

# D.C Circuits

## Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Electricity and Magnetism
Topic	D.C Circuits
Booklet	Question Paper

**Time Allowed:** 55 minutes

**Score:** /46

**Percentage:** /100

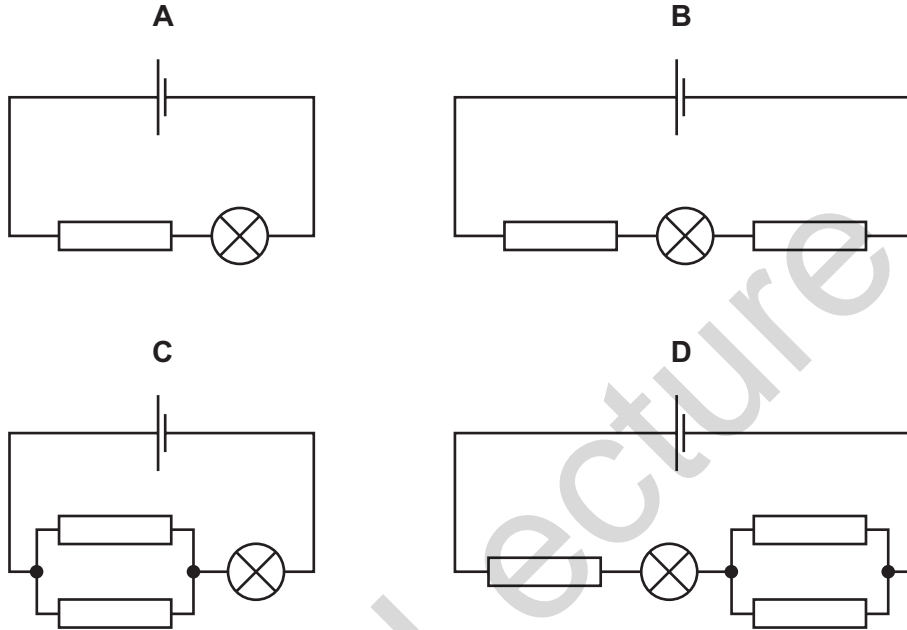
**Grade Boundaries:**

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- 1 The cells, lamps and resistors in the circuits are identical.

In which circuit is the lamp the brightest?



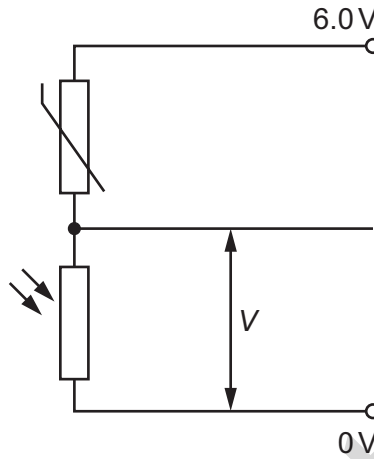
- 2 Which component, when used in a circuit, allows current to pass in only one direction?



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- 3 A potential divider consists of a thermistor and a light-dependent resistor (LDR).



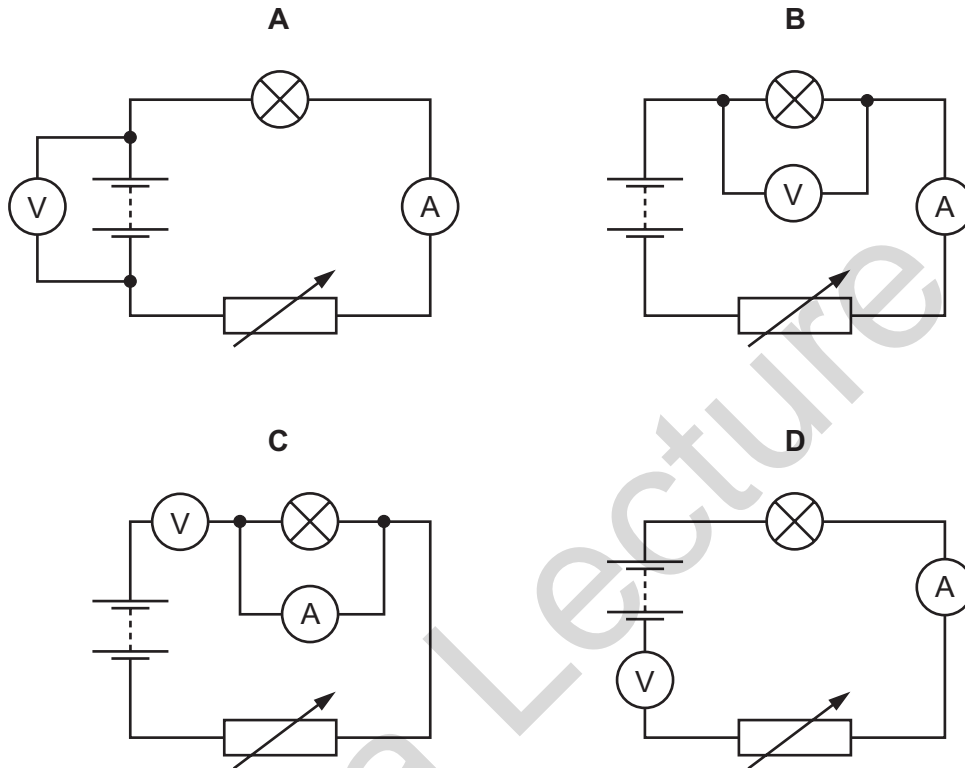
Which conditions give the smallest voltage  $V$  across the LDR?

- A cold and dark
- B cold and light
- C hot and dark
- D hot and light

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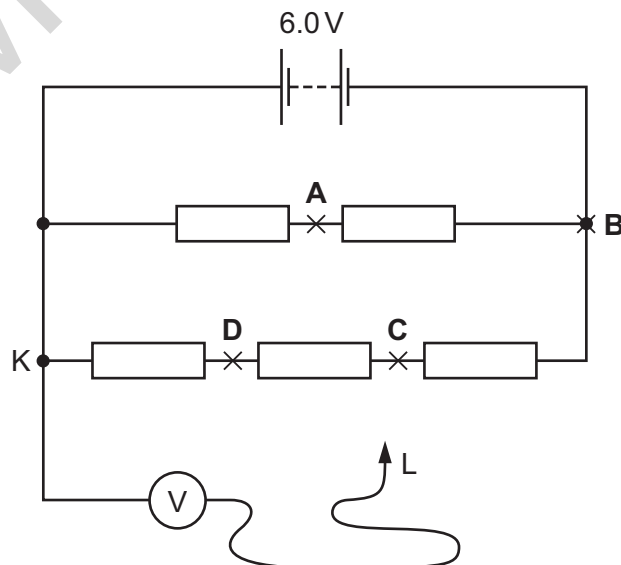
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- 4 Which diagram shows the arrangement of the ammeter and voltmeter to obtain readings to find the power of a lamp?



- 5 A 6.0V battery is connected to a network containing five identical resistors. A voltmeter has one lead connected to point K as shown.

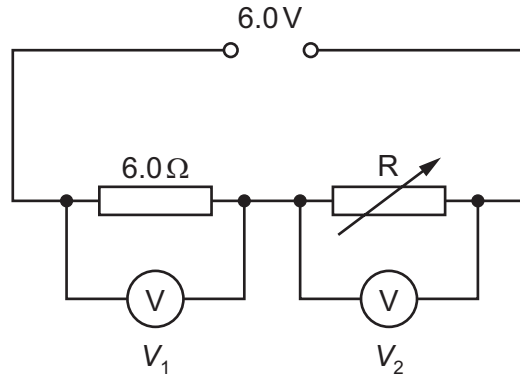
At which point should lead L be connected so that the voltmeter reads 3.0V?



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- 6 A potential divider is connected across the terminals of a 6.0V supply.



