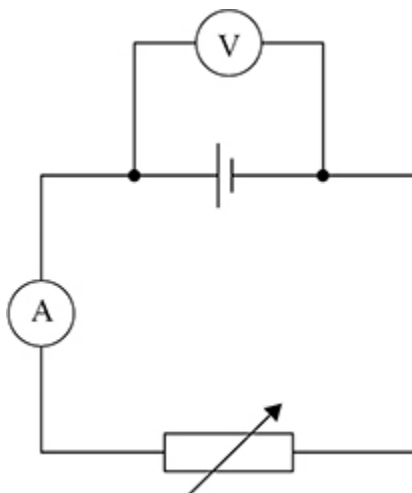


1. In the circuit shown, the cell has an emf of 12 V and an internal resistance which is not negligible.



When the resistance of the variable resistor is $10\ \Omega$ the voltmeter reads 10 V and the ammeter reads 1.0 A.

The resistance of the variable resistor is changed to $5\ \Omega$.

What is the new reading on the ammeter?

A 1.4 A

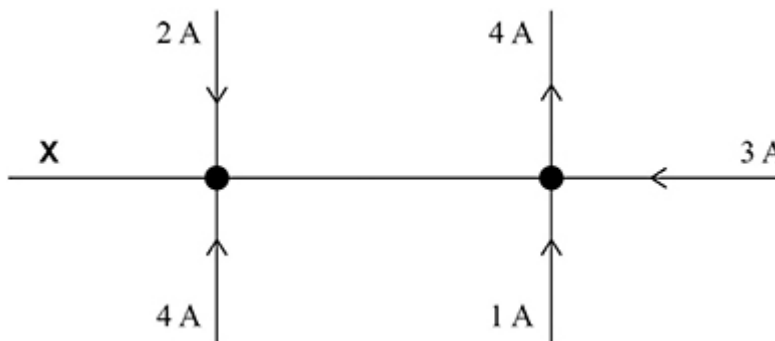
B 1.7 A

C 2.0 A

D 2.4 A

(Total 1 mark)

2. The diagram shows the currents in a set of wires.



What is the magnitude of the current at **X**?

A zero

B 2 A

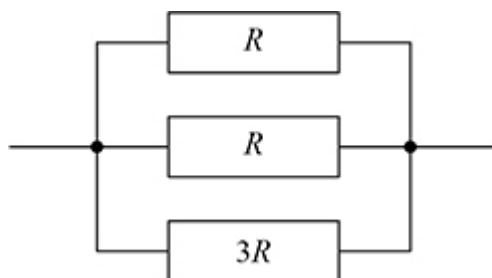
C 3 A

D 6 A

(Total 1 mark)

3.

Resistors of resistance R , R and $3R$ are connected as shown.



What is the resistance of the arrangement?

