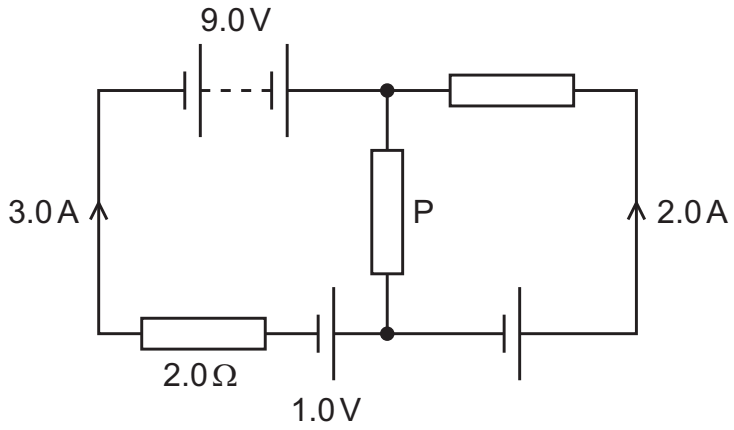
34 The diagram shows a circuit containing a battery and cells with negligible internal resistance.

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

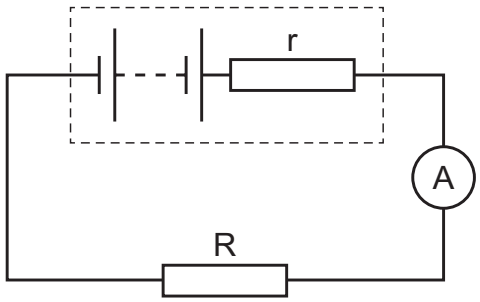
One resistor is labelled P.



What is the resistance of resistor P?

A 0.40 Ω **B** 0.80 Ω **C** 2.0 Ω **D** 2.8 Ω

35 The diagram shows a circuit with a battery connected to a resistor R. The battery has an internal resistance represented by resistor r.

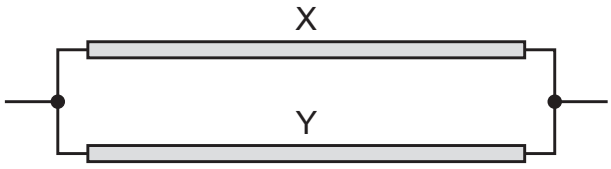


A second resistor, identical to R, is connected in parallel with R.

Which row describes the changes to the potential difference (p.d.) across r and the current shown on the ammeter when the second resistor is connected?

	p.d. across r	current shown on ammeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

36 Two identical wires X and Y, each of length L and radius r, are connected in parallel as shown.



The total resistance of this combination is R_1.

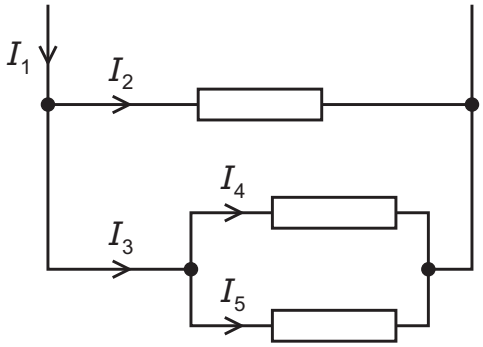
Wire X is replaced with a wire of the same material with length L and radius $2r$.

The total resistance of the new combination is R_2.

What is the ratio $\frac{R_1}{R_2}$?

A $\frac{2}{5}$ **B** $\frac{2}{3}$ **C** $\frac{3}{2}$ **D** $\frac{5}{2}$

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 $I_4 = I_3 - I_5$

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.

