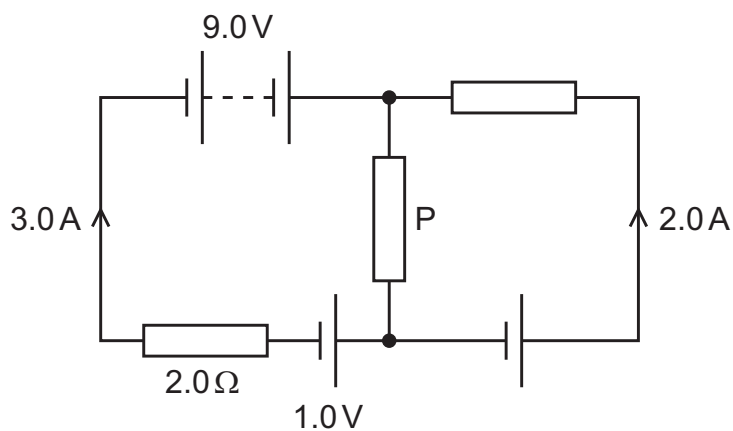


34 The diagram shows a circuit containing a battery and cells with negligible internal resistance.

Some values of current, electromotive force (e.m.f.) and resistance are shown.

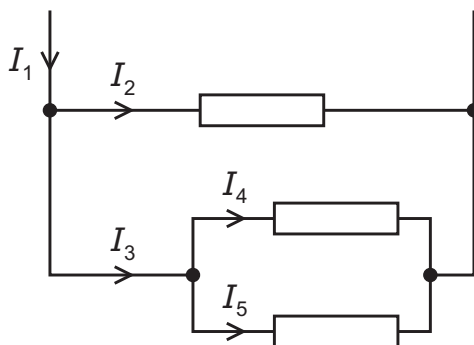
One resistor is labelled P.



What is the resistance of resistor P?

- A** $0.40\ \Omega$ **B** $0.80\ \Omega$ **C** $2.0\ \Omega$ **D** $2.8\ \Omega$

37 The diagram shows the currents in part of an electric circuit.



The resistors are identical.

Which equation is **not** correct?

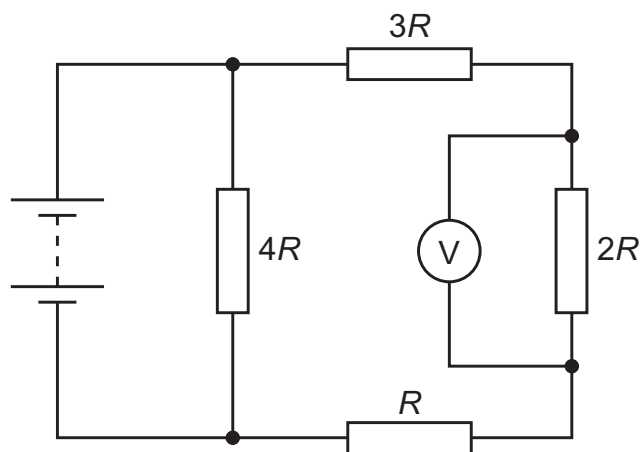
- A** $I_1 = I_2 + I_4 + I_5$
B $I_2 = I_1 - I_3$
C $I_2 = I_3 + I_4 + I_5$
D $I_4 = I_3 - I_5$

- 37** The principles of conservation of which two quantities are associated with Kirchhoff's first and second laws?

	first law	second law
A	charge	energy
B	charge	voltage
C	energy	charge
D	voltage	charge

- 36** Four resistors of resistance R , $2R$, $3R$ and $4R$ are connected to form a network.

A battery of negligible internal resistance and a voltmeter are connected to the resistor network as shown.



The voltmeter reading is 2 V.

What is the electromotive force (e.m.f.) of the battery?

- A** 2 V **B** 4 V **C** 6 V **D** 10 V

5 (a) State Kirchhoff's first law.

.....
..... [1]

(b) Fig. 5.1 shows a circuit containing a thermistor T that has a negative temperature coefficient.