A $\frac{3R}{7}$

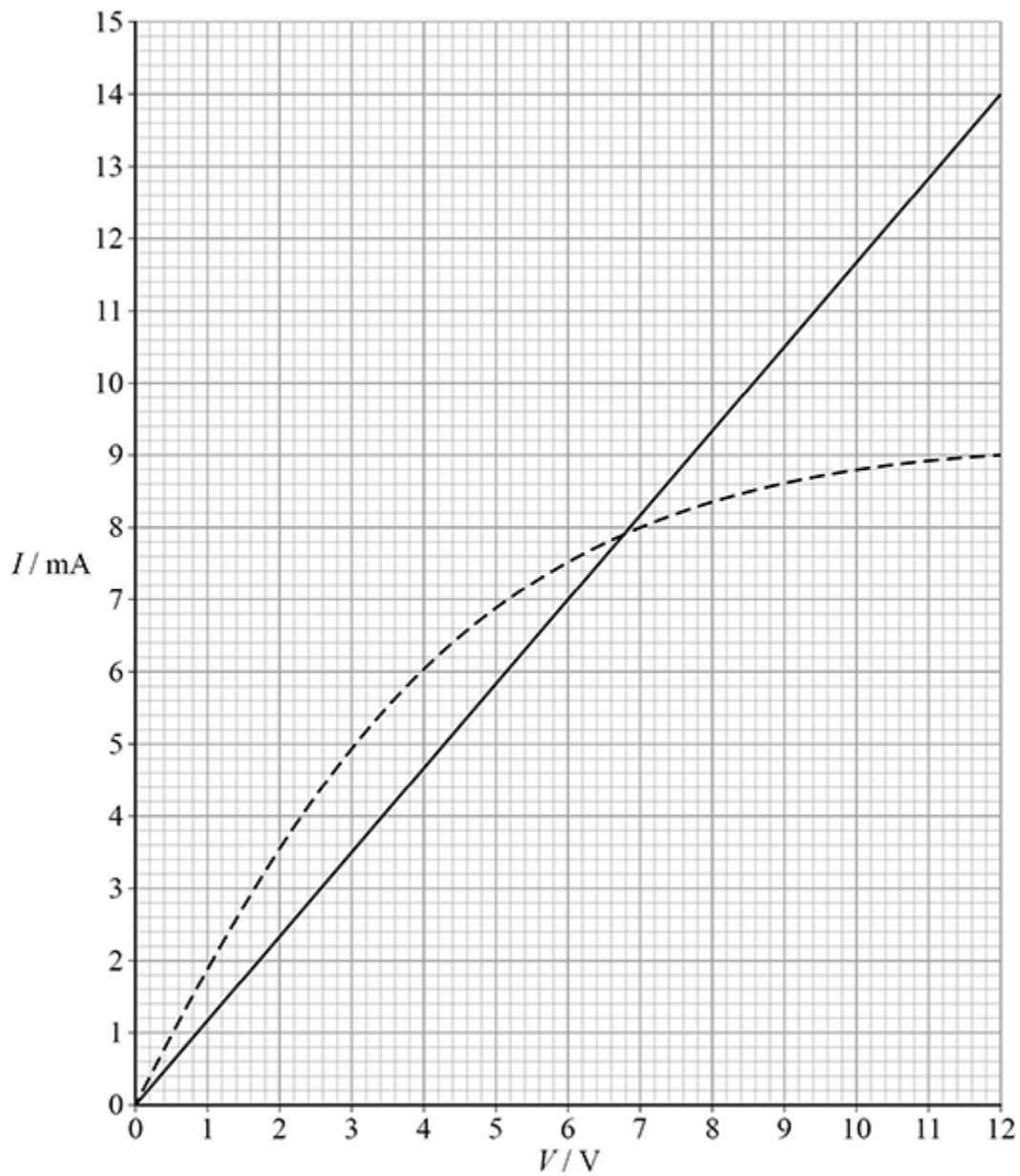
B $\frac{7R}{3}$

C $\frac{5R}{6}$

D $\frac{6R}{5}$

(Total 1 mark)

4. The graph shows the current–voltage (I – V) characteristics for two components.



The two components are connected in parallel with a 12 V battery that has negligible internal resistance.

What is the current in the battery?

A 7.9 mA

B 14.5 mA

C 15.8 mA

D 23.0 mA

(Total 1 mark)

5. Measurements are taken to determine the resistivity of a uniform metal wire. The table shows the quantities measured and their percentage uncertainties.

Quantity	Percentage uncertainty
potential difference across wire	0.3%
current in wire	5.0%
diameter of wire	4.0%
length of wire	0.2%

What is the percentage uncertainty in the calculated value for the resistivity of the metal of the wire?

- A 1.6%
- B 9.5%
- C 13.5%
- D 21.5%

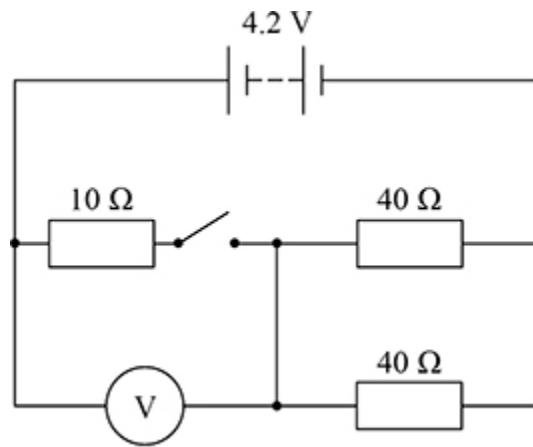
(Total 1 mark)

6. Superconductors are used to

- A increase the strength of electricity cables.
- B make light dependent resistors.
- C produce strong magnetic fields.
- D increase the rate of heat energy transfer.

(Total 1 mark)

7. The battery in this circuit has an emf of 4.2 V and negligible internal resistance.

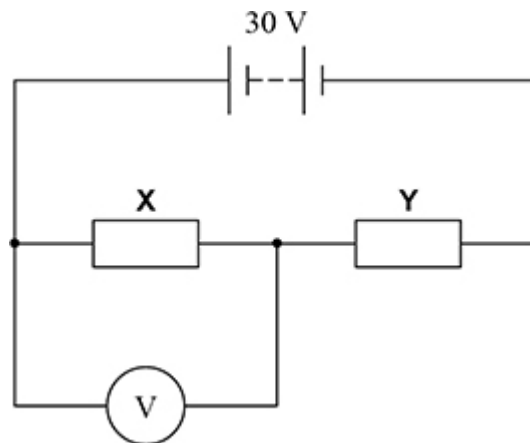


What are the readings on the voltmeter when the switch is open (off) and when the switch is closed (on)?

	Open	Closed	
A	0 V	2.1 V	<input type="radio"/>
B	4.2 V	2.1 V	<input type="radio"/>
C	0 V	1.4 V	<input type="radio"/>
D	4.2 V	1.4 V	<input type="radio"/>

(Total 1 mark)

8. Two resistors **X** and **Y** are connected in series with a power supply of emf 30 V and negligible internal resistance.
The resistors are made from wire of the same material. The wires have the same length. **X** uses wire of diameter d and **Y** uses wire of diameter $2d$.



What is the reading on the voltmeter?