When R is adjusted to 6.0Ω, the voltmeter readings V<sub>1</sub> and V<sub>2</sub> are equal.

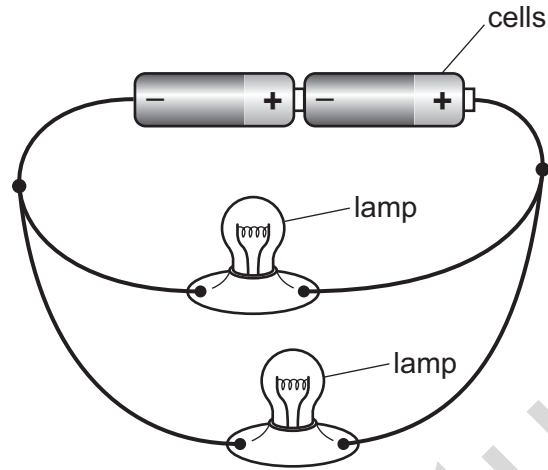
What happens to the readings when the resistance of R is then increased?

	V <sub>1</sub>	V <sub>2</sub>
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	increases	decreases
<b>D</b>	increases	increases

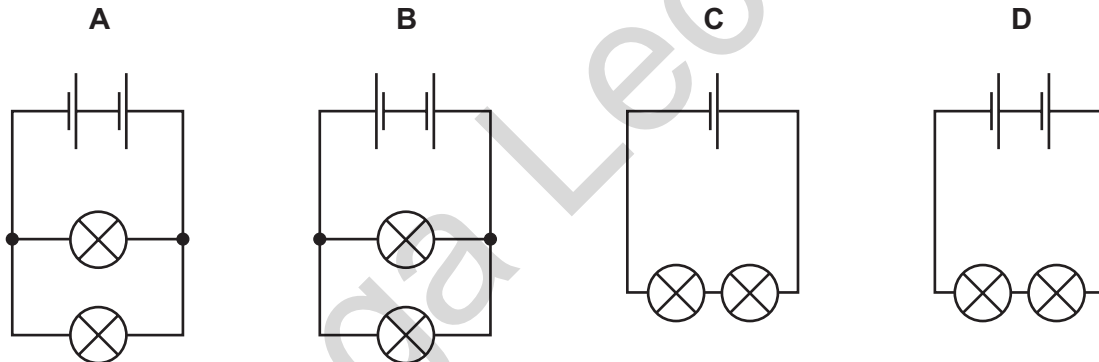
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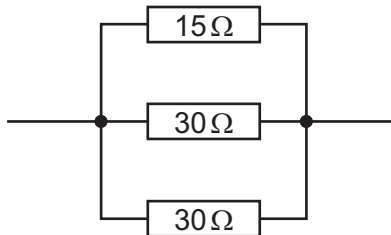
7 The diagram shows a circuit.



Which circuit diagram shows this circuit?



8 The diagram shows three resistors in parallel.



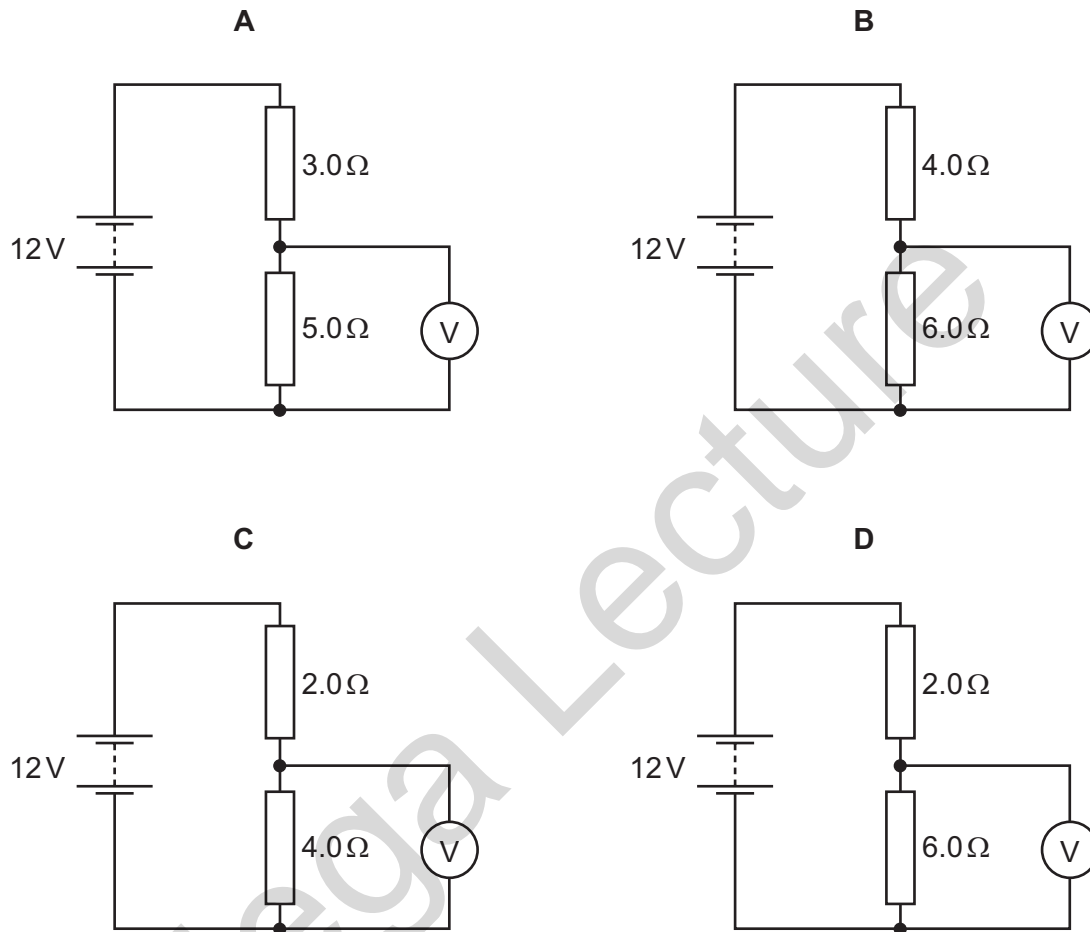
What is the combined resistance?

- A**  $7.5\ \Omega$       **B**  $15\ \Omega$       **C**  $30\ \Omega$       **D**  $75\ \Omega$

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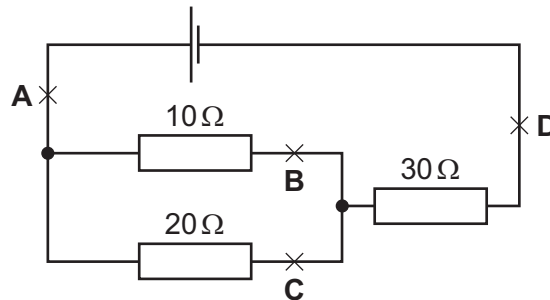
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9 In which circuit is the voltmeter reading 7.2 V?



10 The diagram shows a circuit.

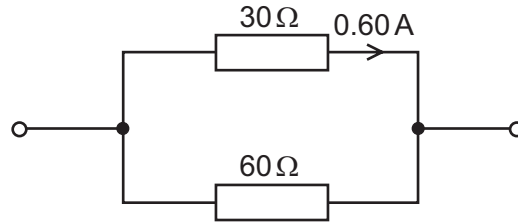
Where must an ammeter be connected to measure the smallest current?



