UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

5054 PHYSICS

5054/03 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 must be read in conjunction with the question papers and the report on the examination.

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Marking scheme – general points

Where the marking scheme does not give specific instructions, apply the following penalties:

- Disregard of instructions leading to poor presentation or error –1
- Systematic error –1
- Supervisor's help

No penalty for correction of faulty apparatus.
No marks to be awarded where the candidate is at fault in the section where he/she was helped. E.g. if told how to use the apparatus in question 2 then the one observation mark in 2(a) cannot be scored but subsequent marks can score.

Marking scheme code

B1 Independent mark.

M1 Method mark, if not given subsequent A mark falls (up to the next B, M or C mark).

A1 Answer mark, not awarded if an M mark immediately before it is not awarded.

C1 Compensation mark, given automatically if the answer is correct, i.e. working need not be seen if the answer is correct. Also given if the answer is wrong but the point is seen in the working.

1 **(b)** t_1 recorded to the nearest second or better with unit and in the range 5 to 40 seconds. B1

(d) t_2 recorded to the nearest second or better with unit and greater than t_1. B1
(No error carried forward)
(Be aware that some t_2 values are as high as 8 minutes)
(Use unit penalty once only in parts **(b)** and **(d)**)

(e) Correct calculation of the rate of fall of temperature for both the insulated and uninsulated thermometers with unit. B1

Comment that rate of fall has been reduced. B1
(Do not accept discussion of insulating properties of tissue unless related to rate of fall of temperature)

(f) Thermometer at same temperatures therefore 'fair test' / Conditions are the same in both experiments. B1 [5]

2 **(c)** x_1 found from the difference of two scale readings. B1

x_1 recorded to the nearest mm or better with unit and sensible value as indicated by second value of x/M within 10% of first value. B1

(d) x_2 recorded to the nearest mm or better with unit and sensible value as indicated by second value of x/M within 20% of first value. B1
(Apply unit penalty once only in **(c)** and **(d)**)

(e) Both x/M values calculated correctly with unit. B1

Either Values are close (provided they are within 20% of each other) so suggestion is supported.
Or Values are different (provided they differ by more than 20%) so suggestion is not supported.
Or Candidate draws a valid conclusion based on his/her sensible suggested percentage difference. B1 [5]

3 **(a)** t in the range 1.5 s to 2.5 s with unit. B1

At least three readings and correct average. B1

The following penalties then apply:
- 1 if all times quoted to the nearest second
- 1 if systematic error in time i.e. 0.020 seconds

(b) Front of ball used as start point (and pile of paper at end of runway as end point) / other valid method. B1

(c) Acceleration correctly calculated. M1
in the range 0.25 to 0.70 ms^{-2} to 2/3 s.f. with unit. A1 [5]

4 (a) **Circuit diagram.**
Power supply, switch and resistor in series, with correct circuit symbols and points A and B labelled. B1

Voltmeter and only voltmeter in parallel with A and B. B1

(b) **Initial readings.**
V in the range 0.6 V to 1.2 V, recorded to 0.1 V or better with unit. B1
(rounded to 2 s.f. by examiner)

Correct calculation of power (ignore unit here). B1

(c) **Table**
Table with units for *V* and *P.* B1

Correct values for *R* & *V* for 100 Ω resistor combinations.
i.e. $V_{200} > V_{100} > V_{50}$ M1

Correct values of *R* &*V* for 1000 Ω resistor combinations.
i.e. $V_{2000} > V_{1000} > V_{500}$ M1

All values of *V* for 1000 Ω combinations greater than all values of *V* for 100 Ω combinations. A1

Correct calculation of power showing correct trend with values of power to > 1 s.f. B1

Resistance / Ω	Voltage / V	Power / mW
100	0.94	8.8
200	1.43	10.2
50	0.55	6.1
1000	2.46	6.1
2000	2.70	3.6
500	2.08	8.7

(d) Graph

Axes labelled with unit and correct orientation. B1

Suitable scale which allows all the data to be plotted with the data occupying more than half page in both directions and scale is easy to follow; no 3s, 6s, 7s etc.
(Allow inclusion of 0.0 mW) B1

All points that can be plotted using the available scale should be plotted.
Check two points plotted correctly from an easy to follow scale, within the correct small square and within ½ small square of the correct position. Check the two points furthest from the line. B1
Best fine line and fine points. B1

(e) Calculations.

R read correctly from graph irrespective of line. B1

In range 150 Ω to 300 Ω with unit, from good curve. B1 [15]
(Allow e.c.f. wrong unit from table or graph)