- A** 10 V
- B** 15 V
- C** 20 V
- D** 24 V

(Total 1 mark)

9.

The table shows corresponding values of potential difference V and current I for four electrical components **A**, **B**, **C** and **D**.

	A	B	C	D
V/V	I/A	I/A	I/A	I/A
0	0.0	0.0	0.0	0.0
2	0.0	0.3	0.4	0.3
4	0.1	0.6	0.8	0.6
6	0.7	0.9	1.2	0.9
8	1.4	1.2	1.6	1.1
10	2.1	1.5	2.0	1.3
12	2.8	1.8	2.4	1.4

Which component is an ohmic conductor with the greatest resistance?

- A**
- B**
- C**
- D**

(Total 1 mark)

10. Which row shows the resistances of an ideal ammeter and an ideal voltmeter?

	Ideal ammeter	Ideal voltmeter	
A	infinite	infinite	<input type="radio"/>
B	infinite	zero	<input type="radio"/>
C	zero	infinite	<input type="radio"/>
D	zero	zero	<input type="radio"/>

(Total 1 mark)

11. The capacity of a portable charger is rated in ampere hours (A h). A charger of capacity 1 A h can provide 1 A for 1 hour at its working voltage.

One charger has a capacity of 1800 mA h at a working voltage of 3.7 V.

What is the energy stored in this charger?

- A 6.5 kJ
- B 24 kJ
- C 400 kJ
- D 24 kJ

(Total 1 mark)

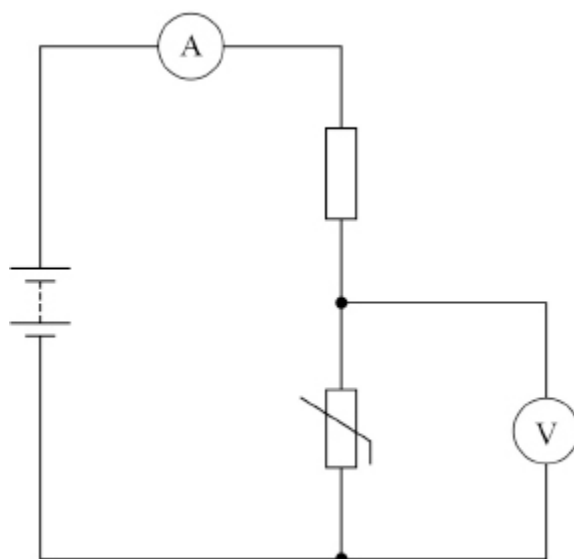
12. A filament lamp with resistance 12Ω is operated at a power of 36 W.

How much charge flows through the filament lamp during 15 minutes?

- A 26 C
- B 1.6 kC
- C 2.7 kC
- D 6.5 kC

(Total 1 mark)

13. The diagram shows a temperature-sensing circuit.



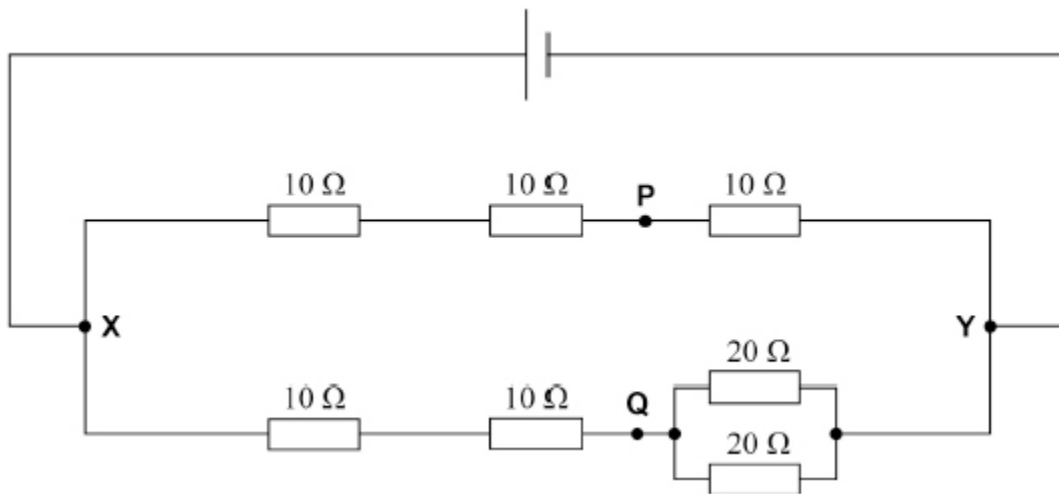
The temperature of the thermistor is decreased.

Which row shows the changes to the ammeter reading and the voltmeter reading?

	Ammeter reading	Voltmeter reading	
A	increases	increases	<input type="radio"/>
B	increases	decreases	<input type="radio"/>
C	decreases	decreases	<input type="radio"/>
D	decreases	increases	<input type="radio"/>

(Total 1 mark)

14. The potential difference between points **X** and **Y** is V .



What is the potential difference between **P** and **Q**?

