Mark scheme for Support Worksheet – Topic 5, Worksheet 2

1 **a** The potential difference across the single resistor is $V = RI = 12 \times 0.48 = 5.76$ V; across the other $12\ \Omega$ resistor it is $V = RI = 12 \times 0.36 = 4.32$ V and so the emf is $5.76 + 4.32 = 10.08 \approx 10$ V [2]

b The total power is the emf times the current; and so is $10.08 \times 0.48 = 4.8$ W [2]

c The potential difference across R is 4.32 V and the current through it is 0.12 A; hence the resistance is $R = \frac{V}{I} = \frac{4.32}{0.12} = 36\ \Omega$ [2]

2 **a** The potential difference across the $25\ \Omega$ resistor (and hence also R_2) is $V = RI = 25 \times 0.20 = 5.0$ V; hence $R_2 = \frac{V}{I} = \frac{5.0}{0.25} = 20\ \Omega$ [2]

b The potential difference across the single resistor R_1 is $12 - 5.0 = 7.0$ V and the current through it is 0.45 A; hence $R_1 = \frac{V}{I} = \frac{7.0}{0.45} \approx 16\ \Omega$ [2]

3 The total resistance of the circuit is given by: $\frac{1}{12} + \frac{1}{12} = \frac{1}{6} \Rightarrow R = 6\ \Omega$. The current is therefore $I = \frac{12}{6.0} = 2.0$ A; the potential at the top of the voltmeter is therefore $12 - 4.0 \times 1.0 = 8.0$ V and at the bottom it is $12 - 8.0 \times 1.0 = 4.0$ V; the potential difference is therefore $8.0 - 4.0 = 4.0$ V [3]

4 **a** The current leaving the battery is $I = \frac{P}{\varepsilon} = \frac{9.0}{6.0} = 1.5$ A; the reading of the voltmeter is then $V = \varepsilon - Ir = 6.0 - 2.0 \times 1.5 = 3.0$ V [2]

b the resistance R is then $R = \frac{V}{I} = \frac{3.0}{1.5} = 2.0\ \Omega$ [1]