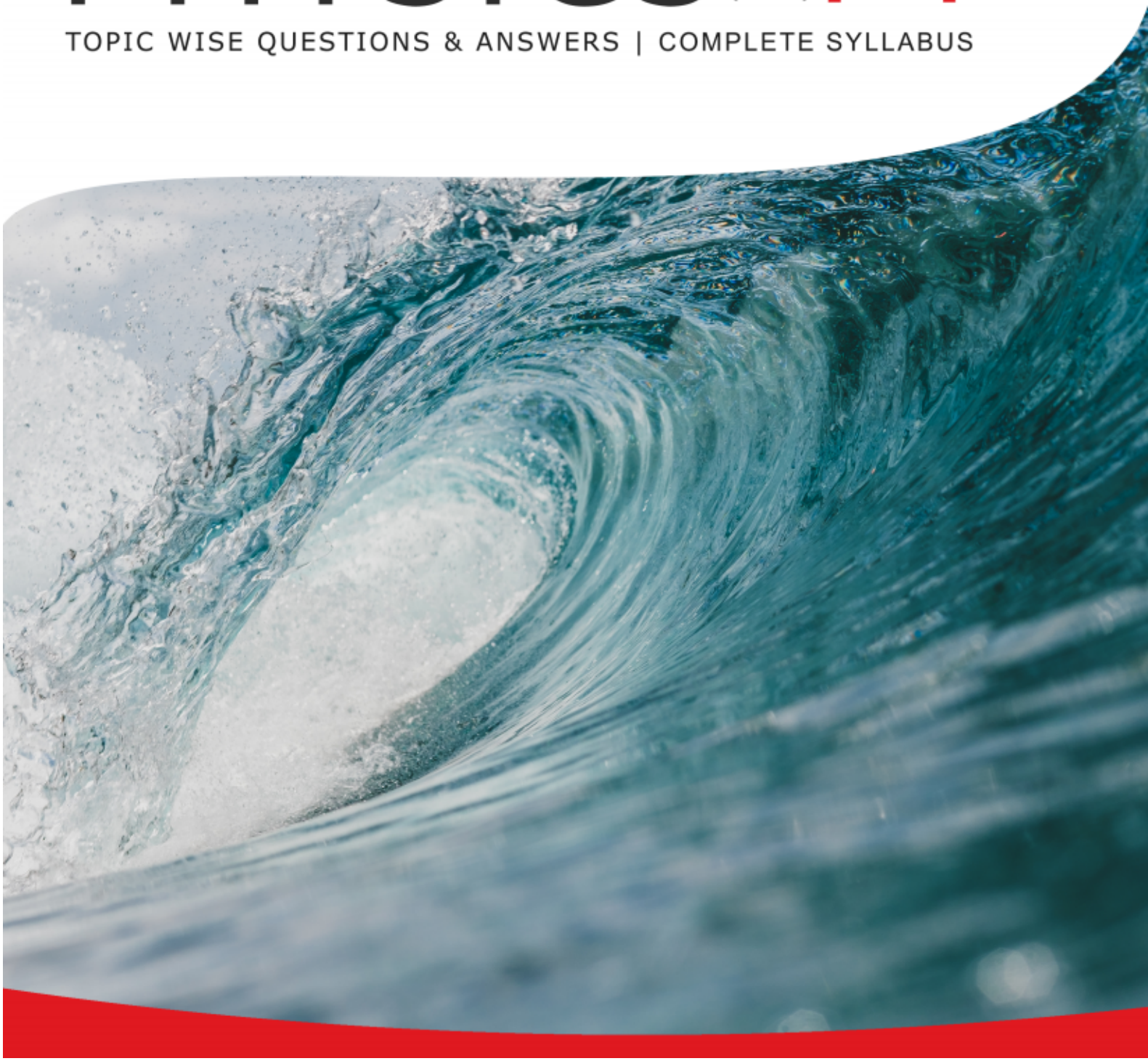
Cambridge International AS & A Level

PHYSICS (9702) P1

TOPIC WISE QUESTIONS & ANSWERS | COMPLETE SYLLABUS



PapaCambridge

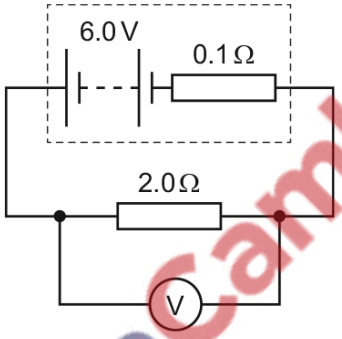
Chapter 12

D.C. circuits

12.1 Practical circuits

1181. 9702_m20_qp_12 Q: 36

The diagram shows a circuit.



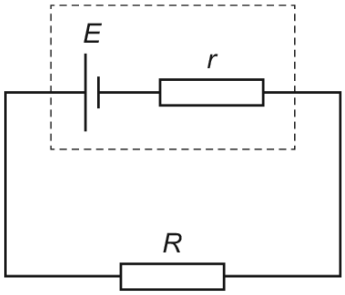
What is the reading on the voltmeter?

A 0.3 V **B** 5.7 V **C** 6.0 V **D** 6.3 V

1182. 9702_s20_qp_11 Q: 36

A cell of electromotive force (e.m.f.) E and internal resistance r is connected to a resistor of resistance R.

A maximum power P can be dissipated by the resistor without overheating.

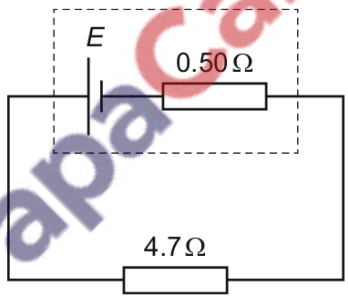


What is the maximum value of E if the resistor does not overheat?

A $R\sqrt{\dfrac{P}{(R-r)}}$ **B** $R\sqrt{\dfrac{P}{(R+r)}}$ **C** $(R-r)\sqrt{\dfrac{P}{R}}$ **D** $(R+r)\sqrt{\dfrac{P}{R}}$

1183. 9702_s20_qp_12 Q: 36

A cell of electromotive force (e.m.f.) E and internal resistance $0.50\,\Omega$ is connected to a resistor of resistance $4.7\,\Omega$.



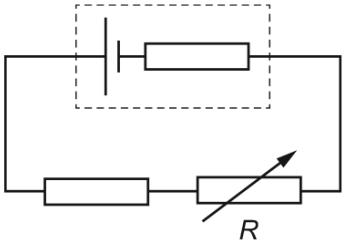
The maximum power that can be dissipated by the resistor without overheating is 0.50 W.

What is the maximum value of E for the resistor **not** to overheat?

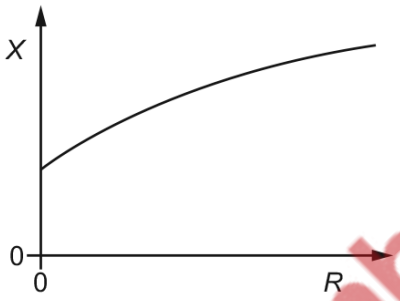
A 1.4 V **B** 1.5 V **C** 1.7 V **D** 2.9 V

1184. 9702_s20_qp_13 Q: 37

A fixed resistor and a variable resistor are connected in series with a cell that has an internal resistance, as shown.



The graph shows the variation of a quantity X with the resistance R of the variable resistor as R is increased from zero to its maximum value.



What could X represent?

A the current in the circuit

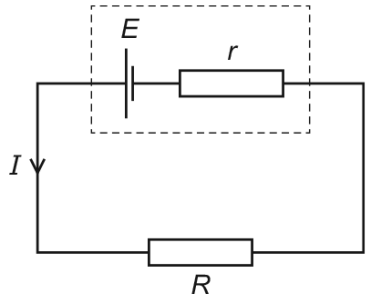
B the electromotive force of the cell

C the potential difference across the internal resistance

D the terminal potential difference across the cell

1185. 9702_m19_qp_12 Q: 36

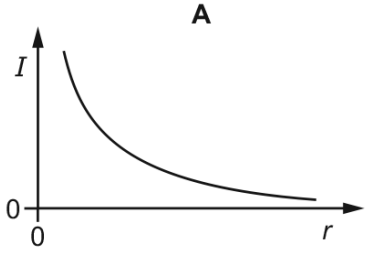
A cell of internal resistance r and electromotive force (e.m.f.) E is connected in series with a resistor of resistance R.



The resistance R and the e.m.f. E remain fixed. The internal resistance r of the cell changes over time.

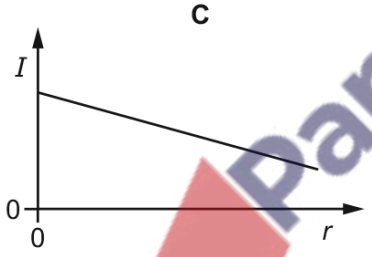
Which graph best shows the variation of the current I in the circuit with the internal resistance r?

A



B

C



D

1186. 9702_s19_qp_11 Q: 35

When a battery is connected to a resistor, the battery gradually becomes warm. This causes the internal resistance of the battery to increase whilst its electromotive force (e.m.f.) stays unchanged.

As the internal resistance of the battery increases, how do the terminal potential difference and the output power change, if at all?

	terminal potential difference	output power
A	decreases	decreases
B	decreases	unchanged
C	unchanged	decreases
D	unchanged	unchanged

1187. 9702_s19_qp_11 Q: 36

A cell is connected to a resistor of resistance 3.00 Ω. The current in the resistor is 1.00 A.

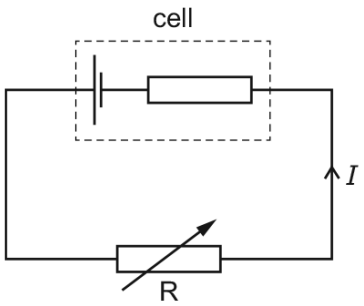
A second identical resistor is added in parallel. The current becomes 1.93 A.

What are the e.m.f. E and internal resistance r of the cell?

	E/V	r/Ω
A	0.113	3.11
B	3.04	0.0358
C	3.11	0.113
D	9.34	6.34

1188. 9702_s19_qp_12 Q: 35

A cell with internal resistance is connected to a variable resistor R as shown.



The resistance of R is gradually decreased.

How do the current I and the terminal potential difference across the cell change?

	current I	terminal potential difference across cell
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

1189. 9702_s19_qp_13 Q: 34

Diagram 1 shows a lamp connected to a supply through two switches.

During repairs, an electrician mistakenly reverses the connections X_1 and Z_1, so that Z_1 is connected to the supply and X_1 to the other switch at Z_2, as shown in diagram 2.

diagram 1

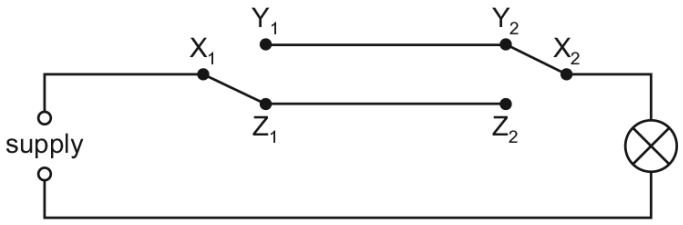
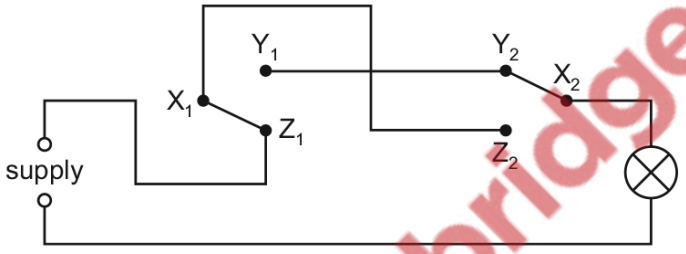


diagram 2

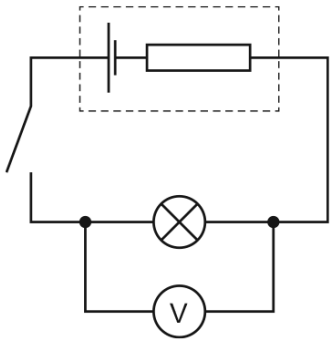


Which switch positions will now light the lamp?

A	X_1 to Y_1	X_2 to Y_2
B	X_1 to Y_1	X_2 to Z_2
C	X_1 to Z_1	X_2 to Y_2
D	X_1 to Z_1	X_2 to Z_2

1190. 9702_w19_qp_11 Q: 35

The diagram shows a circuit.



Which statement about the circuit is **not** correct?

A Electromotive force is the energy transferred per unit charge.

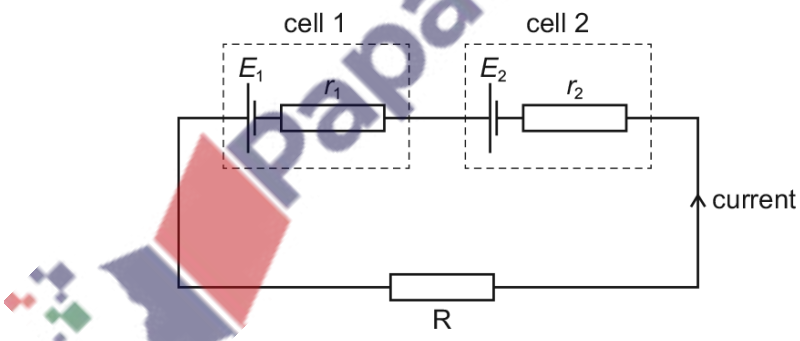
B Energy is transferred from chemical potential energy in the cell to other forms when the switch is closed.

C The electromotive force of the cell is greater than the terminal potential difference when the switch is closed.

D When the switch is open, the voltmeter measures the electromotive force of the cell.

1191. 9702_w19_qp_12 Q: 34

Two cells with electromotive forces E_1 and E_2 and internal resistances r_1 and r_2 are connected to a resistor R as shown.



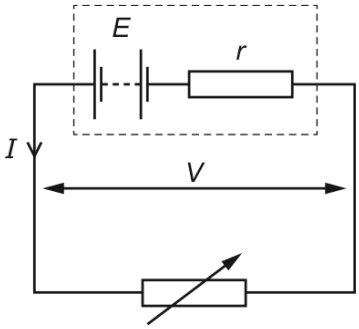
The terminal potential difference across cell 1 is zero.

Which expression gives the resistance of resistor R?

A $\frac{E_2r_1 - E_1r_2}{E_1}$ **B** $\frac{E_2r_1 - E_1r_2}{E_2}$ **C** $\frac{E_1r_2 - E_2r_1}{E_1}$ **D** $\frac{E_1r_2 - E_2r_1}{E_2}$

1192. 9702_w19_qp_12 Q: 35

A battery has an electromotive force (e.m.f.) E and internal resistance r. The battery delivers a current I to a variable resistor and the potential difference (p.d.) across its terminals is V.



The variable resistor is adjusted so that I increases.

Why does V decrease?

A The e.m.f. E decreases.

B The internal resistance r increases.

C The p.d. across r increases.

D The resistance of the variable resistor increases.

1193. 9702_w19_qp_13 Q: 36

A cell of internal resistance $0.5\,\Omega$ is connected to a fixed resistor of resistance $10\,\Omega$.

The resistance of the resistor is changed to $20\,\Omega$.

Which statement is **not** correct?

A The current in the circuit will halve.

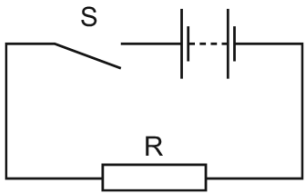
B The e.m.f. of the cell will remain constant.

C The power dissipated by the fixed resistor will decrease.

D The terminal p.d. of the cell will increase.

1194. 9702_m18_qp_12 Q: 32

The diagram shows a simple circuit.



Which statement is correct?

A When switch S is closed, the e.m.f. of the battery falls because work is done against the internal resistance of the battery.

