

Current

Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Electricity and Magnetism
Topic	Current
Booklet	Question Paper

Time Allowed: 85 minutes

Score: /71

Percentage: /100

Grade Boundaries:

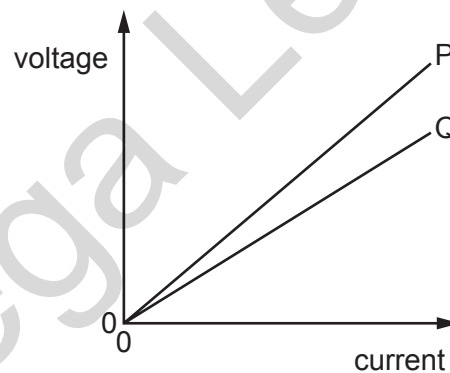
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- 1 The current in a car headlamp is 2.0A. The headlamp is switched on for 4.0 minutes.
How much charge passes through the headlamp?
- A** 8.0C **B** 30C **C** 120C **D** 480C

- 2 How can *one volt* also be expressed?
- A** one coulomb per ampere
B one coulomb per joule
C one joule per ampere
D one joule per coulomb

- 3 The graph is the voltage-current graph for two resistance wires P and Q.



The wires are made from the same material and have equal lengths.

The resistances of the wires and their cross-sectional areas are different.

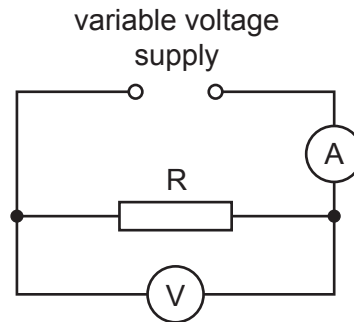
Which wire has the greater resistance and which wire has the larger cross-sectional area?

	greater resistance	larger cross-sectional area
A	P	P
B	P	Q
C	Q	P
D	Q	Q

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- 4 A student is investigating resistance using the circuit shown.



The resistance of R is approximately 5Ω .

What are the most suitable ranges for the voltmeter and for the ammeter?

	voltmeter range	ammeter range
A	0–2V	0–0.5 A
B	0–2V	0–2 A
C	0–5V	0–5 A
D	0–10V	0–5 A

- 5 A charge of 45 C flows through an electric appliance in 3.0 minutes.

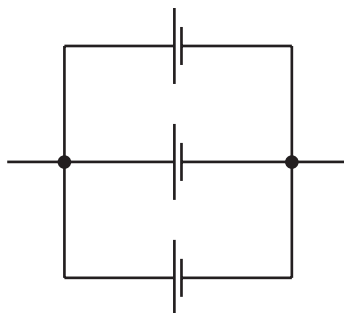
What is the average current in the appliance?

- A** 0.25 A **B** 4.0 A **C** 15 A **D** 135 A

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- 6 The diagram shows a battery of three 1.5V cells.



What is an advantage of this arrangement of cells?

- A** The battery can supply a current for a longer time than a single 1.5V cell.
 - B** The battery can supply any e.m.f. between 0V and 4.5V.
 - C** The battery supplies more energy to each coulomb of charge than a single 1.5V cell.
 - D** The e.m.f. of the battery is 4.5V.
- 7 A charge of 7.5C flows through a resistor in 5.0s. A student has ammeters with different ranges that he can use to measure the current in the resistor.
- Which ammeter range is the most appropriate?
- A** 0-1A **B** 0-2A **C** 0-5A **D** 0-40A
- 8 Three identical cells are connected in parallel to a resistor.
- What is the advantage of using three cells in parallel, rather than using a single cell?
- A** Each cell produces more energy.
 - B** Each cell supplies more charge.
 - C** Each cell takes longer to run down.
 - D** The total electromotive force (e.m.f.) is larger.

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- 9 When the flash on a camera is used, a charge of 1.5C flows through the flash-tube in 0.0030 s.
The average voltage across the flash-tube is 3600V.

What is the electrical energy supplied to the flash-tube and what is the average power supplied?

	energy / J	power / W
A	2400	7.2
B	2400	800 000
C	5400	16.2
D	5400	1.8×10^6

- 10 A 1.0 length of wire of cross-sectional area 0.40 mm^2 has a resistance of 2.0Ω .

What is the resistance of a 0.50 m length of wire, of the same material, with a cross-sectional area of 0.80 mm^2 ?

- A** 0.5Ω **B** 1.0Ω **C** 4.0Ω **D** 8.0Ω

- 11 The flash on a camera operates when a capacitor discharges through a flash-tube.
In 3.2 ms, a charge of 6.0 C passes through the flash-tube.

What is the average current in the flash-tube?

- A** 0.019 A
B 1.9 A
C 19 A
D 1900 A

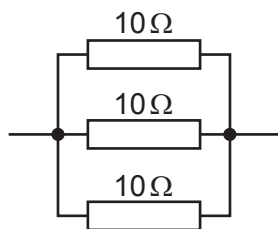
- 12 Which physical quantity is produced by a calculation where a charge is multiplied by a potential difference (p.d.)?

- A** current
B electromotive force (e.m.f.)
C energy
D power

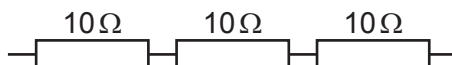
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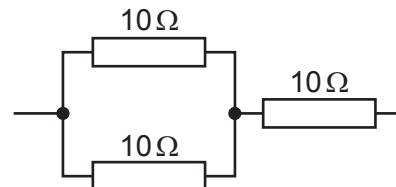
13 Three 10Ω resistors are connected together to form networks X, Y and Z.



network X



network Y

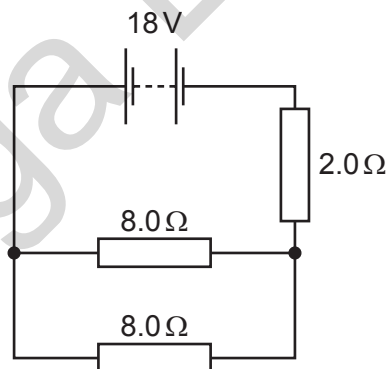


network Z

What is the order of resistance of the networks going from the smallest total resistance to the largest total resistance?

