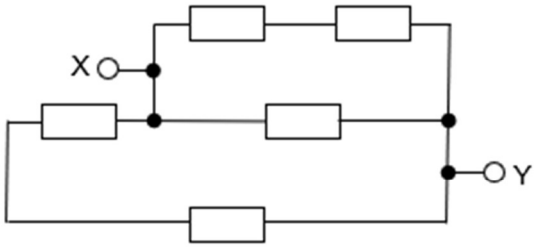
H2 Physics Revision Topic : DC Circuits

Multiple Choice Questions Name: _____

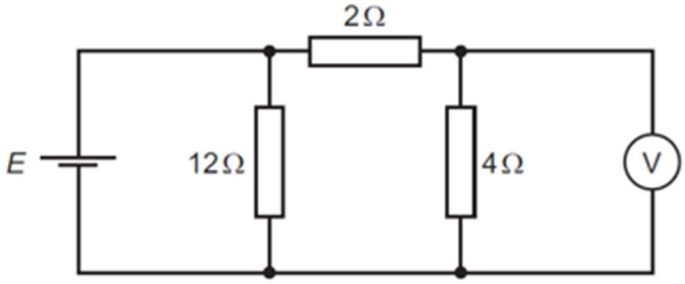
1 The circuit diagram shows a network of resistors each of resistance *R*.



What is the effective resistance between the points X and Y?

A $\frac{2}{3}R$ **B** $\frac{5}{8}R$ **C** $\frac{R}{2}$ **D** $\frac{2}{7}R$

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

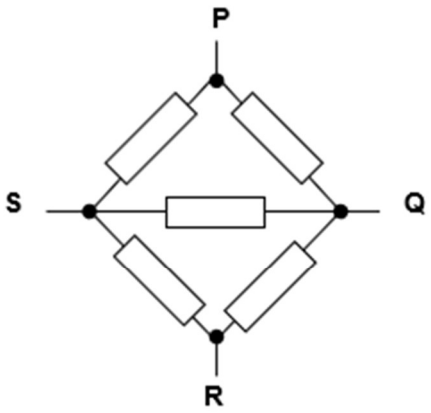


The voltmeter has a very high resistance and reads a potential difference V_{out}.

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

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

3 Five resistors of equal resistance are connected as shown.

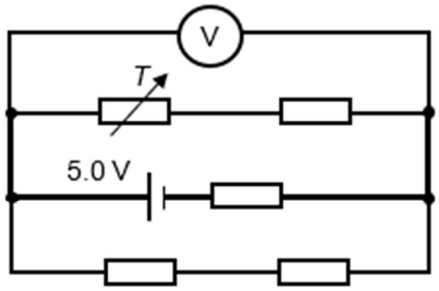


Which two points would give the maximum resistance?

A PQ **B** PR

C PS **D** QS

4 A cell of e.m.f. 5.0 V and negligible internal resistance is connected to four similar resistors and a variable resistor *T*, as shown.

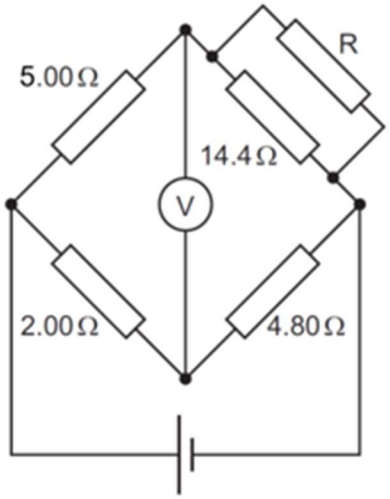


The resistance of each resistor is 1.0 kΩ and the resistance of *T* is 5.0 kΩ.
What is the reading of the ideal voltmeter?

A 0 V **B** 2.0 V

C 3.0 V **D** 5.0 V

5 A cell of negligible internal resistance is connected to a network of resistors and a voltmeter, as shown.

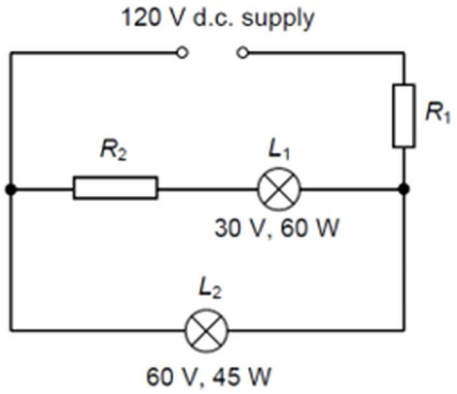


The reading on the voltmeter is zero.

