Electricity and Magnetism

(Past Year Topical Questions 2010-2015)

May/June 2010 (11)

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What is the arrangement of the induced poles in the pieces of iron?

A 

B 

C 

D 

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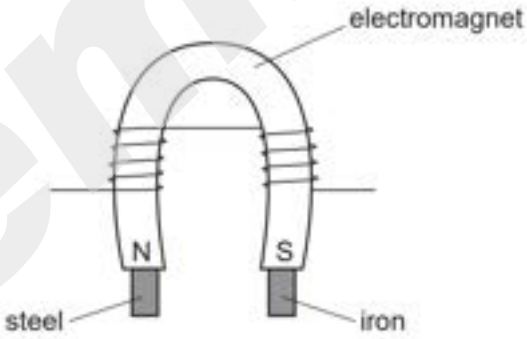

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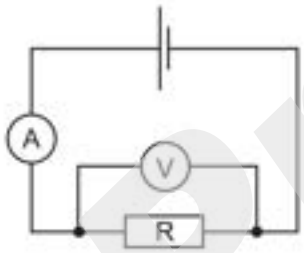

What is the resistance of the resistor R?

A 0.67 Ω **B** 1.5 Ω C 5.0 Ω **D** 6.0 Ω

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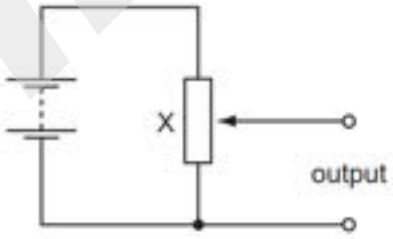

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A a light-dependent resistor

B a relay

C a thermistor

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+6018 – 375 2833

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In which circuit will the lamp be brightest?

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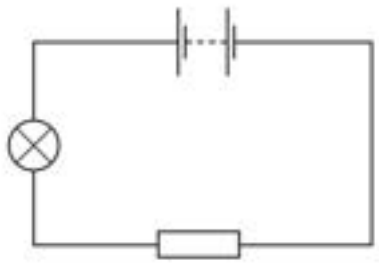

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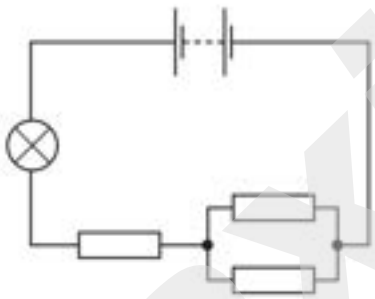

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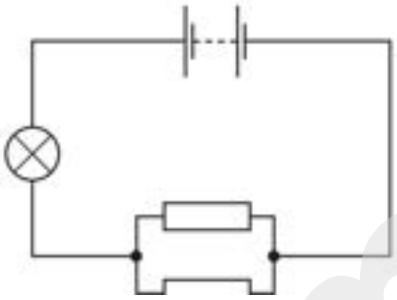

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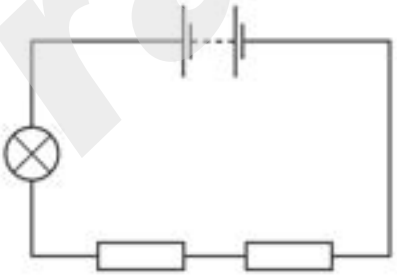

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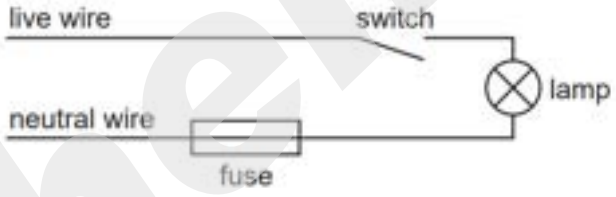

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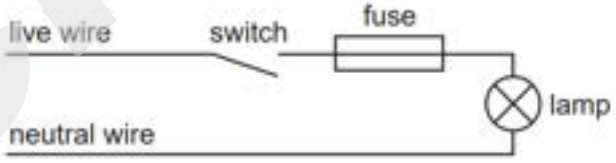

