Question Number	Answer		Mark
19(a)	Power supply, ammeter, variable resistor and nichrome wire all in series	(1)	
	Voltmeter in parallel across nichrome wire	(1)	2
19(b)(i)	Gradient calculated **Or** value of p.d. read off for a corresponding length	(1)	
	Gradient uses more than half of the graph **Or** value of p.d. used is greater than 2.0V **Or** value of length used is greater than 0.5m	(1)	
	Use of $R = \rho l/A$ **and** $R = V/I$ **Or** Use of $\rho = (\text{gradient} \times A)/I$	(1)	
	$\rho = 1.1 \times 10^{-6}\ \Omega\,\text{m}$	(1)	4
	(MP1 – Values read off graph need to be within ½ a square) (MP1 – Gradient should be in the range 4.1 – 4.2 Vm^{-1})		
	Example of calculation Gradient = $V/l = (4.15\ \text{V}/1.00\ \text{m}) = 4.15\ \text{Vm}^{-1}$ $V/l = \rho I/A$, so $\rho = (\text{gradient} \times A)/I$ $= (4.15\ \text{Vm}^{-1} \times 5.31 \times 10^{-8}\ \text{m}^2)/0.200\ \text{A} = 1.10 \times 10^{-6}\ \Omega\,\text{m}$		
19(b)(ii)	V value read from graph = 3.1V	(1)	
	Use of $P = VI$	(1)	
	$P = 0.62$ W	(1)	3
	(MP1 – allow use of resistivity equation with answer from (i) used to calculate V or R) (MP2 – allow combination of equations e.g. $R = V/I$ followed by $P = I^2R$) (MP3 – allow variation of value if using resistivity value that rounds to $1.1 \times 10^{-6}\ \Omega\,\text{m}$ from (i))		
	Example of calculation $P = VI = (3.1\ \text{V} \times 0.200\ \text{A}) = 0.62$ W		
	Total for Question 19		9