What is the resistance of resistor R?

A 0Ω **B** 2.40Ω **C** 14.4Ω **D** 72.0Ω

6 Two filament lamps L_1 and L_2 rated "30 V, 60 W" and "60 V, 45 W" respectively are connected across a 120 V d.c. supply of negligible internal resistance.

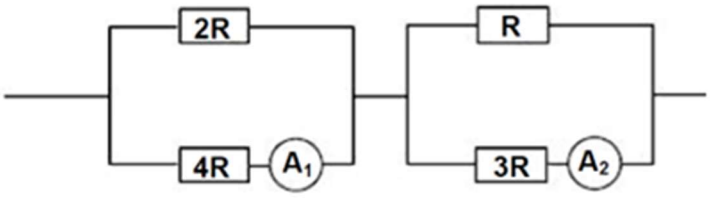


What is the value of the resistance R_1 if both the lamps are operating at their rated powers?

A 15 Ω **B** 22 Ω **C** 30 Ω **D** 80 Ω

7

The circuit shown in the diagram below is connected to a power supply.

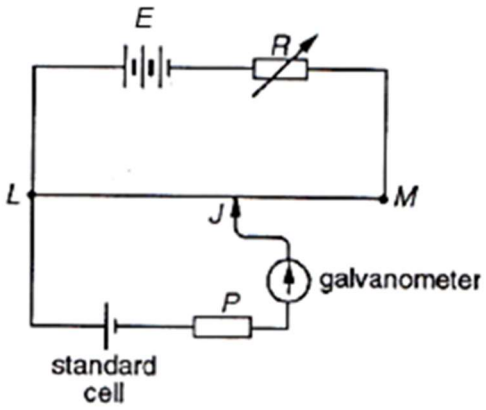


If ammeter A_1 reads 6.0 A, what is the reading on ammeter A_2?

A 13.5 A **B** 6.0 A **C** 4.5 A **D** 2.3 A

8

No balance point can be found for the potentiometer shown below.



Which of the following may allow a balance point to be found?

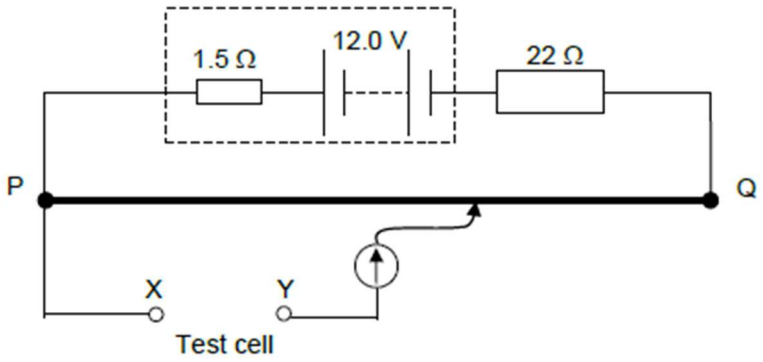
A increasing the resistance of the rheostat *R*.

B replacing the resistance wire LM with one of higher resistance.

C reversing the polarity of the driver cell *E*.

D replacing the resistor P with one of higher resistance.

9 A student attempts to measure the e.m.f. of a test cell using a potentiometer circuit as shown in the diagram.



The wire PQ has a resistance of 3.0 Ω and the driver cell has an e.m.f. of 12.0 V. He was unable to obtain an observable balance length on PQ when he connected the circuit. The tutor he consulted told him that the test cell has an e.m.f. of a few millivolts. What could he do in order to obtain an observable balance length?

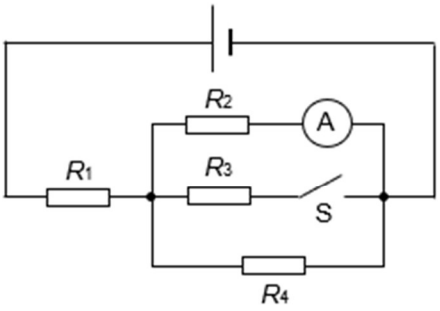
A Reversed the polarity of the test cell at XY.

B Use a driver cell of e.m.f. 20 V.

C Change the resistance of the connected resistor to 1 kΩ.

D Change the wire PQ to a wire of resistance 20 Ω .