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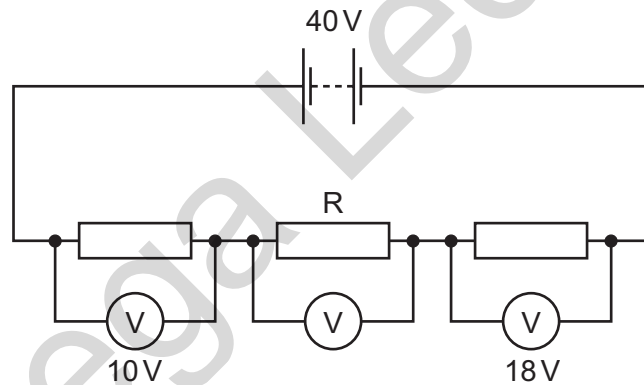
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- 11 Two resistors of resistances  $30\ \Omega$  and  $60\ \Omega$  are arranged in parallel. The current in the  $30\ \Omega$  resistor is  $0.60\ \text{A}$ .



What is the potential difference across the  $60\ \Omega$  resistor?

- A**  $9.0\ \text{V}$       **B**  $18\ \text{V}$       **C**  $36\ \text{V}$       **D**  $54\ \text{V}$
- 12 The circuit shows three resistors in series connected to a battery. Each resistor has a voltmeter across it and two of the voltages are shown.



What is the potential difference (p.d.) across the resistor  $R$ ?

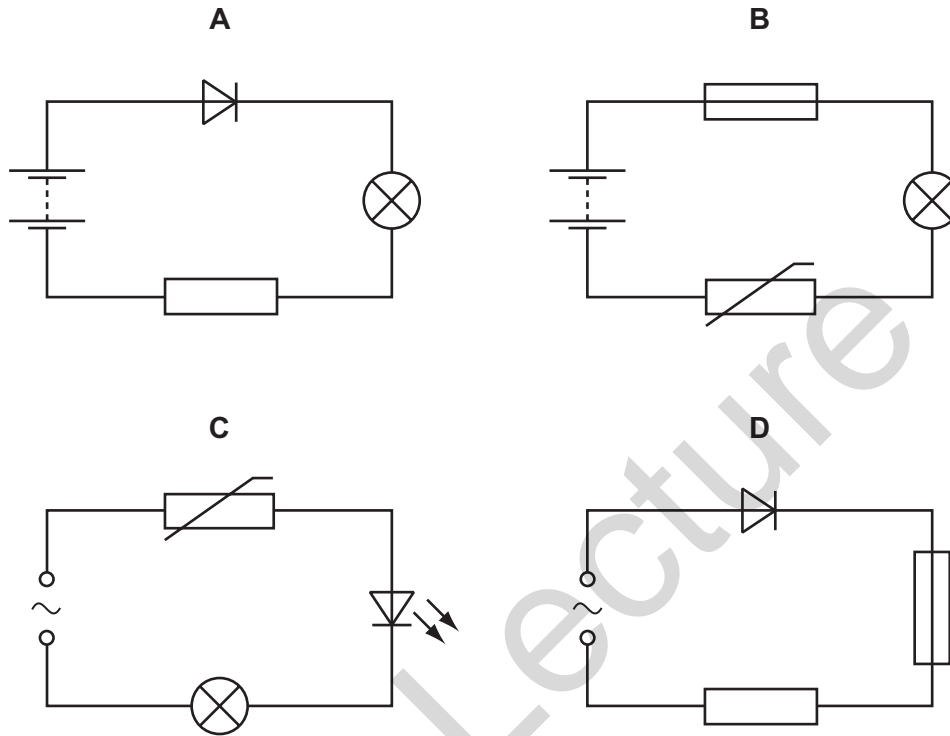
- A**  $12\ \text{V}$       **B**  $22\ \text{V}$       **C**  $30\ \text{V}$       **D**  $68\ \text{V}$



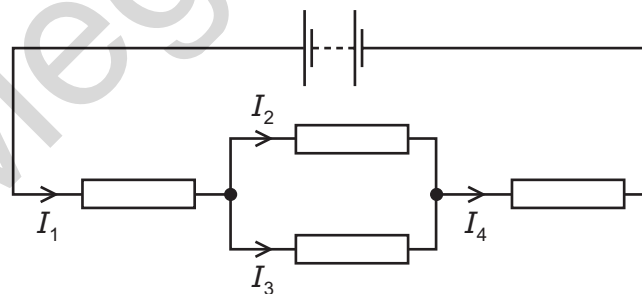
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13 Which circuit contains a fuse and a diode?



14 Four resistors of unequal resistances are connected to a power supply as shown.



The currents in the four resistors are  $I_1$ ,  $I_2$ ,  $I_3$  and  $I_4$ .

Which equation is correct?

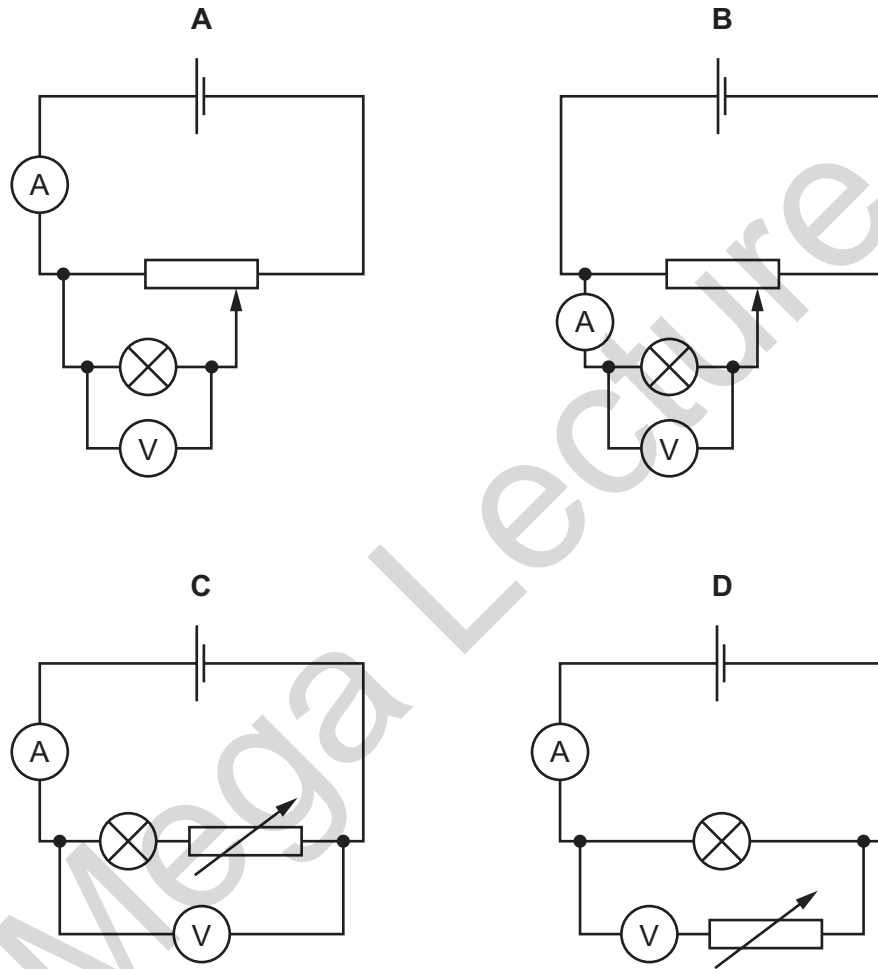
- A**  $I_1 = I_2 - I_3$
- B**  $I_2 = I_1 + I_4$
- C**  $I_3 = I_4 - I_1$
- D**  $I_4 = I_2 + I_3$

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- 15 An experiment is set up to investigate how the current in a filament lamp changes with the potential difference across it.