- A** $X \rightarrow Y \rightarrow Z$ **B** $X \rightarrow Z \rightarrow Y$ **C** $Z \rightarrow X \rightarrow Y$ **D** $Z \rightarrow Y \rightarrow X$

14 A power supply of 18V is connected to three resistors, as shown.



What is the potential difference across the 2.0Ω resistor?

- A** 2.0V **B** 3.6V **C** 6.0V **D** 12V

15 An immersion heater is labelled 24V , 120W .

What is the current in the heater when it is connected to a 24V supply?

- A** 0.20A **B** 5.0A **C** 24A **D** 120A

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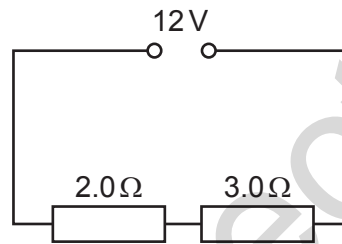
16 A piece of wire has a resistance of $16\ \Omega$.

Another wire made from the same metal has four times the length and twice the cross-sectional area.

What is the resistance of the wire?

- A** $8\ \Omega$ **B** $32\ \Omega$ **C** $96\ \Omega$ **D** $128\ \Omega$

17 The diagram shows a circuit that has two resistors in series with a 12V supply.



What is the current in the circuit?

- A** 2.4A **B** 10A **C** 14A **D** 60A

18 There is a current of 0.25A in a lamp connected to a 240V supply.

What is the input power to the lamp?

- A** 15W **B** 60W **C** 240W **D** 960W

19 A lightning flash carries 40C of charge and lasts for 5.0ms .

What is the average current in the flash?

- A** 0.20A **B** 8.0A **C** 200A **D** 8000A

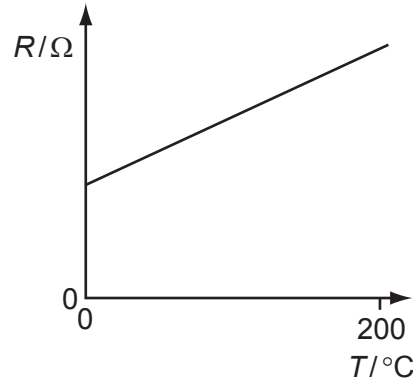
20 Which of the following is equivalent to 1V ?

- A** 1J/A
B 1J/C
C 1J/s
D 1J/W

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- 21 The electrical resistance of a metal wire varies with temperature as shown.

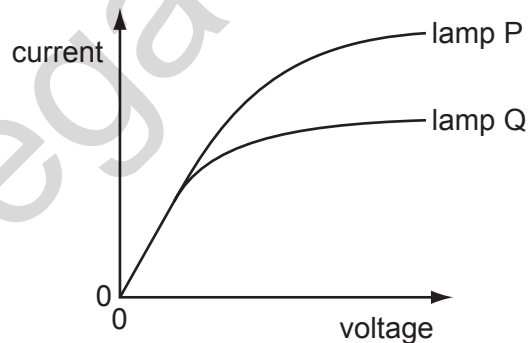


The resistance of the wire at 0°C is $1.00\ \Omega$ and at 100°C is $1.40\ \Omega$.

What is the resistance of the wire at 200°C ?

- A** $1.80\ \Omega$ **B** $1.96\ \Omega$ **C** $2.00\ \Omega$ **D** $2.80\ \Omega$

- 22 The diagram shows the current-voltage graph of two filament lamps.



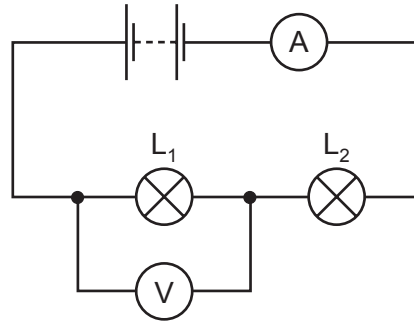
Which statement is correct?

- A** Lamp P has a lower resistance than lamp Q at all currents.
B Lamp P has the same resistance as lamp Q at low currents.
C Lamp P has the same resistance as lamp Q at high currents.
D Lamp P has a higher resistance than lamp Q at all currents.

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- 23 A circuit containing two lamps L_1 and L_2 is connected as shown.



A voltmeter measures the potential difference across the lamp L_1 .

The filament of lamp L_1 breaks. What happens to the readings of the ammeter and of the voltmeter?

	reading on the ammeter	reading on the voltmeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

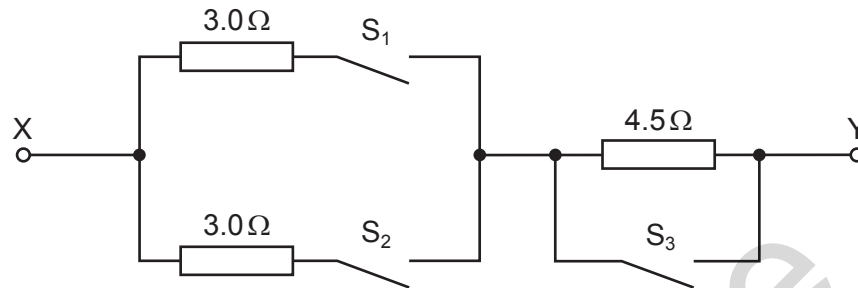
- 24 Which of the following is equivalent to one coulomb?