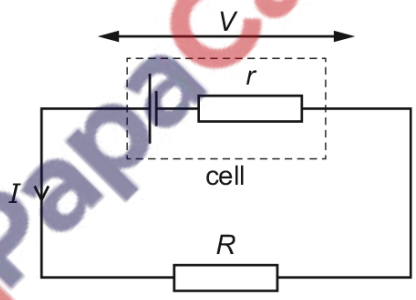
B When switch S is closed, the e.m.f. of the battery falls because work is done against the resistance of R.

C When switch S is closed, the potential difference across the battery falls because work is done against the internal resistance of the battery.

D When switch S is closed, the potential difference across the battery falls because work is done against the resistance of R.

1195. 9702_s18_qp_12 Q: 35

A cell of constant electromotive force drives a current I through an external resistor of resistance R. The terminal potential difference (p.d.) across the cell is V.

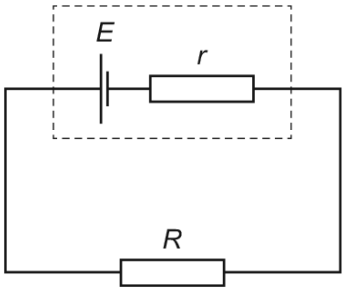


When the internal resistance r of the cell increases, what is the effect on V and on I?

	V	I
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

1196. 9702_s18_qp_13 Q: 31

A cell of electromotive force (e.m.f.) E and internal resistance r is connected to an external resistor of resistance R, as shown.



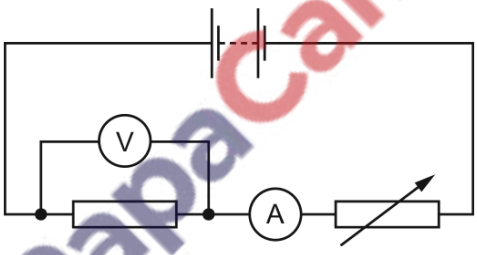
What is the power dissipated in the external resistor?

A $\frac{E^2(R+r)}{R^2}$ **B** $\frac{E^2R}{(R+r)^2}$ **C** $\frac{E^2(R+r)}{r^2}$ **D** $\frac{E^2r}{(R+r)^2}$

1197. 9702_s18_qp_13 Q: 36

The diagram shows a battery, a fixed resistor, an ammeter and a variable resistor connected in series.

A voltmeter is connected across the fixed resistor.



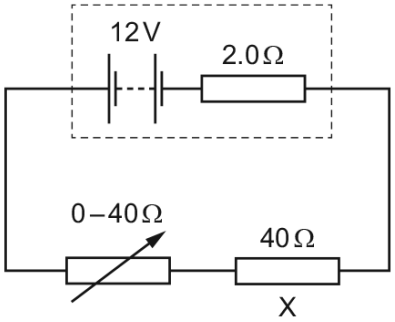
The resistance of the variable resistor is reduced.

Which row describes the changes in the readings of the ammeter and of the voltmeter?

	ammeter	voltmeter
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

1198. 9702_w18_qp_13 Q: 35

A resistor X of resistance 40 Ω and a variable resistor are connected to a battery of electromotive force (e.m.f.) 12 V and internal resistance 2.0 Ω, as shown.



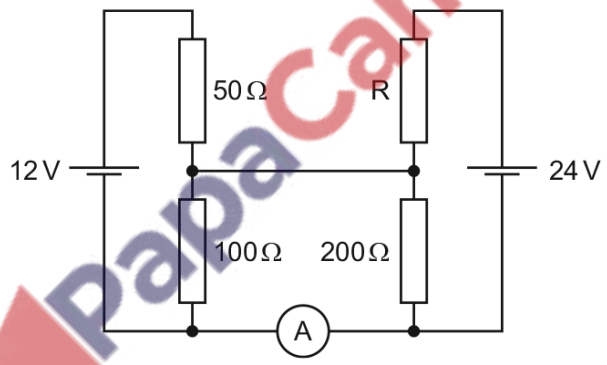
The resistance of the variable resistor is changed from 0 to 40 Ω.

What is the change in power dissipated in resistor X?

A 2.4 W **B** 2.7 W **C** 3.6 W **D** 5.6 W

1199. 9702_w18_qp_13 Q: 37

In the circuit shown, the ammeter reading is zero.

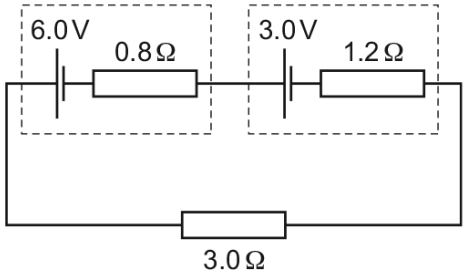


What is the resistance of resistor R?

A 100 Ω **B** 200 Ω **C** 400 Ω **D** 600 Ω

1200. 9702_m17_qp_12 Q: 35

Two cells are connected to a load resistor of resistance 3.0 Ω. The electromotive force (e.m.f). and the internal resistance of each of the cells is shown.

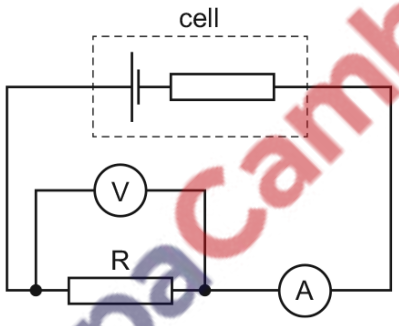


What is the current in the load resistor?

A 0.60 A **B** 1.2 A **C** 1.8 A **D** 3.0 A

1201. 9702_s17_qp_11 Q: 35

The circuit shown includes a cell of constant internal resistance and an external resistor R.



A student records the ammeter and voltmeter readings. She then connects a second identical external resistor in parallel with the first external resistor.

What happens to the ammeter reading and to the voltmeter reading?

	ammeter reading	voltmeter reading
A	decreases	decreases
B	decreases	stays the same
C	increases	decreases
D	increases	stays the same

1202. 9702_s17_qp_12 Q: 35

A cell has a constant electromotive force.

A variable resistor is connected between the terminals of the cell.

The resistance of the variable resistor is decreased.

Which statement about the change of the cell's terminal potential difference (p.d.) is correct?

A The terminal p.d. is decreased because more work is done moving unit charge through the internal resistance of the cell.

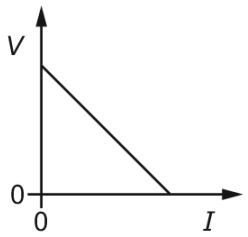
B The terminal p.d. is decreased because the current in the variable resistor is decreased.

C The terminal p.d. is increased because more work is done moving unit charge through the variable resistor.

D The terminal p.d. is increased because the current in the variable resistor is increased.

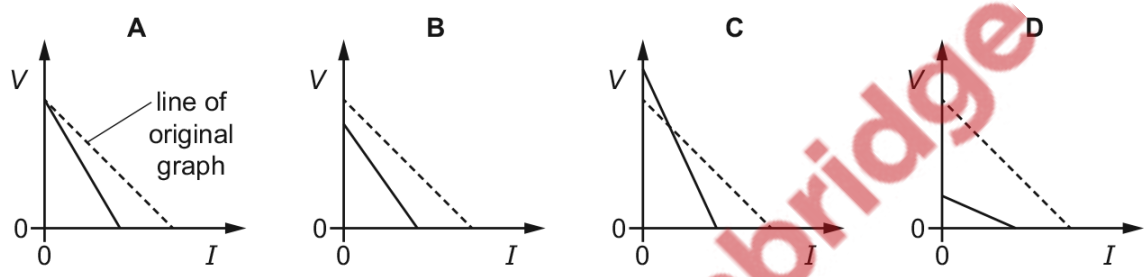
1203. 9702_s17_qp_13 Q: 34

A graph of potential difference (p.d.) V across a cell against current I in the cell is shown.



As the cell reaches the end of its useful life, its internal resistance increases and its electromotive force (e.m.f.) decreases.

Which diagram shows a graph of V against I for the cell nearing the end of its useful life?



1204. 9702_w17_qp_12 Q: 36

A typical mobile phone battery has an e.m.f. of 5.0 V and an internal resistance of 200 mΩ.

What is the terminal p.d. of the battery when it supplies a current of 500 mA?

A 4.8 V **B** 4.9 V **C** 5.0 V **D** 5.1 V

1205. 9702_w17_qp_13 Q: 34

A simple circuit comprises a source of electromotive force (e.m.f.) connected to a load.

How does the output power P of the source depend on the internal resistance r of the source and the resistance R of the load?

A P is independent of both r and R.

B P depends on r but not on R.

C P depends on R but not on r.

D P depends on both r and R.

1206. 9702_m16_qp_12 Q: 37

The battery of a car has an internal resistance of 0.10Ω and an electromotive force of 12V. When the battery is connected to the starter motor, the potential difference across the battery terminals is 7.0V.

What is the current supplied to the starter motor?

A 50A **B** 70A **C** 120A **D** 190A

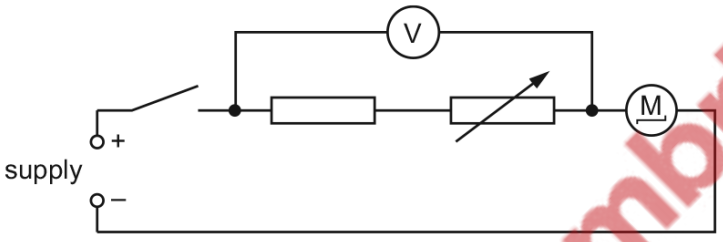
1207. 9702_s16_qp_11 Q: 37

A voltmeter is used to monitor the operation of an electric motor. The motor speed is controlled by a variable resistor. A fixed resistor is used to limit the speed.

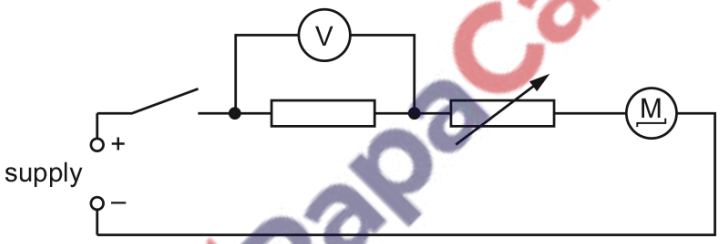
The current in the motor is gradually changed.

In which circuit is the voltmeter reading proportional to the current in the motor?

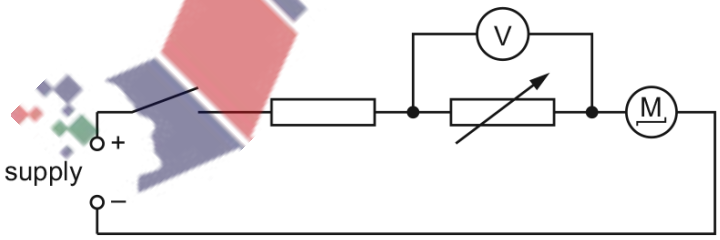
A



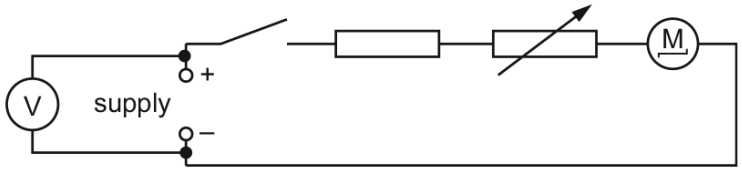
B



C

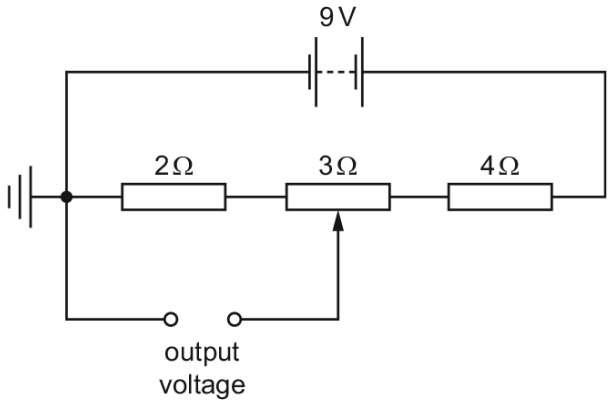


D



1208. 9702_s16_qp_12 Q: 37

In the circuit shown, contact may be made at any point along the 3 Ω resistor (potentiometer).



The battery has e.m.f. 9 V and negligible internal resistance.

What is the maximum range of the output voltage?

A 0–2 V **B** 0–5 V **C** 2–3 V **D** 2–5 V

1209. 9702_w16_qp_12 Q: 36

Four statements about either potential difference or electromotive force are listed.

1 It involves changing electrical energy into other forms.

2 It involves changing other energy forms into electrical energy.

3 It is the energy per unit charge to move charge around a complete circuit.

4 It is the work done per unit charge by the charge moving from one point to another.

Which statements apply to potential difference and which apply to electromotive force?

	potential difference	electromotive force
A	1 and 3	2 and 4
B	1 and 4	2 and 3
C	2 and 3	1 and 4
D	2 and 4	1 and 3

1210. 9702_s15_qp_11 Q: 34

Which equation that links some of the following terms is correct?

potential difference (p.d.)	V
current	I
resistance	R
charge	Q
energy	E
power	P
time	t

A $P = \frac{Q^2R}{t}$

B $ER^2 = V^2t$

C $\frac{VI}{P} = t$

D $PQ = EI$

1211. 9702_s15_qp_12 Q: 33

Which statement is **not** valid?

A Current is the speed of the charged particles that carry it.

B Electromotive force (e.m.f.) is the energy converted to electrical energy from other forms per unit charge.

C The potential difference (p.d.) between two points is the work done per unit charge when moving charge from one point to the other.

D The resistance between two points is the p.d. between the two points per unit current.

1212. 9702_s15_qp_12 Q: 34

A cell of e.m.f. E delivers a charge Q to an external circuit.

Which statement is correct?

A The energy dissipation in the external circuit is EQ.

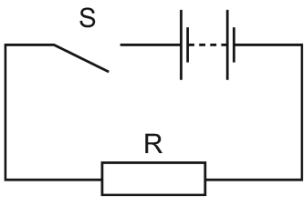
B The energy dissipation within the cell is EQ.

C The external resistance is EQ.

D The total energy dissipation in the cell and the external circuit is EQ.

1213. 9702_s15_qp_13 Q: 33

The diagram shows a simple circuit.



Which statement is correct?

A When switch S is closed, the electromotive force (e.m.f.) of the battery falls because work is done against the internal resistance of the battery.

B When switch S is closed, the e.m.f. of the battery falls because work is done against the resistance of R.

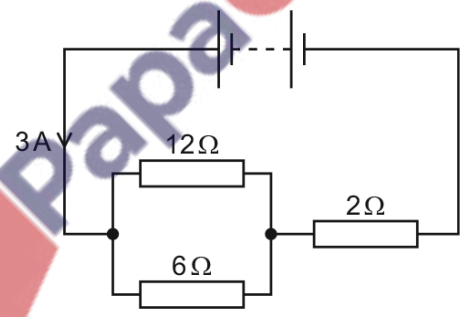
C When switch S is closed, the potential difference across the battery falls because work is done against the internal resistance of the battery.

D When switch S is closed, the potential difference across the battery falls because work is done against the resistance of R.

12.2 Kirchhoff's laws

1214. 9702_m20_qp_12 Q: 33

A battery is connected to three resistors of resistances 12 Ω, 6 Ω and 2 Ω, as shown.



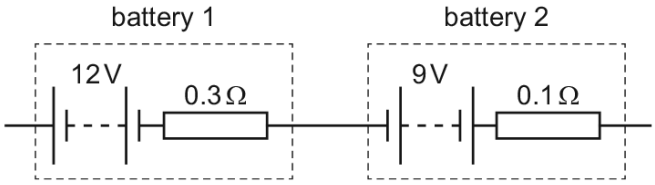
The current from the battery is 3 A.

What is the value of the ratio $\frac{\text{power dissipated in the resistor of resistance } 6\,\Omega}{\text{power dissipated in the resistor of resistance } 2\,\Omega}$?