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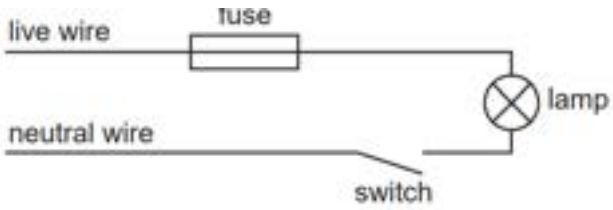

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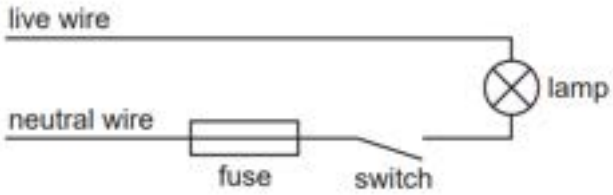

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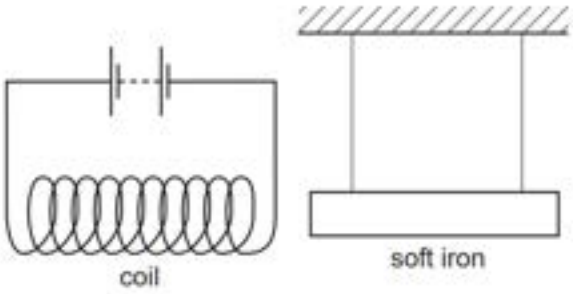

The current is then reversed by reversing the battery connections.

How does the soft iron bar behave in the two cases?

	with the battery as shown	with the battery reversed
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35 A transformer has 15 000 turns on its primary coil and 750 turns on its secondary coil.

Connected in this way, for what purpose could this transformer be used?

A to convert the 8000 V a.c. output of a power station to 160 000 V for long-distance power transmission

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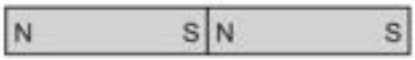
B 

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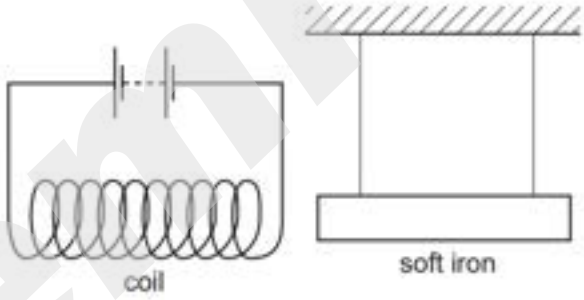

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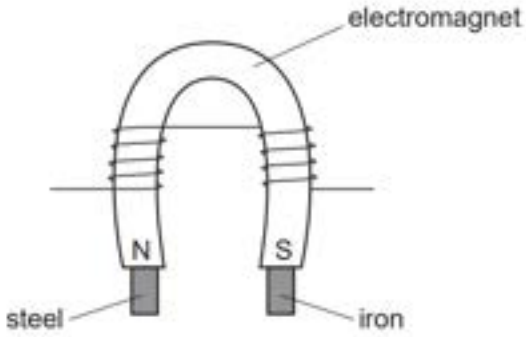

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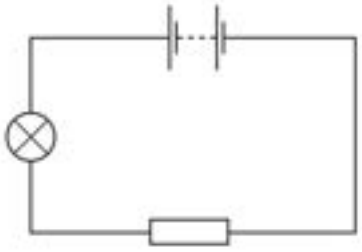

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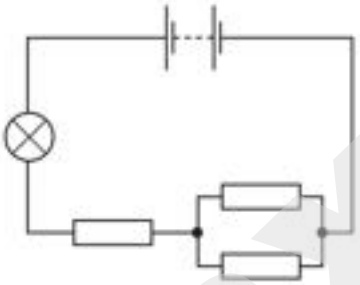

