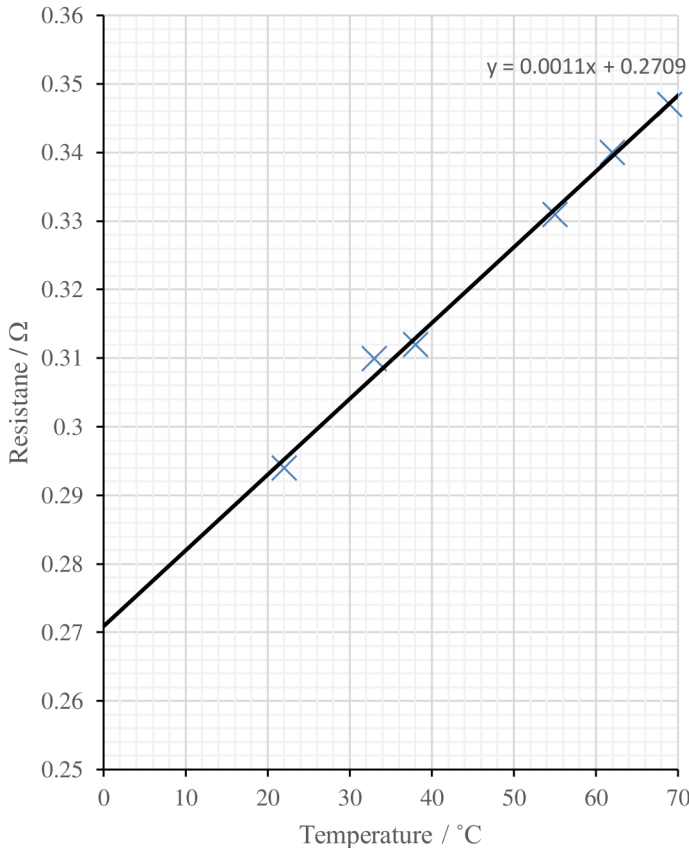


Question Number	Answer	Mark														
5(a)	<ul style="list-style-type: none"><li>Inconsistent number of decimal places for resistance <b>Or</b> resistance should be to 3 d.p. (to match ohmmeter resolution) (1)</li><li>Inconsistent intervals in temperature <b>Or</b> large jump in temperature from 38 to 55 °C (1)</li></ul>	2														
5(b)	<div><ul style="list-style-type: none"><li>Labels axes with quantities and units (1)</li><li>Sensible scales (1)</li><li>Plotting (2)</li><li>Line of best fit (1)</li></ul><div><table><tr><th><math>T / ^\circ\text{C}</math></th><th><math>R / \Omega</math></th></tr><tr><td>69</td><td>0.347</td></tr><tr><td>62</td><td>0.34</td></tr><tr><td>55</td><td>0.331</td></tr><tr><td>38</td><td>0.312</td></tr><tr><td>33</td><td>0.31</td></tr><tr><td>22</td><td>0.294</td></tr></table></div></div>	$T / ^\circ\text{C}$	$R / \Omega$	69	0.347	62	0.34	55	0.331	38	0.312	33	0.31	22	0.294	5
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5(c)	<div><ul style="list-style-type: none"><li>Extends line to y-axis intercept (1)</li><li>Correct <math>R_0</math> for the line drawn (1)</li><li>Calculates gradient using large triangle (1)</li><li>Use of gradient = <math>\alpha R_0</math> (1)</li><li><math>\alpha = 4.0 \times 10^{-3}</math> to <math>4.2 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}</math> (1)</li><li>Value of <math>\alpha</math> to 2 or 3 sig fig and with correct units <math>^\circ\text{C}^{-1}</math> (1)</li></ul><p>For MP5 – accept a correct calculation using the given value for <math>R_0</math> and gradient.</p><p>For MP1 – 5 accept calculation of y-axis intercept using gradient or use of simultaneous equations for 2 pairs of points on the line.</p><p><u>Example calculation</u> Gradient = <math>(0.348 - 0.282) / (70 - 10) = 0.0011 \text{ } \Omega \text{ } ^\circ\text{C}^{-1}</math> <math>\alpha = \text{gradient} / R_0 = 0.0011 / 0.271 = 4.1 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}</math></p></div>	6														

5(d)	<ul style="list-style-type: none"> <li>• Realistic modification suggested (1)</li> <li>• Explains how this improves the accuracy of the values (1)</li> </ul> <p><u>Examples</u></p> <ul style="list-style-type: none"> <li>• Take a resistance measurement at 0 °C</li> <li>• to measure <math>R_0</math> accurately</li> <li>• Take resistance measurements for lower temperatures</li> <li>• to improve the accuracy of the gradient <b>Or</b> to improve the accuracy of the y-axis intercept</li> <li>• Take resistance measurements for smaller increments of temperature</li> <li>• to improve the accuracy of the gradient <b>Or</b> to improve the accuracy of the y-axis intercept</li> <li>• Take resistance measurements for a wider range of temperatures</li> <li>• to improve the accuracy of the gradient <b>Or</b> to improve the accuracy of the y-axis intercept</li> <li>• Stir the water regularly <b>Or</b> place the thermometer inside the copper coil</li> <li>• so the temperature of water plotted is the same as the temperature of the copper</li> <li>• Use a datalogger to measure temperature and resistance</li> <li>• so that the values are recorded simultaneously</li> <li>• Use a digital thermometer</li> <li>• to avoid parallax error</li> </ul> <p>Ignore higher resolution for a digital thermometer.</p>	2
	Total for question 5	15