- A zero
- B $\frac{V}{3}$
- C $\frac{V}{2}$
- D $\frac{2V}{3}$

(Total 1 mark)

15. A resistor with resistance R is made from metal wire of resistivity ρ . The length of the wire is L .

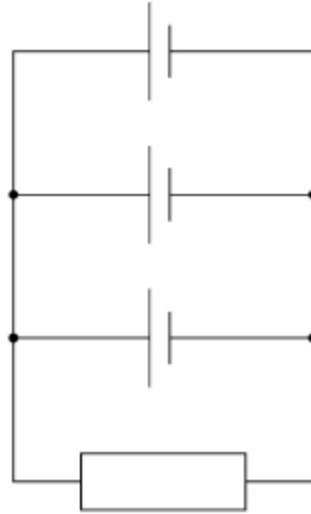
What is the diameter of the wire?

- A $\sqrt{\frac{2\rho R}{\pi L}}$
- B $\sqrt{\frac{2\rho L}{\pi R}}$
- C $2\sqrt{\frac{\rho L}{\pi R}}$
- D $2\sqrt{\frac{\rho R}{\pi L}}$

(Total 1 mark)

16.

A resistor of resistance R and three identical cells of emf E and internal resistance r are connected as shown.



What is the current in the resistor?

A $\frac{3E}{(3R+r)}$

B $\frac{9E}{(3R+r)}$

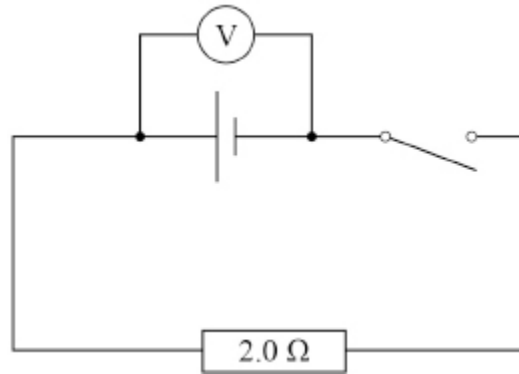
C $\frac{E}{R}$

D $\frac{3E}{R}$

(Total 1 mark)

17. In the circuit, the reading of the voltmeter is V .

When the switch is closed the reading becomes $\frac{V}{3}$.



What is the internal resistance of the cell?

A 0.33 Ω

B 0.67 Ω

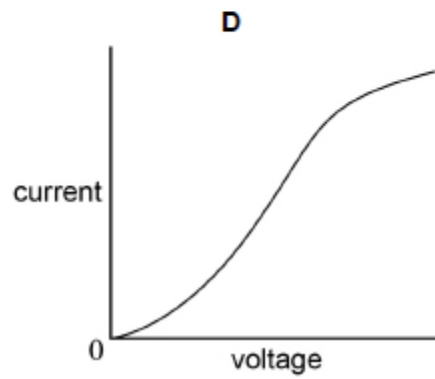
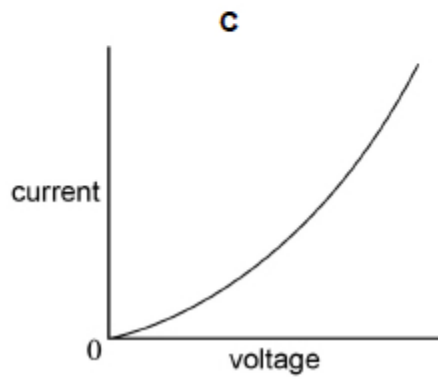
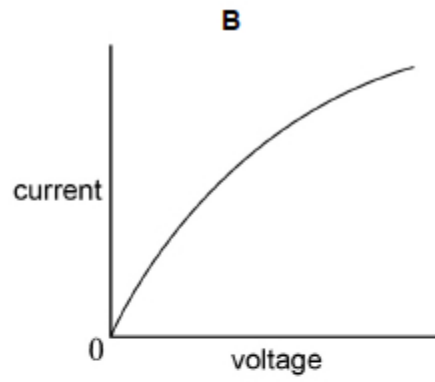
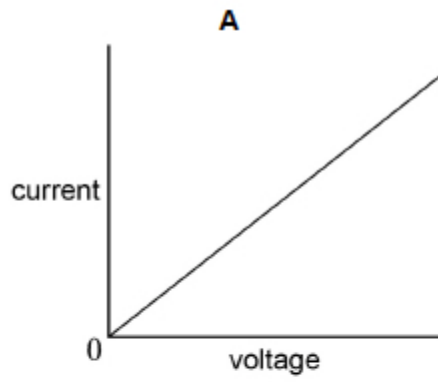
C 4.0 Ω

D 6.0 Ω

(Total 1 mark)

18.

Which is the current–voltage characteristic graph for a filament lamp up to its working voltage?