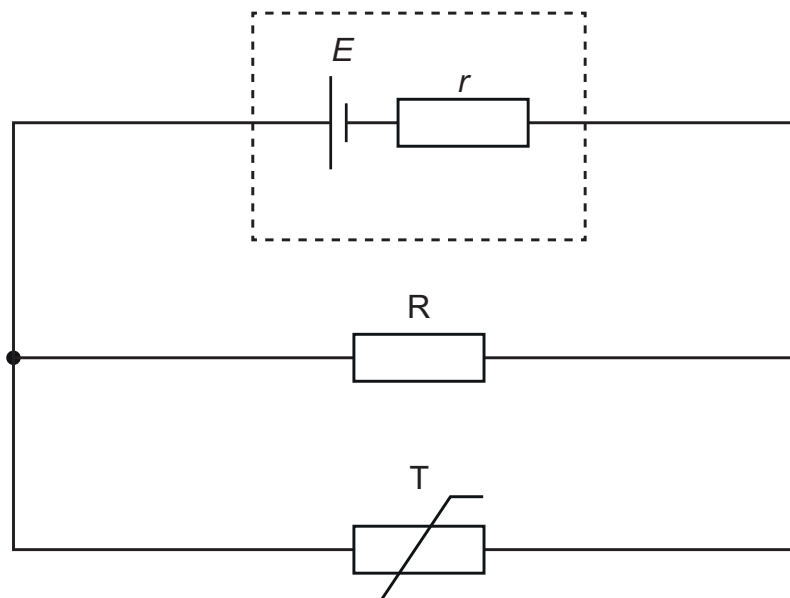


Fig. 5.1

(i) The thermistor has resistance R_0 at a temperature of 0°C .

On Fig. 5.2, sketch a possible variation of the resistance of the thermistor with temperature between 0°C and 100°C .

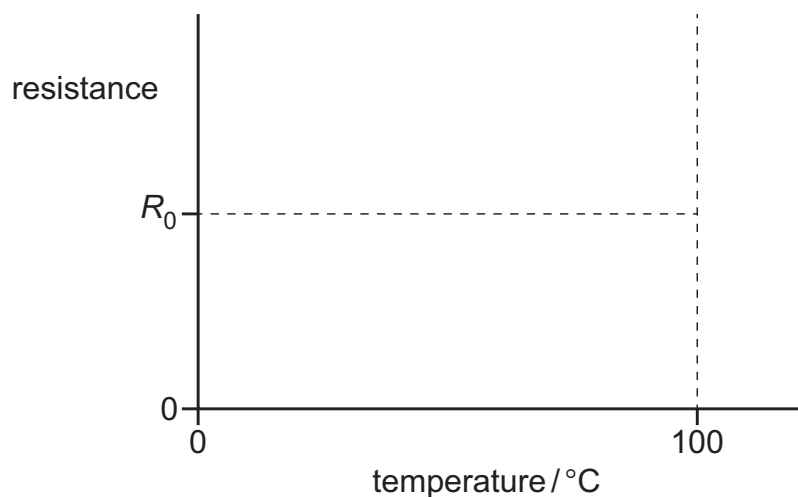


Fig. 5.2

[2]

(ii) With reference to the current in the cell, explain why the current in **resistor R** decreases with increasing temperature of the thermistor.

.....

.....

.....

.....

..... [3]

(c) The electromotive force (e.m.f.) E of the cell in Fig. 5.1 is 1.50 V. The internal resistance r of the cell is $0.12\ \Omega$.

Resistor R has a resistance of $6.00\ \Omega$.

At a particular temperature of the thermistor, the current in R is 0.200 A.

For this temperature of the thermistor, determine:

(i) the current in the cell

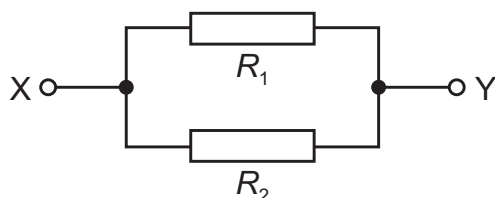
current = A [2]

(ii) the resistance of the thermistor.

resistance = Ω [2]

[Total: 10]

- 36 Two resistors of resistances R_1 and R_2 are connected in parallel.