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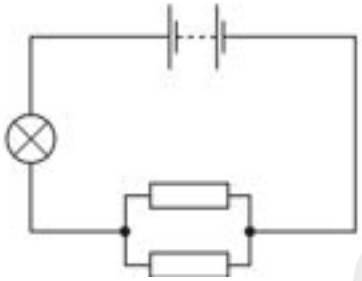

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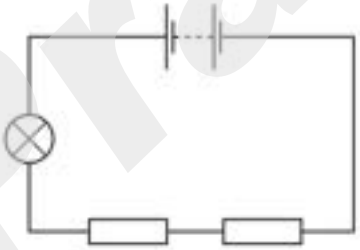

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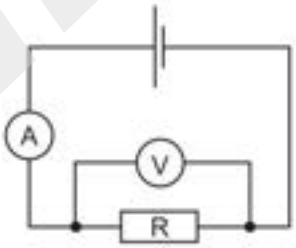

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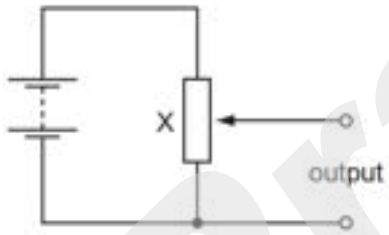

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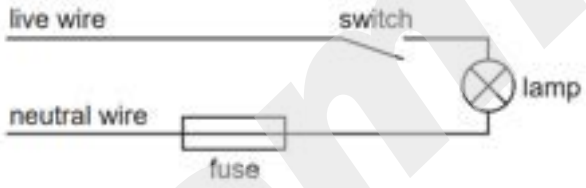

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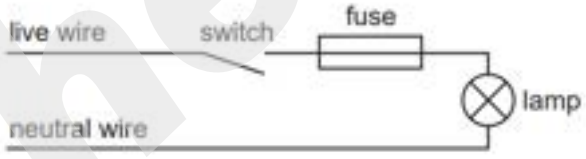

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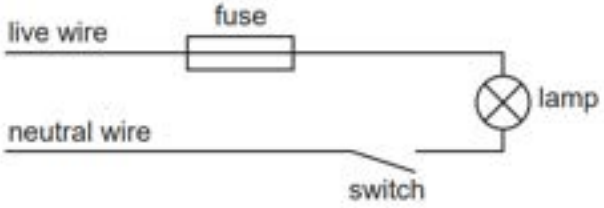

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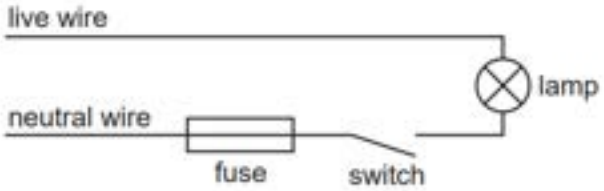

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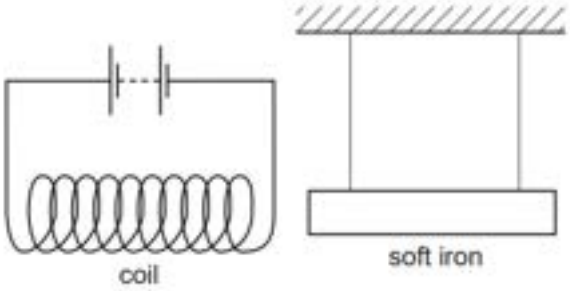

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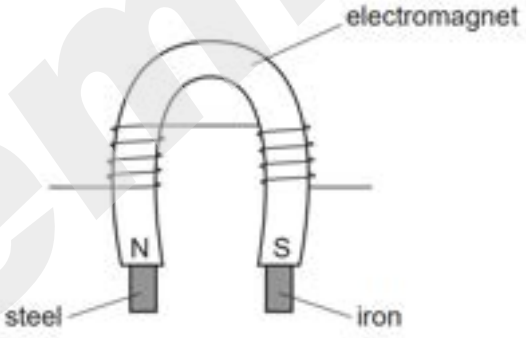