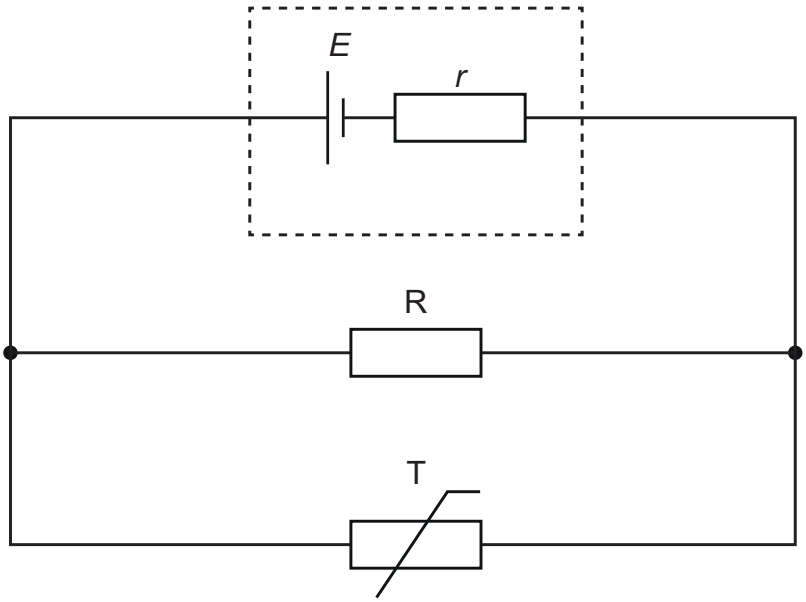


Fig. 5.1

(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.

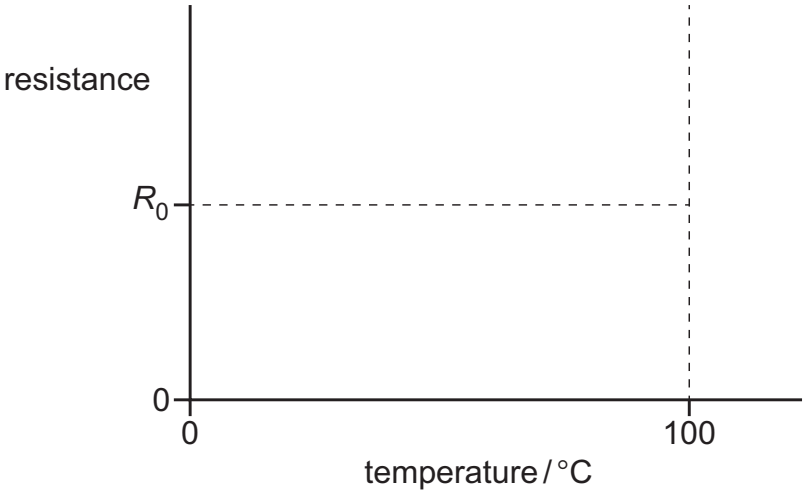


Fig. 5.2

[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 Ω.

Resistor R has a resistance of 6.00 Ω.

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]

5 Fig. 5.1 shows a circuit containing a battery, two fixed resistors X and Y, and a light-dependent resistor (LDR) Z.

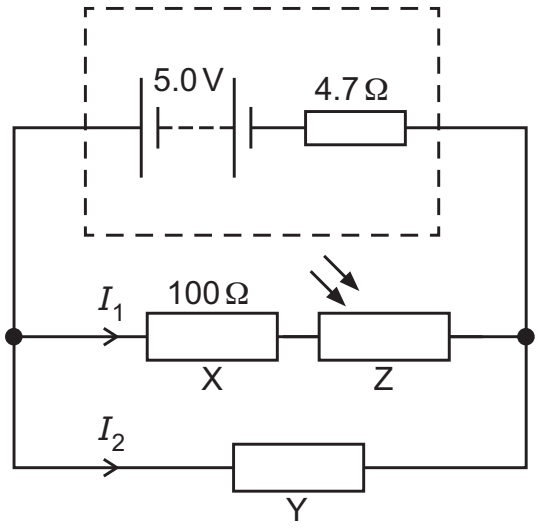


Fig. 5.1

The battery has electromotive force (e.m.f.) 5.0 V and internal resistance 4.7 Ω. The current in X is I_1 and the current in Y is I_2.

The resistance of X is 100 Ω. The resistance of Z varies with the intensity of light incident on it as shown in Fig. 5.2.