A $\frac{1}{3}$ **B** $\frac{4}{3}$ **C** $\frac{2}{1}$ **D** $\frac{3}{1}$

1215. 9702_m20_qp_12 Q: 35

Two batteries are connected together, as shown.



Battery 1 has electromotive force (e.m.f.) 12 V and internal resistance 0.3 Ω.

Battery 2 has e.m.f. 9 V and internal resistance 0.1 Ω.

What are the e.m.f. and the internal resistance of a single battery that has the same effect as the combination?

	e.m.f. / V	internal resistance / Ω
A	3	0.2
B	3	0.4
C	21	0.2
D	21	0.4

1216. 9702_s20_qp_11 Q: 37

Three identical resistors can be connected together in four different ways.

The resistances of two of these combinations are 4.0 Ω and 9.0 Ω.

What is the resistance of each individual resistor?

A 3.0 Ω **B** 6.0 Ω **C** 12 Ω **D** 18 Ω

1217. 9702_s20_qp_12 Q: 37

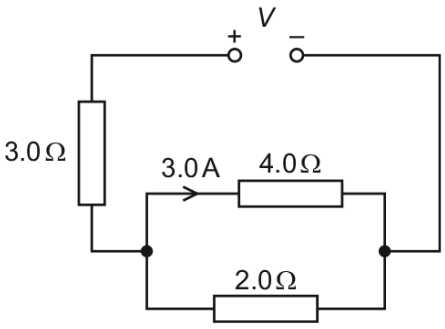
Kirchhoff's first and second laws link to the conservation of physical quantities.

Which quantities do they link to?

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

1218. 9702_s20_qp_13 Q: 35

A power supply of electromotive force (e.m.f.) V and negligible internal resistance is connected in the circuit shown. There is a current of 3.0 A in the 4.0 Ω resistor.

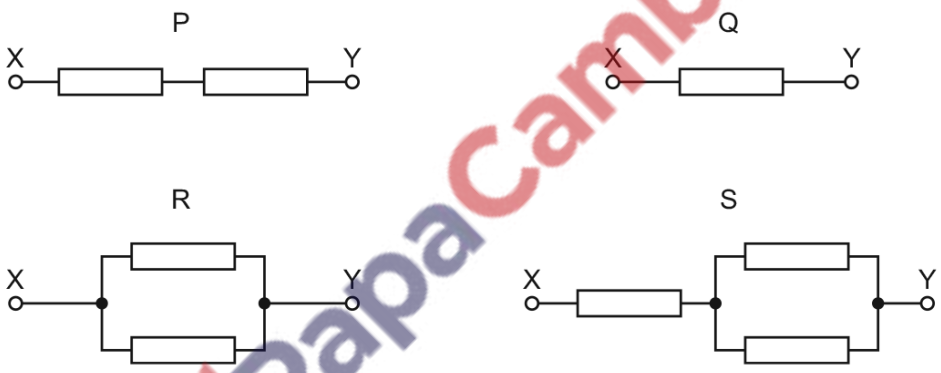


What is the value of V?

A 15 V **B** 29 V **C** 39 V **D** 51 V

1219. 9702_m19_qp_12 Q: 37

Identical resistors are connected in four combinations P, Q, R and S between terminals X and Y.



What is the order of decreasing combined resistance between X and Y (largest first)?

A P → S → Q → R

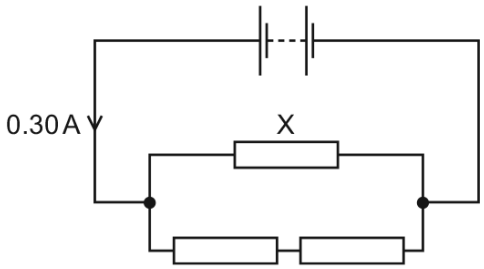
B P → S → R → Q

C Q → R → S → P

D S → P → Q → R

1220. 9702_s19_qp_11 Q: 37

A battery with negligible internal resistance is connected to three resistors, as shown.



All three resistors have the same resistance.

The current in the battery is 0.30 A.

What is the current in resistor X?

A 0.10 A **B** 0.15 A **C** 0.20 A **D** 0.30 A

1221. 9702_s19_qp_12 Q: 36

Kirchhoff's first law states that the sum of the currents entering a junction in a circuit is equal to the sum of the currents leaving it.

The law is based on the conservation of a physical quantity.

What is this physical quantity?

A charge

B energy

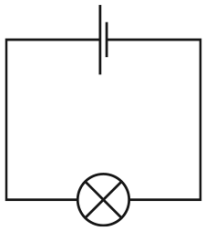
C mass

D momentum

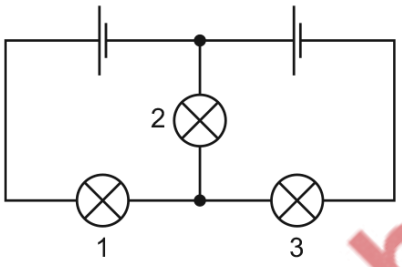
1222. 9702_s19_qp_13 Q: 36

A student has a set of identical cells and identical lamps. The cells have negligible internal resistance.

A lamp connected to a cell lights with normal brightness.



What happens when the student connects the lamps and the cells as shown?



A All three lamps light with normal brightness.

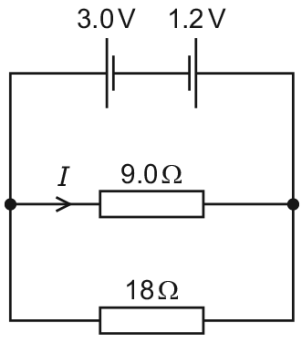
B Only lamp 2 lights with normal brightness.

C Only lamps 1 and 3 light with normal brightness.

D None of the lamps light with normal brightness.

1223. 9702_s19_qp_13 Q: 38

Two cells of electromotive force (e.m.f.) 3.0 V and 1.2 V and negligible internal resistance are connected to resistors of resistance 9.0 Ω and 18 Ω as shown.



What is the current I in the 9.0 Ω resistor?

A 0.10 A **B** 0.20 A **C** 0.30 A **D** 0.47 A

1224. 9702_w19_qp_11 Q: 34

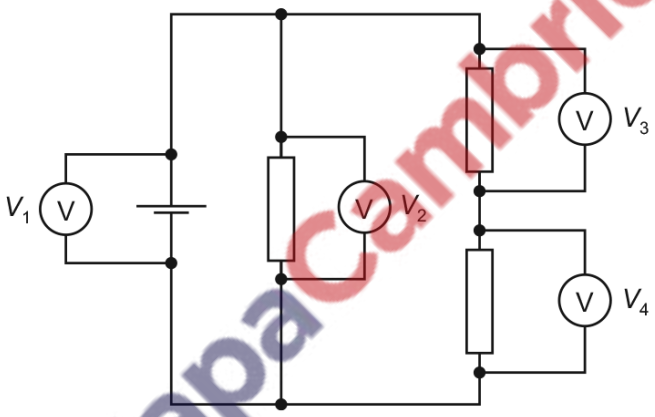
Kirchhoff's two laws for electric circuits can be derived by using conservation laws.

On which conservation laws do Kirchhoff's laws depend?

	Kirchhoff's first law	Kirchhoff's second law
A	charge	current
B	charge	energy
C	current	mass
D	energy	current

1225. 9702_w19_qp_11 Q: 36

The diagram shows a circuit containing four voltmeters. The readings on the voltmeters are V_1, V_2, V_3 and V_4. All the readings are positive.



Which equation relating the voltmeter readings is correct?

A $V_1 = V_2 + V_4$

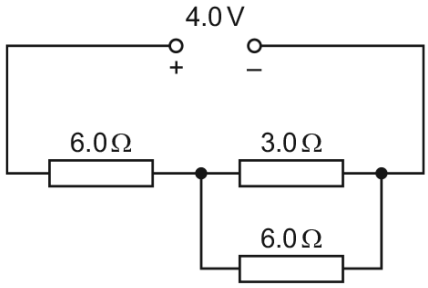
B $V_1 = V_2 + V_3 + V_4$

C $V_2 + V_3 = V_4$

D $V_3 + V_4 - V_2 = 0$

1226. 9702_w19_qp_11 Q: 37

A network consists of a 3.0 Ω resistor and two 6.0 Ω resistors, as shown.



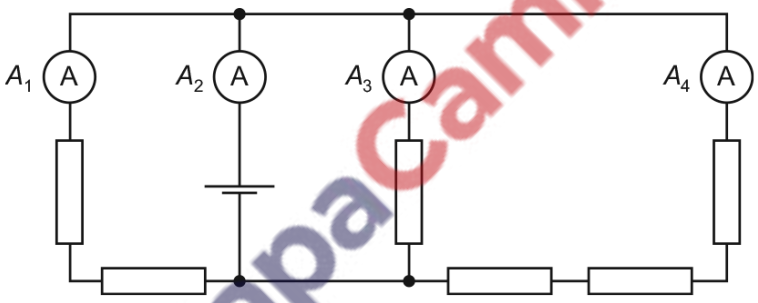
The potential difference (p.d.) across the network is 4.0 V.

What is the current through the 3.0 Ω resistor?

A 0.17 A **B** 0.25 A **C** 0.33 A **D** 1.3 A

1227. 9702_w19_qp_11 Q: 38

In the circuit shown, all the resistors are identical and all the ammeters have negligible resistance.



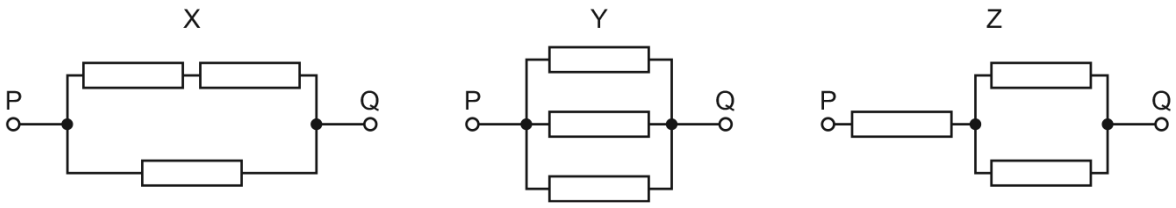
The reading A_1 is 0.6 A.

What are the readings on the other ammeters?

	A_2 / A	A_3 / A	A_4 / A
A	1.0	0.3	0.1
B	1.4	0.6	0.2
C	1.8	0.9	0.3
D	2.2	1.2	0.4

1228. 9702_w19_qp_12 Q: 36

Three identical resistors are connected between terminals P and Q in different networks X, Y and Z as shown.



What is the order of increasing combined resistance between P and Q (lowest first)?

A X → Y → Z

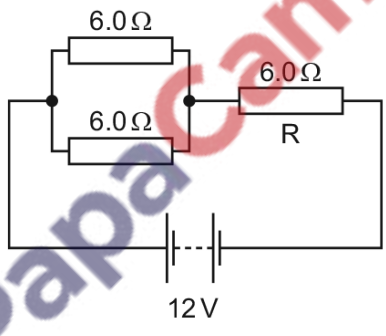
B X → Z → Y

C Y → X → Z

D Y → Z → X

1229. 9702_w19_qp_13 Q: 34

A battery of electromotive force (e.m.f.) 12 V and negligible internal resistance is connected to three resistors, each of resistance 6.0 Ω, as shown.



What is the power dissipated in resistor R?

A 2.7 W **B** 6.0 W **C** 11 W **D** 24 W

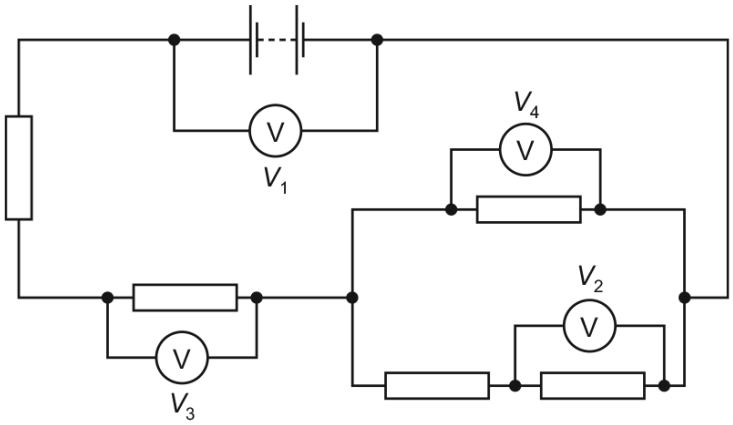
1230. 9702_w19_qp_13 Q: 37

Which row correctly describes Kirchhoff's laws?

	Kirchhoff's first law	physics principle applied for first law	Kirchhoff's second law	physics principle applied for second law
A	The sum of the currents entering a junction equals the sum of the currents leaving the junction.	conservation of charge	The sum of the e.m.f.s around any closed loop in a circuit equals the sum of the p.d.s around the same loop.	conservation of energy
B	The sum of the currents entering a junction equals the sum of the currents leaving the junction.	conservation of energy	The sum of the e.m.f.s around any closed loop in a circuit equals the sum of the p.d.s around the same loop.	conservation of charge
C	The sum of the e.m.f.s around any closed loop in a circuit equals the sum of the p.d.s around the same loop.	conservation of energy	The sum of the currents entering a junction equals the sum of the currents leaving the junction.	conservation of charge
D	The sum of the e.m.f.s around any closed loop in a circuit equals the sum of the p.d.s around the same loop.	conservation of charge	The sum of the currents entering a junction equals the sum of the currents leaving the junction.	conservation of energy

1231. 9702_w19_qp_13 Q: 38

In the circuit shown, all the resistors are identical.



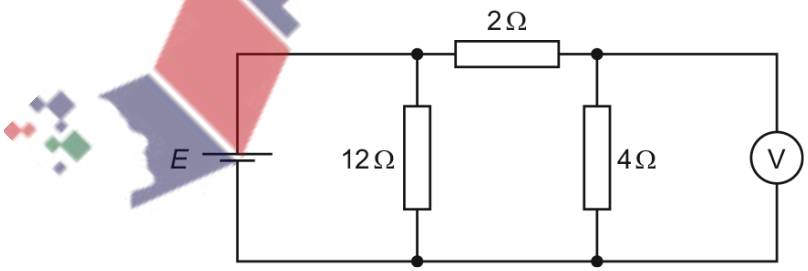
The reading V_1 is 8.0 V and the reading V_2 is 1.0 V.

What are the readings on the other voltmeters?

	V_3/V	V_4/V
A	1.5	1.0
B	3.0	2.0
C	4.5	3.0
D	6.0	4.0

1232. 9702_m18_qp_12 Q: 37

A cell of electromotive force (e.m.f.) E and negligible internal resistance is connected into a circuit, as shown.



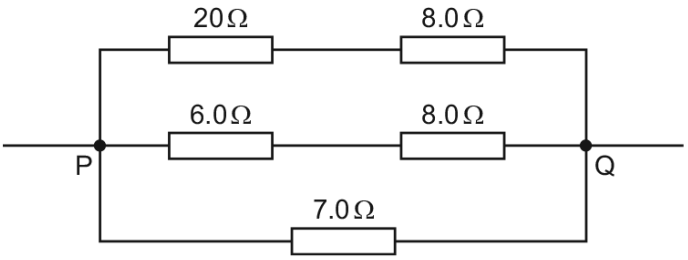
The voltmeter has a very high resistance and reads a potential difference V_{out}.

What is the ratio $\frac{V_{out}}{E}$?

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

1233. 9702_m18_qp_12 Q: 38

Five resistors are connected as shown.



What is the total resistance between points P and Q?

A 0.25Ω **B** 0.61Ω **C** 4.0Ω **D** 16Ω

1234. 9702_s18_qp_11 Q: 33

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.