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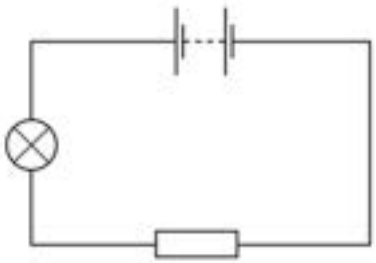

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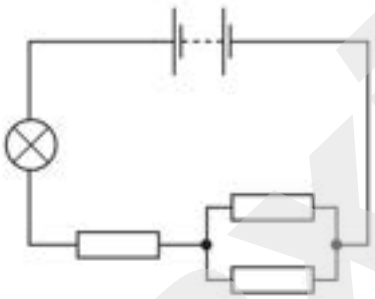

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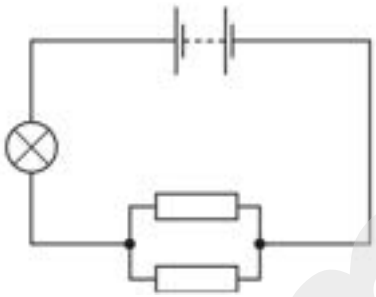

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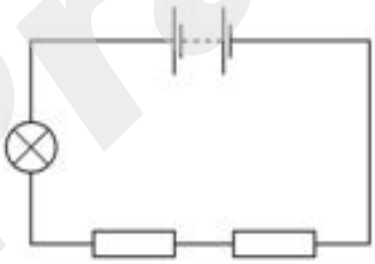

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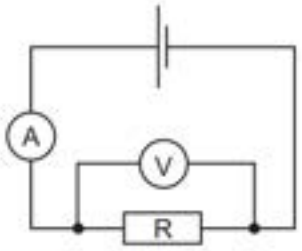

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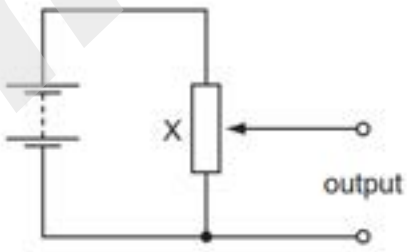

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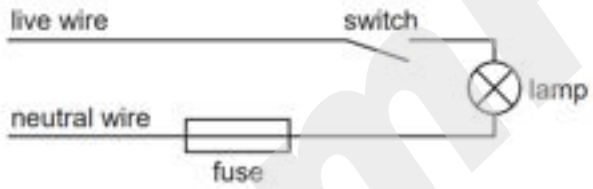

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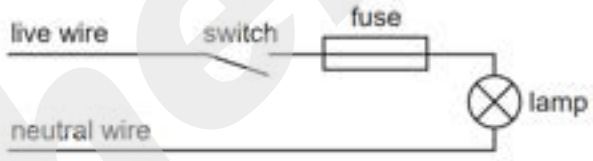

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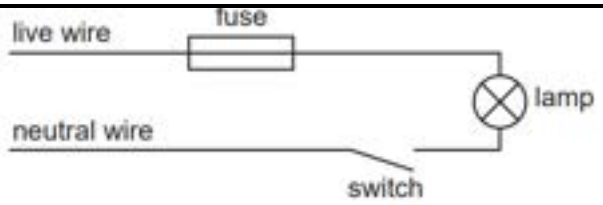

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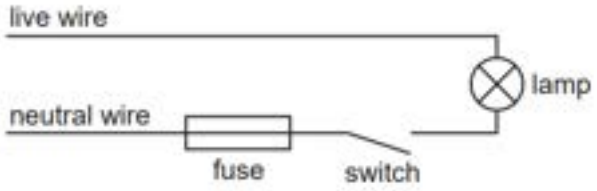


October/November 2010 (11)

26 Which statement about a magnet is **not** correct?

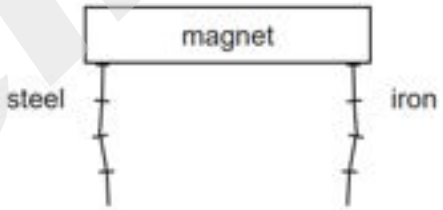
A It can attract another magnet.

