

Exercise walk-through

2.1

Circuit symbols, electrical charge and current (4.2.1.1–4.2.1.2)

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Exercises 2.1·2.3

2.1 Name the component for each symbol. [4]

(a) a circle with an A inside (b) a rectangle with an arrow through it diagonally (c) a triangle and bar that passes current one way (d) a rectangle whose resistance falls when light shines on it

2.2 State two conditions needed for charge to flow in a circuit. [2]

2.3 A lamp carries 2.0 A for 4.0 minutes. Calculate the charge flow. [2]

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2.1 (a) ammeter. (b) variable resistor. (c) diode. (d) LDR / light-dependent resistor.

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2.2 The circuit must be closed (a complete loop) and include a source of potential difference.

2.3 A lamp carries 2.0 A for 4.0 minutes. Calculate the charge flow. [2]

2.3 Convert: 4.0 min = 240 s (C1).

$$Q = It = 2.0 \text{ A} \times 240 \text{ s} = \mathbf{480 \text{ C}}$$

(answer with unit B1.)

Exercise 3.1

3.1 The fuse in a plug melts when a charge of 2.0 C flows through it in 0.40 s .

- (a) Calculate the current in the fuse wire. [3]
- (b) The fuse is replaced by one that melts at the same current. State what would happen to the charge flow before it melts if the fault current were larger, and explain why. [2]

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3.1 (a) Known: charge 2.0 C and time 0.40 s; current is charge per unit time.

$$I = \frac{Q}{t} = \frac{2.0 \text{ C}}{0.40 \text{ s}} = \mathbf{5.0 \text{ A}}$$

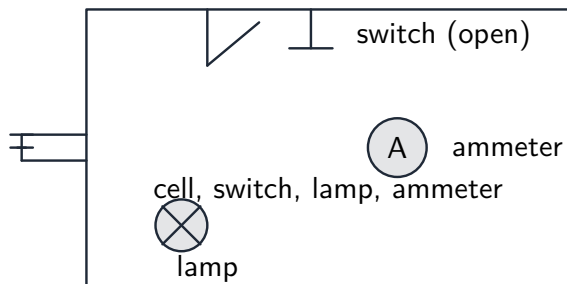
(rearrangement C1, substitution C1, answer with unit A1.) (b) Less charge would flow before it melts: a larger fault current moves the same charge (needed to heat and melt the wire) in a shorter time, because $Q = It$ and $t = Q/I$.

Exercise 3.2

3.2 A student sets up a series circuit: cell, switch, lamp, ammeter. The ammeter reads 0.31 A with the switch closed.

(a) State what the ammeter would read at a point between the lamp and the cell, with reasons. [2]

(b) The switch is opened. State the new ammeter reading and explain it using the conditions for charge flow. [2]

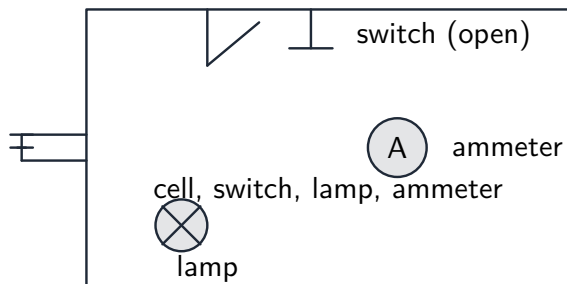


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3.2 (a) 0.31 A: in a series loop the current has the same value at every point – charge is not used up. (b) 0 A: the circuit is now open, so there is no complete path – no charge can flow even though the cell still supplies a potential difference.