- A** one ampere second
- B** one ampere per volt
- C** one volt ampere
- D** one volt per ampere

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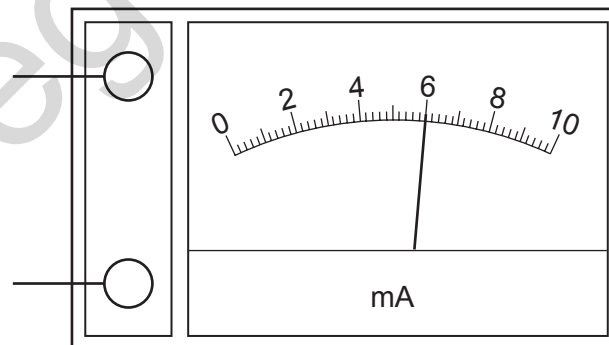
25 The diagram shows a circuit in which all the switches are open.



Which switch positions give a resistance of $6.0\ \Omega$ between X and Y?

	S_1	S_2	S_3
A	closed	closed	closed
B	closed	closed	open
C	closed	open	closed
D	closed	open	open

26 An ammeter is used to measure the current in a $300\ \Omega$ resistor. The ammeter is shown below.



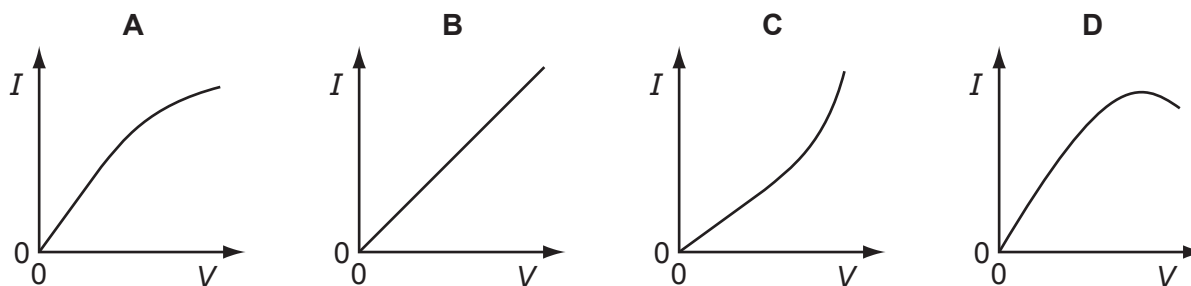
What is the potential difference across the resistor?

- A** 0.050 V **B** 1.8 V **C** 50 V **D** 1800 V

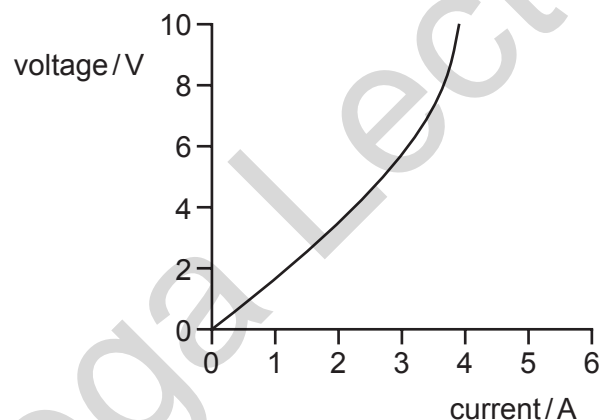
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27 Which is the current/voltage (I/V) graph of a filament lamp?



28 The voltage/current graph for a filament lamp is shown.



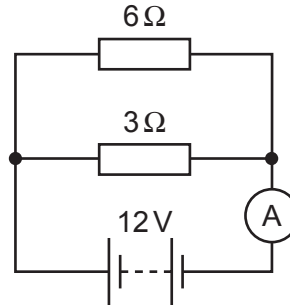
The voltage across the lamp increases. What happens to the temperature of the lamp and the resistance of the lamp?

	temperature	resistance
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

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29 A 12V battery is connected across a parallel arrangement of two resistors.



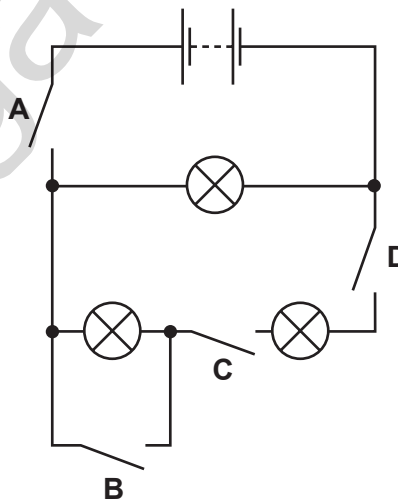
What is the reading on the ammeter?

- A 1.3A B 2.0A C 4.0A D 6.0A

30 The circuit shown is set up and then all the switches are closed.

One switch is now opened and all the lamps are lit.

Which switch is opened?



