Question			Expected response	Max mark	Additional guidance
12.	(a)	(i)	$\left(\frac{1}{R_T}=\frac{1}{R_1}+\frac{1}{R_2}\right)$ $\left(\frac{1}{R_T}=\frac{1}{16}+\frac{1}{16}\right)$ $R_T=8(\Omega)$ **(1)** $R=((8+16)=)24(\Omega)$ **(1)** $V=IR$ **(1)** $V=0.38\times 24$ **(1)** $V=9.1$ V **(1)**	**5**	Accept: 9, 9.12, 9.120 24 (Ω) anywhere 2 marks $V=IR$ anywhere - 1 mark Alternative methods 2 marks for 24 (Ω) anywhere 1 mark for **all** relationships 1 mark for **all** substitutions 1 mark for final answer
		(ii)	$E=V+Ir$ **(1)** $12=9.1+(0.38\times r)$ **(1)** $r=7.6\ \Omega$ **(1)**	**3**	Or consistent with a(i)* Accept: 8, 7.63, 7.632 *If V = 12 V then max 1 mark for relationship. Alternative method: $E=I(R+r)$ **(1)** $12=0.38(24+r)$ **(1)** $r=7.6\ \Omega$ **(1)** For this method accept: 8, 7.58, 7.579 for 'lost volts' accept: $V=Ir$ $V=IR$

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12.	(a)	(iii)	$P = I^2R$ **(1)** $P = 0.38^2 \times 7.6$ **(1)** $P = 1.1\ \text{W}$ **(1)**	**3**	Or consistent with (a)(i) and/or(a)(ii) Accept: 1, 1.10, 1.097 Accept: $P = I^2r$ Alternative methods: $P = IV$ **(1)** $P = 0.38 \times (12 - 9.1)$ **(1)** $P = 1.1\ \text{W}$ **(1)** **OR** $P = \frac{V^2}{R}$ **(1)** $P = \frac{(12 - 9.1)^2}{7.6}$ **(1)** $P = 1.1\ \text{W}$ **(1)**
	(b)		(Power dissipated) less than **(1)** (Total circuit resistance increases), current decreases, internal resistance stays the same **(1)**	**2**	**MUST JUSTIFY** Accept: current decreases, and lost volts decreases. lost volts decreases, and internal resistance stays the same.