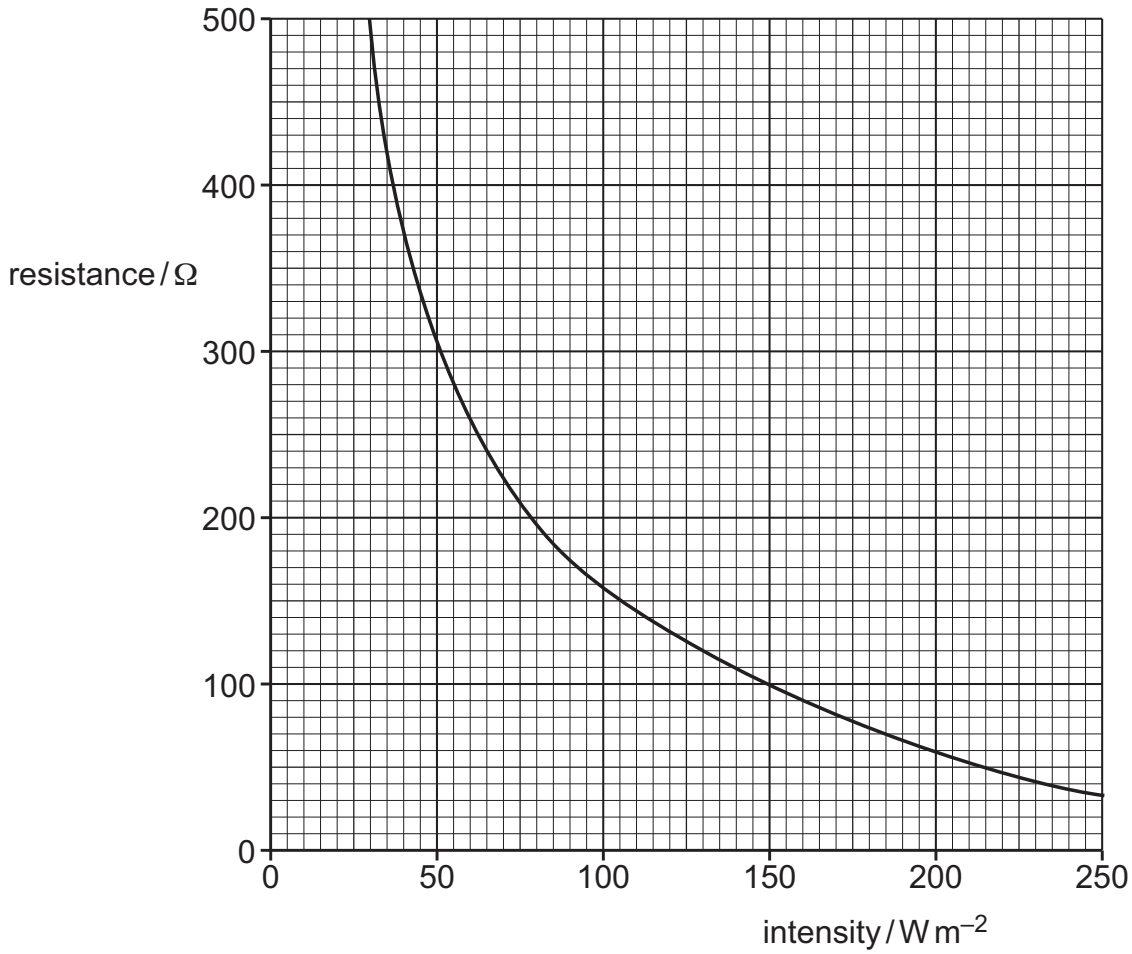


Fig. 5.2

(a) State Kirchhoff's first law.

.....

..... [1]

(b) The intensity of light incident on Z is 130 W m^{-2}. The current in the battery is 38 mA.

(i) Show that the terminal potential difference of the battery is 4.8 V.

[2]

(ii) Calculate the current I_2 in Y.

I_2 = ... A [3]

(iii) Calculate the power dissipated in Y.

power = ... W [2]

(iv) The intensity of the light incident on Z decreases.

State and explain the effect on the terminal potential difference of the battery.

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.....

.....

.....

