**M1.**          (a)     (i)      spilling boiling / hot water

*accept any sensible suggestion*

**1**

suitable precaution to reduce risk from hot water eg

clamp the probe / complete the experiment standing

*accept any sensible answer but must be linked to the named risk*

**1**

(ii)     3 (V)

*allow* ***1*** *mark for substitution into correct equation  
ie 0.5 × 6*

**2**

(b)     (i)      resistance of thermistor decreases

**1**

therefore the current in the circuit increases

**1**

causing a bigger share of the p.d. across 6 Ω resistor

**1**

(ii)     0 – 100 (°C)

*accept 10° – 100°C*

**1**

(iii)     20°C to 40°C

**1**

because a small temperature change gives a bigger  
voltmeter reading change

**1**

(c)     thermostat

*accept a correct description of a use*

**1**

**[11]**

**M2.**          (a)     (i)      A1 = 0.5

*ignore any units*

**1**

A = 0.5



*allow* ***1*** *mark for A1 = A4 ≠ 0.5*

**1**

(ii)     the resistance of **P** is more than 20 Ω

**1**

         a smaller current goes through P / A2 (than 20 Ω)

*dependent on getting 1st mark correct  
accept converse*

**1**

(b)     (i)      potential difference = current  resistance



*accept pd / voltage for potential difference  
accept V = I  R, correct symbols and correct case only  
accept volts = amps  ohms  
accept   
  
provided subsequent method is correct  
allow combination of  
physical quantities and named units  
allow voltage = I  R*



**1**

(ii)     6

*allow* ***1*** *mark for correct substitution*

**2**

(iii)     6

*accept their (b)(ii)*

**1**

(c)     thermistor or



*accept correct circuit symbol  
allow phonetic spelling*

**1**

resistance goes down (as temperature of thermistor goes up)

*do* ***not*** *accept changes for goes down  
do* ***not*** *accept an answer in terms of current only  
answers in terms of other components are incorrect*

**1**

**[10]**

**M3.**          (a)     (i)      4 (V)

*allow* ***1*** *mark for correct substitution*

**2**

(ii)     5 (V) or (9 – their (a)(i)) correctly calculated

*e.c.f*

*do* ***not*** *allow a negative answer*

**1**

(b)     (i)      thermistor

*c.a.o*

**1**

(ii)     0°C to 20°C

**1**

**[5]**

**M4.**          (a)     (i)      potential difference = current × resistance

*accept voltage* ***or*** *pd for potential difference*

*accept V = I × R*

*accept correct transformation*

*do* ***not*** *accept V = C × R  
do* ***not*** *accept V = A × R*

*accept  provided*



*subsequent use of Δ correct*

*do* ***not*** *accept an equation expressed in units*

**1**

(ii)     46

*credit correct transformation for* ***1*** *mark*

*allow 1 mark for use of 11.5 V or division of final resistance by 20*

*a final answer of 920 gains* ***2*** *marks only*

**3**

         ohm(s)

*accept symbol Ω  
do* ***not*** *accept Ω s*

*unit / symbol mark can be awarded in (iii) provided unit / symbol is omitted in (ii)*

**1**

(iii)     920 (ohms) **or** their (a)(ii) × 20

**1**

(b)     as temperature increases, resistance increases

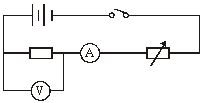
*accept hotter for temperature increase*

*do* ***not*** *accept a reference to resistance only i.e. it / resistance goes up*

**1**

**[7]**

**M5.**          (a)     all symbols correct



*accept push switch symbol switch may be open or closed  
any lines through symbols =* ***0*** *marks*

**1**

          correct circuit drawn

*polarity of cells not relevant provided they are joined correctly*

**1**

          voltmeter must be across resistor only

*two cells are required in the diagram  
ignore the order of the components  
allow small gaps in circuit*

*omission of any component =* ***0*** *marks*

**1**

(b)     (i)      potential difference  = current × resistance

*accept voltage or p.d. for potential difference*

*accept V= I × R*

*accept  provided I R subsequent use correct*



*do* ***not*** *accept C for current*

**1**

(ii)     2

*allow* ***1*** *mark for correct substitution  
wrong working loses both marks*

**2**

(iii)     straight line drawn through the origin

*judge by eye*

         straight line passes through I = 0.4, V = their (b)(ii) / 2 **and** 0.0

*this mark may be awarded if all points shown including these points are correct even if no line is drawn  
N.B. a curve scores* ***0*** *marks*

**1**

(c)     temperature increases

*accept filament lamp / it gets hotter  
allow heat for temperature*

**1**

**[8]**

**M6.**          level drops as petrol used;  
causes circuit resistance to increase;  
causes current to decrease

*for 1 mark each*

**or** if change not specified;  
*(one correct and two vague statements gains 2 marks,  
three vague statements gains 1 mark)*e.g. level changes;       )  
so resistance changes; ) = 1 mark  
so current changes      )

**[3]**