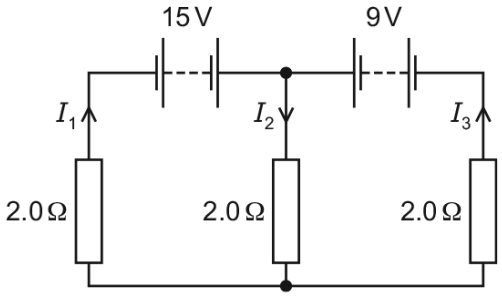
B This is Kirchhoff's first law, which results from the conservation of energy.

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.

1235. 9702_s18_qp_11 Q: 34

In the circuit shown, the batteries have negligible internal resistance.

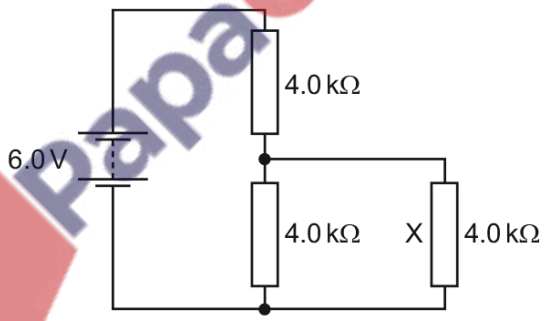


What are the values of the currents I_1, I_2 and I_3?

	I_1 / A	I_2 / A	I_3 / A
A	–5.5	1.0	6.5
B	0.5	4.0	3.5
C	3.5	4.0	0.5
D	6.5	1.0	–5.5

1236. 9702_s18_qp_11 Q: 35

A battery of electromotive force (e.m.f.) 6.0 V and negligible internal resistance is connected to three resistors as shown.



Each resistor has a resistance of 4.0 kΩ.

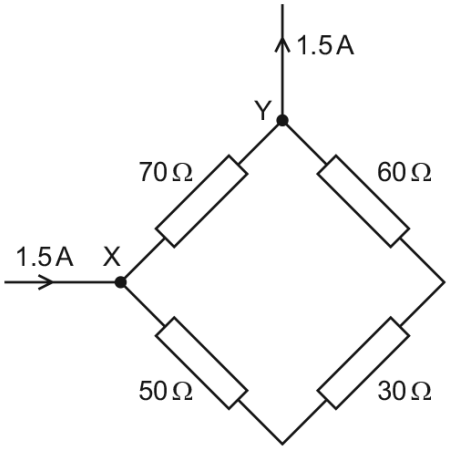
What is the current in resistor X?

A 0.25 mA **B** 0.50 mA **C** 0.75 mA **D** 1.0 mA

1237. 9702_s18_qp_12 Q: 34

Four different resistors are arranged as shown.

A current of 1.5 A enters the network at junction X and leaves through junction Y.



What is the current in the resistor of resistance 30 Ω?

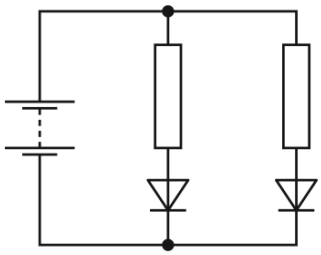
A 0.21 A **B** 0.50 A **C** 0.75 A **D** 1.0 A

1238. 9702_s18_qp_12 Q: 36

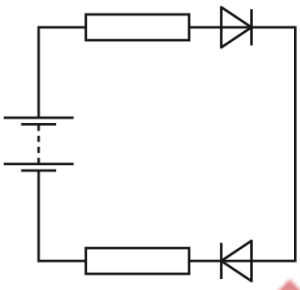
In the circuits shown, the batteries are identical and all have negligible internal resistance. All of the resistors have the same resistance. The diodes have zero resistance when conducting and infinite resistance when not conducting.

In which circuit is the current in the battery greatest?

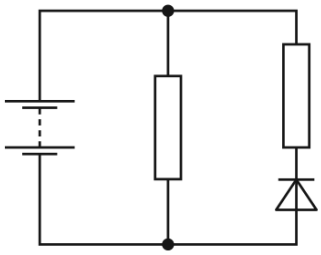
A



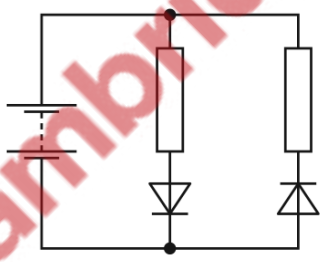
B



C



D

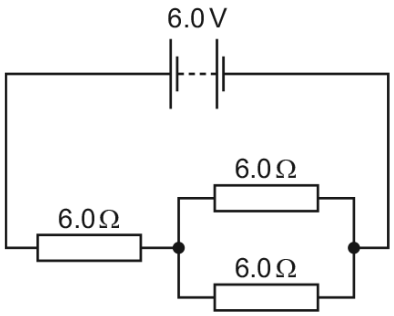


1239. 9702_s18_qp_13 Q: 34

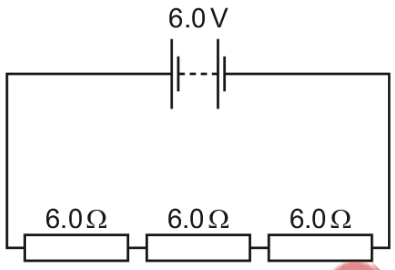
A battery of electromotive force (e.m.f.) 6.0 V and negligible internal resistance is connected to three resistors each of resistance 6.0 Ω.

Which circuit will produce a current through the battery of 0.67 A?

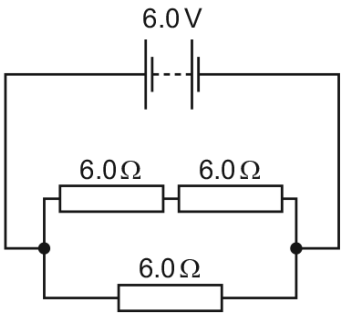
A



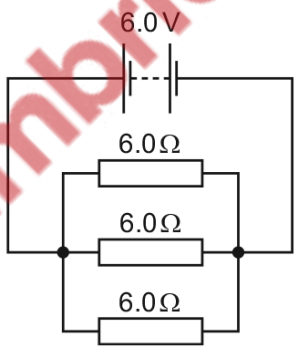
B



C

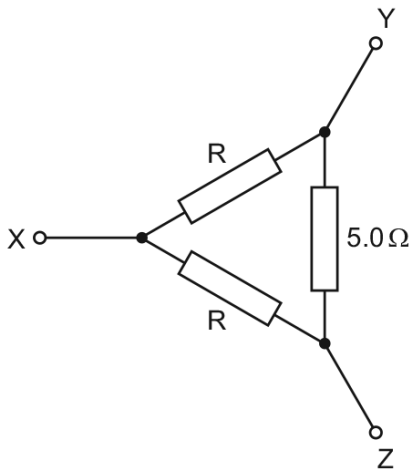


D



1240. 9702_s18_qp_13 Q: 35

The diagram shows a network of three resistors. Two of these, marked R, are identical. The other resistor has a resistance of 5.0 Ω.



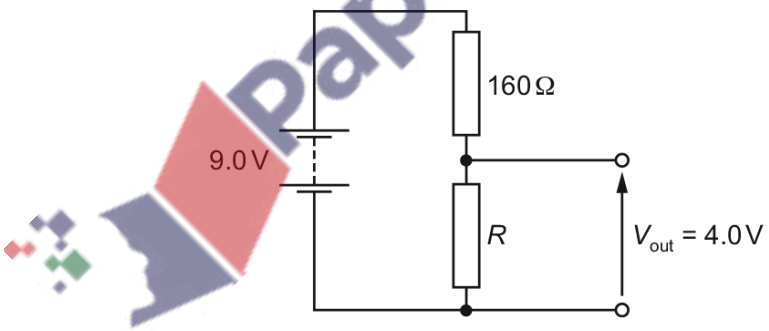
The resistance between Y and Z is found to be 2.5 Ω.

What is the resistance between X and Y?

A 0.30 Ω **B** 0.53 Ω **C** 1.9 Ω **D** 3.3 Ω

1241. 9702_s18_qp_13 Q: 37

The circuit diagram shows a battery of electromotive force (e.m.f.) 9.0 V and negligible internal resistance. It is connected to two resistors of resistances 160 Ω and R. The output potential difference V_{out} is 4.0 V.

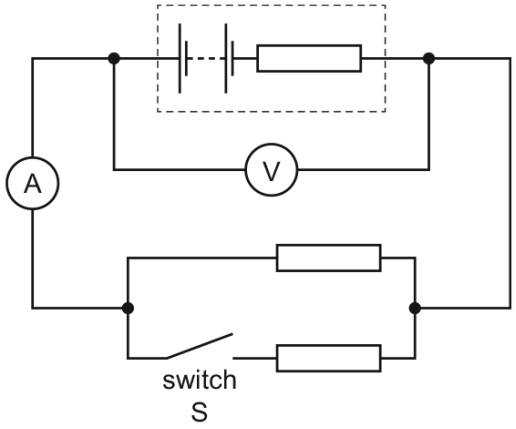


What is the resistance R?

A 32 Ω **B** 49 Ω **C** 71 Ω **D** 128 Ω

1242. 9702_w18_qp_11 Q: 36

A battery, with internal resistance, is connected to a parallel arrangement of two resistors and a switch S, as shown.



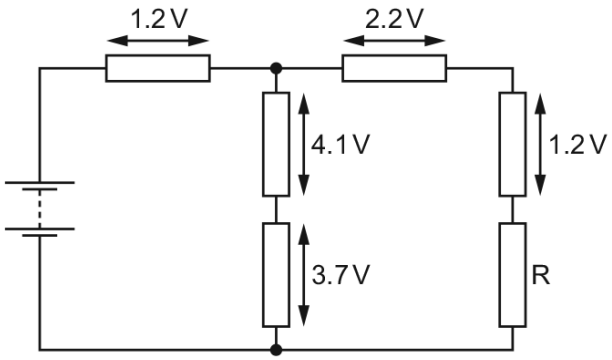
Initially switch S is open.

What happens to the voltmeter and ammeter readings when switch S is closed?

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

1243. 9702_w18_qp_11 Q: 37

A battery is connected to a network of six resistors, as shown.



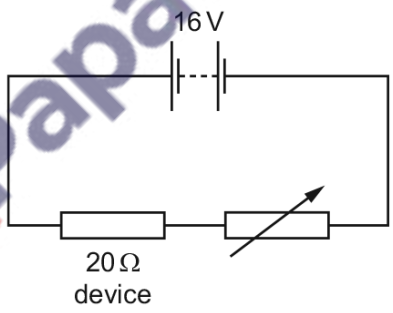
The potential differences across five of the resistors are labelled on the diagram.

What is the potential difference across resistor R?

A 4.4 V **B** 4.6 V **C** 6.6 V **D** 11.2 V

1244. 9702_w18_qp_12 Q: 34

An electrical device of fixed resistance 20 Ω is connected in series with a variable resistor and a battery of electromotive force (e.m.f.) 16 V and negligible internal resistance.

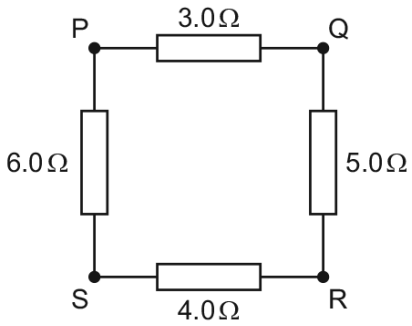


What is the resistance of the variable resistor when the power dissipated in the electrical device is 4.0 W?

A 16 Ω **B** 36 Ω **C** 44 Ω **D** 60 Ω

1245. 9702_w18_qp_12 Q: 36

A battery of negligible internal resistance may be connected between any two points P, Q, R and S of the network of resistors shown.



Which connections will give the largest current and the smallest current in the battery?

	largest current	smallest current
A	PQ	PR
B	PQ	QS
C	RS	PR
D	RS	QS

1246. 9702_w18_qp_12 Q: 37

Kirchhoff's second law is a consequence of a basic principle.

What is this principle?

A The charge flowing in an electric circuit is conserved.

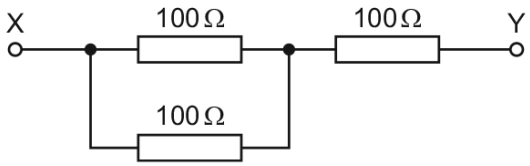
B The energy in an electric circuit is conserved.

C The sum of the electric currents entering a point in an electrical circuit is equal to the sum of the electric currents leaving that point.

D The sum of the potential differences in a circuit is equal to the sum of the products of the current and resistance.

1247. 9702_w18_qp_13 Q: 33

Three resistors are to be connected into a circuit with the arrangement shown.



The power in any resistor must not be greater than 4.0 W.

What is the maximum voltage across XY?

A 24 V **B** 30 V **C** 40 V **D** 60 V

1248. 9702_w18_qp_13 Q: 36

All the resistors shown in the resistor networks W, X, Y and Z have the same resistance.

Which list gives the networks in order of increasing total resistance?

A W → Z → Y → X

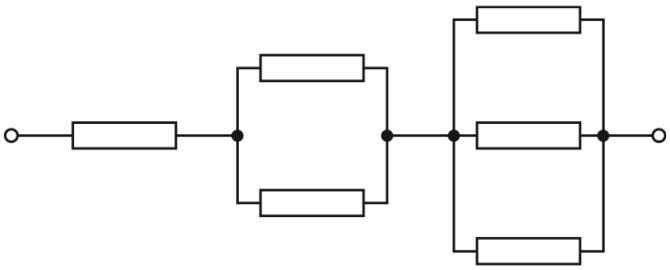
B X → W → Y → Z

C X → Y → W → Z

D X → Y → Z → W

1249. 9702_m17_qp_12 Q: 36

Six resistors, each of resistance R, are connected as shown.



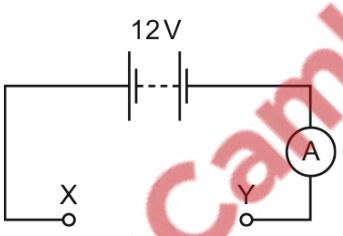
The combined resistance is 66 kΩ.

What is the value of R?

A 11 kΩ **B** 18 kΩ **C** 22 kΩ **D** 36 kΩ

1250. 9702_s17_qp_11 Q: 37

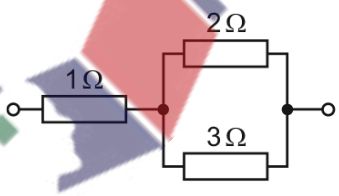
In the circuit shown, the battery and ammeter have negligible resistance.



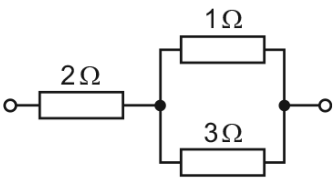
The following combinations of resistors are each separately placed between the terminals X and Y of the circuit.

Which combination would give an ammeter reading of 8 A?

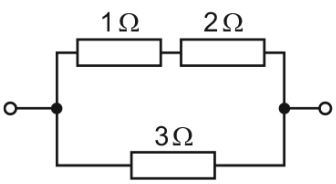
A



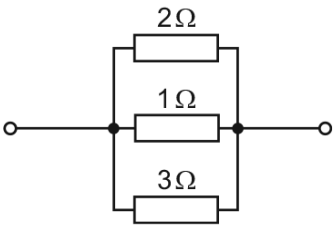
B



C

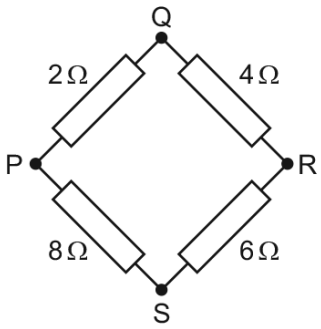


D



1251. 9702_s17_qp_12 Q: 36

Four resistors are connected in a square as shown.



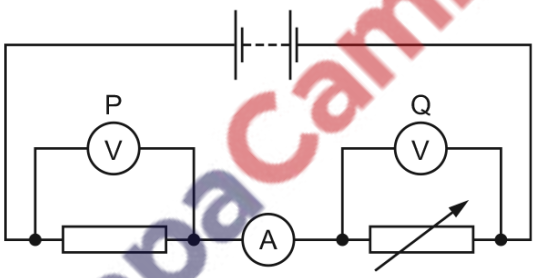
The resistance may be measured between any two junctions.