A

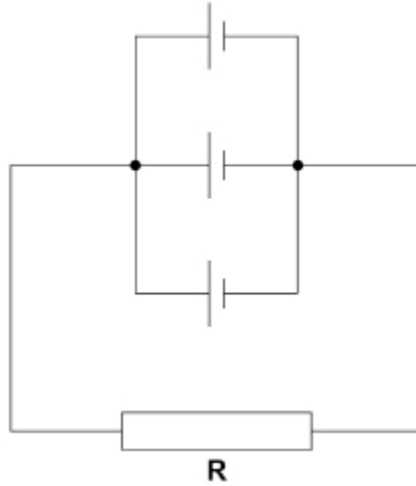
B

C

D

(Total 1 mark)

19. Three identical cells, each of emf 1.5 V and internal resistance 6.0Ω , are connected to resistor **R**. The resistance of **R** is 6.0Ω .



What is the current in **R**?

A 0.19 A

B 0.25 A

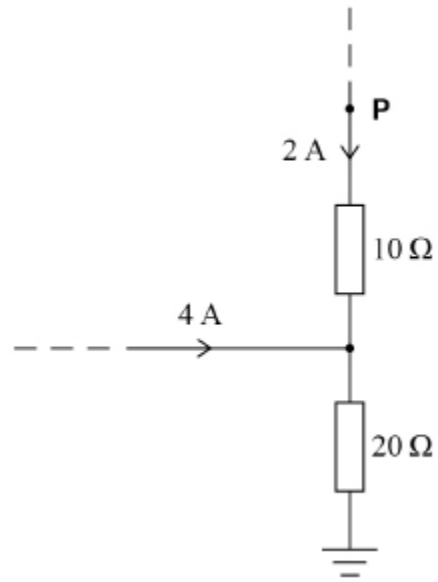
C 0.56 A

D 0.75 A

(Total 1 mark)

20.

The diagram shows part of a circuit and the currents in the circuit.



What is the potential difference between point P and earth?

A 60 V

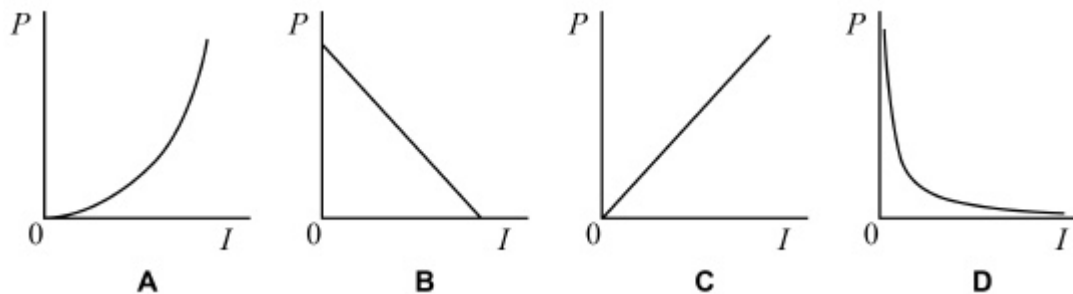
B 100 V

C 120 V

D 140 V

(Total 1 mark)

21. Which graph shows how power dissipated P varies with current I in a component that obeys Ohm's law?



A

B

C

D

(Total 1 mark)

22. A gas containing doubly-charged ions flows to give an electric current of 0.64 A
How many ions pass a point in 1.0 minute?

A 2.0×10^{18}

B 4.0×10^{18}

C 1.2×10^{20}

D 2.4×10^{20}

(Total 1 mark)

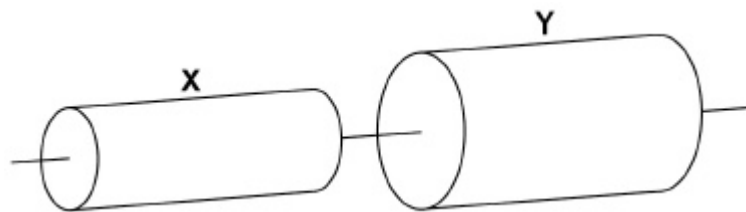
23. A mobile phone operates at a constant power of 200 mW
It has a 3.7 V lithium-ion battery that has a charge capacity of 9400 C

What is the time taken for the battery to discharge completely?

- A 2 hours
- B 48 hours
- C 120 hours
- D 140 hours

(Total 1 mark)

24. The two resistors shown are both uniform cylinders of equal length made from the same conducting putty.



The diameter of Y is twice that of X. The resistance of Y is R .

What is the total resistance of the combination?

- A $\frac{4R}{5}$
- B $3R$
- C $4R$
- D $5R$

(Total 1 mark)

25. The combined resistance of n identical resistors connected in parallel is R_n .

Which statement correctly describes the variation of R_n as n increases?

- A R_n decreases linearly as n increases
- B R_n decreases non-linearly as n increases
- C R_n increases linearly as n increases
- D R_n increases non-linearly as n increases

(Total 1 mark)

26. The table shows the resistivity, length and cross-sectional area of wires P and Q.

	resistivity	length	cross-sectional area
wire P	ρ	L	A
wire Q	$\frac{\rho}{4}$	L	$\frac{A}{2}$

The resistance of wire P is R .

