3.11 Circuits, Resistance and Components: Test Pack

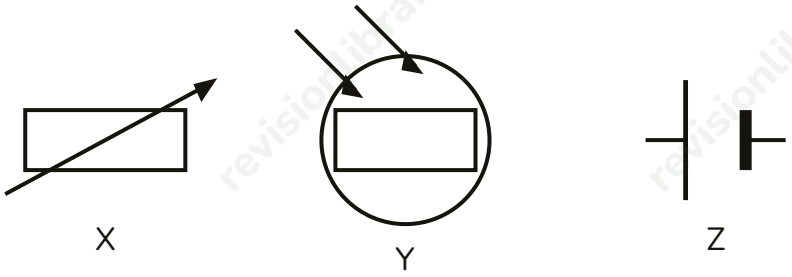
AQA 8464 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The diagram shows three standard circuit symbols, labelled X, Y and Z.



(a) State the name of the component represented by symbol X. **(1)**

(b) State the name of the component represented by symbol Y. **(1)**

(c) State the name of the component represented by symbol Z. **(1)**

(Total for Question 1 is 3 marks)

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2 A phone charger delivers a current of 2.5 A to a phone battery for 3.0 minutes. Use the equation charge = current x time (Q = I x t).

(a) Convert the charging time into seconds. **(1)**

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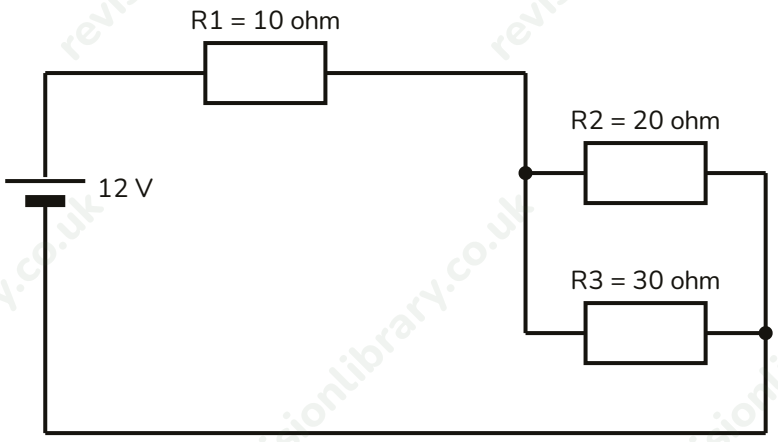
(b) Calculate the charge that flows into the battery during the 3.0 minutes. **(2)**

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(Total for Question 2 is 3 marks)

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3 Higher tier only. Figure 5 shows a 10 ohm resistor (R1) connected in series with a parallel combination of a 20 ohm resistor (R2) and a 30 ohm resistor (R3). The circuit is connected to a 12 V supply.



(a) Show that the combined resistance of R2 and R3 in parallel is 12 ohm. **(2)**

(b) Calculate the total resistance of the circuit. **(1)**

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(c) Calculate the current supplied by the 12 V supply, giving your answer to 2 significant figures. **(2)**

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(d) Calculate the potential difference across R1. **(1)**

.....

(Total for Question 3 is 6 marks)

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4 A filament lamp is connected in the same type of circuit and its I-V graph is plotted.

(a) Describe the shape of the I-V graph for a filament lamp. **(1)**

(b) Explain why the graph has this shape, referring to the temperature and resistance of the filament. **(3)**

(Total for Question 4 is 4 marks)

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5 In an I-V characteristics investigation, a student obtains the following readings for a resistor at constant temperature: at V = 1.0 V, I = 0.20 A; at V = 2.0 V, I = 0.40 A; at V = 3.0 V, I = 0.60 A; at V = 4.0 V, I = 0.80 A.

(a) Use two pairs of readings to show that the resistance of the resistor is constant. **(3)**

(b) The student repeats the investigation with a filament lamp and obtains one further pair of readings: V = 4.0 V, I = 0.50 A. Calculate the resistance of the filament lamp at this potential difference. **(2)**

(c) Explain why the resistance of the filament lamp calculated in part (b) is greater than the resistance of the resistor at the same potential difference (4.0 V, in part (a)). **(1)**

(Total for Question 5 is 6 marks)

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Mark scheme · 3.11 Circuits, Resistance and Components: Test Pack

Question 1

(a) variable resistor (accept rheostat) **B1**

(a) Answer: Variable resistor

(b) light-dependent resistor (accept LDR) **B1**

(b) Answer: Light-dependent resistor (LDR)

(c) cell (single cell, not a battery) **B1**

(c) Answer: Cell

Question 2

(a) 180 s (3.0 x 60) **B1**

(a) Answer: 180 s

(b) substitutes: Q = 2.5 x 180 **M1**

(b) 450 C cao **A1**

(b) Answer: 450 C

Question 3

(a) substitutes: 1/R = 1/20 + 1/30 = 3/60 + 2/60 = 5/60 **M1**

(a) R = 12 ohm cso (answer given) **A1**

(a) Answer: 12 ohm (shown)

(b) 22 ohm (10 + 12) **B1**

(b) Answer: 22 ohm

(c) ft substitutes: I = 12 / 22 **M1**

(c) 0.55 A (awrt, 2 s.f.) ft **A1**

(c) Answer: 0.55 A

(d) 5.5 V (awrt, ft: their (c) x 10) **B1**

(d) Answer: 5.5 V

Question 4

(a) a curve that becomes less steep (bends towards the potential difference axis) as potential difference increases, oe **B1**

(a) Answer: A curve that gets less steep as the potential difference increases.

(b) as current increases, the filament gets hotter **B1**

(b) the resistance of the filament increases as its temperature increases **B1**

(b) so for each additional volt, a smaller increase in current occurs, curving the graph, oe **B1**

(b) Answer: The filament heats up as current increases; its resistance rises with temperature, so the current increases less for each extra volt.

Question 5

(a) calculates R for one pair, e.g. R = 1.0 / 0.20 = 5.0 ohm **M1**

(a) calculates R for a second pair, e.g. R = 4.0 / 0.80 = 5.0 ohm **M1**

(a) both values are equal (5.0 ohm), so resistance is constant, since current is directly proportional to potential difference, cso **A1**

(a) Answer: 5.0 ohm for both pairs, showing constant resistance.

(b) substitutes: R = 4.0 / 0.50 **M1**

(b) 8.0 ohm cao **A1**

(b) Answer: 8.0 ohm

(c) calculates 8.0 ohm for the filament lamp and 5.0 ohm for the resistor; accept that a filament resistance rises as it heats, while the comparison with a different resistor also depends on material and dimensions **B1**

(c) Answer: The filament lamp has resistance 8.0 ohm and the resistor has resistance 5.0 ohm. A filament resistance rises as it heats, but comparing it with a different resistor also depends on their materials and dimensions.

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