Between which two junctions is the measured resistance greatest?

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

1252. 9702_s17_qp_12 Q: 37

A circuit is set up as shown.



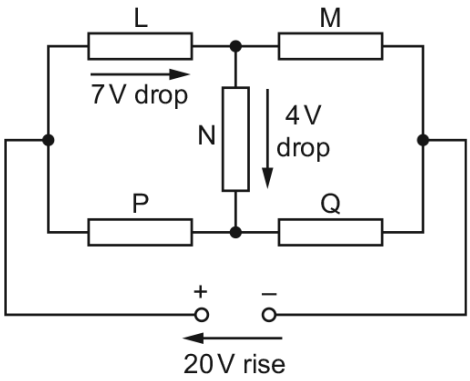
The variable resistor is adjusted so that the ammeter reading decreases.

How do the readings of the voltmeters change?

	reading on voltmeter P	reading on voltmeter Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

1253. 9702_s17_qp_13 Q: 35

A 20 V d.c. supply is connected to a circuit consisting of five resistors L, M, N, P and Q.



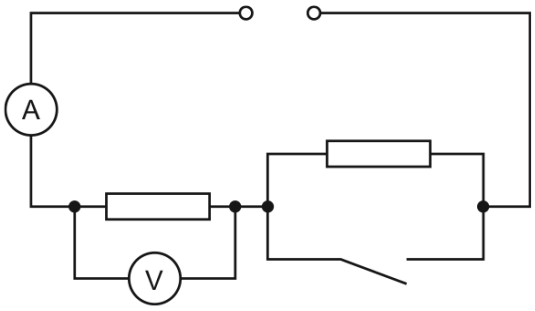
There is a potential drop of 7 V across L and a further 4 V potential drop across N.

What are the potential drops across M, P and Q?

	potential drop across M / V	potential drop across P / V	potential drop across Q / V
A	9	7	13
B	13	7	13
C	13	11	9
D	17	3	17

1254. 9702_w17_qp_11 Q: 36

In the circuit shown, the ammeter reading is I and the voltmeter reading is V.

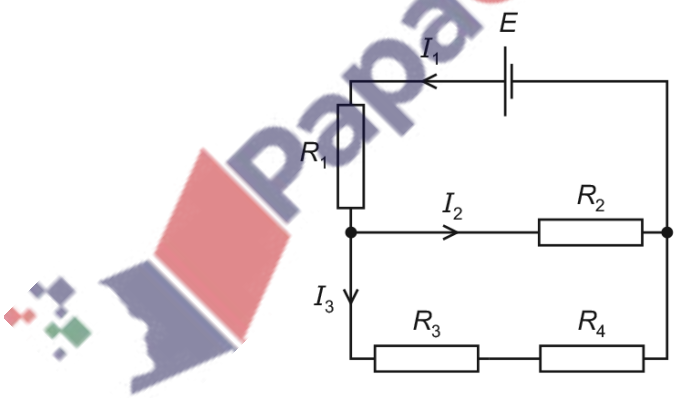


When the switch is closed, which row describes what happens to I and to V?

	I	V
A	decreases	decreases
B	increases	increases
C	increases	stays the same
D	stays the same	increases

1255. 9702_w17_qp_11 Q: 37

A cell of electromotive force E and negligible internal resistance is connected to a network of resistors of resistances R_1, R_2, R_3 and R_4 as shown.



The branches of the circuit have currents I_1, I_2 and I_3.

Which equation is correct?

A $I_1R_1 + I_2R_2 = I_3R_3 + I_3R_4$

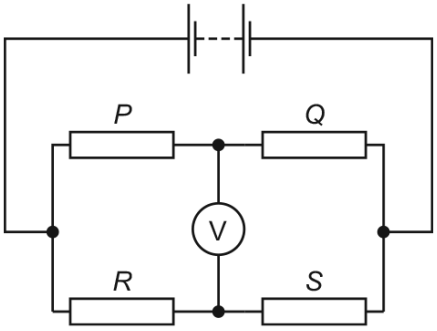
B $I_2R_2 - I_3R_4 - I_3R_3 = 0$

C $E = I_1R_1 + I_2R_2 + I_3R_3 + I_3R_4$

D $E = I_1R_1 + I_2R_2 - I_3R_3 - I_3R_4$

1256. 9702_w17_qp_11 Q: 38

The circuit diagram shows four resistors of different resistances P, Q, R and S connected to a battery.



The voltmeter reading is zero.

Which equation is correct?

A $P - Q = R - S$

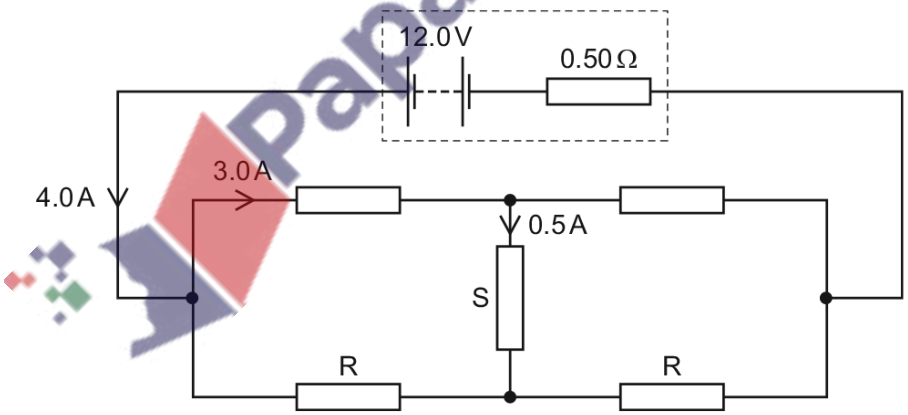
B $P - S = Q - R$

C $PQ = RS$

D $PS = QR$

1257. 9702_w17_qp_12 Q: 37

The circuit shown contains a resistor S that is neither in series nor in parallel with the other resistors.



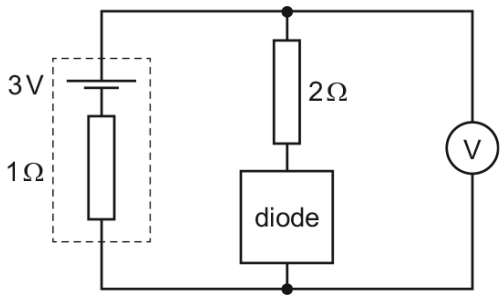
Kirchhoff's laws can be used with the data in the diagram to deduce the resistance of each of the two identical resistors labelled R.

What is the resistance of each resistor R?

A 3.0 Ω **B** 4.0 Ω **C** 4.8 Ω **D** 5.0 Ω

1258. 9702_w17_qp_13 Q: 35

An ideal diode has zero resistance when forward biased and infinite resistance when reverse biased. The diode is connected in series with a 2Ω resistor across the terminals of a source having electromotive force (e.m.f.) 3 V and internal resistance 1 Ω, as shown.



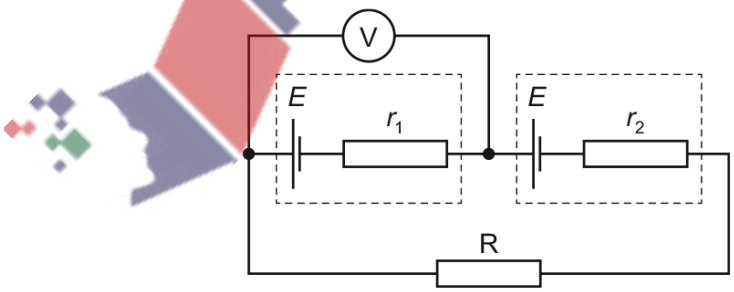
A high-resistance voltmeter is connected across the diode and resistor.

Which row gives the readings of the voltmeter for the two ways of connecting the diode?

	forward biased	reverse biased
A	1 V	3 V
B	2 V	0 V
C	2 V	3 V
D	3 V	0 V

1259. 9702_w17_qp_13 Q: 36

Two cells, each with electromotive force (e.m.f.) E, but different internal resistances r_1 and r_2, are connected in series to a resistor R. The reading on the voltmeter is 0 V.

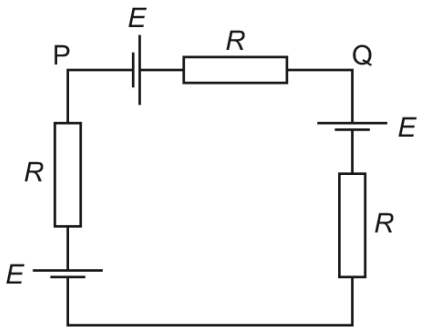


What is the resistance of R?

A 0 **B** $r_1 - r_2$ **C** $r_1 + r_2$ **D** $\frac{r_1 r_2}{r_1 + r_2}$

1260. 9702_w17_qp_13 Q: 37

Three identical cells each have electromotive force (e.m.f.) E and negligible internal resistance. The cells are connected to three identical resistors, each of resistance R, as shown.



What is the potential difference between P and Q?

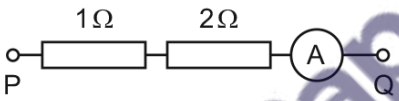
A 0 **B** $\frac{E}{3}$ **C** $\frac{2E}{3}$ **D** E

1261. 9702_w17_qp_13 Q: 38

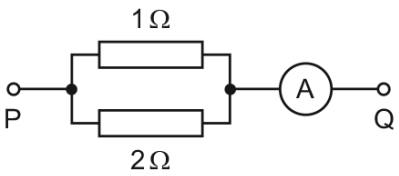
In each arrangement of resistors, the ammeter has a resistance of 2 Ω.

Which arrangement gives the largest reading on the ammeter when the same potential difference is applied between points P and Q?

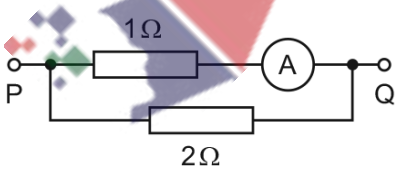
A



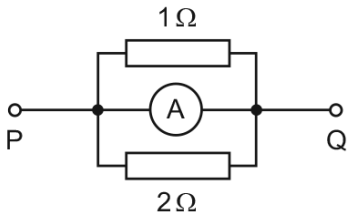
B



C

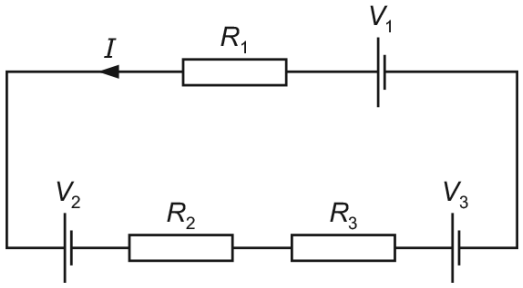


D



1262. 9702_m16_qp_12 Q: 34

Three cells with e.m.f.s V_1, V_2 and V_3, have negligible internal resistance. These cells are connected to three resistors with resistances R_1, R_2 and R_3, as shown.



The current in the circuit is I.

Which equation is correct?

A $V_1 + V_2 + V_3 = I(R_1 + R_2 + R_3)$

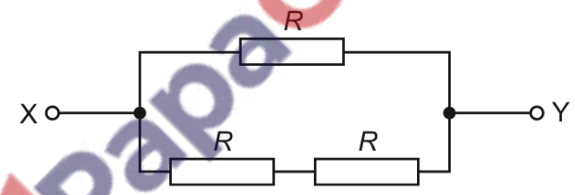
B $V_1 + V_2 - V_3 = I(R_1 + R_2 + R_3)$

C $V_1 - V_2 + V_3 = I(R_1 + R_2 + R_3)$

D $V_1 - V_2 - V_3 = I(R_1 + R_2 + R_3)$

1263. 9702_m16_qp_12 Q: 35

Three resistors, each of resistance R, are connected in a network, as shown.



The total resistance between points X and Y is 8.0 Ω.

What is the value of R?

A 2.7 Ω **B** 4.0 Ω **C** 5.3 Ω **D** 12 Ω

1264. 9702_m16_qp_12 Q: 36

In deriving a formula for the combined resistance of three different resistors in series, Kirchhoff's laws are used.

Which physics principle is involved in this derivation?

A the conservation of charge

B the direction of the flow of charge is from negative to positive

C the potential difference across each resistor is the same

D the current varies in each resistor, in proportion to the resistor value

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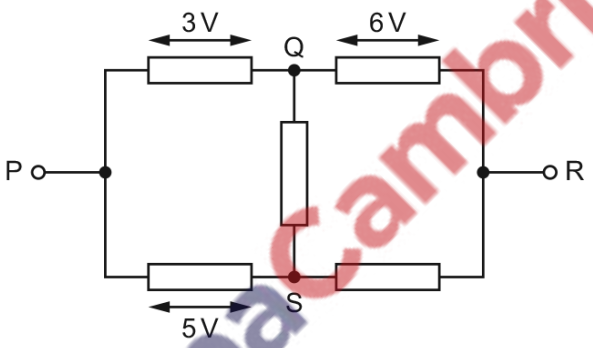
1265. 9702_s16_qp_11 Q: 35

There is a current from P to R in the resistor network shown.



The potential difference (p.d.) between P and Q is 3 V.

The p.d. between Q and R is 6 V.

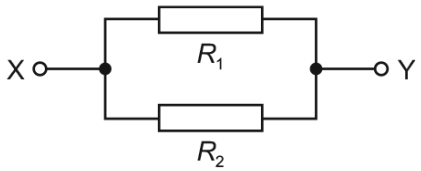
The p.d. between P and S is 5 V.

Which row in the table is correct?

	p.d. between Q and S	p.d. between S and R
A	2 V	4 V
B	2 V	10 V
C	3 V	4 V
D	3 V	10 V

1266. 9702_s16_qp_11 Q: 36

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

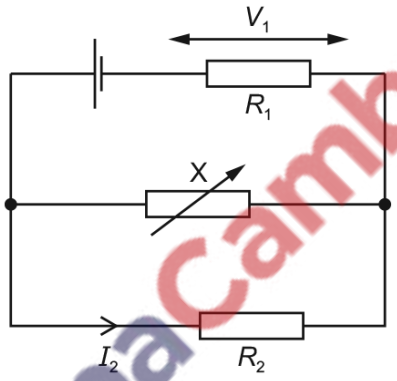


What is the combined resistance between X and Y?

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** $\frac{R_1}{R_2}$

1267. 9702_s16_qp_13 Q: 35

A circuit contains a cell, two resistors of resistances R_1 and R_2 and a variable resistor X. The cell has negligible internal resistance.



V_1 is the potential difference across the resistor of resistance R_1.

I_2 is the current through the resistor of resistance R_2.

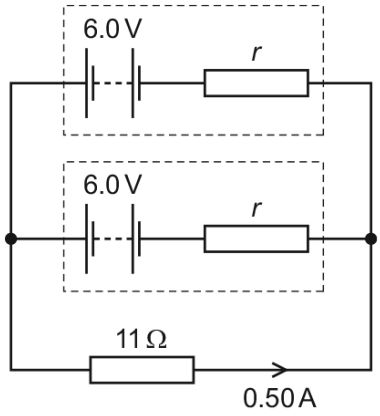
The resistance of X is reduced.

What is the effect on V_1 and I_2?

	V_1	I_2
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

1268. 9702_s16_qp_13 Q: 37

Two identical batteries each have e.m.f. 6.0 V and internal resistance *r*. The batteries are connected to an external resistor of resistance 11 Ω, as shown.



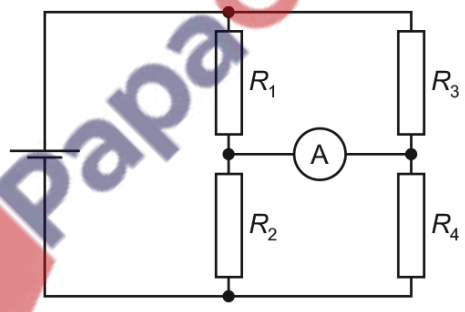
The current in the external resistor is 0.50 A.

