UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education O Level

MARK SCHEME for the November 2004 question paper

5054 PHYSICS

5054/04 **Paper 4 (Alternative to Practical), maximum mark 30**

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UNIVERSITY of CAMBRIDGE
International Examinations

NOVEMBER 2004

GCE O Level

MARK SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 5054/04

PHYSICS
(Alternative to Practical)

UNIVERSITY of CAMBRIDGE
International Examinations

1 **Accept answers from text or drawing**

Method 1. **Turns, N>1, on rule**

(a) Chosen method is evident from diagram or text. B1
(b) Uses two readings, accept zero if stated or on diagram, also accept Δx, and N, text or diagram B1
(c) **(i)** Some method to prevent the wire moving, use plasticine or tight coils, on diagrams accept blobs to mean plasticine. B1
(ii) How to avoid parallax/coils close/tight together/accept $d = \Sigma d/N$ (as calc) here. B1
(d) Text or equation $d = \Delta x/N$ B1
(e) Each turn has contributed/average of N turns, also accept "*d = Σd/N is an average*"/no wire will have a constant diameter. B1

{6}

Method 2. **N Turns on the reel**

(a) Accept statement if Δx within end stops of reel and N mentioned. B1
(b) Even if method **2(a)** not awarded; Uses two readings, accept zero if stated or on diagram, also accept Δx, and N, text or diagram B1
(c) **(i)** Some method to prevent the wire moving, use plasticine or tight coils, on diagrams accept blobs to mean plasticine. B1
(ii) How to avoid parallax/coils close/tight together/accept $d = \Sigma d/N$ (as calc) here/rule close to reel B1
(d) Text or equation $d = \Delta x/N$ B1
(e) Each turn has contributed/average of N turns, also accept "*d = **Σd/N is an average***"/no wire will have a constant diameter. B1

{6}

Method 3. **Misreading of Question, Measurement of diameter of the reel by using a loop of wire.**

(a) Length of "loop" of wire identified/or loop **"**remade**"** on bench/do not accept use of end stops B1
(b) Length of loop measured B1
(c) **(i)** Some method to prevent the wire moving, use plasticine B1
(ii) How to avoid parallax/use a second loop or more B1
(d) Uses $d = c/\pi$ B1
(e) Using two wires gives an average/no loop is a perfect circle. B1

{6}

Method 4. **Using more than one piece. {Do not accept use of holes}**

(a) Several lengths of wire and rule mentioned B1
(b) Some detail how rule is used to measure *d, e.g. wires place across rule etc.* B1
(c) **(i)** How wires fixed B1
(ii) How to avoid parallax when taking **one** reading. B1
(d) Explains how *d* is obtained from **more** than one measurement. B1
(e) Each piece of wire has contributed/say the method using wires and gives average. B1

{6}

2. **(a)** Suitable table (boxes or space) for five sets of θ, *I, V, R (or R=V/I), N.B. R = V/I therefore accept θ,R and one other (i.e. 3 quantities).* B1
Four labels, words or symbols. B1
Correct units for the three quantities given in the table. B1
[3]

(b) Any two from:- wait for equilibrium/heat slowly/stir/place thermometer near R/reference to length of thermometer immersed/tap meters (having pointers)/tight connections/<u>how</u> to avoid parallax (equivalent to line of sight perpendicular to reading) leave thermometer in oil when reading the temperature. B2
[2]

(c) Oil has a high resistance between input leads/water low resistance/similar/ oil less volatile/evaporation/experiment quicker/specific heat capacity low/bigger range of temperature. B1
[1]

{6}

3. **(a)** 0, unit not required, B1
ice melts at 0°C (or reverse) accept statement even if subsequent reason is wrong/good comment re ice-water mix B1
[2]

(b) **(i)** Diagram showing….liquid level in test tube <u>*just*</u> within the thickness of ice B1

(ii) 1. All liquid would be at 0°C/cooling more effective B1
2. Large enough to give accuracy/small enough not to take too long to cool/thermometer 1/3rd immersion B1
[3]

(c) 14 °C (unit required) B1
[1]

{6}

4. **(a)** Incident ray starting from O, and correct through points, neat and thin (arrows not required) B1
Emergent ray, " B1
Angle, 138° or 42° +/- 1° B1
[3]

(b) Correct ray through the prism, (ignore drawing qualities) (need not be labelled) B1

(c) Position such that OE along the ray = 25 cm, using see-through graph paper, E is on the ray and on or "beyond" the second horizontal thick line. B1

(d) "Correct" angle shown (normal and ray), accept numerical value of about 35°/accept correct label *i* B1
[3]

{6}

5 **(a)** Axes: correct, non awkward uniform scale, may use true origin, scale cannot be double, axes labelled with units. B1

Plotting: correct to nearest ½ small square (check any one but also penalise obvious miss plot), no plotting mark for awkward scales B1

Line: good judgement re plots, smooth and does not meander through the points, B1

thin neat line B1

[4]

(b) 21 mm of scale between the labels/smallest amount of scale between labels/equiv B1

[1]

(c) Magnification increases B1

[1]

{6}

Paper total 30