FOUNDATION

P2F Electricity: Foundation Tier Practice

Total Marks

AQA 8463 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Electric current is a flow of charged particles. Answer the following recall items.

(a) State the unit of electrical current. **(1)**

(b) Give the direction conventional current is said to flow in a circuit. **(1)**

(c) State the charge on an electron (name and sign). **(1)**

(Total for Question 1 is 3 marks)

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2 A simple circuit contains a 1.5 V cell and a lamp. The lamp is connected with a switch and a single fixed resistor.

(a) Name the instrument used to measure current in a circuit. **(1)**

(b) Name the instrument used to measure potential difference (voltage). **(1)**

(Total for Question 2 is 2 marks)

3 A student measures the current through a lamp as 0.20 A when connected to a 3.0 V battery. Calculate the resistance of the lamp using R = V / I.

(a) Substitute the values into the equation R = V / I. **(1)**

.....

(b) Compute R and give the unit. **(2)**

.....

(Total for Question 3 is 3 marks)

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4 A circuit has two identical 1.5 V cells connected in series. State the total potential difference (voltage) supplied by the pair.

(Total for Question 4 is 1 mark)

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5 Two resistors, 4.0 ohm and 6.0 ohm, are connected in series across a 10 V supply. Calculate the total resistance and the current through the series circuit.

(a) Calculate the total resistance in the series circuit. **(1)**

.....

(b) Calculate the current through the series circuit. Use I = V / R. **(2)**

.....

(Total for Question 5 is 3 marks)

6 A student measures the current through a simple circuit at three different points and records 0.50 A, 0.50 A and 0.50 A. The circuit contains one cell, one lamp and one resistor in a single loop.

(a) State whether these measurements are consistent with the circuit being series or parallel. **(1)**

(b) Explain why the current readings are the same at all three points. **(2)**

(Total for Question 6 is 3 marks)

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7 A classroom power supply is set to 12 V. A small heater connected to it draws a current of 0.50 A. Use V = I x R to find the resistance of the heater.

(a) Substitute the values into R = V / I. **(1)**

.....

(b) Compute R and give the unit. **(2)**

.....

(Total for Question 7 is 3 marks)

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8 A torch uses a 3.0 V cell. The torch bulb draws a current of 0.20 A while switched on.

(a) Calculate the charge that flows through the bulb in 10 seconds. Use Q = I x t. **(2)**

.....

(b) Calculate the energy transferred to the bulb in that 10 seconds. Use E = V x Q. **(1)**

.....

(Total for Question 8 is 3 marks)

9 A 6.0 V battery supplies two identical lamps connected in parallel. Each lamp draws 0.50 A.

(a) Calculate the total current drawn from the battery. **(2)**

.....

(b) State whether the potential difference across each lamp is the same as the battery voltage and give a short reason. **(1)**

(Total for Question 9 is 3 marks)

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10 An electric kettle is rated 2.0 kW when connected to a 230 V supply. A student wants to find the current drawn by the kettle. Use P = V x I.

(a) Rearrange and substitute to find the current. Show the substitution. **(1)**

.....

(b) Compute the current and give the unit. **(1)**

.....

(Total for Question 10 is 2 marks)

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11 A 13 A fuse is fitted in a plug to protect a small immersion heater. The heater normally draws 11 A. Explain why a 13 A fuse is used rather than a 5 A fuse and why the fuse protects the circuit.

(a) Explain why a 13 A fuse is used rather than a 5 A fuse for this heater. **(1)**

(b) Explain how the fuse protects the circuit when a fault causes a large current. **(1)**

(Total for Question 11 is 2 marks)

12 In an experiment to investigate the resistance of a wire, a student is told to keep the temperature of the wire constant. State one practical way the student could keep the wire at constant temperature and give one reason why this control is important.

(a) State one practical way to keep the wire at constant temperature during measurements. **(1)**

(b) Give one reason why keeping the temperature constant is important for resistance measurements. **(1)**

(Total for Question 12 is 2 marks)

Mark scheme · P2F Electricity: Foundation Tier Practice

Question 1

- (a) **B1** ampere or amp or A cao
- **(a) Answer: A (ampere)**
- (b) **B1** from the positive terminal to the negative terminal of the power supply, oe
- **(b) Answer: From the positive terminal to the negative terminal**
- (c) **B1** negative (electron has negative charge) cao
- **(c) Answer: Negative charge**

Question 2

- (a) **B1** ammeter cao
- **(a) Answer: Ammeter**
- (b) **B1** voltmeter cao
- **(b) Answer: Voltmeter**

Question 3

- (a) **M1** substitutes: R = 3.0 / 0.20
- **(a) Answer: R = 3.0 / 0.20**
- (b) **M1** does the division: 3.0 / 0.20
- (b) **A1** 15 ohm cao
- **(b) Answer: 15 ohm**

Question 4

- **B1** 3.0 V cao
- **Answer: 3.0 V**

Question 5

- (a) **B1** Rtot = 4.0 + 6.0 = 10 ohm cao
- **(a) Answer: 10 ohm**
- (b) **M1** substitutes: I = 10 / 10
- (b) **A1** 1.0 A cao
- **(b) Answer: 1.0 A**

Question 6

- (a) **B1** series
- **(a) Answer: Series**
- (b) **M1** states that charge flows in a single loop so the same current passes every component
- (b) **A1** there is only one path so current is equal at all points, oe
- **(b) Answer: Because the circuit is a single loop, there is only one path for charge to flow so the same current passes every point in the circuit.**

Question 7

- (a) **M1** substitutes: R = 12 / 0.50
- **(a) Answer: R = 12 / 0.50**
- (b) **M1** performs division: 12 / 0.50
- (b) **A1** 24 ohm cao
- **(b) Answer: 24 ohm**

Question 8

- (a) **M1** substitutes: Q = 0.20 x 10
- (a) **A1** 2.0 C cao
- **(a) Answer: 2.0 C**
- (b) **A1** 6.0 J cao
- **(b) Answer: 6.0 J**

Question 9

- (a) **M1** adds currents: Itot = 0.50 + 0.50
- (a) **A1** 1.0 A cao
- **(a) Answer: 1.0 A**
- (b) **B1** yes, because in parallel each component is connected across the battery so has the same potential difference as the battery, oe
- **(b) Answer: Yes. In parallel each lamp is connected across the battery so each has the same potential difference as the battery.**

Question 10

- (a) **M1** rearranges and substitutes: I = P / V = 2000 / 230
- **(a) Answer: I = 2000 / 230**
- (b) **A1** 8.7 A cao (to 2 s.f.)
- **(b) Answer: 8.7 A**

Question 11

- (a) **B1** 13 A is higher than the normal current 11 A so it will not blow during normal use; 5 A would blow because it is lower than the normal current, oe
- **(a) Answer: Because the heater draws 11 A normally, a 13 A fuse will not blow during normal use while a 5 A fuse would blow.**
- (b) **B1** the fuse contains a thin wire that melts if the current is too large, breaking the circuit and stopping current flow, oe
- **(b) Answer: If a fault causes a very large current the thin wire in the fuse melts, breaking the circuit and stopping the dangerous current.**

Question 12

- (a) **B1** use short measurement times and allow the wire to cool between readings or keep ambient temperature constant (e.g. perform in a draught-free room), oe
- **(a) Answer: Use short measurement times and allow the wire to cool between readings or carry out the experiment in a draught-free room to keep temperature constant.**
- (b) **B1** temperature affects resistance of the wire so changes in temperature would change the resistance and affect the results, oe
- **(b) Answer: Because temperature affects the resistance, and any temperature change would change the resistance and make the results unreliable.**