What is the internal resistance *r* of each battery?

A 1.0 Ω **B** 2.0 Ω **C** 4.0 Ω **D** 6.5 Ω

1269. 9702_w16_qp_11 Q: 36

In the circuit shown, the reading on the ammeter is zero.



The four resistors have different resistances R_1, R_2, R_3 and R_4.

Which equation is correct?

A $R_1 - R_3 = R_2 - R_4$

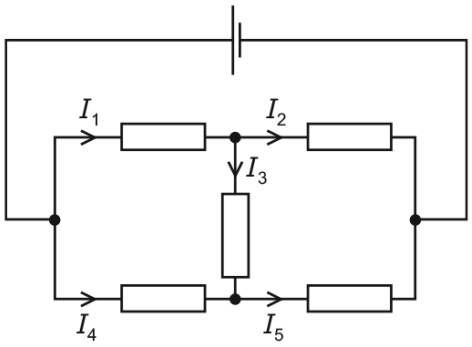
B $R_1 \times R_3 = R_2 \times R_4$

C $R_1 - R_4 = R_2 - R_3$

D $R_1 \times R_4 = R_2 \times R_3$

1270. 9702_w16_qp_11 Q: 37

The diagram shows currents I_1, I_2, I_3, I_4 and I_5 in different branches of a circuit.



Which equation is correct?

A $I_1 = I_2 + I_3$

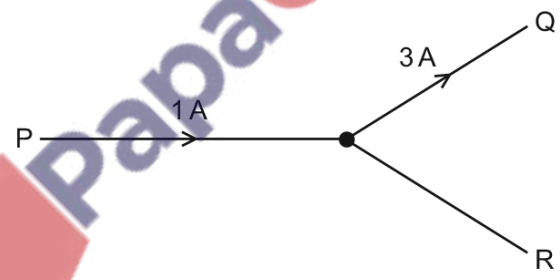
B $I_2 = I_1 + I_3$

C $I_3 = I_4 + I_5$

D $I_4 = I_5 + I_3$

1271. 9702_w16_qp_12 Q: 32

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.

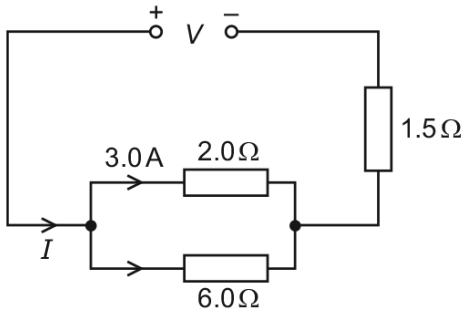


How much charge passes a given point in wire R in a time of 5 s?

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

1272. 9702_w16_qp_12 Q: 37

In the circuit shown, there is a current of 3.0 A in the 2.0 Ω resistor.

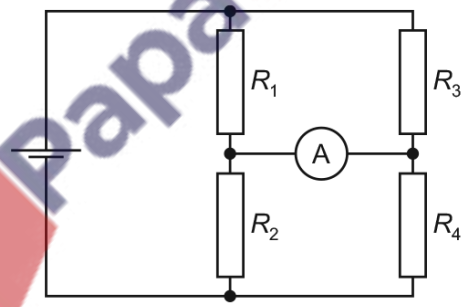


What are the values of the current I delivered by the power supply and the voltage V across it?

	I/A	V/V
A	3.0	10.5
B	4.0	9.0
C	4.0	12
D	12	18

1273. 9702_w16_qp_13 Q: 36

In the circuit shown, the reading on the ammeter is zero.



The four resistors have different resistances R_1, R_2, R_3 and R_4.

Which equation is correct?

A $R_1 - R_3 = R_2 - R_4$

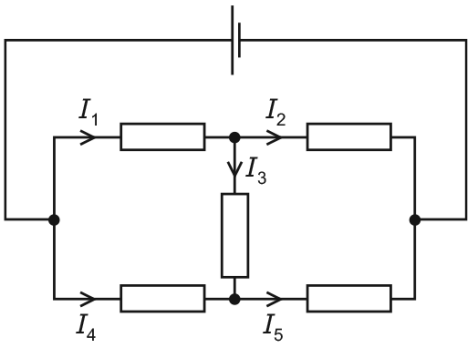
B $R_1 \times R_3 = R_2 \times R_4$

C $R_1 - R_4 = R_2 - R_3$

D $R_1 \times R_4 = R_2 \times R_3$

1274. 9702_w16_qp_13 Q: 37

The diagram shows currents I_1, I_2, I_3, I_4 and I_5 in different branches of a circuit.



Which equation is correct?

A $I_1 = I_2 + I_3$

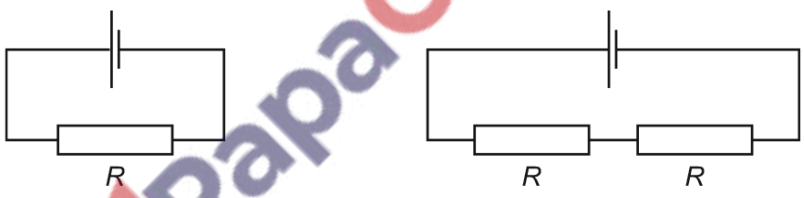
B $I_2 = I_1 + I_3$

C $I_3 = I_4 + I_5$

D $I_4 = I_5 + I_3$

1275. 9702_s15_qp_11 Q: 33

The diagrams show two different circuits.



The cells in each circuit have the same electromotive force and zero internal resistance. The three resistors each have the same resistance *R*.

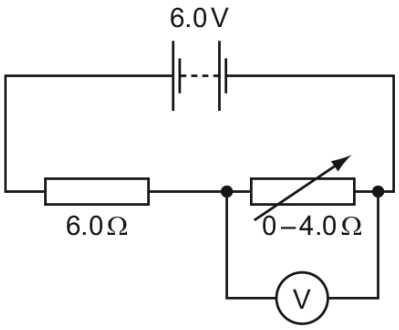
In the circuit on the left, the power dissipated in the resistor is *P*.

What is the total power dissipated in the circuit on the right?

A $\frac{P}{4}$ **B** $\frac{P}{2}$ **C** P **D** $2P$

1276. 9702_s15_qp_11 Q: 37

A battery of electromotive force (e.m.f.) 6.0 V and negligible internal resistance is connected in series with a resistor of resistance 6.0 Ω and a variable resistor of resistance from zero to 4.0 Ω. A voltmeter is connected across the variable resistor. The resistance of the variable resistor is changed.



What is the range of the voltmeter reading?

A 0 V – 2.4 V

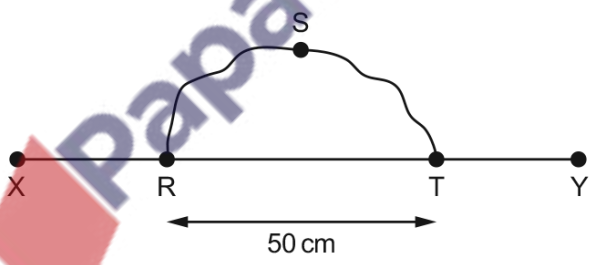
B 0 V – 3.6 V

C 2.4 V – 6.0 V

D 3.6 V – 6.0 V

1277. 9702_s15_qp_11 Q: 38

A wire RST is connected to another wire XY as shown.



Each wire is 100 cm long with a resistance per unit length of 10 Ω m^{-1}.

What is the total resistance between X and Y?

A 3.3 Ω **B** 5.0 Ω **C** 8.3 Ω **D** 13.3 Ω

1278. 9702_s15_qp_12 Q: 35

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

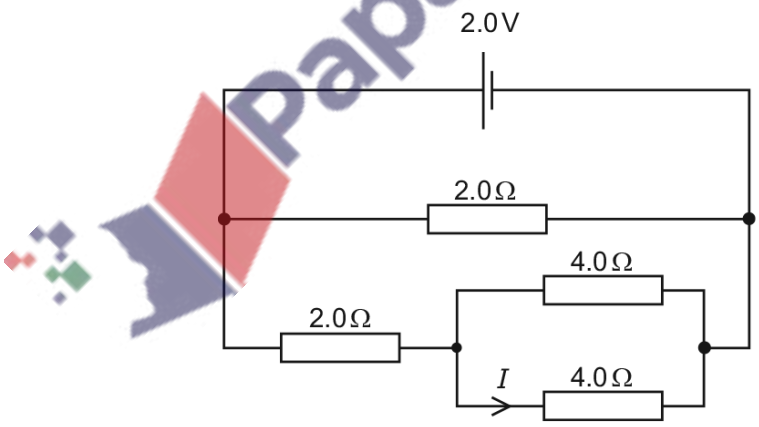
Which row states Kirchhoff's **first** law and names the quantity that is conserved?

	statement	quantity
A	the algebraic sum of currents into a junction is zero	charge
B	the algebraic sum of currents into 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

---

1279. 9702_s15_qp_12 Q: 37

A cell of e.m.f. 2.0 V and negligible internal resistance is connected to a network of resistors as shown.

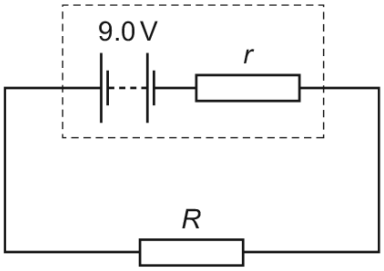


What is the current I?

A 0.25 A **B** 0.33 A **C** 0.50 A **D** 1.5 A

1280. 9702_s15_qp_13 Q: 34

A simple circuit is formed by connecting a resistor of resistance R between the terminals of a battery of electromotive force (e.m.f.) 9.0 V and constant internal resistance r.



A charge of 6.0 C flows through the resistor in a time of 2.0 minutes causing it to dissipate 48 J of thermal energy.

What is the internal resistance r of the battery?

A 0.17 Ω **B** 0.33 Ω **C** 20 Ω **D** 160 Ω

1281. 9702_s15_qp_13 Q: 35

A source of e.m.f. 9.0 mV has an internal resistance of 6.0 Ω.

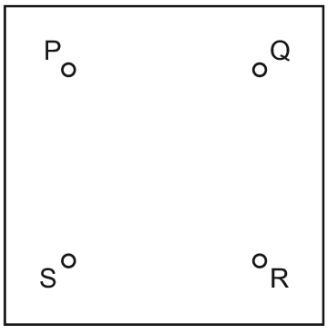
It is connected across a galvanometer of resistance 30 Ω.

What is the current in the galvanometer?

A 250 μA **B** 300 μA **C** 1.5 mA **D** 2.5 mA

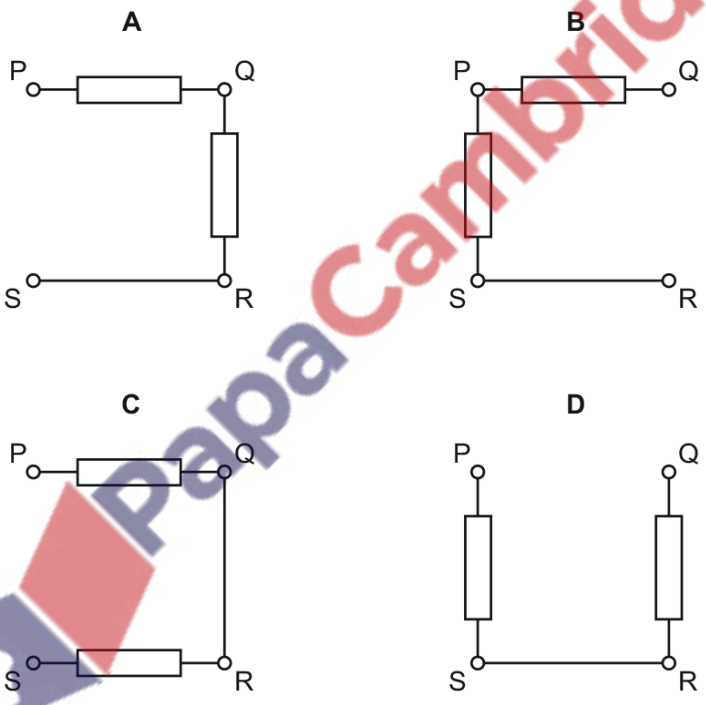
1282. 9702_s15_qp_13 Q: 36

A box with four terminals P, Q, R and S contains two identical resistors.



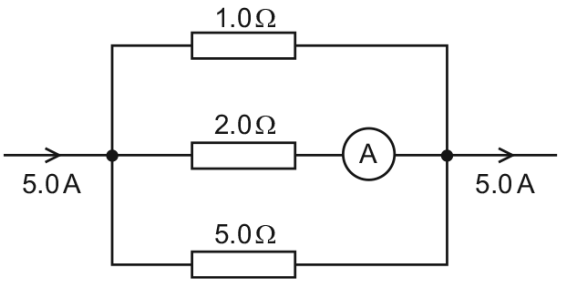
When a battery of electromotive force (e.m.f.) E and negligible internal resistance is connected across PS, a high-resistance voltmeter connected across QR reads $\frac{E}{2}$.

Which diagram shows the correct arrangement of the two resistors inside the box?



1283. 9702_s15_qp_13 Q: 37

The diagram shows part of a current-carrying circuit. The ammeter has negligible resistance.



What is the reading on the ammeter?

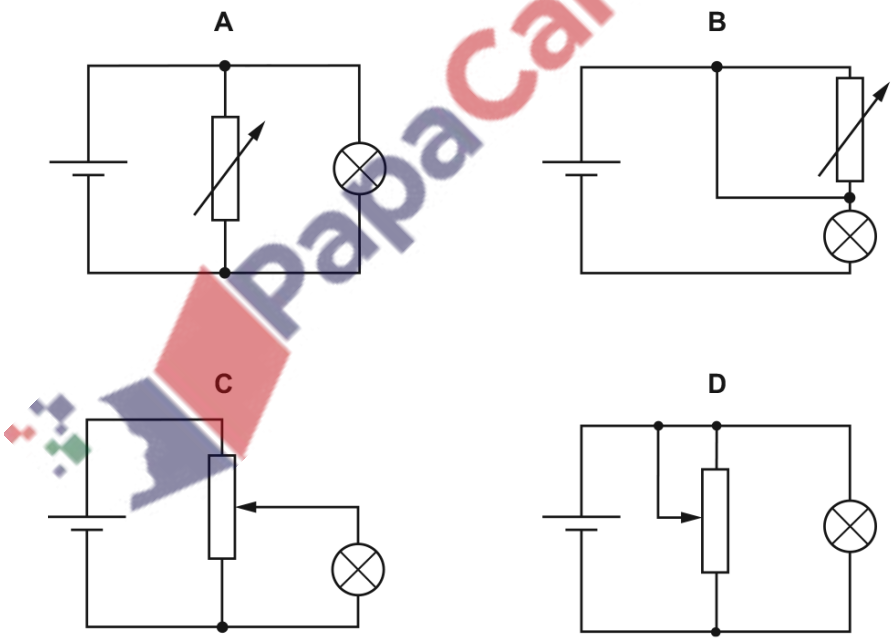
A 0.7A **B** 1.3A **C** 1.5A **D** 1.7A

12.3 Potential dividers

1284. 9702_m20_qp_12 Q: 37

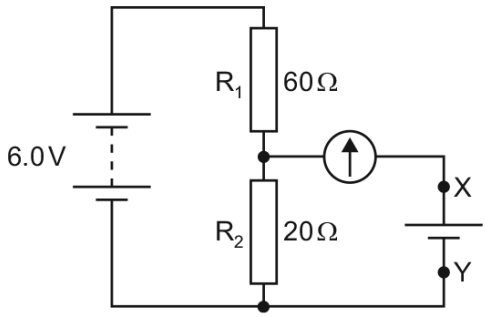
In the circuits shown, the cell has negligible internal resistance.

