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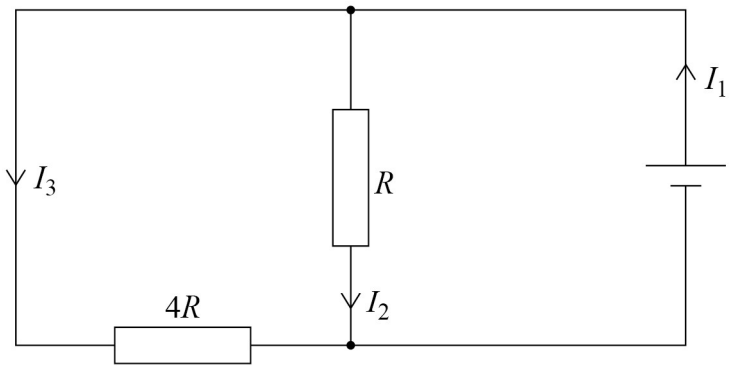
1 1 A cell with negligible internal resistance is connected to two resistors of resistance $4R$ and R.
The currents I_1, I_2 and I_3 in the circuit are shown.



Which equation is correct for this circuit?

[1 mark]

A $I_1 = 4I_2$ ⬭

B $I_1 = 4I_3$ ⬭

C $I_2 = 4I_3$ ⬭

D $I_3 = 4I_1$ ⬭

Turn over for the next question

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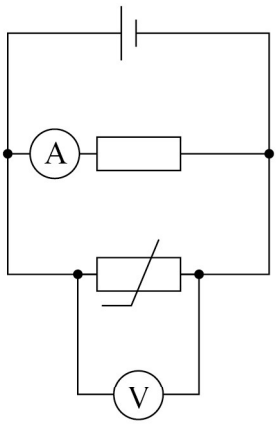
1 8 A circuit contains a thermistor and a resistor in parallel. The internal resistance of the cell is negligible.



The temperature of the thermistor is increased.
The temperature of the resistor is kept constant.

What is observed on the voltmeter and the ammeter?

[1 mark]

	Voltmeter reading	**Ammeter reading**	
A	decreases	increases	⬭
B	increases	increases	⬭
C	no change	increases	⬭
D	no change	no change	⬭

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1 9 The table shows the lengths and cross-sectional areas of two wires **X** and **Y** of the same metal.

Wire	Length / cm	Cross-sectional area / mm^2
X	47	0.10
Y	23	0.40

The resistance of **X** is $6.0\ \Omega$.
The temperature of **Y** is the same as the temperature of **X**.

What is the resistance of **Y**?

[1 mark]

A $0.12\ \Omega$ ⬭

B $0.73\ \Omega$ ⬭

C $1.2\ \Omega$ ⬭

D $3.1\ \Omega$ ⬭

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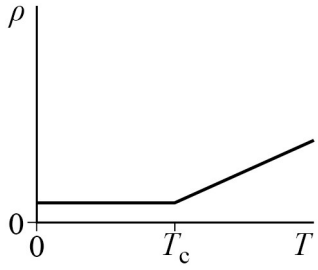
2 0 A superconducting material has a critical temperature T_c.

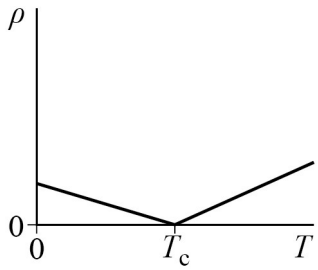
Which graph shows the variation of resistivity ρ with temperature T?

[1 mark]