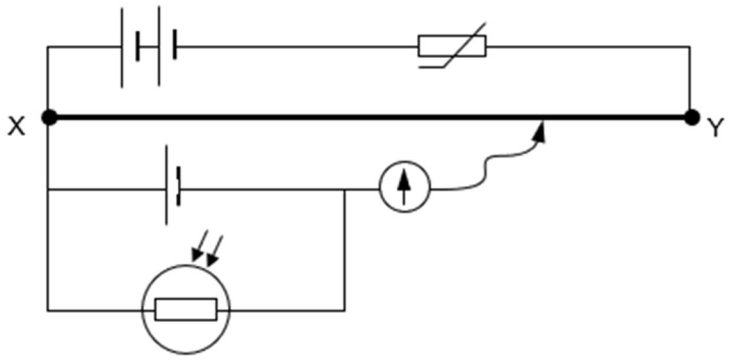
10 Four resistors R_1, R_2, R_3, R_4 are connected in a circuit. R_2 is in series with an ammeter, while R_3 is in series with switch S. Switch S is initially open.



Which of the following changes, when made independently, would increase the reading on the ammeter?

A Increase R_1 **B** Increase R_2 **C** Increase R_4 **D** Close S

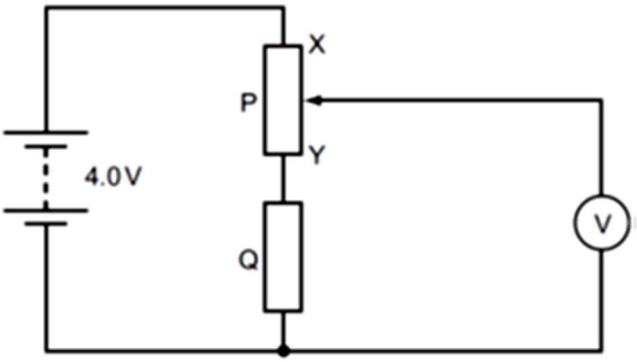
11 A NTC thermistor and a light-dependent resistor are connected in a potentiometer circuit. The batteries have finite internal resistance. XY is a resistance wire.



Which row of environmental conditions maximizes the balance length of the potentiometer?

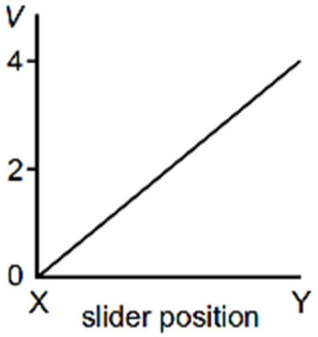
	temperature	lighting condition
A	high	bright
B	high	dark
C	low	bright
D	low	dark

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

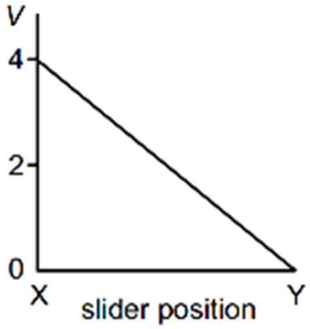


Which of the following shows the correct graph obtained?

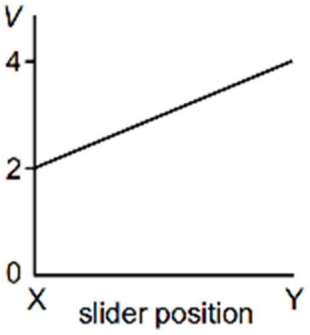
A



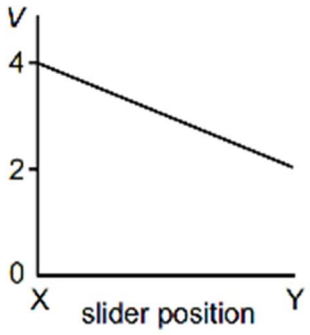
B



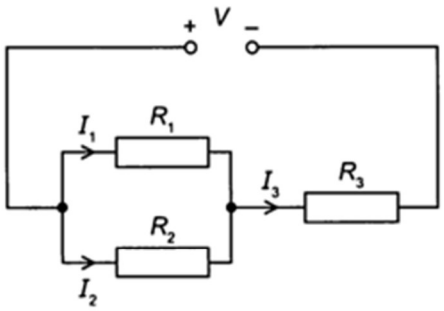
C



D



13 A power supply giving an output potential difference V is connected as shown to resistors R_1, R_2 and R_3. The currents in the circuit are I_1, I_2, and I_3.