Which diagram shows a potential divider circuit that can vary the potential difference (p.d.) across the lamp?



1285. 9702_s20_qp_11 Q: 38

In the circuit shown, a battery of negligible internal resistance is connected in series with a pair of fixed resistors R_1 and R_2.



The circuit is to be used to test whether the electromotive force (e.m.f.) of a particular cell is 1.5V. The cell is connected between terminals X and Y in parallel with R_2 and in series with a galvanometer.

Which statement about the test is correct?

A Any non-zero reading on the galvanometer means the cell has an e.m.f. of 1.5V.

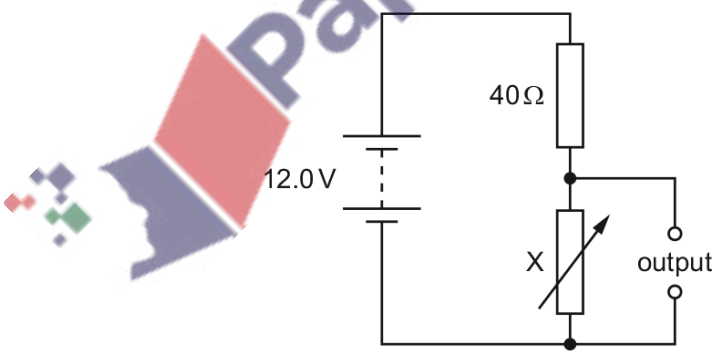
B The battery does not need to have an e.m.f. of 6.0V.

C The cell may be connected either way round between X and Y.

D The galvanometer does not need a scale calibrated in amperes.

1286. 9702_s20_qp_12 Q: 38

In the circuit shown, X is a variable resistor whose resistance can be changed from 5.0Ω to 500Ω. The electromotive force (e.m.f.) of the battery is 12.0V. It has negligible internal resistance.



What is the maximum range of values of potential difference across the output?

A 1.3V to 11.1V

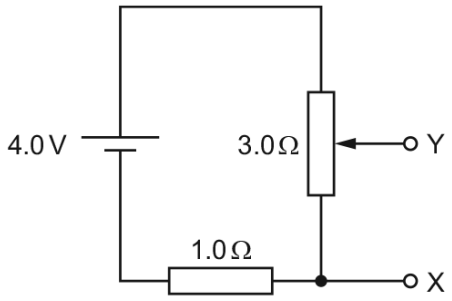
B 1.3V to 12.0V

C 1.5V to 11.1V

D 1.5V to 12.0V

1287. 9702_s20_qp_13 Q: 38

A cell of electromotive force (e.m.f.) 4.0 V and negligible internal resistance is connected to a fixed resistor of resistance 1.0 Ω and a potentiometer of maximum resistance 3.0 Ω, as shown.



Which range of potential differences can be obtained between the terminals X and Y?

A 0 V to 3.0 V

B 0 V to 4.0 V

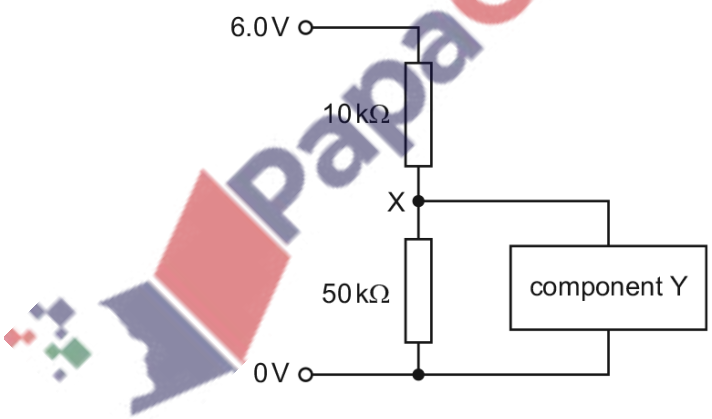
C 1.0 V to 3.0 V

D 1.0 V to 4.0 V

1288. 9702_m19_qp_12 Q: 38

The circuit shown consists of two resistors of resistances 10 kΩ and 50 kΩ and a component Y.

A 6.0 V supply is provided. The electric potential of the bottom wire is 0 V.



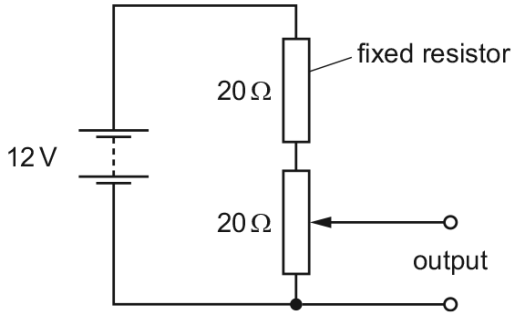
The current in component Y is negligible.

What is the electric potential at junction X?

A 1.0 V **B** 1.2 V **C** 4.8 V **D** 5.0 V

1289. 9702_s19_qp_11 Q: 38

The diagram shows a potentiometer and a fixed resistor connected across a 12 V battery of negligible internal resistance.



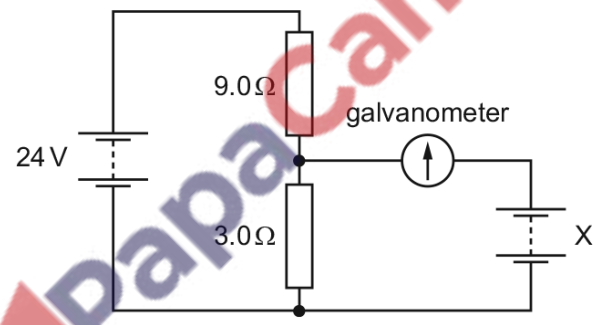
The fixed resistor and the potentiometer each have resistance 20 Ω. The circuit is designed to provide a variable output voltage.

What is the range of output voltages?

A 0 – 6 V **B** 0 – 12 V **C** 6 – 12 V **D** 12 – 20 V

1290. 9702_s19_qp_12 Q: 37

A circuit contains two batteries, each of negligible internal resistance, and two resistors as shown.



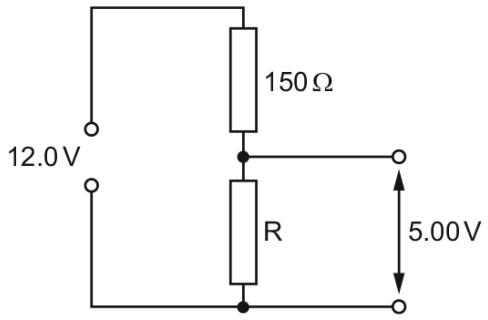
The galvanometer has a current reading of zero.

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

A 6.0 V **B** 8.0 V **C** 16.0 V **D** 18.0 V

1291. 9702_s19_qp_13 Q: 37

A potential divider circuit is shown.

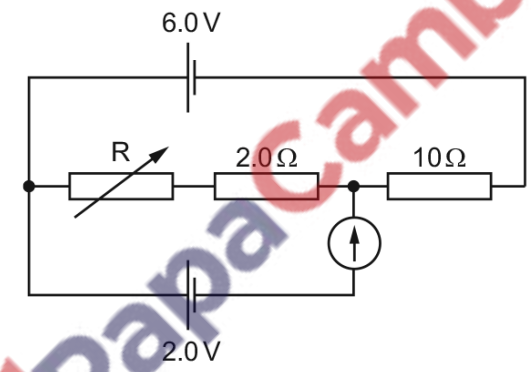


What is the resistance of resistor R in the potential divider circuit?

A 62.5 Ω **B** 107 Ω **C** 210 Ω **D** 360 Ω

1292. 9702_w19_qp_12 Q: 37

The diagram shows a variable resistor R and two fixed resistors connected in series in a circuit to act as a potential divider.



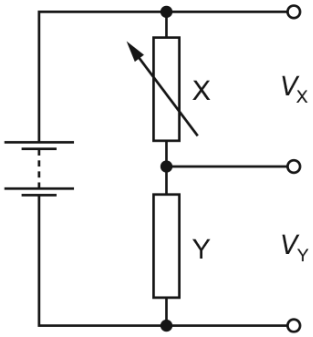
The cell of electromotive force (e.m.f.) 6.0 V has negligible internal resistance. A cell of e.m.f. 2.0 V and a galvanometer are connected into the potential divider. The resistance of R is varied until the galvanometer reads zero.

What is the resistance of resistor R?

A 3.0 Ω **B** 5.0 Ω **C** 8.0 Ω **D** 18 Ω

1293. 9702_m18_qp_12 Q: 36

A potential divider circuit is constructed with one variable resistor X and one fixed resistor Y, as shown.



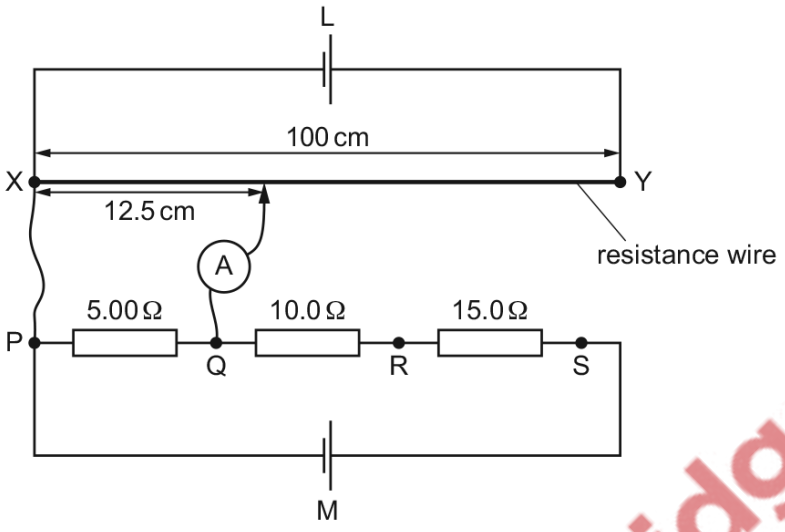
The potential difference across resistor X is V_X and the potential difference of resistor Y is V_Y.

As the resistance of X is increased, what happens to V_X and to V_Y?

	V_X	V_Y
A	falls	rises
B	falls	stays the same
C	rises	falls
D	rises	stays the same

1294. 9702_s18_qp_11 Q: 36

A uniform resistance wire XY of length 100 cm is connected in series with a cell L. Another cell M is connected in series with resistors of resistances 5.00 Ω, 10.0 Ω and 15.0 Ω.



The potential difference (p.d.) between P and Q is balanced against 12.5 cm of the resistance wire, so that the ammeter reads zero.

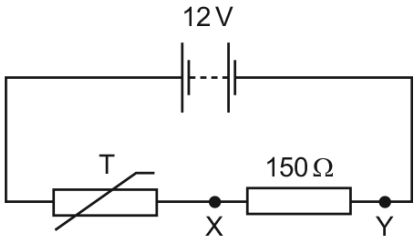
The p.d. across the other resistors is then balanced against other lengths of the resistance wire.

Which balanced lengths of resistance wire correspond to the connection points given in the table?

connection points	balanced length / cm			
	A	**B**	**C**	**D**
Q and R	12.5	25.0	25.0	25.0
Q and S	62.5	62.5	75.0	62.5
P and R	37.5	37.5	37.5	12.5

1295. 9702_s18_qp_12 Q: 37

A thermistor is an electrical component with a resistance that varies with temperature. A thermistor T is used in a fire alarm system. The alarm is triggered when the potential difference between X and Y is 4.5 V.

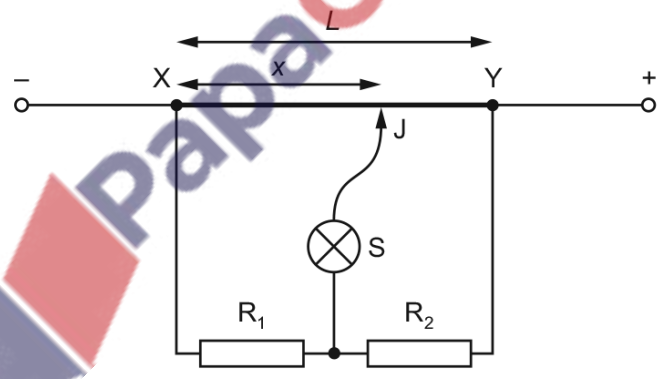


What is the resistance of T when the alarm is triggered?

A 90 Ω **B** 150 Ω **C** 250 Ω **D** 400 Ω

1296. 9702_s18_qp_13 Q: 38

In the circuit shown, XY is a length L of uniform resistance wire. A potential difference is applied across XY. R_1 and R_2 are unknown resistors. J is a sliding contact that joins the junction of R_1 and R_2 to points on XY through a lamp S.



J is moved along XY to a point at which the lamp is off. This point is at a distance x from X.

The potential difference across R_1 is V_1 and the potential difference across R_2 is V_2.

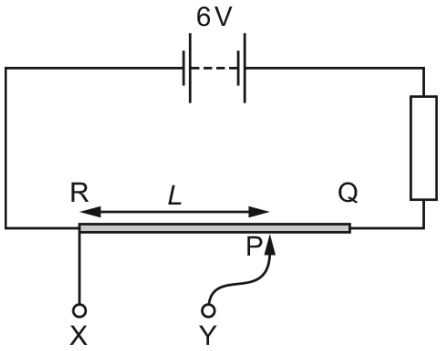
What is the value of the ratio $\frac{V_1}{V_2}$?

A $\frac{L}{x}$ **B** $\frac{x}{L}$ **C** $\frac{L-x}{x}$ **D** $\frac{x}{L-x}$

1297. 9702_w18_qp_11 Q: 38

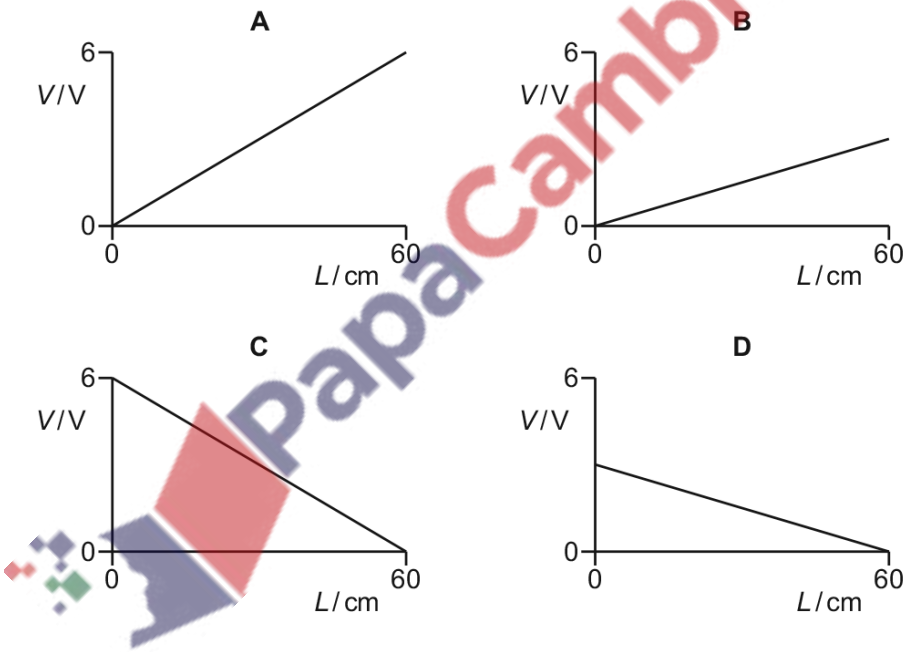
The diagram shows a battery of electromotive force (e.m.f.) 6 V, connected in series with a resistor and a uniform resistance wire RQ of length 60 cm.

The resistance of RQ is equal to the resistance of the resistor.