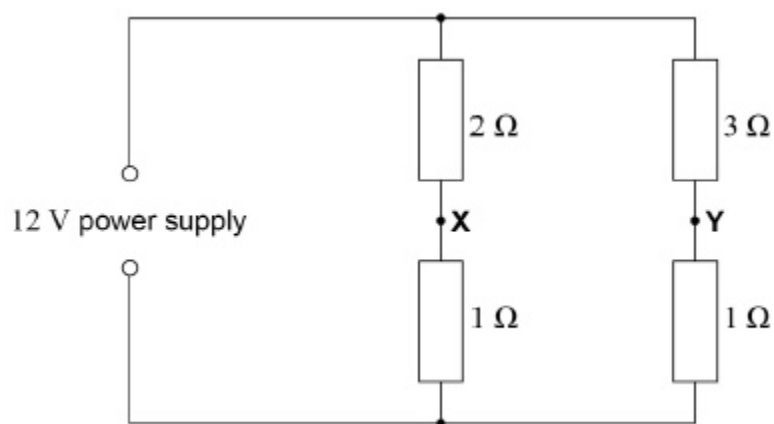
What is the total resistance of the wires when they are connected in parallel?

- A $\frac{R}{9}$
- B $\frac{R}{3}$
- C $\frac{2R}{3}$
- D $\frac{3R}{2}$

(Total 1 mark)

27.

In this resistor network, the emf of the supply is 12 V and it has negligible internal resistance.



What is the reading on a voltmeter connected between points X and Y?

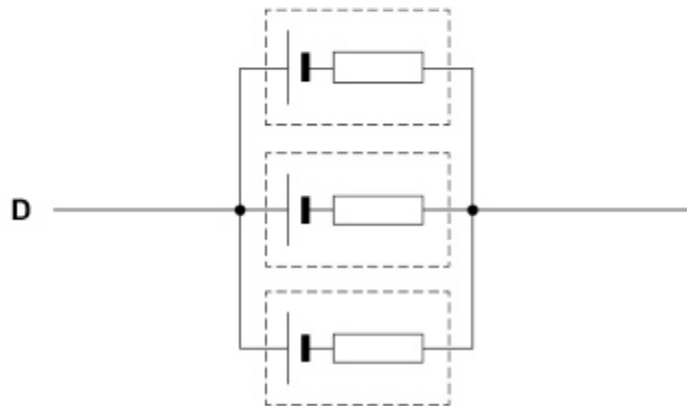
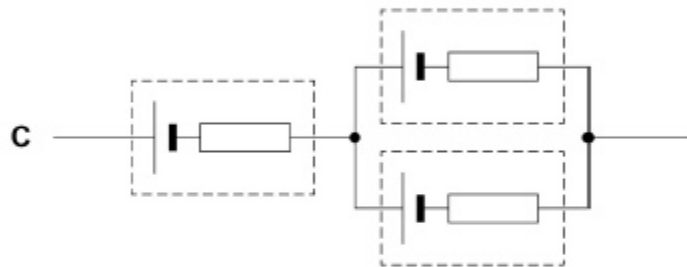
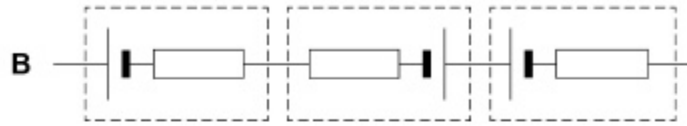
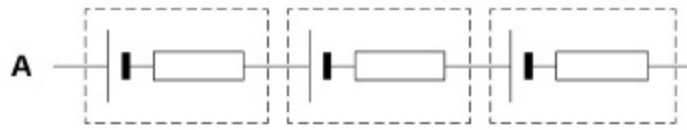
- A** 0 V
- B** 1 V
- C** 3 V
- D** 4 V

(Total 1 mark)

28.

Three cells each have an emf $\epsilon = 1.5 \text{ V}$ and an internal resistance $r = 0.6 \Omega$.

Which combination of these cells will deliver a total emf of 1.5 V and a maximum current of 7.5 A ?