What is the combined resistance between X and Y?

- A $R_1 + R_2$ B $\frac{R_1 R_2}{R_1 + R_2}$ C $\frac{R_1 + R_2}{R_1 R_2}$ D $\frac{R_1}{R_2}$

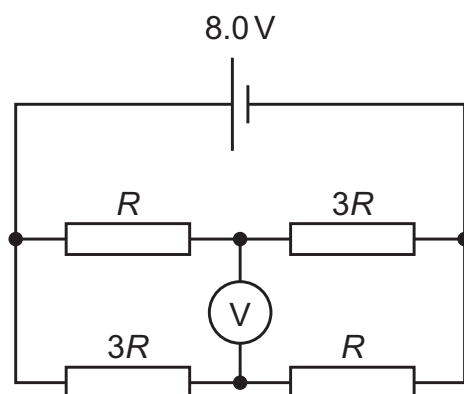
- 37 Each of Kirchhoff's two laws presumes that some quantity is conserved.

Which row states Kirchhoff's **first** law and names the quantity that is conserved?

	statement	quantity
A	The algebraic sum of currents at a junction is zero.	charge
B	The algebraic sum of currents at a junction is zero.	energy
C	The e.m.f. in a loop is equal to the algebraic sum of the product of current and resistance round the loop.	charge
D	The e.m.f. in a loop is equal to the algebraic sum of the product of current and resistance round the loop.	energy

- 35 Two resistors of resistance R and two resistors of resistance $3R$ are connected to a cell of e.m.f. 8.0 V as shown.

The cell has negligible internal resistance.



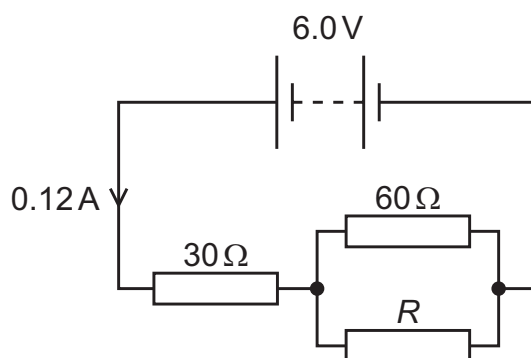
What is the reading on the voltmeter?

- A 0.0 V B 2.0 V C 4.0 V D 6.0 V

- 34** The sum of the electrical currents into a point in a circuit is equal to the sum of the currents out of the point.

Which statement is correct?

- A** This is Kirchhoff's first law, which results from the conservation of charge.
 - B** This is Kirchhoff's first law, which results from the conservation of energy.
 - C** This is Kirchhoff's second law, which results from the conservation of charge.
 - D** This is Kirchhoff's second law, which results from the conservation of energy.
- 35** A battery of electromotive force (e.m.f.) 6.0 V and negligible internal resistance is connected to three resistors, as shown.



The current in the battery is 0.12 A .

What is resistance R ?

- A** $12\ \Omega$
- B** $30\ \Omega$
- C** $50\ \Omega$
- D** $60\ \Omega$

- 6 A battery of electromotive force (e.m.f.) 6.0 V and negligible internal resistance is connected in series with a variable resistor and a uniform resistance wire XY, as shown in Fig. 6.1.

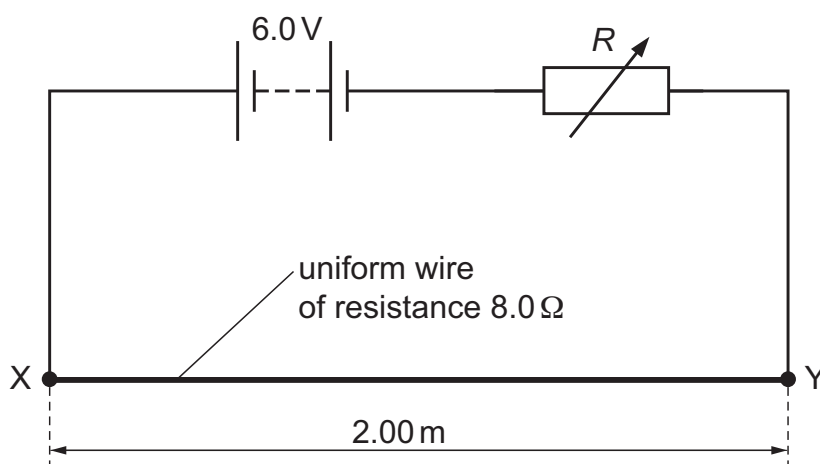


Fig. 6.1

Wire XY has length 2.00 m and resistance $8.0\ \Omega$. The resistance R of the variable resistor is adjusted so that the potential difference across wire XY is 2.4 V .