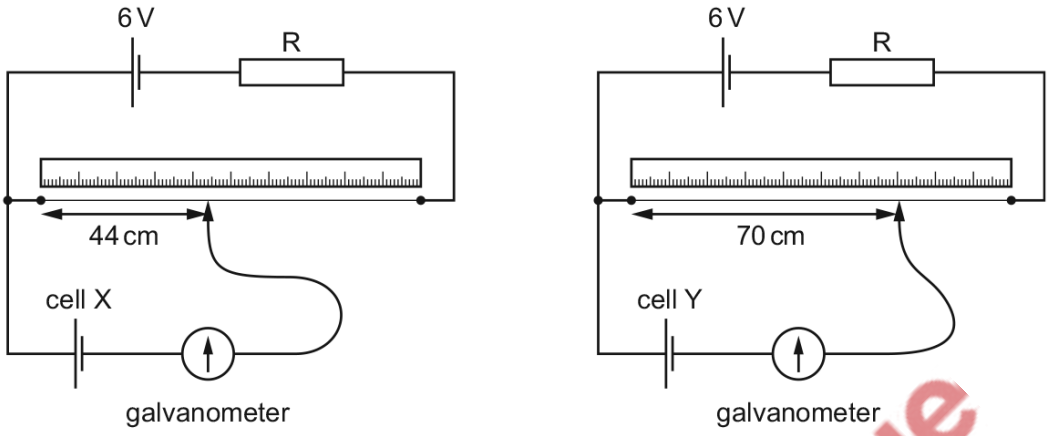
Terminal X is connected to fixed point R. Terminal Y is connected to point P, a connection that may be made at any position along the wire. L is the distance between R and P.

Which graph shows the variation with L of the potential difference (p.d.) V across XY?



1298. 9702_w18_qp_12 Q: 38

Two cells are investigated using a potentiometer. At the balance point, cell X gives a reading of 44 cm and cell Y gives a reading of 70 cm.



Which statement is **not** correct?

A A potentiometer balance point results in zero current through the galvanometer.

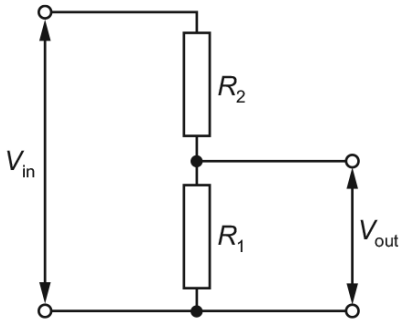
B At the balance point, the current through resistor R in both circuits is the same.

C The electromotive force (e.m.f.) of cell X is larger than that of cell Y.

D The value of the e.m.f. of each of the cells X and Y is less than 6 V.

1299. 9702_m17_qp_12 Q: 37

A potential divider consists of two resistors of resistances R_1 and R_2 connected in series across a source of potential difference (p.d.) V_{in}. The p.d. across R_1 is V_{out}.



Which changes to R_1 and to R_2 will increase the value of V_{out}?

	R_1	R_2
A	doubled	doubled
B	doubled	halved
C	halved	doubled
D	halved	halved

1300. 9702_s17_qp_11 Q: 36

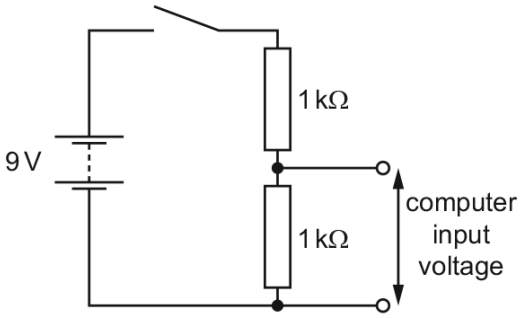
A computer is used to detect the change of position of a switch.

To detect the change of position, the computer requires a potential difference (p.d.) of 0 V to its input at one switch position and a p.d. of between 5 V and 7 V at the other switch position.

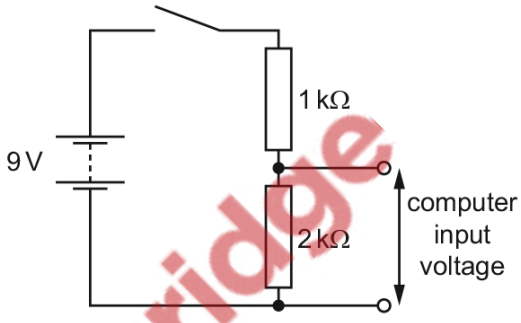
For each of the circuits, assume the battery has negligible internal resistance.

Which circuit provides an input voltage to the computer that enables it to detect the change of position of the switch?

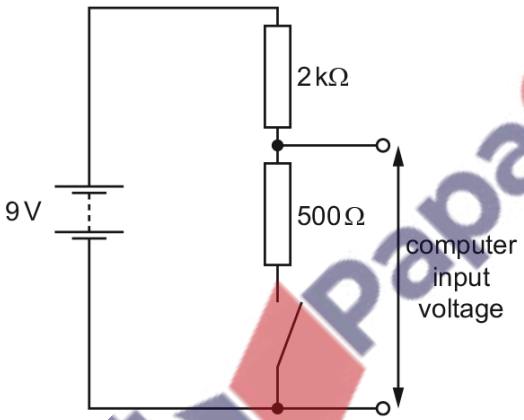
A



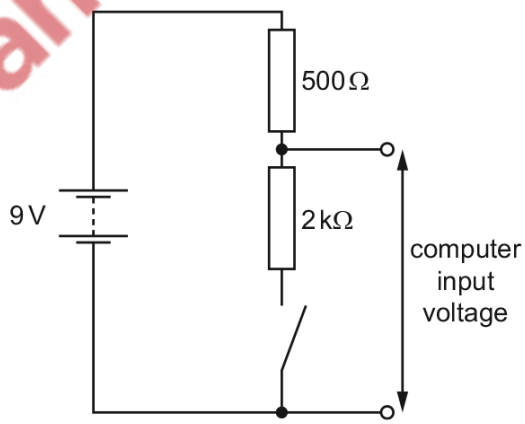
B



C

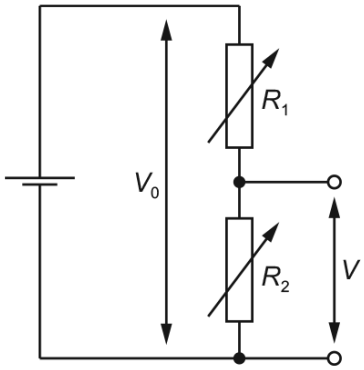


D



1301. 9702_s17_qp_13 Q: 36

A potential divider circuit consists of a cell of negligible internal resistance in series with two variable resistors of resistances R_1 and R_2. The potential difference (p.d.) across the cell is V_0. The p.d. at the output is V.



Which statement is correct?

A When R_1 increases, it takes a greater proportion of V_0, so V decreases.

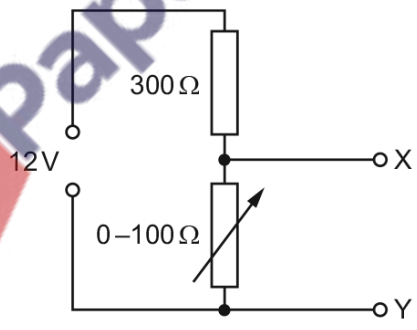
B When R_1 increases, the current through R_1 and R_2 decreases, so V increases.

C When R_2 decreases, it takes a smaller proportion of V_0, so V increases.

D When R_2 increases, the current through R_1 and R_2 decreases, so V decreases.

1302. 9702_w17_qp_12 Q: 38

The diagram shows a potential divider connected to a 12 V supply of negligible internal resistance.

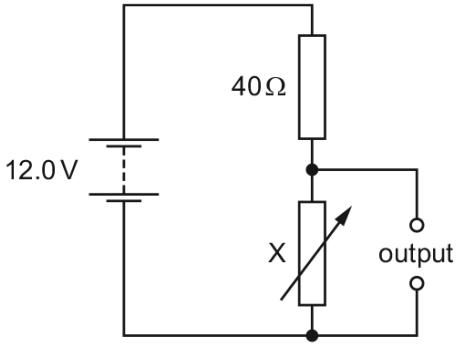


Which range of voltages can be obtained between X and Y?

A 0 to 3 V **B** 0 to 4 V **C** 0 to 8 V **D** 0 to 9 V

1303. 9702_s16_qp_11 Q: 34

In the circuit shown, X is a variable resistor whose resistance can be changed from 5.0Ω to 500Ω. The e.m.f. of the battery is 12.0V. It has negligible internal resistance.



What is the maximum range of values of potential difference across the output?

A 1.3V to 11.1V

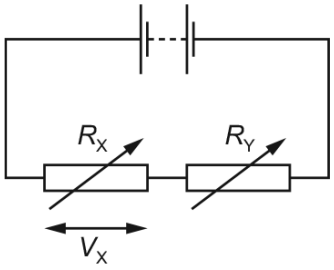
B 1.3V to 12.0V

C 1.5V to 11.1V

D 1.5V to 12.0V

1304. 9702_s16_qp_12 Q: 36

A potential divider circuit is formed by connecting a battery of negligible internal resistance in series with two variable resistors, as shown.



The variable resistors have resistances R_X and R_Y.
V_X is the potential difference across resistance R_X.

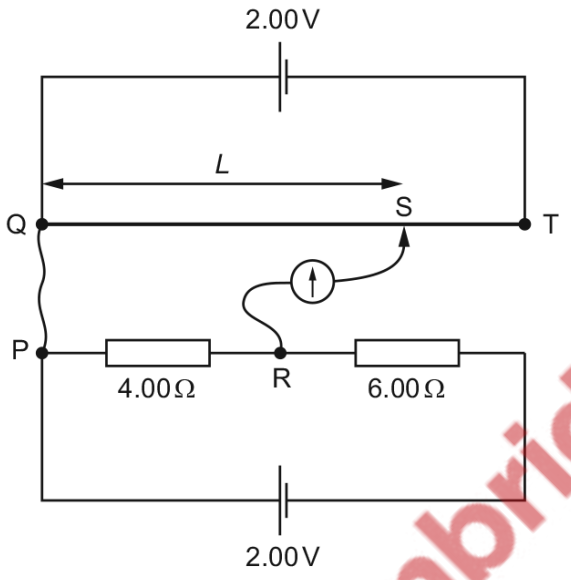
R_X and R_Y are both changed at the same time.

Which combination of changes **must** cause V_X to increase?

	R_X	R_Y
A	larger	larger
B	larger	smaller
C	smaller	larger
D	smaller	smaller

1305. 9702_s16_qp_13 Q: 36

A 100 cm potentiometer wire QT is connected in series with a 2.00 V cell. Another circuit, consisting of a 2.00 V cell in series with resistors of resistance 4.00 Ω and 6.00 Ω, is set up alongside the potentiometer. Connections PQ and RS are then made so that the potential difference (p.d.) across the 4.00 Ω resistor is balanced against the p.d. across a length *L* of potentiometer wire. Both cells have negligible internal resistance.

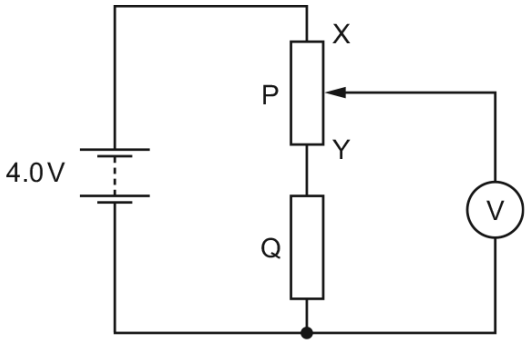


What is the balance length *L*?

A 0 cm **B** 40 cm **C** 60 cm **D** 100 cm

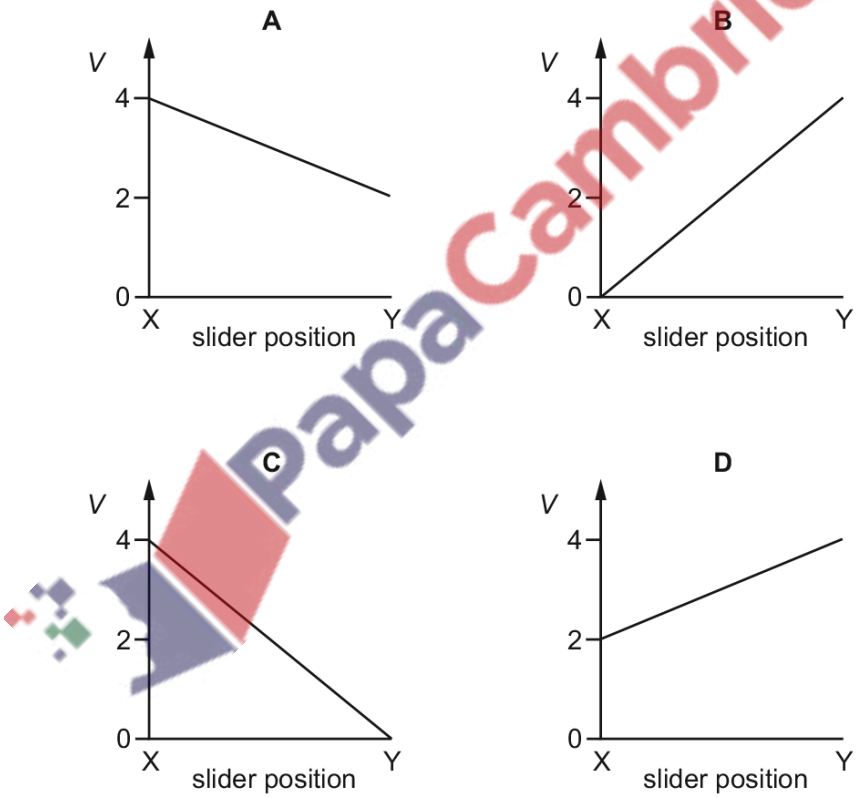
1306. 9702_w16_qp_12 Q: 38

In the circuit below, P is a potentiometer of total resistance 10Ω and Q is a fixed resistor of resistance 10Ω. The battery has an e.m.f. of 4.0V and negligible internal resistance. The voltmeter has a very high resistance.



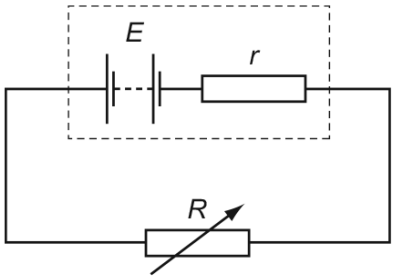
The slider on the potentiometer is moved from X to Y and a graph of voltmeter reading V is plotted against slider position.

Which graph is obtained?



1307. 9702_s15_qp_11 Q: 36

A battery with e.m.f. E and internal resistance r is connected in series with a variable external resistor.



The value of the external resistance R is slowly increased from zero.

Which statement is correct? (Ignore any temperature effects.)

A The potential difference across the external resistance decreases.

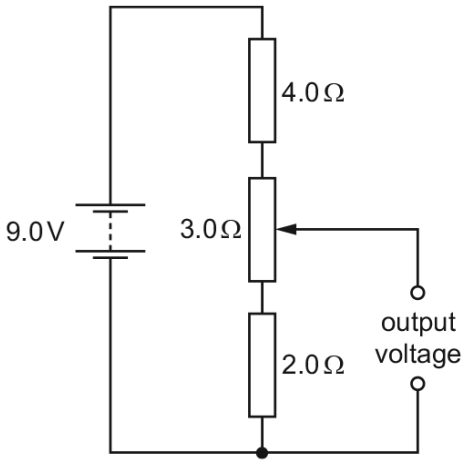
B The potential difference across the internal resistance increases.

C The power dissipated in r increases and then decreases.

D The power dissipated in R increases and then decreases.

1308. 9702_s15_qp_12 Q: 36

A potential divider circuit consists of fixed resistors of resistance 2.0Ω and 4.0Ω connected in series with a 3.0Ω resistor fitted with a sliding contact. These are connected across a battery of e.m.f. 9.0 V and zero internal resistance, as shown.



What are the maximum and the minimum output voltages of this potential divider circuit?

	maximum voltage/V	minimum voltage/V
A	4.0	2.0
B	5.0	2.0
C	9.0	0
D	9.0	2.0