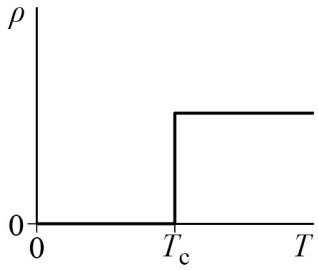
A



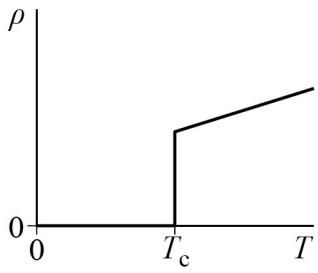
B



C



D



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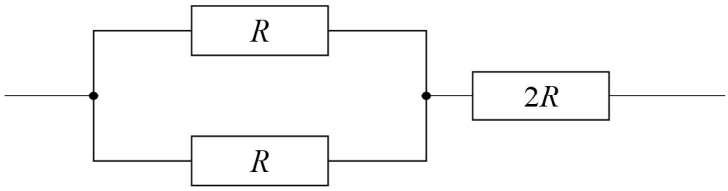
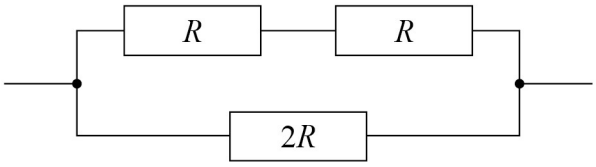
2 1 **X**, **Y** and **Z** are three networks of resistors.

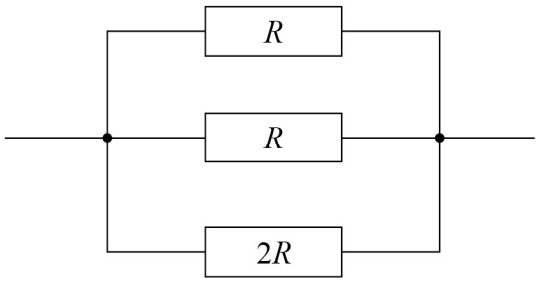
X



Y



Z



Which gives the networks in order of largest total resistance to smallest total resistance?

[1 mark]

A **X**, **Y**, **Z** ⬭

B **Y**, **X**, **Z** ⬭

C **Z**, **X**, **Y** ⬭

D **Z**, **Y**, **X** ⬭

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What is the Young modulus of the material?

[1 mark]

A 1.2×10^5 Pa ⬭

B 1.5×10^5 Pa ⬭

C 1.2×10^{11} Pa ⬭

D 1.5×10^{11} Pa ⬭

2 8 Which row shows the resistance of an ideal ammeter and of an ideal voltmeter?

[1 mark]

	Resistance of ammeter	**Resistance of voltmeter**	
A	zero	zero	⬭
B	zero	infinite	⬭
C	infinite	zero	⬭
D	infinite	infinite	⬭

2 9 The current in a resistor is 15 mA.

How many electrons pass through the resistor in 3 minutes?

[1 mark]

A 2.8×10^{17} ⬭

B 1.7×10^{19} ⬭

C 2.8×10^{20} ⬭

D 1.7×10^{22} ⬭

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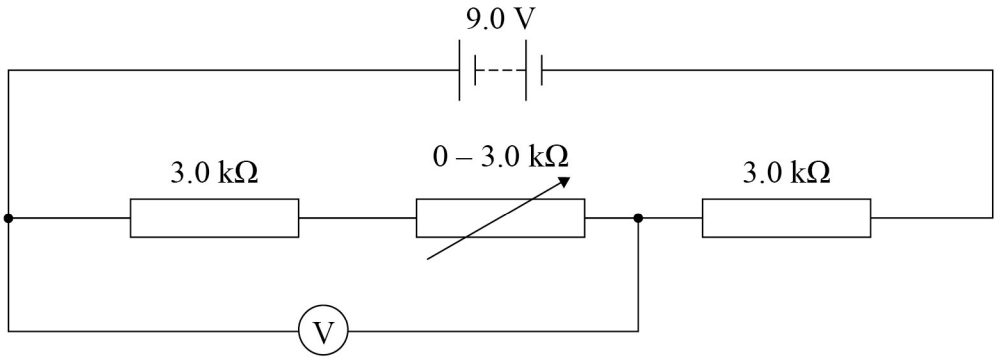
3 0 Three resistors are connected in series with a $9.0\ \text{V}$ battery of negligible internal resistance.



The resistance of the variable resistor is varied from 0 to $3.0\ \text{k}\Omega$.