B It can attract an unmagnetised piece of iron.

C It can repel another magnet.

D It can repel an unmagnetised piece of iron.

27 A chain of steel nails and a chain of iron nails hang from a strong magnet. The chains are then carefully removed from the magnet.



What happens to the chains?

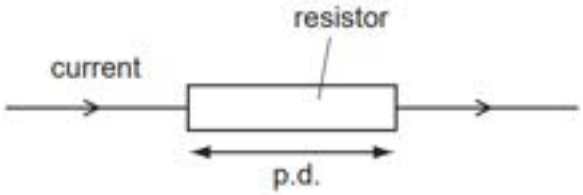
A Both chains fall apart.

B Both chains stay together.

C Only the chain of iron nails falls apart.

D Only the chain of steel nails falls apart.

28 A potential difference (p.d.) across a resistor causes a current in it.

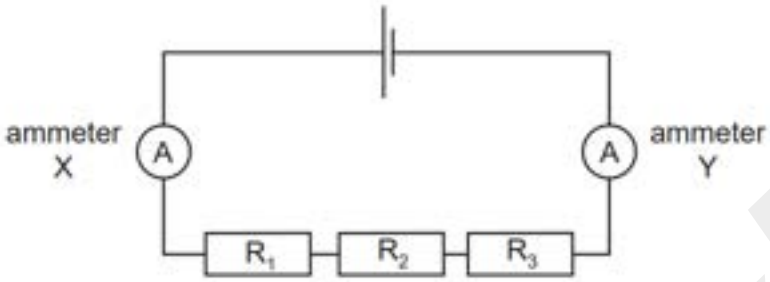


The p.d. and the resistance of the resistor can both be changed.

Which row shows two changes that will **both** increase the current in the resistor?

	change	change
A	decrease p.d.	decrease resistance
B	decrease p.d.	increase resistance
C	increase p.d.	decrease resistance
D	increase p.d.	increase resistance

29 The diagram shows a circuit containing two ammeters and three resistors.



Which of the ammeters will show the current in resistor R_2?

A ammeter X only

B ammeter Y only

C both ammeter X and ammeter Y

D neither ammeter X nor ammeter Y

30 Which component can store energy and can be used in time-delay circuits?

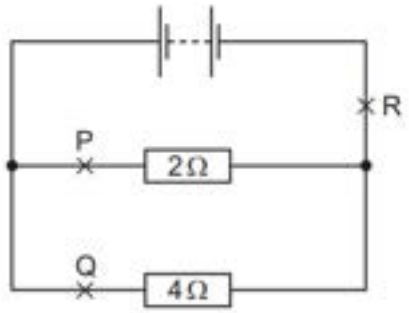
A a capacitor

B a potentiometer

C a resistor

D a thermistor

31 A circuit contains two resistors connected in parallel with a battery.



Which of the following statements about the currents at P, Q and R is true?

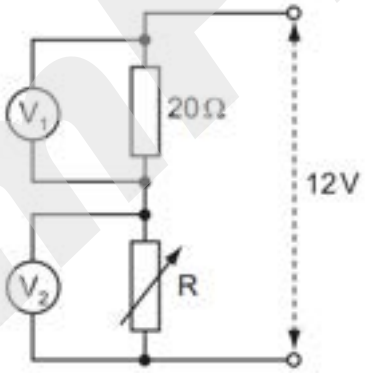
A The current at P is the greatest.

B The current at Q is the greatest.

C The current at R is the greatest.

D The current is the same at points P, Q and R.

32 The potential divider shown is connected across a constant 12 V supply.



When R has a value of 20Ω, the voltmeter readings are equal.

How do these readings change when the value of R is reduced to 10Ω?

	reading on V_1	reading on V_2
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 A fuse is a safety device for use in an electrical appliance.