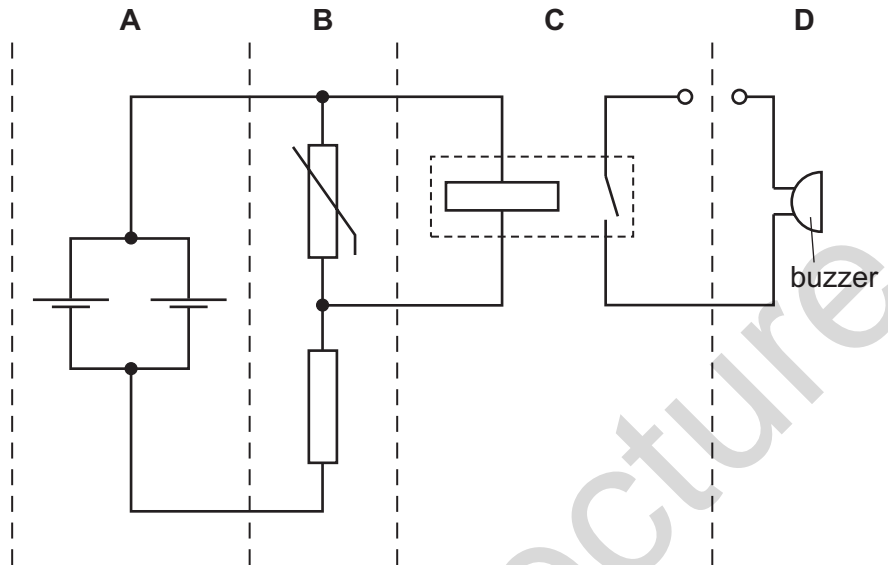
Which circuit is correct?



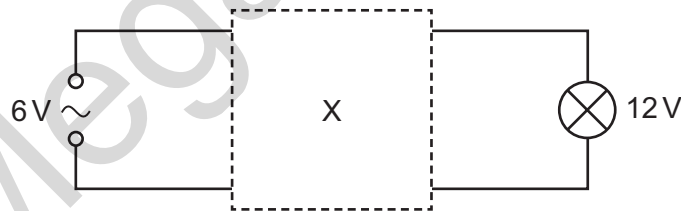
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16 Which section of the circuit contains a potential divider?



17 The diagram shows an electrical device X connected between a 6V a.c. supply and a 12V lamp



The lamp is seen to glow with normal brightness.

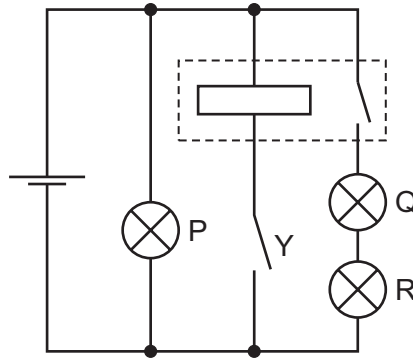
What is X?

- A a capacitor
- B a potential divider
- C a relay
- D a transformer

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18 In the circuit shown, all lamps are identical. Lamp P lights with normal brightness.



Switch Y is closed and lamps come on.

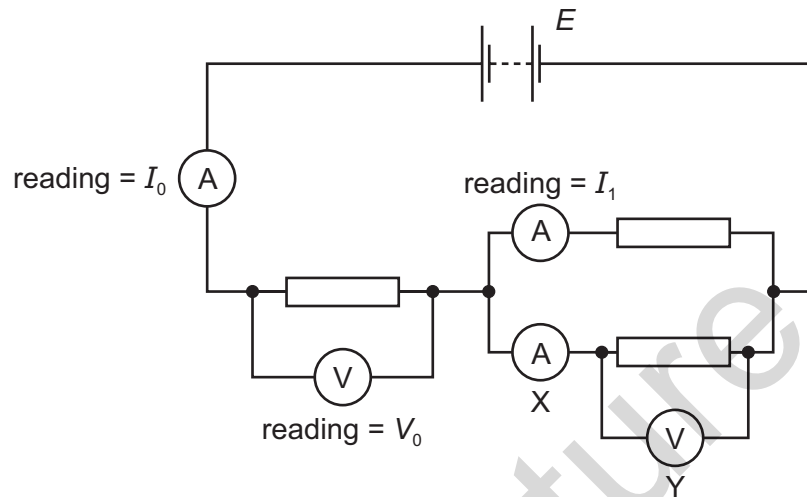
Which row indicates the brightness of the lamps?

	P	Q	R
A	dim	dim	dim
B	normal	dim	dim
C	normal	off	off
D	off	normal	normal

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19 A battery of e.m.f.  $E$  is connected in a circuit containing three resistors.



The readings of two ammeters and a voltmeter are shown.

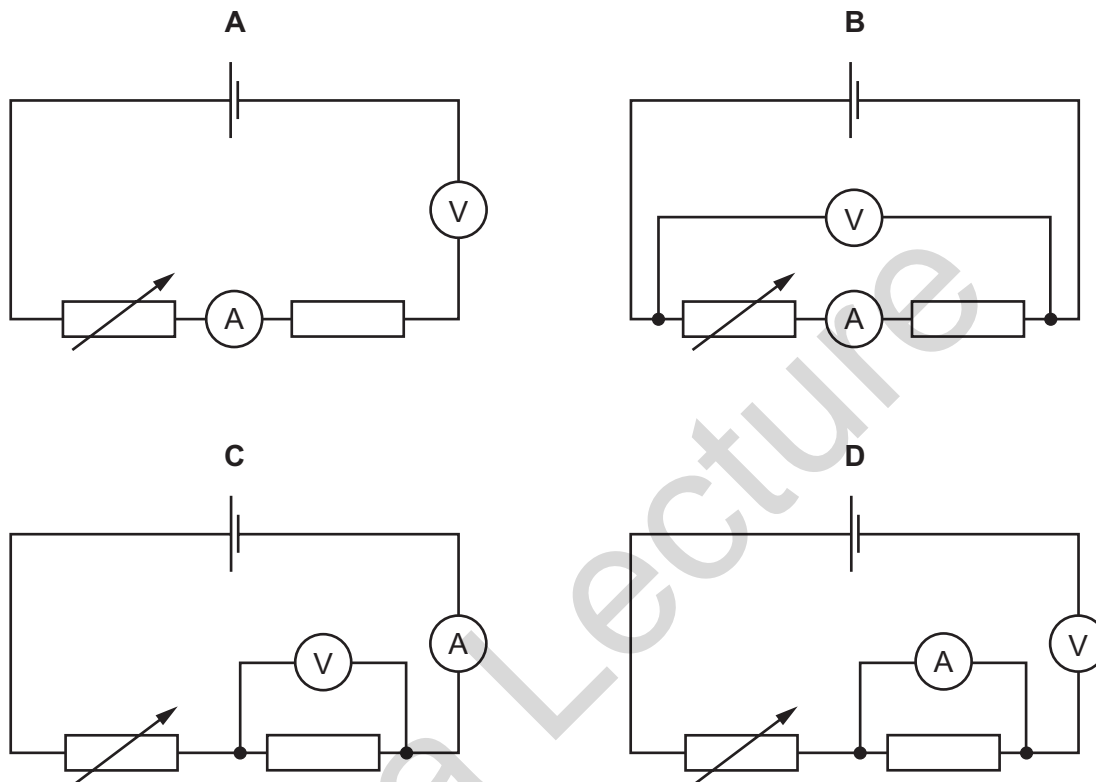
Which readings are shown on ammeter  $X$  and on voltmeter  $Y$ ?

	X	Y
<b>A</b>	$I_0 - I_1$	$E - V_0$
<b>B</b>	$I_0 - I_1$	$E + V_0$
<b>C</b>	$I_0 + I_1$	$E + V_0$
<b>D</b>	$I_0 + I_1$	$E - V_0$

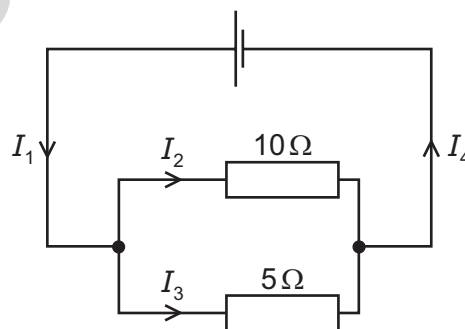
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- 20 Which circuit is connected correctly to measure the current in a fixed resistor and the potential difference (p.d.) across the same resistor?



