MARK SCHEME for the October/November 2011 question paper

for the guidance of teachers

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.

1 **(a)** **(i)** pins P_3 and P_4 at least 5 cm apart [1]

     (ii) normal correct position and at 90° [1]

    (b) **(i)** **AB** drawn neatly and $r = 20° \pm 2°$ [1]

     (ii) $i = 32° \pm 2°$ and unit shown at least once and no contradiction [1]

    (c) view bases of pins / keep line of sight low / view close to table [1]

                                                          [Total: 5]

2 **(a)** 83 (°C) [1]

    (b) 5460 [1]
        7140 and J at least once, not contradicted
        ecf θ_h from **(a)** [1]

    (c)

     (i) no, difference too large [1]

     (ii) any sensible suggestion involving heat loss to surroundings/ heat gained by
            container [1]

    (d) ticks in boxes 3 and 4 [2]
        (–1 for any extra ticks in boxes 1, 2, 5 or 6 to minimum of 0
        if only two boxes ticked, 1 correct and 1 incorrect scores 1 mark)

                                                          [Total: 7]

3 **(a)** table:
        l in m [1]
        V in V, I in A, R in Ω (words or symbols) [1]
        R values 1.6875, 3.4375, 5.03125 (2 or more significant figures) [1]
        R values consistent 2 or 3 significant figures [1]

    (b) R (directly) proportional to l o.w.t.t.e. [1]
        numerical example given, allow two ratios [1]
        idea of within limits of experimental accuracy [1]

    (c) prediction 10 → 10.35, no unit needed [1]
        working shown [1]

(d) two from:
   wire gets hot / burns out
   meter damaged
   wire gets floppy / expands
   higher meter readings / readings off scale
   power source cuts out / fuses
   resistance of wire increases [2]

[Total: 11]

4 **(a)** any one from:
   use of darkened room
   how to avoid parallax when taking readings
   moving lens back and forth to obtain clearest image
   mark at centre of lens holder
   place / secure ruler on the bench
   lens, object, screen perpendicular to the bench [1]

   (b) correct graph:
   axes labelled and scales [1]
   all plots correct to nearest ½ small square [1]
   well-judged best-fit line [1]
   thin line and small plots, ≤ ½ small square [1]

   (c) both intercepts correct to ½ small square [1]
   both between 6.4 and 7.0 [1]

[Total: 7]

5 **(a)** **(i)** h = 3.6, w = 3.4, d = 3.2 (cm)   c.a.o. [1]

   (ii) V = 39 OR 39.2 OR 39.17 OR 39.168 AND cm^3 ecf **(i)** [1]
   ρ = 2.6 OR 2.63 OR 2.64, ignore significant figures and unit,   ecf [1]

   (b) **(i)** V_1 = 50 (cm^3) [1]

   (ii) V_2 = 64 (cm^3) [1]

   (iii) bottom of meniscus, direct vision [1]

   (iv) V_s = 14 (cm^3)   ecf **(i)(ii)**

   (v) ρ = 2.46, 2 or 3 significant figures AND g/cm^3 ecf **(iv)** [1]

(c) (i) two from:
difficulty of making perfect cuboid shape   o.w.t.t.e.
measuring cylinder readings only to nearest cm^3 o.w.t.t.e.
smaller mass so greater inaccuracy
volume of thread not taken into account
air bubbles in clay / uneven density distribution / clay may absorb water / some
clay may stick to the knife   [2]

(ii) either method but with sensible matching reason   [1]

[Total: 10]