31 A lamp connected to a 12V supply converts energy at a rate of 36W.

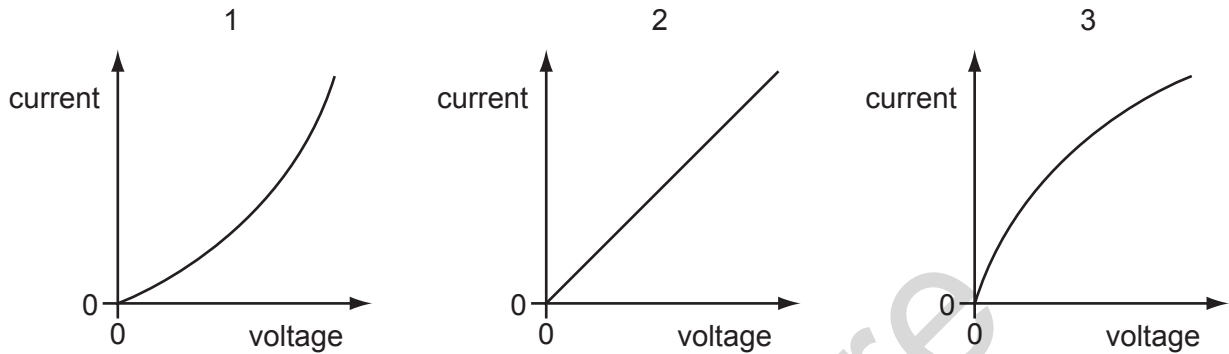
How much energy will be converted in 10s?

- A 30J B 36J C 120J D 360J

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32 The current/voltage graphs are for different electrical components.



Which graph is for a resistor at constant temperature and which is for a filament lamp?

	resistor	lamp
A	1	2
B	2	1
C	2	3
D	3	2

33 A lamp is rated at 12V, 600mW.

What is the current in the lamp?

- A** 20mA **B** 50mA **C** 2.0A **D** 5.0A

34 Three identical cells are connected in parallel to a resistor.

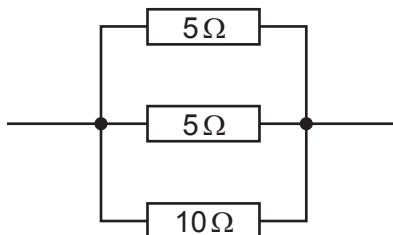
What is the advantage of using three cells in parallel, rather than a single cell?

- A** Each cell produces more energy.
- B** Each cell supplies more charge.
- C** Each cell takes longer to run down.
- D** The total electromotive force (e.m.f.) is larger.

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35 The diagram shows three resistors in parallel.



What is the combined resistance?

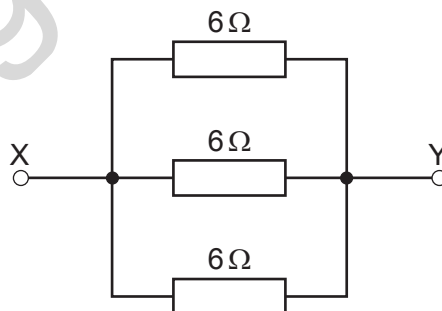
- A** $0.50\ \Omega$ **B** $2.0\ \Omega$ **C** $20\ \Omega$ **D** $250\ \Omega$

36 A metal wire has length l and cross-sectional area A .

What is the resistance proportional to?

- A** $A + l$ **B** $\frac{A}{l}$ **C** $\frac{l}{A}$ **D** $l \times A$

37 A student joins three $6\ \Omega$ resistors as shown in the diagram.



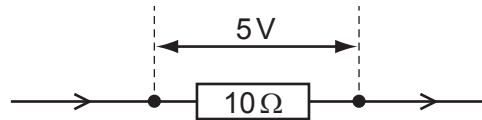
What is the total resistance between points X and Y?

- A** $0.5\ \Omega$ **B** $2\ \Omega$ **C** $6\ \Omega$ **D** $18\ \Omega$

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38 The potential difference (p.d.) across a $10\ \Omega$ resistor is 5 V.



How much charge passes through the $10\ \Omega$ resistor in 30 seconds?

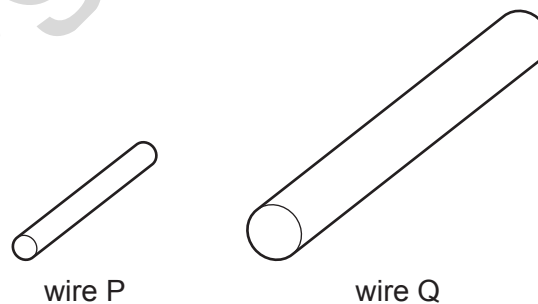
- A** 2 C **B** 15 C **C** 60 C **D** 1500 C

39 Which changes both cause a decrease in the resistance of a copper wire?

	size of wire	temperature of wire
A	decrease in length	lower
B	increase in length	lower
C	decrease in thickness	higher
D	increase in thickness	higher

40 The resistance of a cylindrical wire P is $60\ \Omega$ and wire Q is made from the same material.

The cross-sectional area of Q is four times that of P. The length of Q is twice the length of P.



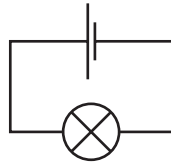
What is the resistance of Q?

- A** $10\ \Omega$ **B** $40\ \Omega$ **C** $160\ \Omega$ **D** $640\ \Omega$

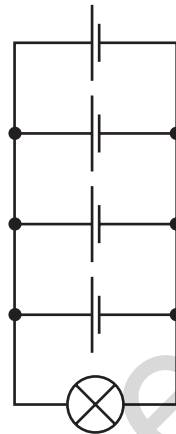
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- 41 A lamp, designed to work at 1.5V, is connected to a cell of electromotive force (e.m.f.) 1.5V. The lamp lights at normal brightness.

