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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
1  (a) $h_0$ present and $H_0 = 84.0 \text{(cm)}$ [1]

(b) suitable explanation, 
   e.g. same no. of graduations between 60 cm mark and each end of mass owtte, 
   or mark on side of rule and mass [1]

(c)(d) $h$ present and $H = 83.0$ [1] 

$D = 1.0$ and $d \times D$ calculations correct: 60, 75, 100, 111, 100 [1]

(e) $d \times D$ not constant / $D$ doesn’t always double when $d$ halves owtte [1]

(f) (i) reference to mass/weight of rule [1]

(ii) measure height at bench [1] 
   subtract $H_0$ [1] 

[Total: 8]

2  (a) $\theta$ for A 76 (°C) and for B 79 (°C) [1]

(b) units all correct [1] 

$t$ values correct 0, 30, 60, 90, 120, 150, 180 [1]

(c) statement matching temperature changes with justification referring to results and involving correct comparative change in temperature [1] 

justification has specific mention of temperature change in the same time owtte [1]

(d) appropriate source of inaccuracy associated with procedure e.g. any one from: 
   - water levels not the same 
   - thermometer scales not read at 90° 
   - initial temperatures different 
   - not able to stir water 
   - not waiting for temperature to stabilise initially / waiting time not long enough [1]

(e) any two factors relating to apparatus from: 
   - keep thermometer at same depth 
   - same size/thickness/material of test-tube / same test-tube 
   - same water levels/volume/quantity/amount of water 
   - same thickness/surface area of surface material [2]

[Total: 8]
3 (a) \( h_0 = 2.0 \text{ (cm)} \) [1]

(b)(c) \( h_1 = 1.9 \text{ (cm)} \) [1]

\( S \) values round to 1.1 (allow ecf), 1.3, 1.7, 2.0, 2.2, 2.5 [1]

(d) graph:
- axes labelled with quantity and unit and in correct orientation [1]
- appropriate scales [1]
- plots correct to \( ½ \) small square [1]
- well-judged straight line and thin continuous line, precise plots [1]
- triangle method/information for gradient seen marked on graph [1]

(e) (i) \( G \) calculated from at least \( ½ \) line [1]

(ii) \( f \) in range 15 – 19 (cm) [1]

[Total: 10]

4 (a) (i) (as \( \theta \) increases) \( d \) increases (to a maximum at 40°/between 40° and 50°/between 30° and 40°) then decreases [1]

(ii) both in range 15 to 35 (cm) [1]

(b) any suitable means of detecting \( d \) more easily, e.g. any one from:
- sand tray
- use of carbon paper
- ink on ball
- fixing rule to floor
- use of video
- reference to releasing ball remotely
- mark approximate point and repeat to confirm [1]

(c) repeats owtte [1]

qualification or detail regarding repeats, e.g. repeat at each value of \( \theta \)/repeat and take an average/take more sets of readings/repeat for \( \theta \) values between those given in table [1]

[Total: 5]
5 (a) voltmeter in parallel with lamp L and with correct symbol [1]

(b)(c) table:
\[ V = 1.7 \text{(V)} \] [1]
\[ I = 0.18 \text{(A)} \] [1]
\[ R = 9.4(4) \text{ecf (b), 7.6/7.58 with 2 or 3 sig. figs.} \] [1]
all units correct (V, A, Ω) [1]

(d) statement matches results, with matching justification which refers to values being 'too different'/'difference beyond limits of experimental accuracy' owtte [1]

(e) lamp in circuit 1 brighter than in circuit 2 and has greater resistance [1]

(f) correct circuit symbol for variable resistor (rectangle with strike-through arrow only) connected in correct series circuit [1]

[Total: 9]