..... [3]

[Total: 11]

1 Fig. 1.1 shows a model wind turbine with blades, each of length *L*, placed in moving air.

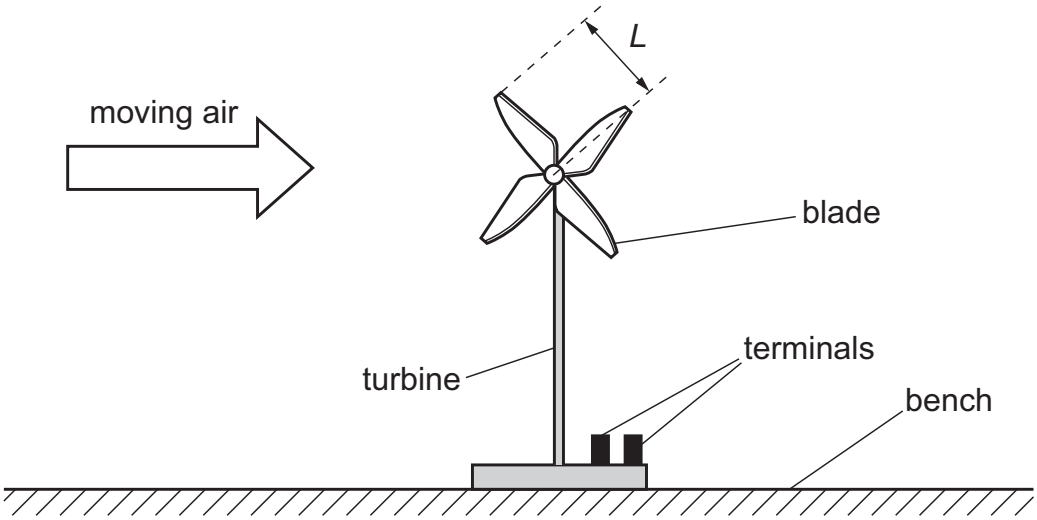


Fig. 1.1

The area of the circle swept by the blades of the turbine is *A*.

The output of the turbine has two terminals. The turbine is connected to a resistor of resistance *R*. At a speed *v* of the moving air, the current in the resistor is *I*.

The atmospheric pressure is *P* and the thermodynamic temperature of the air is *T*.

It is suggested that *I* is related to *v* by the relationship

$$\frac{I^2R}{Q} = \frac{APv^3}{2T}$$

where *Q* is a constant.

Plan a laboratory experiment to test the relationship between *I* and *v*.

Draw a diagram showing the arrangement of your equipment.

Explain how the results could be used to determine a value for *Q*.

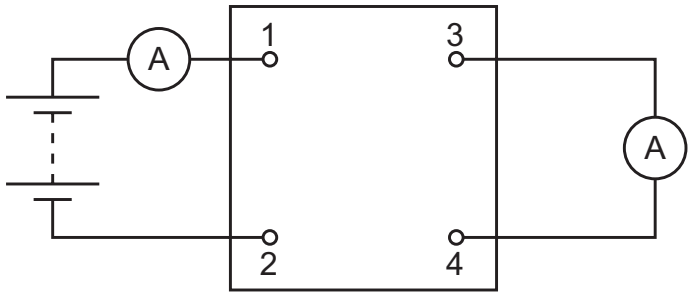
In your plan you should include:

- the procedure to be followed
- the measurements to be taken
- the control of variables
- the analysis of the data
- any safety precautions to be taken.

Diagram

[15]

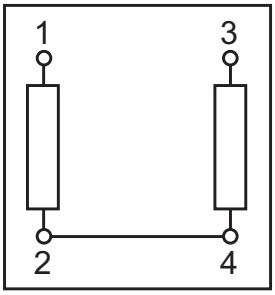
36 The diagram shows a four-terminal box connected to a battery and two ammeters.



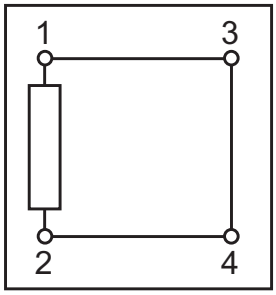
The currents in the two ammeters are identical.

Which circuit, within the box, gives this result?

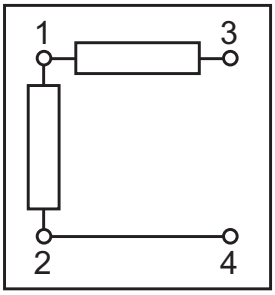
A



B



C



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