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 May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
1 (a)(i)(ii) $m_1 = 40.68 \text{ (g)}$ and $m_2 = 113.60 \text{ (g)}$

   correct answer only (not 40:68, 113:60) [1]

   (iii) $V_1 = 72 \text{ (cm}^3\text{)}$ correct answer only [1]

   (iv) $\rho_1$ with unit of $g/\text{cm}^3$ or $kg/m^3$ seen in (a), (b) or (c) and not contradicted

           (unit must match value) [1]

(b)(i)(ii) $m_3 = 15.47 \text{ (g)}$ and $V_2 = 88 \text{ (cm}^3\text{)}$ correct answer only [1]

   (iii) $V_3 = 16 \text{ (cm}^3\text{)}$/ecf [1]

   (iv) $\rho_2$ to 2/3 sig. figs. [1]

(c) $\rho_{AV} 0.99(1) \text{ (g/cm}^3\text{)}$ or $991/990 \text{ (kg/m}^3\text{)}$ or ecf from (a) and (b) [1]

(d) any one from:

   • take reading perpendicularly/ at right angles to scale
   • read bottom of meniscus
   • other suitable precaution [1]

(e) appropriate source of inaccuracy, other than in (d)

   e.g. balance not at zero/test-tube catches on side of measuring cylinder [1]

   matching effect on $\rho$ with explanation
   e.g. $\rho$ greater as mass reading larger/ $\rho$ greater as volume smaller [1]

[Total: 10]

2 (a)(b) 87 and 89, both correct answer only [1]

(c) units correct in symbols or words, $s$, °C, °C [1]

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

(d) appropriate pattern which fully matches results

   e.g. rate of temperature drop greater at start than at end

   NOT stated pattern which partly matches results [1]

(e) statement matching temperature changes

   (expect ‘Yes’ but accept ‘No’ or ‘no significant difference’ if ecf) [1]

   justification referring to results and involving comparative change in temperature

   with specific mention of in the same time. [1]
(f) any two from:
- room temperature/external temperature (but not outside temperature)/ environmental factor such as draughts/sunshine
- initial water temperature/start temperature
- same amount of stirring/wait same time before reading
- keep thermometer at same depth
- same size/thickness/material/surface area of beaker
- same volumes of water

[Total: 8]

3 (a)(b) 2.8
0.9(0)
units both correct, symbols or words, V, A

(c) (i) 3.1(1)/ecf, 2.0/1.95, 1.0(0) penalise rounding errors
correct unit seen once and not contradicted

(ii) statement matches results (expect ‘Yes’ but allow ‘No’ if ecf >10%) with matching and correct justification (which refers to figures)
(e.g. ‘within limits of experimental accuracy’ owte for ‘Yes’ or ‘too different’ for ‘No’)

(d) any one from:
- switch off between readings
- only switch on for short time
- use smaller currents/p.d.s
- suitable means of dissipating thermal energy

[Total: 7]

4 (a) correct symbols for ammeter and variable resistor (rectangle with diagonal strike-through arrow only)
correct series circuit accept use of potential divider symbol only if correctly shown in parallel circuit

(b) (i) 8.24 and 12.36 correct answer only
(ii) expect ‘Yes’ but allow ecf for incorrect M values appropriate justification referring to figures

[Total: 5]
5  (a)  (i)  \( w = 2.6 \) to \( 2.5 \) and \( h = 2.5 \) to \( 2.4 \)  

(ii) \( s = 2.6 \) or correct rounding from candidate’s values  

(iii) appropriate reason e.g.  
• \( w \) and \( h \) not always the same (NOT ‘increase at different rates’) (need reference to square shape – NOT just ‘distorted’)  
• difficult to measure shadows/edges not distinct  
• card might not be perpendicular/card might be tilted  
• lamp is not a point source  
• improve reliability  

(b) axes labelled with quantity and unit  

scales appropriate, plots covering at least \( \frac{1}{2} \) grid  
plots correct to \( \frac{1}{2} \) small square  
well judged curve  
thin, continuous line, precise plots  

(c) large gap between plots for 25 and 15 cm  
allow gaps becoming larger/ to ensure curve is consistent  
NOT ‘more plots, more accurate’, ‘make line more accurate’  

(d) any suitable reason e.g.  
• shadow would be too big (for screen)  
• difference between \( w \) and \( h \) becomes larger  
• shadows become less distinct/more blurred/too distorted  

[Total: 10]