- 21 The currents in different parts of the circuit are  $I_1$ ,  $I_2$ ,  $I_3$  and  $I_4$ .



Which statement is correct?

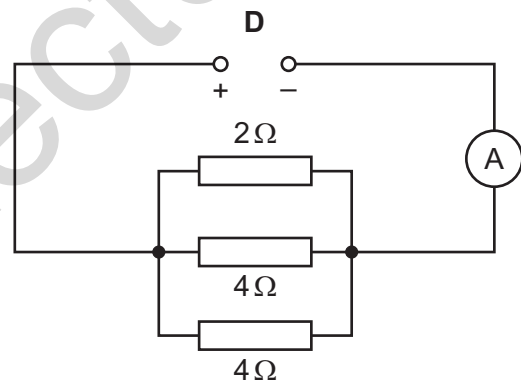
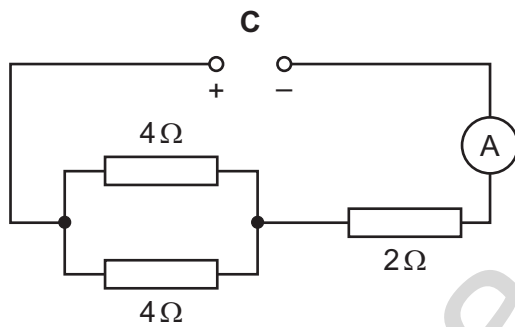
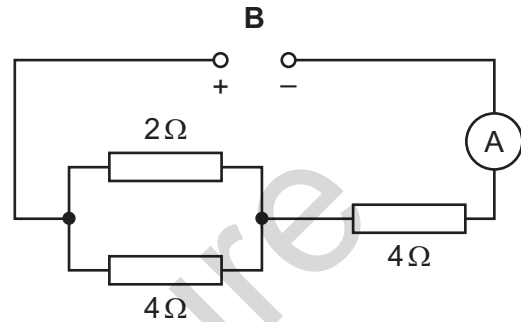
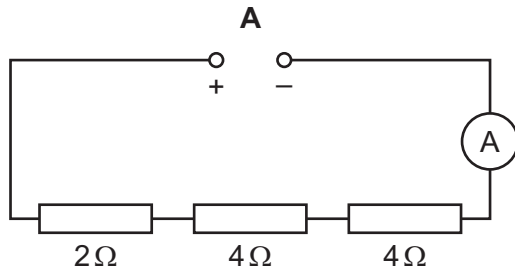
- A  $I_1 = I_4$  and  $I_2$  is greater than  $I_3$ .
- B  $I_1 = I_4$  and  $I_3$  is greater than  $I_2$ .
- C  $I_2$  is greater than  $I_1$  and less than  $I_3$ .
- D  $I_2$  is greater than  $I_1$  and greater than  $I_3$ .

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22 An ammeter is connected to three resistors and a power supply.

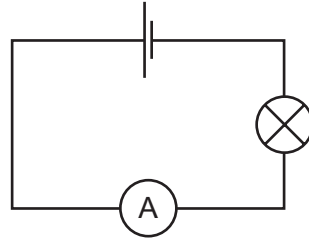
Which arrangement of resistors gives the greatest ammeter reading?



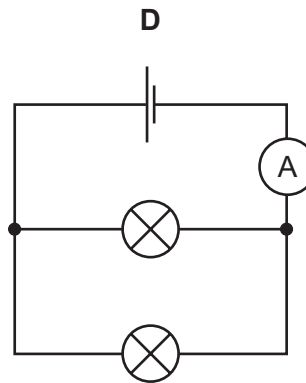
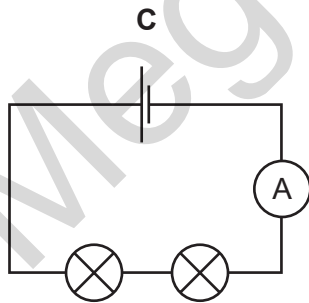
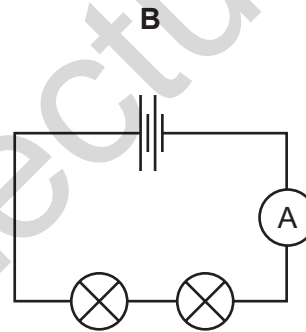
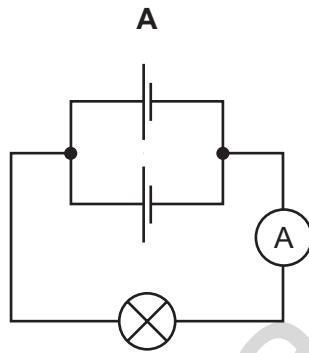
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23 A cell is connected in series with an ammeter and a lamp. The reading on the ammeter is 1 A.



In which circuit, using identical lamps, ammeters and cells, is the reading on the ammeter 2 A?

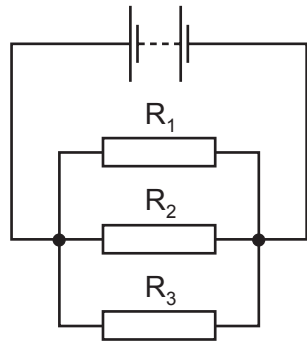




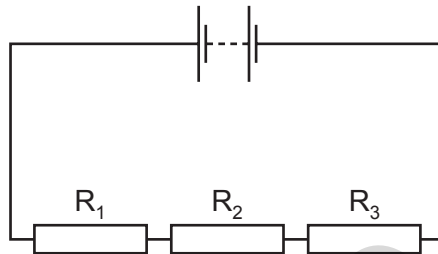
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24 In the circuits P and Q below, resistors  $R_1$ ,  $R_2$  and  $R_3$  have different resistances.



circuit P



circuit Q

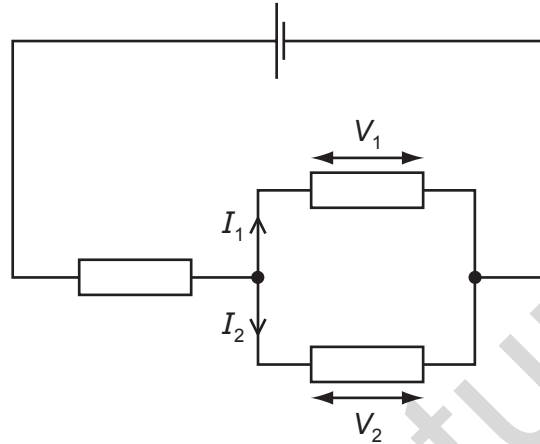
In which circuit are the currents in the resistors equal and in which circuit are the potential differences across the resistors equal?

	currents equal	potential differences equal
<b>A</b>	P	P
<b>B</b>	P	Q
<b>C</b>	Q	P
<b>D</b>	Q	Q

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25 The circuit shows three resistors connected to a cell.



The resistors have different values of resistance.

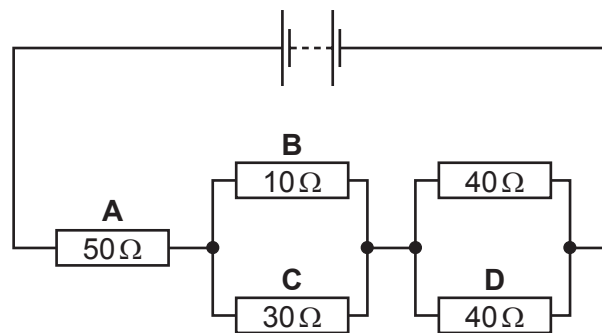
$V_1$  and  $V_2$  are potential differences and  $I_1$  and  $I_2$  are currents as shown.

Which pair of relationships is correct?