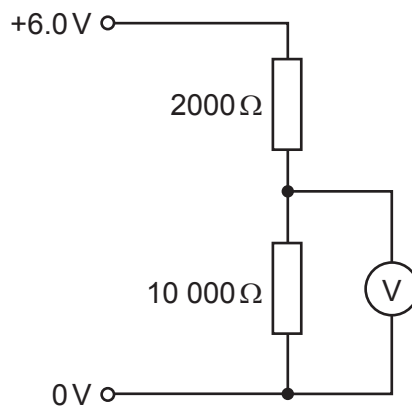


The lamp is now connected to four similar cells, each of e.m.f. 1.5V, arranged in parallel.



What is the effect of connecting the extra cells in this way?

- A The lamp burns out.
 - B The lamp is dimmer.
 - C The lamp produces light for a longer time.
 - D The lamp produces light for a shorter time.
- 42 The diagram shows a potential divider system of two resistors connected to a 6.0V power supply.



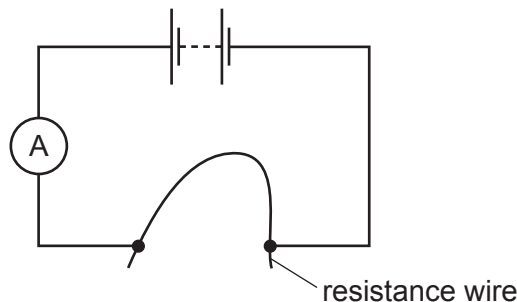
What is the reading on the voltmeter?

- A 1.0V
- B 1.2V
- C 3.0V
- D 5.0V

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43 A length of resistance wire is used as a resistor in a simple circuit.



Four separate changes are made to the wire.

Which change will **not** reduce the value of the resistance of the wire?

- A** It is covered in an insulating sleeve.
- B** Its cross-sectional area is increased.
- C** Its length is decreased.
- D** Its temperature is decreased.

44 Sets of voltage-current readings are obtained for different electrical components.

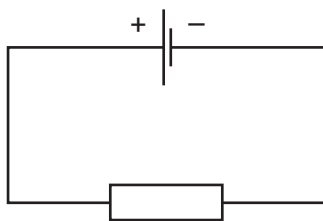
Which set of readings is for a 100Ω resistor?

A	voltage / V	-3	-2	-1	0	+1	+2	+3
	current / mA	-30	-15	-5	0	+5	+15	+30
B	voltage / V	-3	-2	-1	0	+1	+2	+3
	current / mA	-30	-20	-10	0	+10	+20	+30
C	voltage / V	-3	-2	-1	0	+1	+2	+3
	current / mA	-60	-40	-20	0	+20	+40	+60
D	voltage / V	-3	-2	-1	0	+1	+2	+3
	current / mA	-60	-45	-30	0	+30	+45	+60

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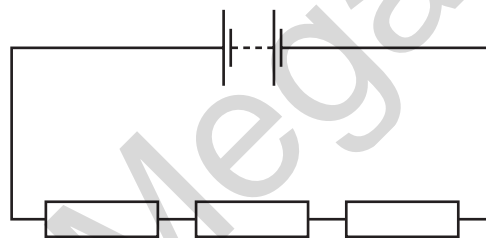
45 The diagram shows a simple electric circuit.



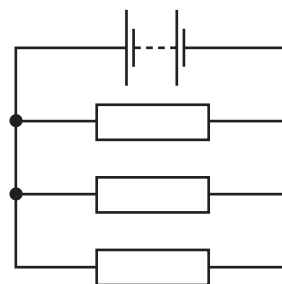
Which row describes the charge on an electron and the direction of electron flow through the resistor?

	charge on an electron	direction of electron flow
A	negative	– to +
B	negative	+ to –
C	positive	– to +
D	positive	+ to –

46 When three identical resistors are connected in series, their combined resistance is $6\ \Omega$.



series



parallel

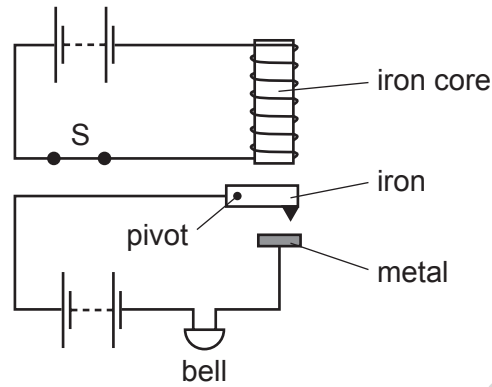
What is their combined resistance when they are connected in parallel?

- A** $\frac{1}{6}\ \Omega$ **B** $\frac{2}{3}\ \Omega$ **C** $\frac{3}{2}\ \Omega$ **D** $6\ \Omega$

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47 The diagram shows an alarm system in which the switch S is shown closed.



What happens when the switch S is opened?