The range of potential difference observed on the voltmeter is

[1 mark]

A 0 to $6.0\ \text{V}$ ⬭

B $3.0\ \text{V}$ to $6.0\ \text{V}$ ⬭

C $4.5\ \text{V}$ to $6.0\ \text{V}$ ⬭

D $4.5\ \text{V}$ to $9.0\ \text{V}$ ⬭

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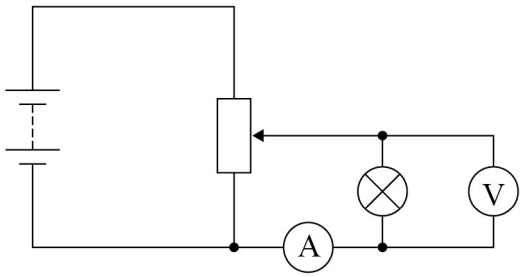
3 1 The current–voltage characteristic between 0 and $6.0\ \text{V}$ is required for a filament lamp. The lamp is connected in a circuit with a battery of emf $6.0\ \text{V}$ and negligible internal resistance.

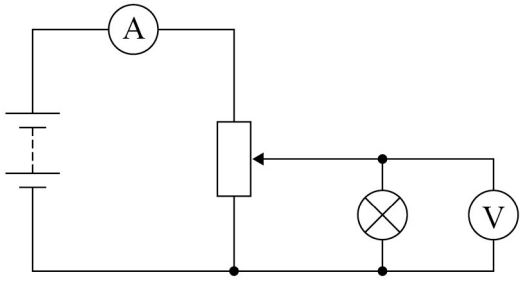
Which circuit should be used?

[1 mark]

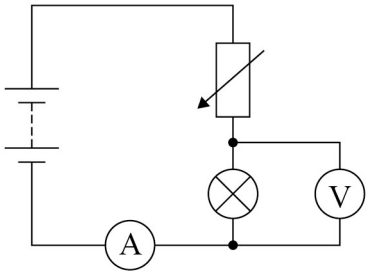
A



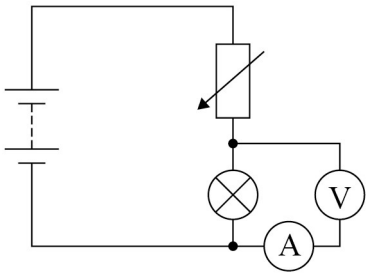
B



C



D



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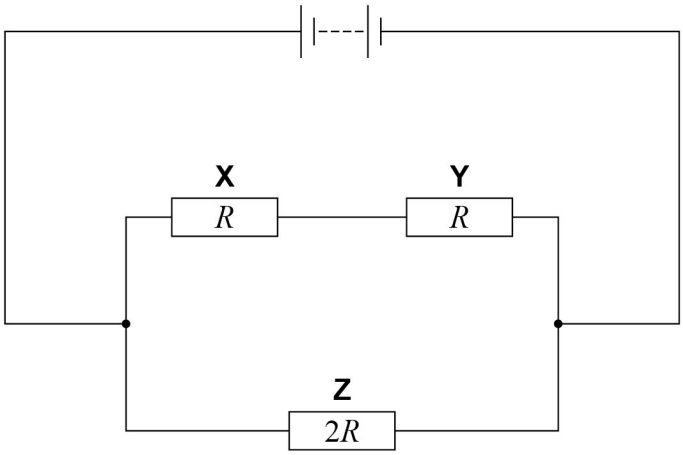
3 2 The diagram shows a circuit containing three resistors **X**, **Y** and **Z**.



X and **Y** each have resistance R.
Z has resistance $2R$.

What is $\frac{\text{power in } \mathbf{X}}{\text{power in } \mathbf{Z}}$?

[1 mark]

A $\frac{1}{4}$ ⬭

B $\frac{1}{2}$ ⬭

C 2 ⬭

D 4 ⬭

3 3 A pellet of mass $25\ \text{g}$ travelling horizontally at $40\ \text{m s}^{-1}$ enters a fixed wooden block. The pellet stops after travelling a horizontal distance of $2.5\ \text{cm}$ in the block.

What is the average resistive force acting on the pellet?

[1 mark]

A $20\ \text{N}$ ⬭

B $800\ \text{N}$ ⬭

C $1600\ \text{N}$ ⬭

D $8000\ \text{N}$ ⬭