A

B

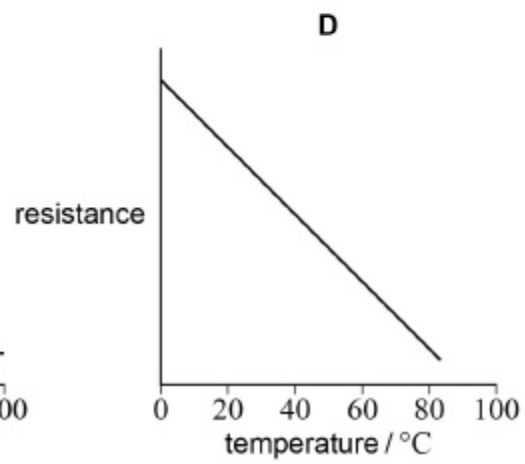
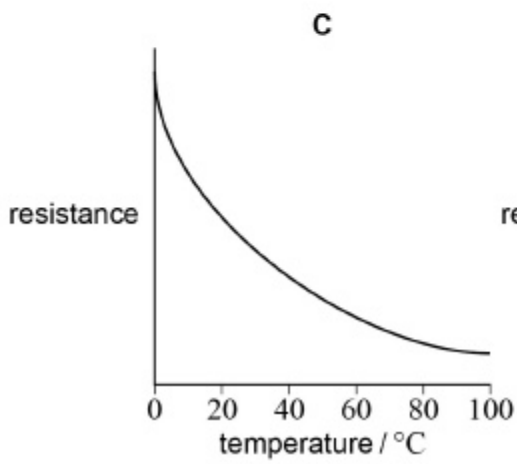
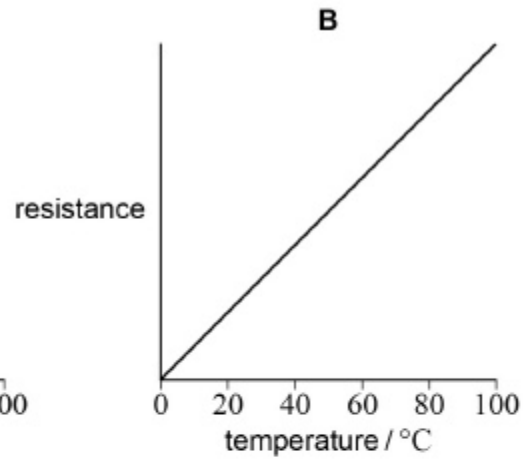
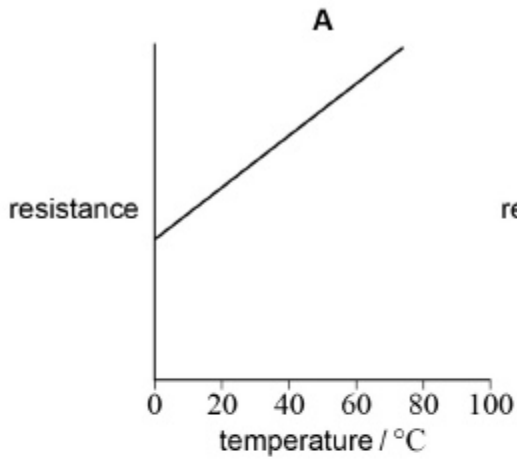
C

D

(Total 1 mark)

29.

Which graph shows the variation of the resistance with temperature for an ntc thermistor?



A

B

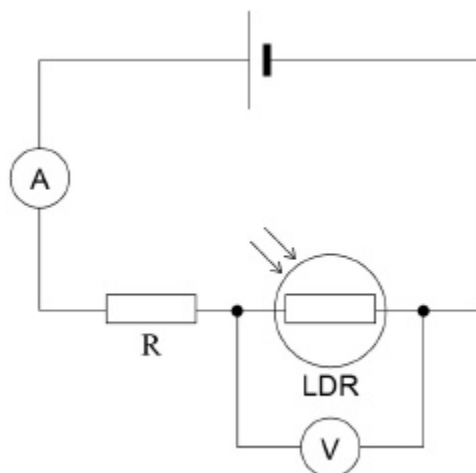
C

D

(Total 1 mark)

30.

The figure shows a light dependent resistor (LDR) and fixed resistor R connected in series across a cell. The internal resistance of the cell is negligible.

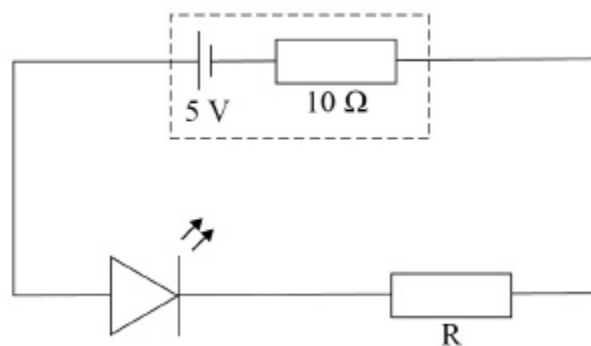


Which row shows how the readings on the ammeter and the voltmeter change when the light intensity incident on the LDR is increased?

	Ammeter reading	Voltmeter reading	
A	decreases	increases	<input type="checkbox"/>
B	decreases	decreases	<input type="checkbox"/>
C	increases	increases	<input type="checkbox"/>
D	increases	decreases	<input type="checkbox"/>

(Total 1 mark)

31. In the circuit below, the potential difference across the light emitting diode (LED) is 1.8 V when it is emitting light.



The current in the circuit is 20 mA.

What is the value of the resistor R?