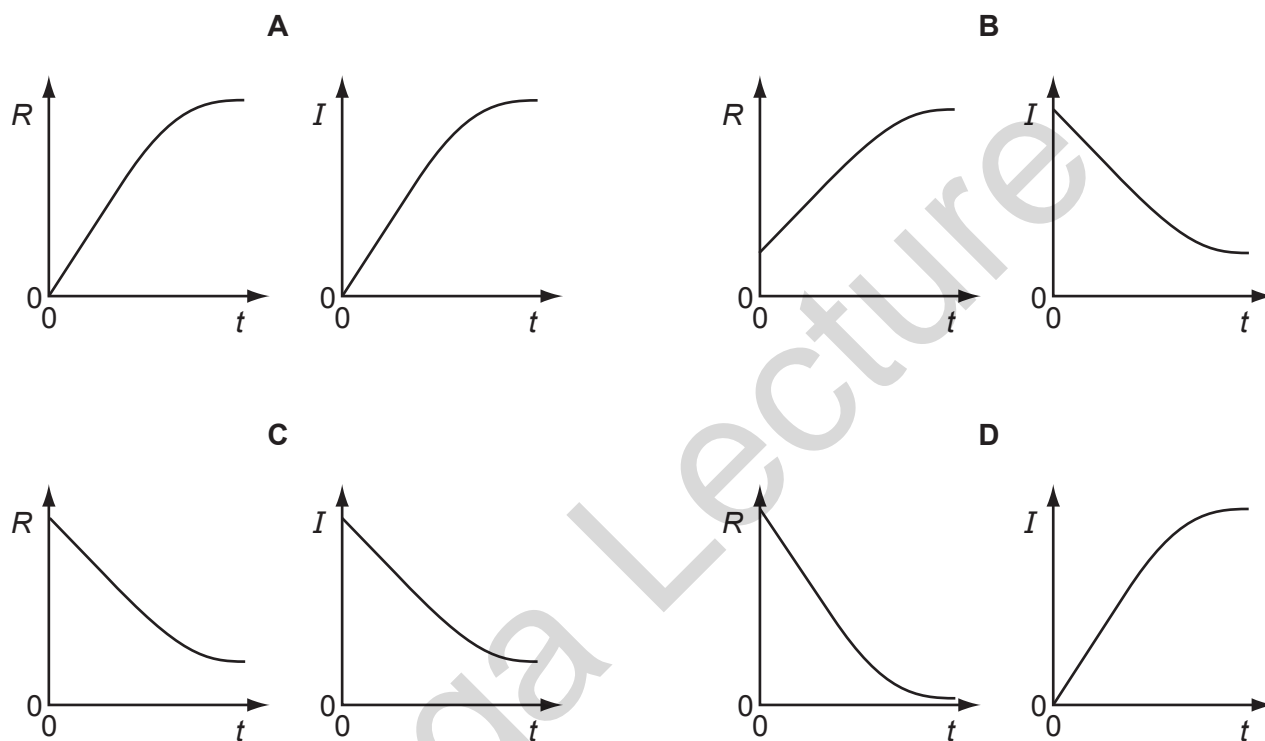
	iron	bell
A	drops	rings
B	drops	stops ringing
C	moves up	rings
D	moves up	stops ringing

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- 48 When a filament lamp is switched on, there is a current in the lamp. As the temperature of the filament rises, its resistance changes.

Which pair of graphs shows how the resistance R of the filament and the current I vary with time after the lamp is switched on?



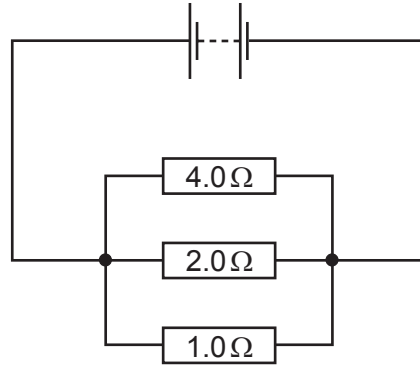
- 49 One volt can also be written as

- A** one coulomb per ampere.
- B** one coulomb per joule.
- C** one joule per ampere.
- D** one joule per coulomb.

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- 50 The circuit diagram shows three resistors in parallel with a battery.



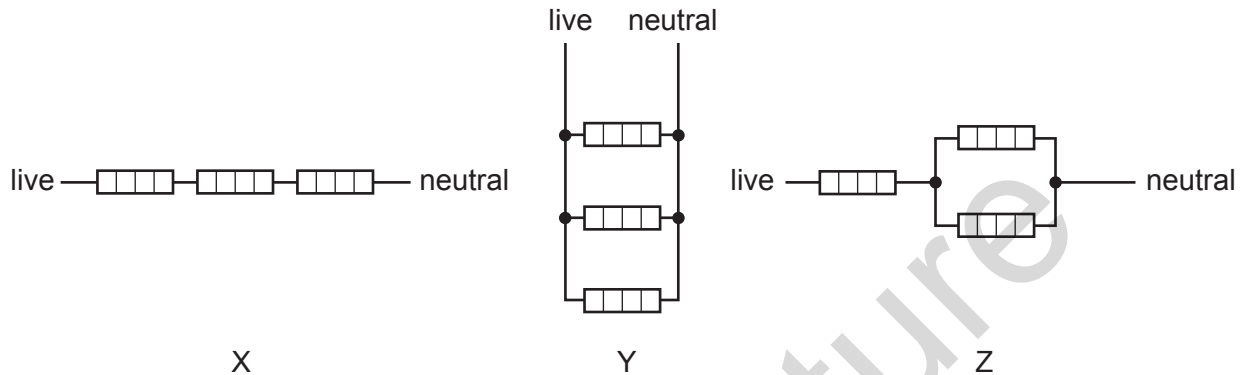
What is the effective resistance of these three resistors?

- A** $0.57\ \Omega$ **B** $0.86\ \Omega$ **C** $1.75\ \Omega$ **D** $7.00\ \Omega$
- 51 Ohm's law states that the current in a conductor is proportional to the potential difference across it, provided that a certain quantity remains constant.
- What is this quantity?
- A** length
B pressure
C temperature
D thickness

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- 52 Three identical heating elements are wired up to the mains supply in the three arrangements shown.



In which arrangement is the current from the supply lowest and in which is it highest?

