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 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
1. (a) \( d_0 = 21 \text{ (mm)} \)  

(b) \( D_o = 210 \text{ (mm)} \) or \( 10 \times \text{candidate’s (a)} \)  

(c) \( L \) values 1.0, 2.0, 3.0, 4.0, 5.0  
\( e \) values 1.0, 9.0, 21.0, 29.0, 40.0  

(d) Graph:  
Axes correctly labelled with quantity and unit and correct way around  
Suitable scales  
All plots correct to \( ½ \) small square  
Good line judgement and a single, thin, continuous line  

(e) Triangle method used and shown on the graph  
Using at least half of line  

(f) Any one from:  
Always measure from same point on spring (top or bottom of ring)  
Wait for spring/weight to stop bouncing  
Use of horizontal aid/ensure ruler is vertical  
Bench surface not uniform  

[Total: 11]

2. (a) \( \theta_k = 24^\circ \text{C} \)  

(b) (i) Table:  
\( s, \ ^\circ \text{C}, \ ^\circ \text{C} \)  

(ii) About the same  
Justified with reference to numbers in table  

(c) Any two from:  
Volumes of water  
Room temperature/draughts  
Same beaker  
Initial water temperature  

[Total: 6]
3 (a) Correct symbols for ammeter, voltmeter and lamps
   Ammeter and voltmeter in correct positions
   Correct parallel circuit [1]

(b) (i) and (ii) $V_A = 1.9(V)$ $R_A = 2.9(2) (\Omega)$
   Units $V$ and $\Omega$ [1]
   (iii) Pointer at correct position (0.65) [1]

(c) No mark awarded

(d) Statement matches readings (expect YES)
   Justified with idea of experimental inaccuracy
   (expect ‘close enough’, owtte) [1]

[Total: 8]

4 (a) Trace:
   Normal at $90^\circ$ in correct position
   Angle of incidence = $30^\circ \pm 2^\circ$ [1]

(b) $P_1P_2$ distance $\geq 5.0 \text{ cm}$
   $P_3P_4$ line and line $GE$ correctly and neatly drawn [1]

(c) (i) $r = 18$ or 19 or 20
   (ii) $i/r$ value correct [1]

(d) (i) $i/r$ value 1.54 and both $i/r$ values with no unit and to 2 or 3 significant figures
   (ii) Idea of within (or beyond) limits of experimental accuracy [1]

[Total: 8]
5 (a) Measuring cylinder
   Tape measure
   Newtonmeter (spring balance)
   Electronic balance
   Manometer
   1 mark each  [5]

(b) (i) Viewing scale perpendicularly (owtte)  [1]

(ii) Any one from:
   Moving lens back and forth
   Dark area (owtte)
   Object and lens at same height from bench
   Object lens and screen at right angles to bench  [1]

[Total: 7]