- A  $I_1 = I_2$  and  $V_1 = V_2$
- B  $I_1 = I_2$  and  $V_1 \neq V_2$
- C  $I_1 \neq I_2$  and  $V_1 = V_2$
- D  $I_1 \neq I_2$  and  $V_1 \neq V_2$

26 The diagram shows a circuit containing five resistors connected to a battery.

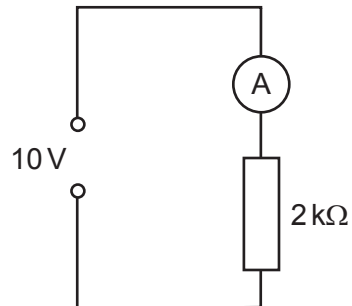
In which resistor is the current the smallest?



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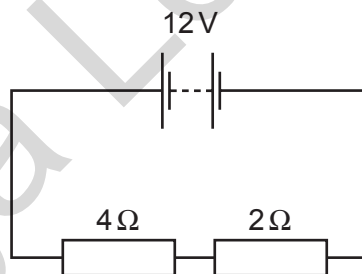
27 The diagram shows an ammeter connected in a circuit.



What is the current in the ammeter?

- A** 5 mA      **B** 20 mA      **C** 0.2 A      **D** 5 A

28 In the circuit shown, the potential difference (p.d.) across the  $4\Omega$  resistor is 8 V.



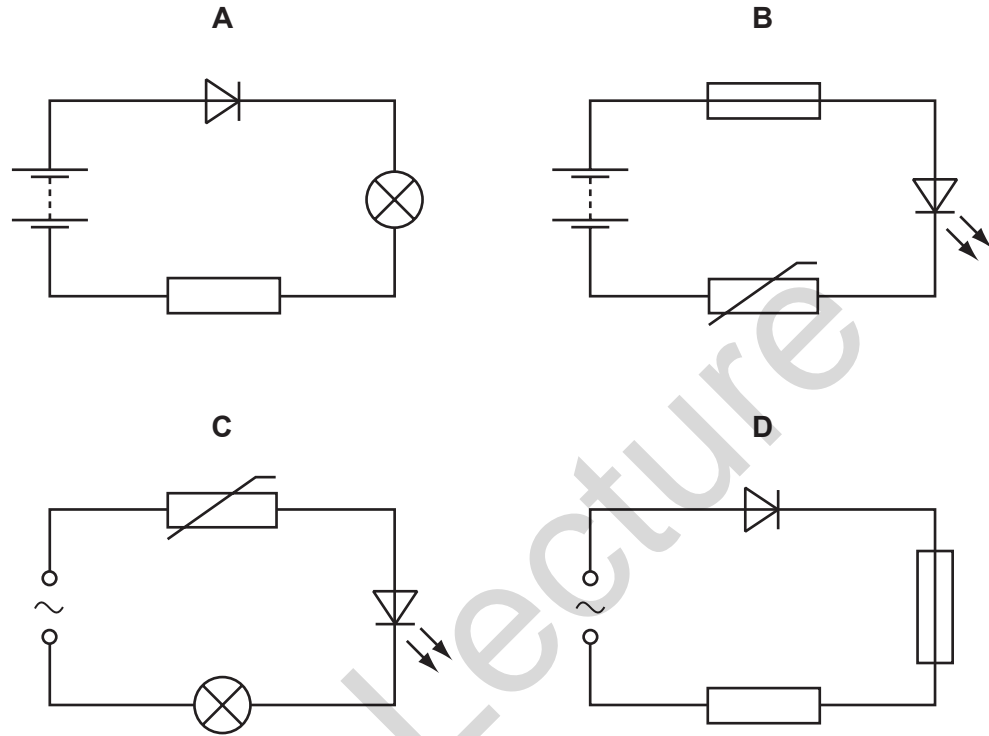
What is the p.d. across the  $2\Omega$  resistor?

- A** 4 V      **B** 6 V      **C** 8 V      **D** 16 V

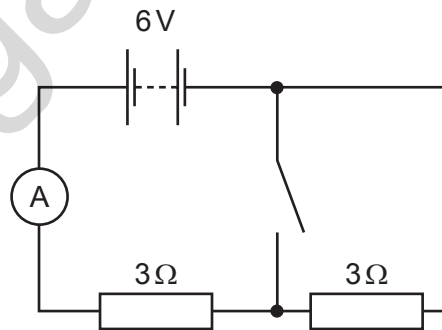
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29 Which circuit contains a fuse and a rectifying diode?



30 The diagram shows a circuit.



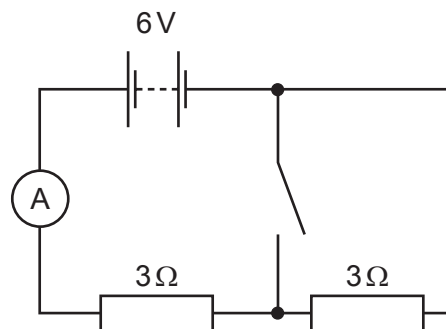
What is the reading on the ammeter when the switch is open, and the reading when it is closed?

	ammeter reading when open / A	ammeter reading when closed / A
<b>A</b>	1	1
<b>B</b>	1	2
<b>C</b>	2	1
<b>D</b>	2	2

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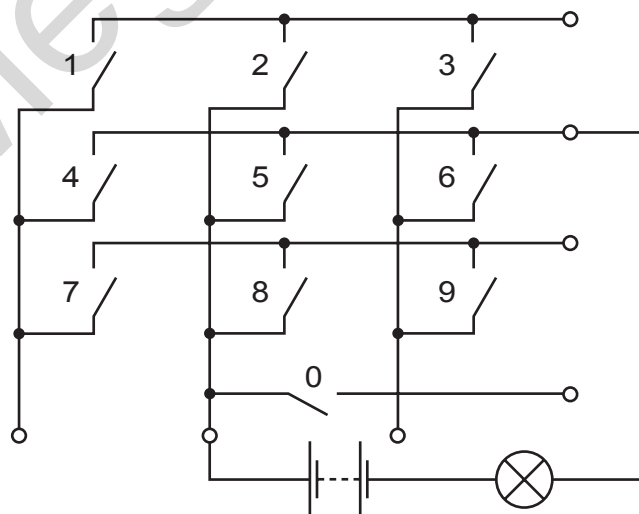
31 The diagram shows a circuit.



What is the reading on the ammeter when the switch is open, and the reading when it is closed?

	ammeter reading when open / A	ammeter reading when closed / A
<b>A</b>	1	1
<b>B</b>	1	2
<b>C</b>	2	1
<b>D</b>	2	2

32 A student tests the circuit of a press-button telephone with a lamp and a battery.



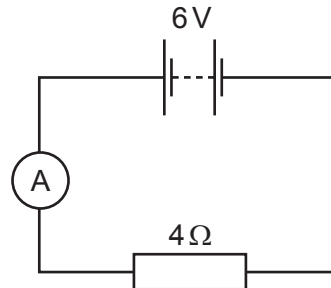
Which single switch can be pressed to make the lamp light?

- A** 0                      **B** 1                      **C** 5                      **D** 6

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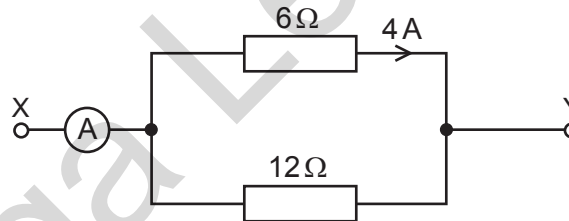
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- 33 A 6V supply is connected in series with an ammeter and a  $4\Omega$  resistor.



What is the reading on the ammeter?

