AQA AS Physics exam practice answers

5 Electricity

**1 (a) (i)** resistance (a) = 5.4 V/35 mA = 154 

**(i)** resistance (b) = 3.7 V/35 mA = 106 

**(ii)** (a) is the higher temperature because of the higher resistance.

**(b) (i)** *A* = *V*/*I* = 25/2.5 = 10 

**(ii)** No. The current does not vary linearly with the voltage.

**2 (a)** 400 

**(b)** Let us assume that the p.d. across the circuit is 6 V with +6 V at the left and zero on the right.

Now look at the two resistors in the top arm. The potential at the join is 2 V, which is found by considering the ratio of the two resistors (a 4 V drop through the 400  and a 2 V drop through the 200 ).

Now look at the two resistors in the lower arm. The potential at the join is also 2 V. This is found by considering the ratio of the two resistors (a 4 V drop through the 800  and a 2V drop through the 400 ).

This means that the potential at the top of the 150  resistor (2 V) is the same as that at the bottom of the 150  resistor (2 V). Therefore the p.d. across the 150  resistor is zero and so no current flows through this resistor — it acts like an open circuit and we could ‘remove’ it without affecting the circuit. This means that the circuit simply reduces to a parallel circuit of two arms with 600  in the top arm and 1200  in the bottom.

Using the formula for the resistance of resistors in parallel we have:

*R* = (600 × 1200)/(600 +1200) = 400 

**3 (a)** 10 k and 5 k in series

**(b)** 20 k and 5 k in parallel and 10 kin series

**(c)** 20 k and 10 k in parallel

**(d)** 10 k and 5 k in parallel and 1 k in series

**4** B

**5 (a)** output voltage, *V*o = *R*2/(*R*1 + *R*2) = (400/600) × 6 = 4 V

**(b)** The output resistance is altered by the much lower resistance of the meter in parallel with *R*2.

resistance at the output = (400 × 1000)/(400 +1000) = 286 

output voltage = (286/600) × 6 = 2.86 V

**(c)** initial output voltage = (200/600) × 6 = 2 V

As the thermistor is heated its resistance will decrease and so the output voltage will fall below 2 V.

**6 (a)** The potential difference that gives a charge of 1 C an energy of 1 J (*V* = *J*/*Q*).

**(b)** The greatest potential difference that can be generated across the output terminals of a supply. The ‘open circuit’ potential of the supply.

**(c)** The resistance of the ‘internal circuit’ of a cell or power supply.

**(d)** It prevents too much current from being drawn from the course if the external resistance connected to it is small (for example if the terminals are shorted).

**7 (a)** output current = *E*/(*R* + *r*) = 12/28 = 0.43 A

output voltage, *V* = *IR* = 0.43 × 25 = 10.7 V

**(b)** output current = *E*/(*R* + *r*) = 12/5.5 = 2.18 A

output voltage, *V* = *IR* = 2.18 × 2.5 = 5.45 V

**(c)** As the output current increases more energy will be lost within the cell, since *V* = *Ir*, where *r* is the internal resistance. This means that the output potential difference between the terminals will fall.

**8** D