Length & Time

Mark Scheme 2

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	General Physics
Sub-Topic	Length & Time
Paper Type	Alternative to Practical
Booklet	Mark Scheme 2

Time Allowed: 60 minutes

Score: /50

Percentage: /100

1 **(a** tape measure   [1]

 (b)   symbols for ammeter, voltmeter and resistor (for copper wire) correct   [1]
              note: accept in wrong places for this mark

              variable resistor or potential divider present with symbol   [1]
              NOT if labelled "copper wire"

              ammeter in series and voltmeter in parallel with copper wire / resistor   [1]
              note: do NOT award this mark if there is no power supply

 (ii)   observe current shown on ammeter (ignore any reference to a voltmeter)   [1]
              accept change variable resistor / use rheostat (to see if it then glows)
              accept 'change current' as meaning changing variable resistor
              ignore checking wires or changing power supply or use of a voltmeter
              accept connect lamp directly across supply

 (iii)   no, deflection too small / range too large (owtte)   [1]
              accept 'scale' for range
              accept suggestion of alternative maximum meter
              accept readings not precise enough / sensitivity not sufficient;
              accept accurate for precision, ignore misuse of 'reliable'
              ignore 'circuit voltage not large enough'

                                                                                                    [Total: 6]

2   **(a**   1.925, 1.800, 1.670, 1.570, 1.410, 1.275 (2 or more sig. figs.)   [1]
        all *T* values consistently to 2 or 3 significant figures   [1]

    (b) any one from:
        gives a more accurate <u>value of *T*</u>
        gives an average value (of *T*)
        reduces (effect of) human reaction error
        reaction time less significant
        T too small / oscillations are too quick / bob swings too fast   [1]

    (c) avoidance of parallax error <u>explained</u>   [1]

    (d) blocks arranged parallel either side of bob and touching bob   [1]
        rule correctly placed, touching the blocks and spanning the gap   [1]

                                                                                                                                    [Total: 6]

3 **(a** appropriate precaution (can be written or diagram):
e.g. take reading with eye line perpendicular to rule / use set square to ensure rule vertical [1]

(b) h recorded, increasing and with consistent 2 or 3 sig. figs. [1]
H = 10.0, 19.5, 30.5, 39.0, 49.5 [1]

(c) T seen and T^2 = 1.96, 1.54, 1.18, 0.80, 0.40 [1]

(d) axes labelled with appropriate scales [1]
plots correct [1]
well judged line [1]
thin neat line, fine plots [1]

(e) G recorded to 2 or 3 sig. figs. (expect range (–)0.032 to (–)0.047)
<u>and</u> triangle method seen <u>on graph</u>, using at least half of line [1]

(f) appropriate change <u>which improves reliability</u>:
e.g. repeat readings for each length (and take average) / greater no. of oscillatio [1]

[Total: 10]

4 **(a** **(i)** 3.1 cm (31 mm), unit required [1]

(b) table:
s, s [1]
31.(0) e.c.f. **(a)** [1]
1.12 c.a.o. [1]

(c) statement matches results (expect NO) [1]
justification using idea of within or beyond limits of experimental accuracy (o.w.t.t.e.) [1]

(d) <u>straight</u> line / constant gradient [1]
through the origin [1]

(e) has <u>no</u> effect [1]

[Total: 9]

5   **(a** m = 180.2(0) and unit (g)   [1]
             V_1 value = m [1]
             unit <u>cm</u>^{3} c.a.o.   [1]

    (b) V_2 = 170 c.a.o.   [1]

    (c) d_1 = 7.35 to 7.4, d_2 = 5.0 to 5.1, h = 7.9   [1]
         D = 6.2 to 6.3 allow e.c.f.   [1]
         V_3 = 239 to 246 <u>and</u> 2 or 3 significant figures only allow e.c.f.   [1]

    (d) method 2 – one from:
         some water left in cup/spilt
         measuring cylinder not read at eye level/perpendicularly/bottom of meniscus
         parallax explained   [1]

         method 3 – one from:
         d_1 not at liquid level
         d_1 and d_2 not inside diameters
         difficult to measure h (because of sloping side)
         h not measured at eye level/perpendicularly/parallax explained   [1]

    (e) mass of cup / zero reading on balance   [1]

                                                  [Total: 10]

6   **(a** V_1 = 74   [1]
         Line of sight perpendicular to scale   [1]
         Perpendicular line continues to measuring cylinder at surface level   [1]

    (b) V_2 = 81, V_G = 7 (ecf allowed)   [1]
         All volumes in cm^3, unit given at least once, not contradicted   [1]

    (c) ($V_3 - V_1$) = 24, V_A = 17 (ecf allowed)   [1]

    (d) Any three from:
         V_A: Finger increases V_3 / tube not pushed in far enough
              Some water in test-tube/air is compressed
         V_W: Water remaining in tube
              Water remaining in measuring cylinder
              Tube overfilled, wtte (surface tension effect)   [3]
         Either V_A or V_W (accept only once):
             Measuring cylinder readings not very sensitive
             Subtraction produces large percentage uncertainty

                                                  [Total: 9]