- A** 0.67 A      **B** 1.5 A      **C** 10 A      **D** 24 A
- 34 Two resistors of  $6\Omega$  and  $12\Omega$  are arranged in parallel. A potential difference is connected across the terminals X and Y. The current in the  $6\Omega$  resistor is 4 A.



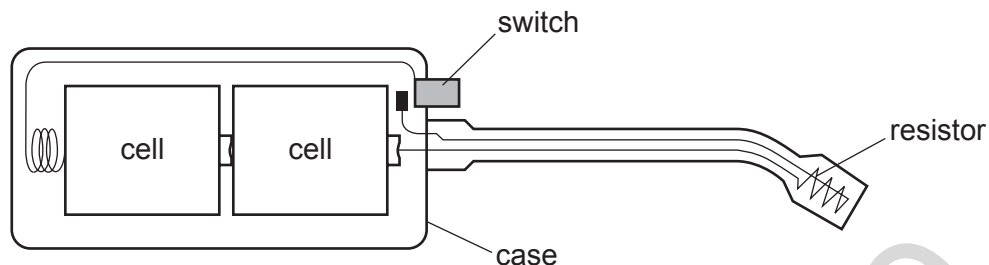
What is the current in the ammeter?

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

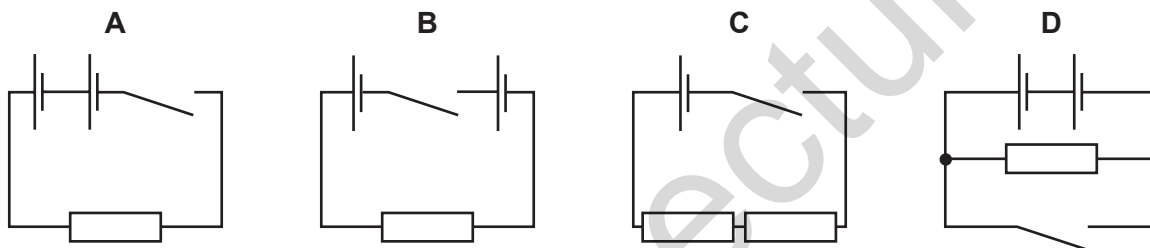
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35 The diagram shows the components of a lighter for a gas cooker.



Which circuit diagram is correct for this lighter?

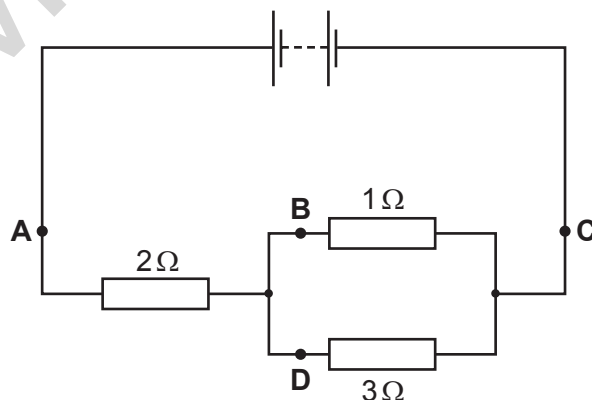


36 An electric heater is rated at 3 kW. Electrical energy costs 20 cents per kWh.

What is the cost of using the heater for five hours?

- A** 12 cents      **B** 60 cents      **C** 100 cents      **D** 300 cents

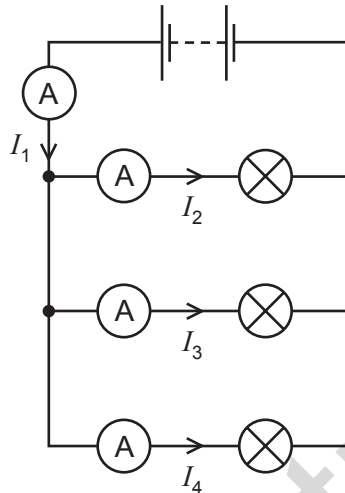
37 At which point in the circuit is the current the smallest?



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38 A student sets up the circuit shown.

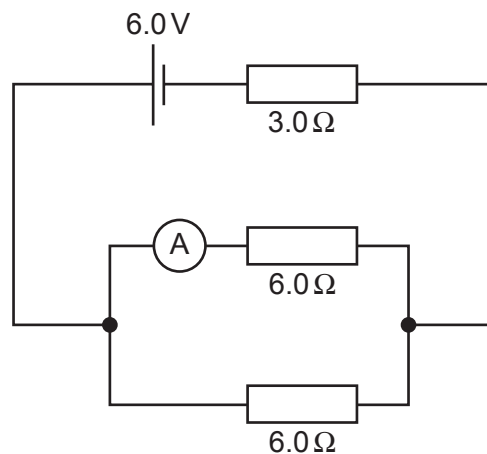


The currents measured with the ammeters are shown.

Which equation is correct?

- A**  $I_1 = I_2 + I_3 + I_4$
- B**  $I_1 = I_2 = I_3 = I_4$
- C**  $I_2 + I_3 = I_4 + I_1$
- D**  $I_4 = I_3 + I_2 + I_1$

39 The following circuit is set up.



What is the reading on the ammeter?

- A** 0.33A
- B** 0.50A
- C** 0.67A
- D** 1.0A



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40 Diagram 1 shows a resistor connected to a battery, an ammeter and a voltmeter.

The ammeter reading is 0.5A and the voltmeter reading is 3.0V.

A second identical resistor is now connected in parallel with the first resistor, as shown in diagram 2.

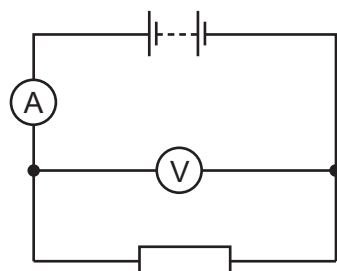


diagram 1

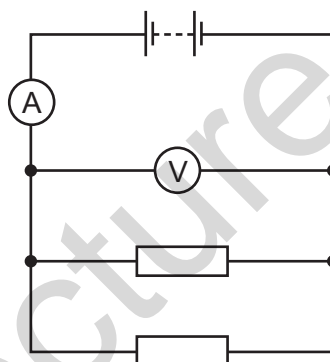


diagram 2

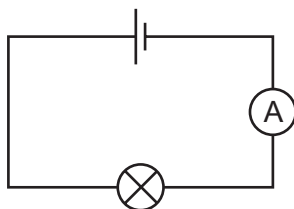
What are the ammeter and voltmeter readings in the circuit shown in diagram 2?

	ammeter reading /A	voltmeter reading /V
A	1.0	3.0
B	1.0	1.5
C	0.5	6.0
D	0.5	3.0

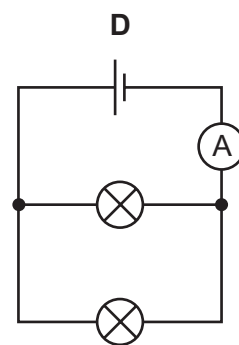
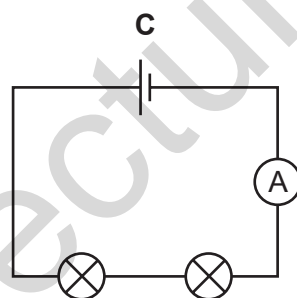
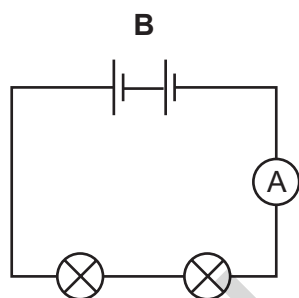
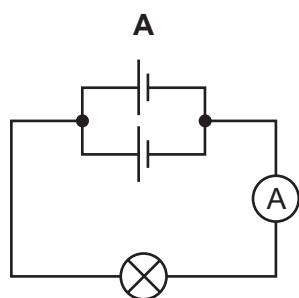
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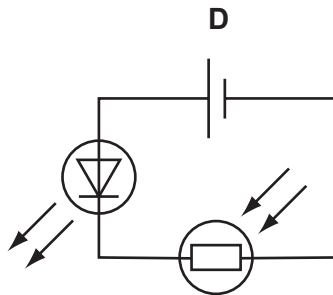
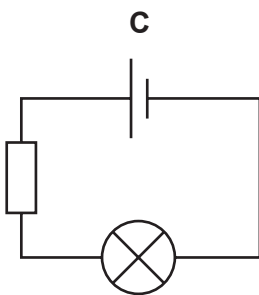
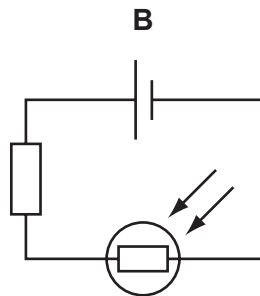
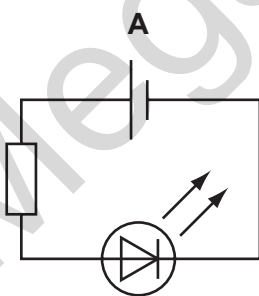
41 A cell is connected in series with an ammeter and a lamp. The current is 1 A.



