

Question Number	Answer	Mark
<b>13a</b>	<p>Use of <math>P = V^2 / R</math> <b>Or</b> Use of <math>P = VI</math> <b>and</b> <math>R = V/I</math> (1)</p> <p>Use of <math>R = \rho l / A</math> (1)</p> <p>Use of <math>A = \pi r^2</math> or <math>\pi d^2 / 4</math> (1)</p> <p>Length of wire = 2.1 m (1)</p> <p><u>Example of calculation</u></p> <p><math>R = V^2 / P = (12V)^2 / 60 \text{ W} = 2.4 \Omega</math>.</p> <p><math>A = \pi r^2 = \pi \times (0.125 \times 10^{-3} \text{ m})^2 = 4.9 \times 10^{-8} \text{ m}^2</math></p> <p><math>l = RA / \rho = (2.4 \Omega)(4.9 \times 10^{-8} \text{ m}^2) / (5.6 \times 10^{-8} \Omega \text{ m}) = 2.1 \text{ m}</math></p>	<b>4</b>
<b>13b</b>	<p>A has a lower resistance than B (1)</p> <p><b>Or</b> (at 12V) <math>R_A = 2.4\Omega</math>. <math>R_B = 4.8\Omega</math></p> <p>p.d. will not be shared equally between them</p> <p><b>Or</b> B requires/has greater p.d. than A (1)</p> <p>A will have less than 12V so will not operate normally (so the student is incorrect)</p> <p><b>Or</b> B will have more than 12V so will not operate normally (so the student is incorrect) (1)</p> <p><b>OR</b></p> <p>(at 12V) <math>I_A = 5\text{A}</math>, <math>I_B = 2.5\text{A}</math> (1)</p> <p>(Circuit is series so) current should be the same for both (1)</p> <p>Either A will have too little current, so will not operate normally (so student is incorrect)</p> <p><b>Or</b> B will have too much current, so will not operate normally (so student is incorrect)</p> <p>(For MP2 in second alternative, do not allow a calculation of total circuit current = 3.3 A, as this would not be the current in this circuit) (1)</p>	<b>3</b>
<b>Total for question 13</b>		<b>7</b>