- (a) Determine R .

$R = \dots\dots\dots\ \Omega$ [2]

- (b) Explain why the potential difference V between any two points on wire XY is proportional to the distance L between those points.

.....
.....
.....
..... [2]

(c) A cell of e.m.f. E and internal resistance r is connected to the circuit, as shown in Fig. 6.2.

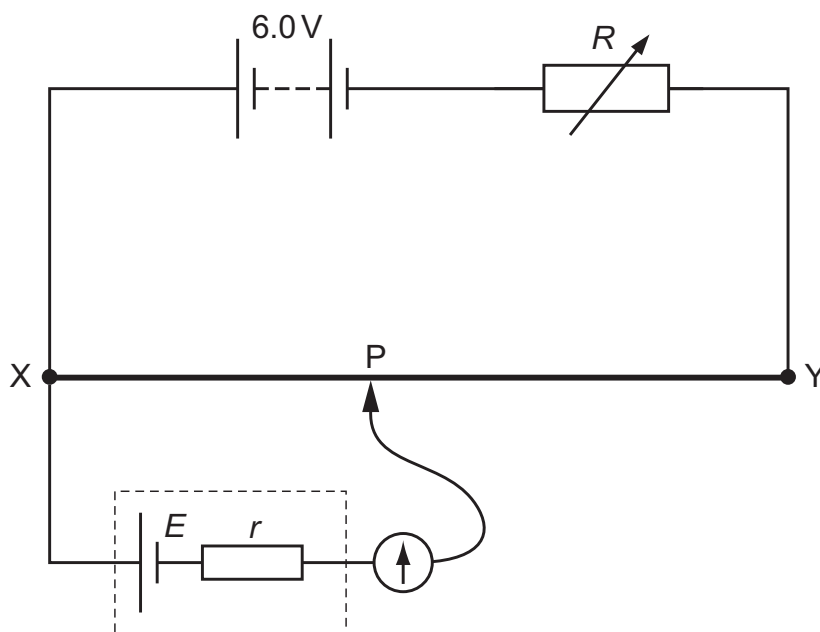


Fig. 6.2

Resistance R is unchanged.

The movable connection P is positioned on wire XY so that the galvanometer reading is zero. Distance XP is 1.24 m.

(i) Calculate E .

$$E = \dots\dots\dots \text{ V [2]}$$

(ii) The value of R is now decreased.

State and explain the change that must be made to the position of P on wire XY so that the galvanometer reads zero again.

.....

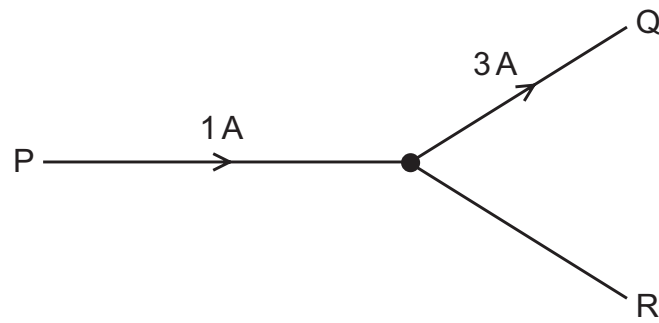
.....

.....

..... [2]

[Total: 8]

- 35** The diagram shows a junction in a circuit where three wires, P, Q and R, meet. The currents in P and Q are 1 A and 3 A respectively, in the directions shown.



How much charge passes a given point in wire R in a time of 5 s?

- A** 0.4 C **B** 2 C **C** 10 C **D** 20 C