In which circuit, using identical cells, lamps and ammeters, is the current reading 2 A?



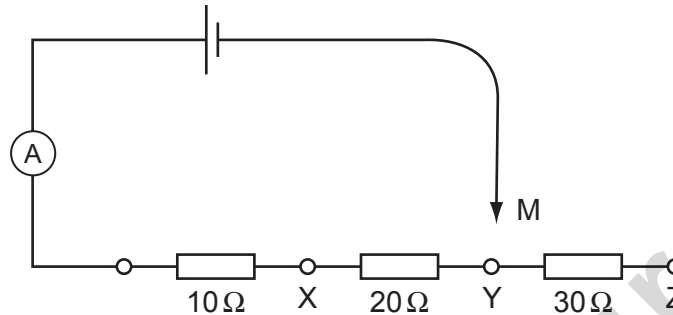
42 Which circuit contains a cell, a light-emitting diode and a fixed resistor?



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- 43 The diagram shows a cell connected in series with an ammeter and three resistors ( $10\Omega$ ,  $20\Omega$ ,  $30\Omega$ ). The circuit can be completed by a moveable contact M.

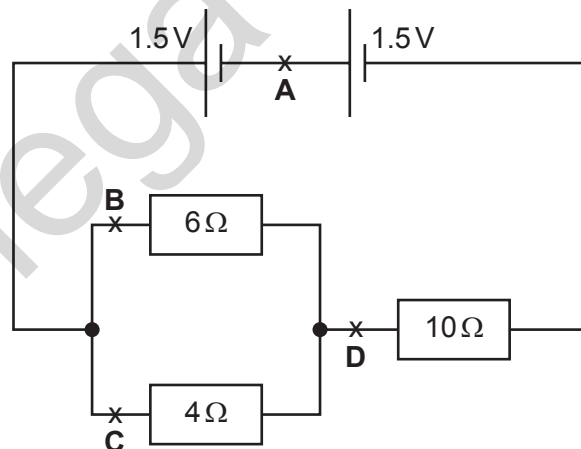


When M is connected to X, the ammeter reads  $0.6\text{A}$ .

What is the ammeter reading when M is connected to Y?

- A**  $0.1\text{A}$       **B**  $0.2\text{A}$       **C**  $0.3\text{A}$       **D**  $0.6\text{A}$

- 44 In the circuit shown, at which point is the current the smallest?



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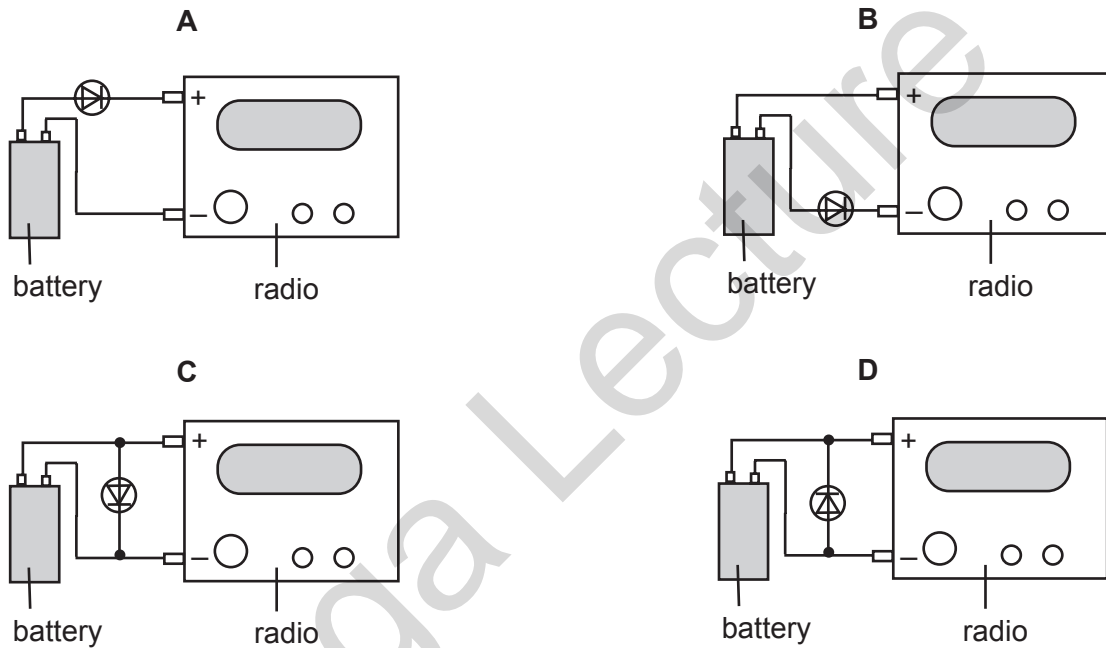
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15

45 An electrical engineer connects a diode to a radio so that:

if the battery is connected the right way round the radio works,  
if the battery is connected the wrong way there is no current.

Which diagram is correct?



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**46** Diagram 1 shows a resistor connected to a battery, an ammeter and a voltmeter.

The ammeter reading is 0.5 A and the voltmeter reading is 3.0 V.

A second identical resistor is now connected in parallel with the first resistor, as shown in diagram 2.

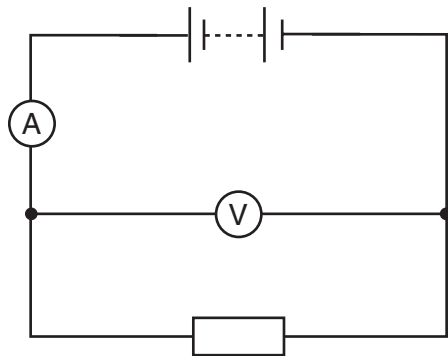


diagram 1

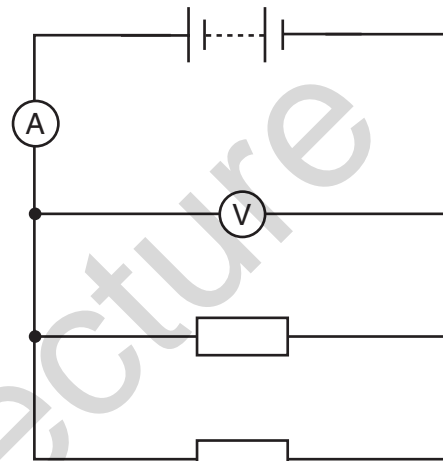


diagram 2

What are the ammeter and voltmeter readings in the circuit shown in diagram 2?

	ammeter reading / A	voltmeter reading / V
<b>A</b>	0.5	3.0
<b>B</b>	0.5	6.0
<b>C</b>	1.0	1.5
<b>D</b>	1.0	3.0