2 A student investigates the resistances of identical wires connected in parallel.

She uses the circuit shown in Fig. 2.1.

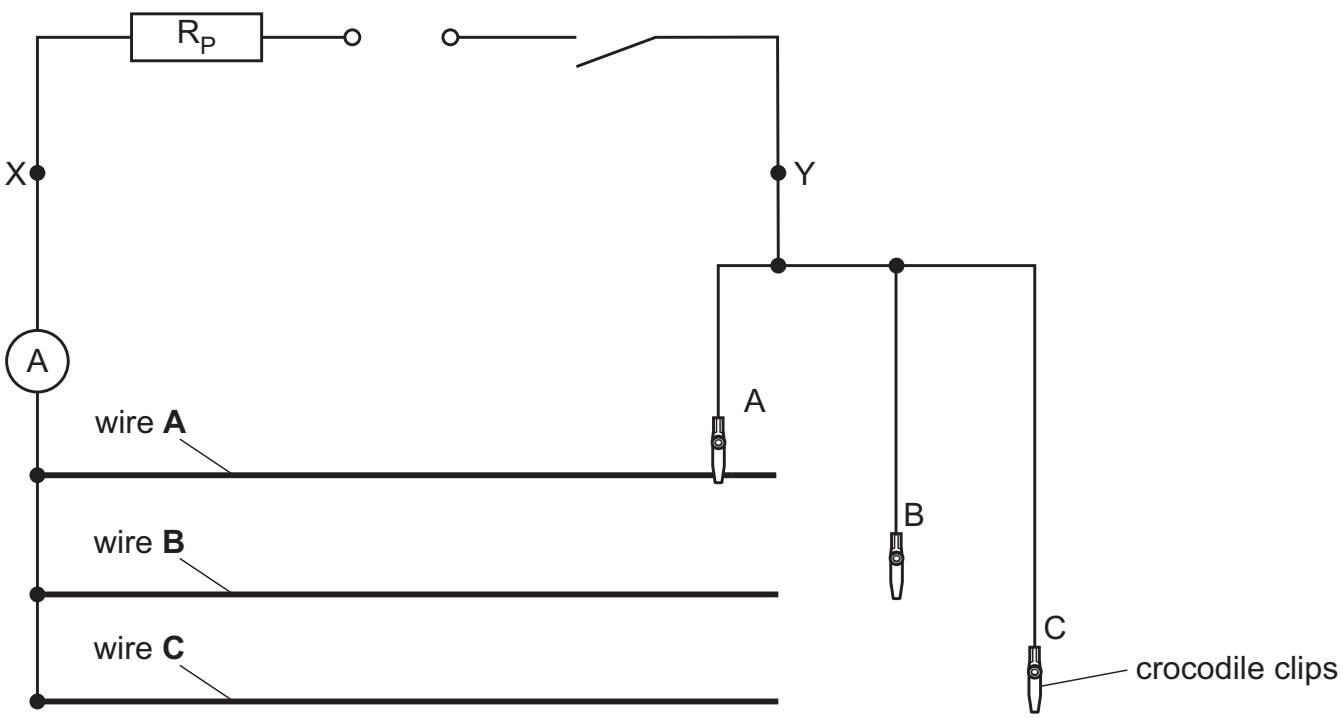

Fig. 2.1

(a) On Fig. 2.1, draw a voltmeter connected so that it will measure the potential difference (p.d.) across terminals X and Y.

[1]

Circuit A

(b) The student connects crocodile clip A to a length l = 80.0 cm of resistance wire A.

(i) On Fig. 2.2, draw an arrow (⟷) to indicate precisely between which two points she should measure l = 80.0 cm for wire A.

[1]

Fig. 2.2

(ii) The student measures the potential difference V across terminals X and Y and measures the current I in the circuit.
The readings on the meters are shown in Fig. 2.3 and Fig. 2.4.

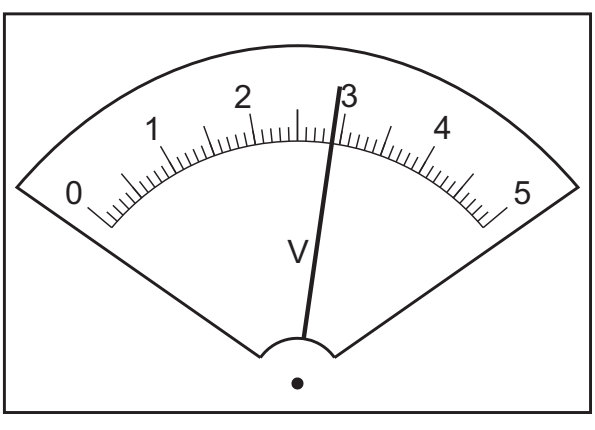

Fig. 2.3

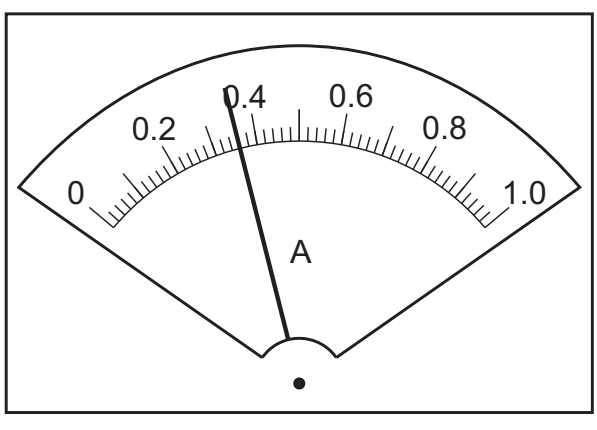

Fig. 2.4

Read, and record in the first line of Table 2.1, the values of V and I shown on the meters in Fig. 2.3 and Fig. 2.4.

Table 2.1

circuit	V/V	I/A	R/Ω
A			
B	2.2	0.59	
C	1.8	0.72	

[2]

(c)

Circuit B

The student connects crocodile clip B to a length l = 80.0 cm of resistance wire B so that wires A and B are connected in parallel.

Circuit C

The student connects crocodile clip C to a length l = 80.0 cm of resistance wire C so that wires A, B and C are connected in parallel.
In each circuit, she measures the potential difference V across terminals X and Y and measures the current I in the circuit.
Her readings are shown in Table 2.1.

Calculate, and record in Table 2.1, the resistance R of each wire combination.
Use the equation:

$$R = \frac{V}{I}.$$

[2]

(d) (i) Record a resistance R_A. R_A is the value of R from Circuit A.

R_A = ... Ω

Calculate a resistance R_B. Use the value of R from Circuit B and the equation:

$$R_B = R \times 2$$

R_B = ... Ω

Calculate a resistance R_C. Use the value of R from Circuit C and the equation:

$$R_C = R \times 3$$

R_C = ... Ω

[1]

(ii) A student suggests that the values of R_A, R_B and R_C should be equal.

State whether your results support this suggestion. Use values from your results to justify your answer.

statement .....

justification .....

.....

.....

[2]

(e) Briefly explain why resistor R_P, shown in Fig. 2.1, must remain in place throughout the experiment.

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..... [1]

(f) One possible problem with this type of experiment is heating of the resistance wires. Suggest what to do to reduce this.

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..... [1]

[Total: 11]