*: remove one of the good values marks. Systematic errors in *V* or *I*: remove one or both of the good values marks. Allow error carried forward if any of these problems were penalised in **(a)**.)

Graph

(d) Axes labelled with units and correct orientation. B1
(No ecf from table)

Suitable scale, not based on 3, 6, 7 etc. with data occupying more than half the page in both directions. 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. 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

(e) Triangle (from straight line or tangent) uses more than half the drawn line. B1

Correct calculation (from straight line or tangent)
(Ignore unit) B1

For 28 swg constantan, value in range 0.040 (Ω/cm) to 0.049 (Ω/cm) to 2/3 s.f. B1 [3]

Alternative wires

Wire	minimum value/ Ω/cm	maximum value/ Ω/cm
26 swg constantan	0.027	0.033
30 swg constantan	0.057	0.069
26 swg nichrome	0.059	0.072
28 swg nichrome	0.088	0.107
30 swg nichrome	0.125	0.153
32 swg nichrome	0.165	0.201
metric 0.63 mm diameter nichrome	0.031	0.038