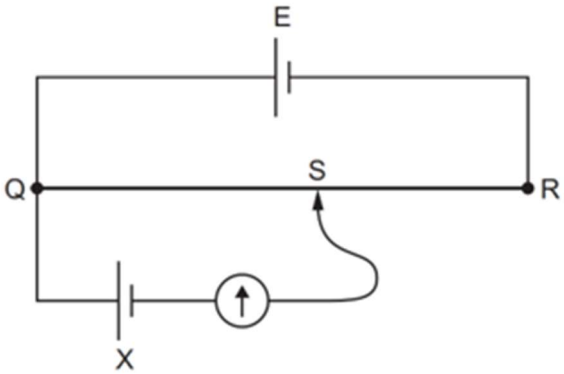
A student wishes to calculate the value of R_2.

Which group of values would be enough to enable the student to find R_2?

A I_1, I_2, I_3 and R_3
B I_1, I_2, I_3 and V
C I_2, R_1, R_3, and V
D I_3, R_1, R_3, and V

14 A potentiometer circuit is used to determine the unknown electromotive force (e.m.f.) of a cell X.

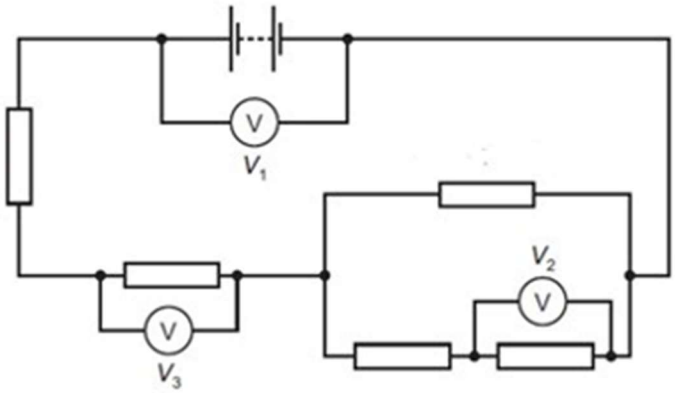
In the circuit shown, E is a cell with an e.m.f. that is known accurately. QR is the potentiometer wire, which has a movable contact S. Contact S is connected to a galvanometer and to cell X.



What is not a necessary requirement to determine the e.m.f. of X from the circuit?

A The e.m.f. of cell X must be lower than the e.m.f. of cell E.
B The internal resistance of cell X must be known.
C The lengths QS and QR must be determined accurately.
D The resistance of the wire QR must be proportional to its length.

15 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 is the reading V_3?

A 1.5 V **B** 3.0 V **C** 4.5 V **D** 6.0 V

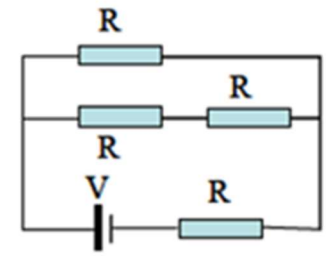
16 Two wires each of length L are used to connect an a.c. power supply to a lamp. The a.c power supply has a peak voltage of 12 V and negligible internal resistance.

The r.m.s potential difference across the lamp is 7.00 V. The r.m.s current in the wires is 2.50 A. Each wire is made of a metal of resistivity 1.70×10^{-8} Ω m and has a cross-sectional area of 6.00×10^{-7} m^2.

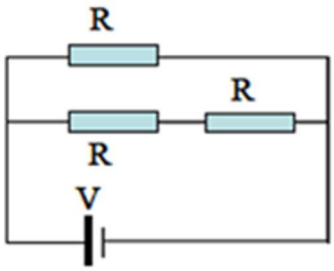
What is the length L of each wire?

A 10.5 m **B** 21.0 m **C** 35.3 m **D** 58.8 m

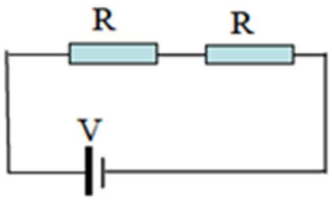
17 Four circuits are shown below. The batteries all have the same voltage V and all resistors have the same resistance R. In which circuit does the battery produce the most power?