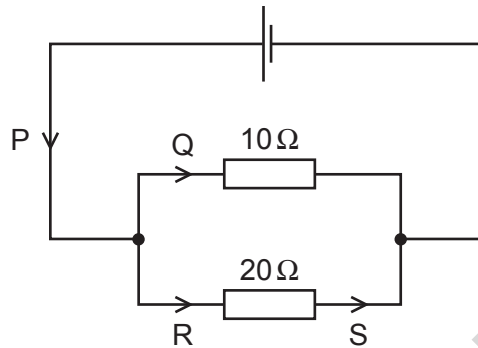
	lowest current	highest current
A	X	Z
B	X	Y
C	Y	X
D	Y	Z

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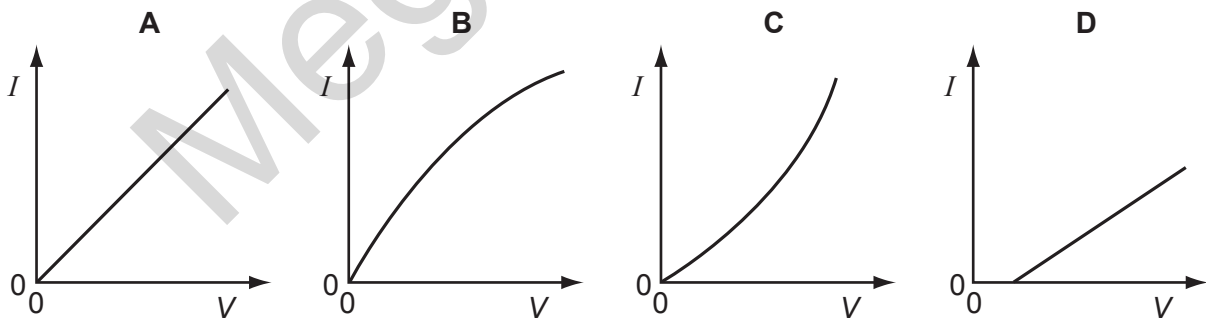
53 The circuit diagram shows a parallel arrangement of resistors.

P, Q, R and S represent the current at the points shown.



Which statement is correct?

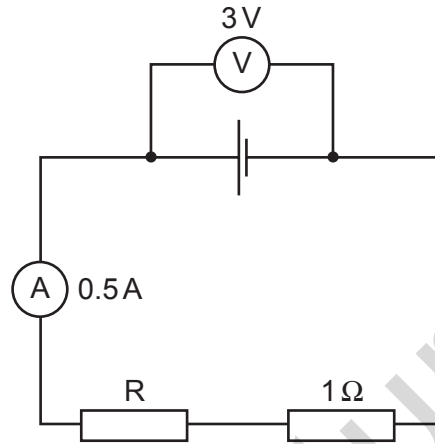
- A P is greater than Q.
 - B Q is equal to R.
 - C R is greater than S.
 - D S is equal to P.
- 54 Which graph best represents how current I varies with voltage V in a component in which the resistance **increases** as the current **increases**.



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55 The diagram shows a circuit.



The ammeter has negligible resistance.

What is the resistance of the resistor R?

- A** 0.5Ω **B** 1.5Ω **C** 5Ω **D** 6Ω

56 Under which condition does Ohm's law apply?

- A** The current must be constant.
B The power must be constant.
C The temperature must be constant.
D The voltage must be constant.

57 An electrical quantity is defined as 'the energy converted by a source in driving a unit charge round a complete circuit.'

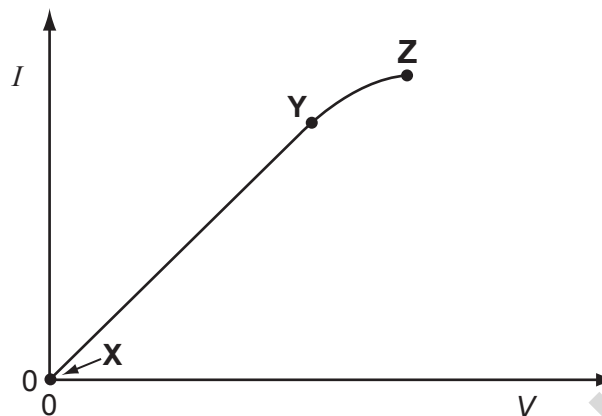
What is this quantity called?

- A** current
B electromotive force
C potential difference
D power

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58 The diagram shows the current I /voltage V graph for a length of resistance wire.



Where can Ohm's law be applied to the wire?

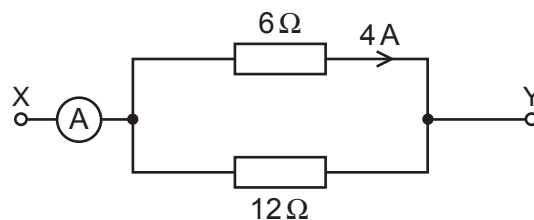
- A at Y only
- B at Z only
- C from X to Y
- D from X to Z

59 A wire has a resistance of 8Ω . A second wire, made of the same material, has half the length and twice the cross-sectional area.

What is the resistance of the second wire?

- A 1Ω
- B 2Ω
- C 8Ω
- D 16Ω

60 Two resistors of 6Ω and 12Ω are arranged in parallel. A p.d. is connected across the terminals X and Y. The current through the 6Ω resistor is 4 A .



What is the current in the ammeter?

- A 4 A
- B 6 A
- C 8 A
- D 12 A

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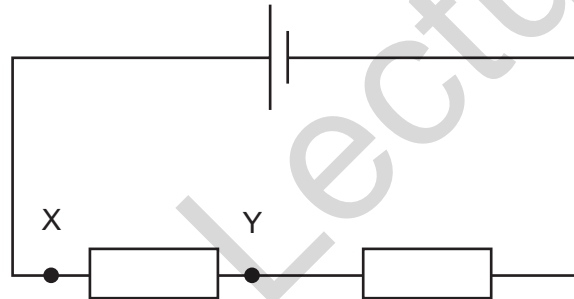
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61 A cell is connected to a resistor.