A 80 Ω

B 90 Ω

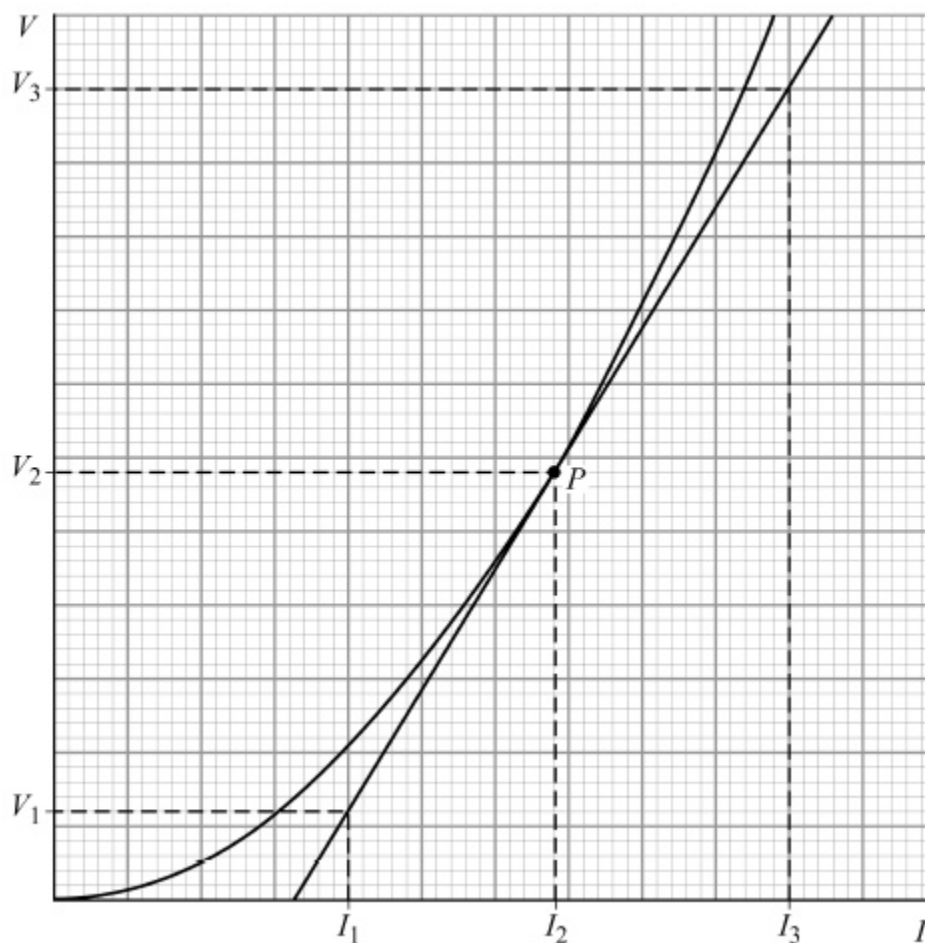
C 150 Ω

D 160 Ω

(Total 1 mark)

32. The graph shows how the potential difference V across an electrical component varies with current I in the component.

A tangent has been drawn on the curve at point P for a current of I_2 .



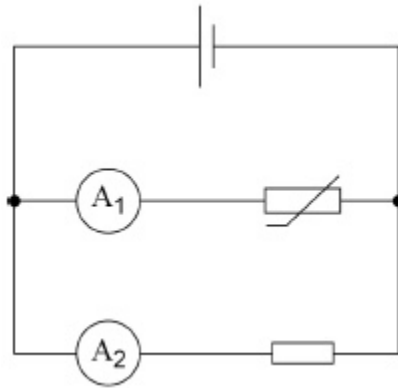
What is the resistance of the electrical component when the current in the component is I_2 ?

- A $\frac{V_3 - V_1}{2I_2}$
- B $\frac{V_3 - V_1}{I_3 - I_1}$
- C $\frac{V_2}{I_2}$
- D $\frac{2V_2}{I_2 - I_1}$

(Total 1 mark)

33.

A circuit consists of a cell, a thermistor, a fixed resistor and two ammeters.



The cell has a constant electromotive force and negligible internal resistance. Readings from the two ammeters are taken.

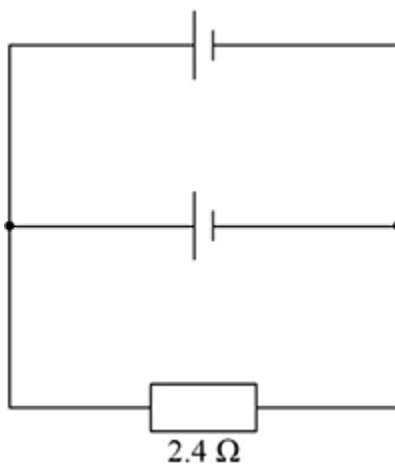
Which row describes what happens to the current in each ammeter when the temperature of the thermistor decreases?

	Current in ammeter A ₁	Current in ammeter A ₂	
A	Decreases	Unchanged	<input type="checkbox"/>
B	Decreases	Increases	<input type="checkbox"/>
C	Increases	Decreases	<input type="checkbox"/>
D	Increases	Unchanged	<input type="checkbox"/>

(Total 1 mark)

34.

Two identical batteries each of emf 1.5 V and internal resistance 1.6Ω are connected in parallel. A 2.4Ω resistor is connected in parallel with this combination.



What is the current in the 2.4Ω resistor?

A 0.38 A

B 0.47 A

C 0.75 A

D 0.94 A

(Total 1 mark)