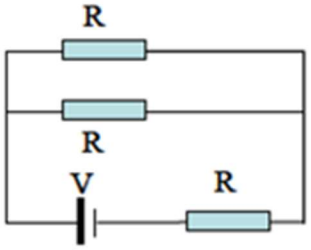
A



B

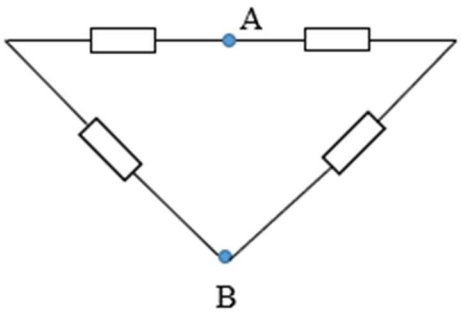


C



D

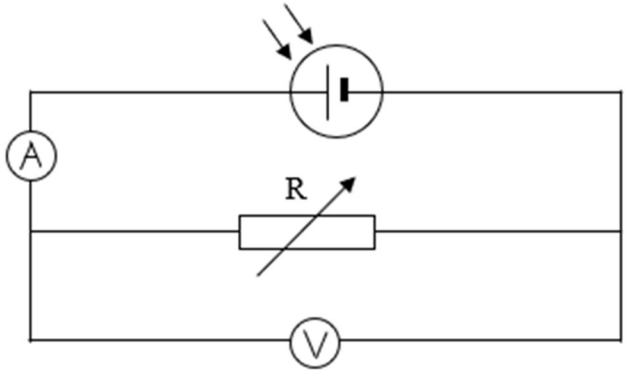
18 Four identical resistors, each of resistance R, are connected as shown in the diagram below.



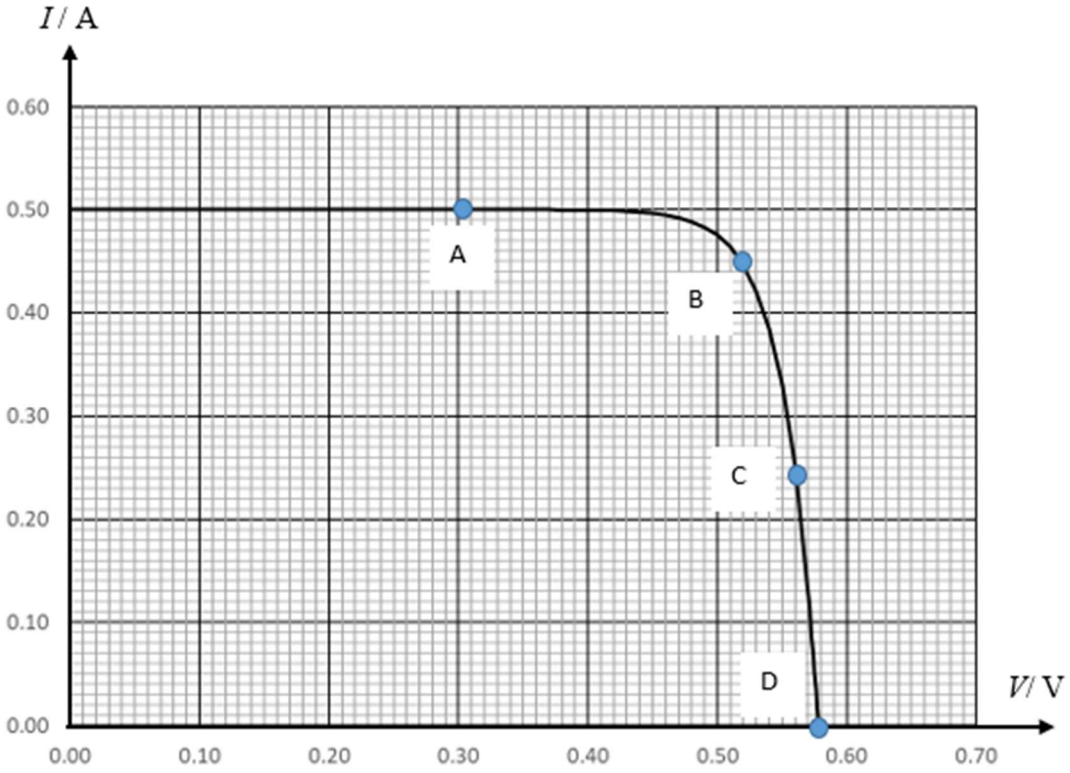
What is the effective resistance between points A and B?

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

19 A photovoltaic cell is connected to a variable resistor R as shown below.



As the resistance of the variable resistor is adjusted, the current I and voltage V recorded by the ammeter and voltmeters are recorded. The variation with the voltage V of current I is shown in the graph below.



Approximately at which point is the power delivered to the resistor a maximum?