What is the e.m.f. of the cell equal to?

- A The potential difference across the resistor for each unit of current.
- B The power produced in the circuit for each unit of charge that passes.
- C The work done in the circuit for each unit of charge that passes.
- D The work done in the circuit for each unit of current.

62 The diagram shows two resistors connected in series with a cell.



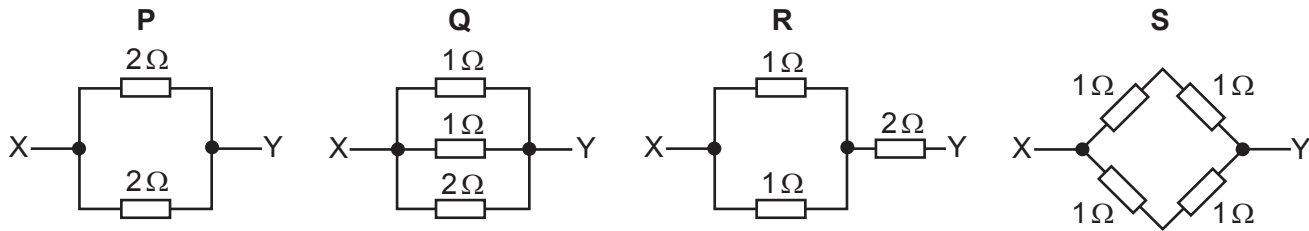
Which statement defines the potential difference across XY?

- A the power needed to drive a unit charge through the cell
- B the power needed to drive a unit charge between X and Y
- C the work done in driving a unit charge through the cell
- D the work done in driving a unit charge between X and Y

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63 Which two resistor combinations have the same resistance between X and Y?



- A** P and Q
- B** P and S
- C** Q and R
- D** R and S

64 The potential difference between the ends of a conductor is 12V.

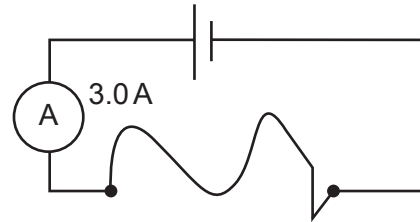
How much electrical energy is converted to other forms of energy in the conductor when 100 C of charge flows through it?

- A** 0.12J
- B** 8.3J
- C** 88J
- D** 1200J

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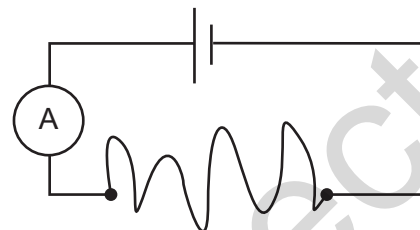
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- 65 A wire of length 1.0 m has a resistance of $2.0\ \Omega$. When connected to a cell, the current in the wire is 3.0 A.



1.0 m wire of resistance $2.0\ \Omega$

A 2.0 m length of the same wire is connected to the same cell.



2.0 m wire

What is the resistance of the wire and the current in it?

	resistance	current
A	$1.0\ \Omega$	1.5 A
B	$1.0\ \Omega$	3.0 A
C	$4.0\ \Omega$	1.5 A
D	$4.0\ \Omega$	3.0 A

- 66 An electrical quantity is defined as 'the energy converted by a source in driving a unit charge round a complete circuit.'

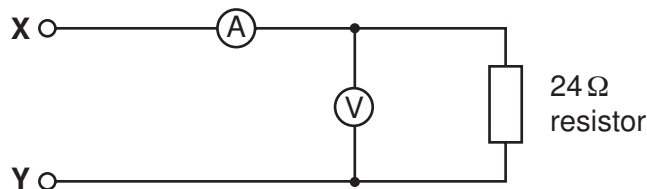
What is this quantity called?

- A** current
- B** electromotive force
- C** potential difference
- D** power

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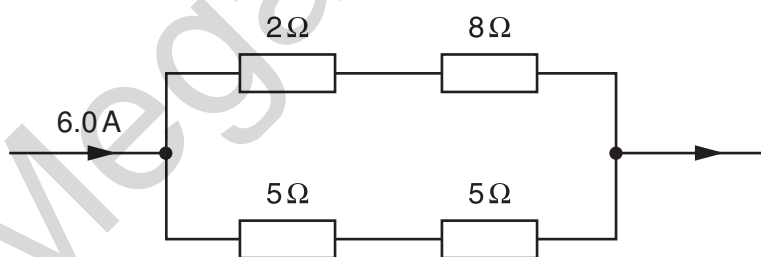
67 The diagram shows an electric circuit.



Which pair of readings is obtained when a suitable power supply is connected between **X** and **Y**?

	voltmeter	ammeter
A	2 V	6 A
B	2 V	0.5 A
C	12 V	0.5 A
D	12 V	2 A

68 The diagram shows part of an electric circuit.



What is the current in the 2Ω resistor?

- A** 0.6 A **B** 1.2 A **C** 3.0 A **D** 6.0 A

69 How could the unit of potential difference, the volt, also be written?

- A** A/s
B C/A
C C/J
D J/C

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70 X and Y are lamps with filaments made from the same material.

The filament of lamp X is thicker and shorter than that of lamp Y.

When connected to the mains and switched on, which is the brighter lamp and which lamp has the larger resistance?

	brighter lamp	larger resistance
A	X	X
B	X	Y
C	Y	X
D	Y	Y

71 A $1.0\ \Omega$ resistor and a $2.0\ \Omega$ resistor are connected in series across a 12 V d.c. supply.

What is the current in the circuit?

- A** 0.25 A
- B** 4.0 A
- C** 6.0 A
- D** 12 A