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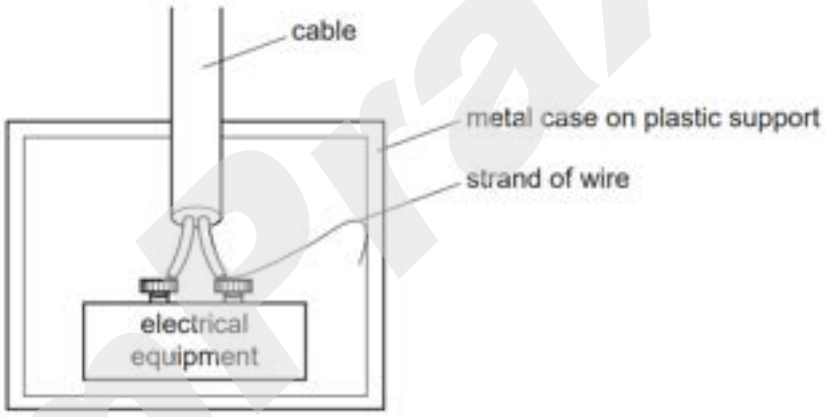

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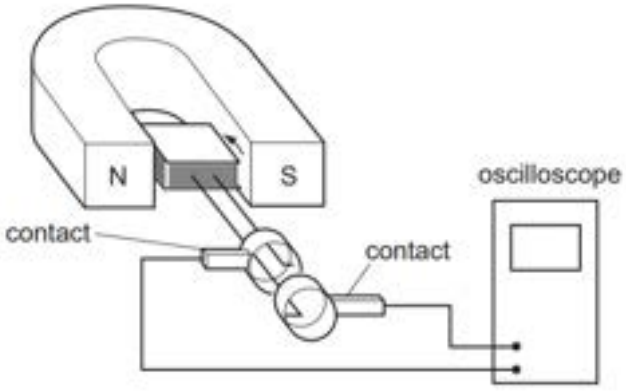

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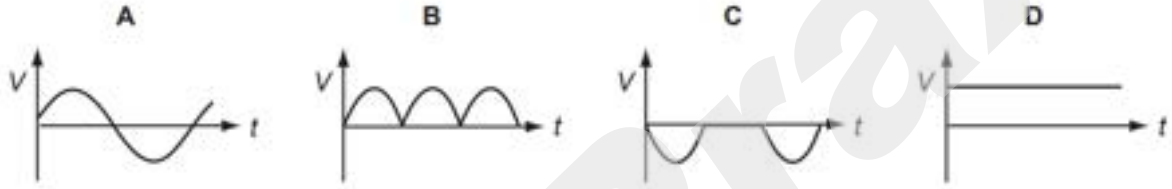

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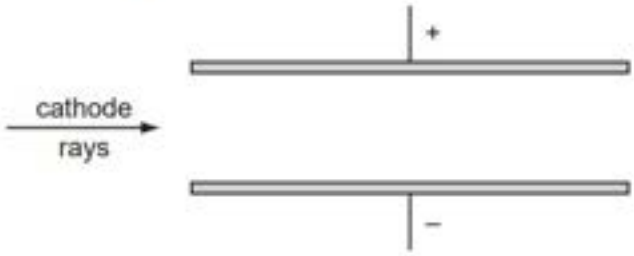

In which direction are the cathode rays deflected by the electric field?

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October/November 2010 (12)

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A a capacitor

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D a transformer

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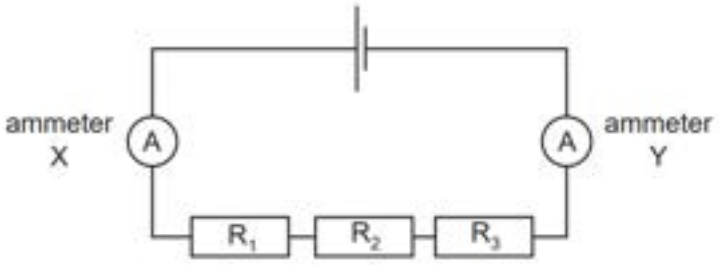

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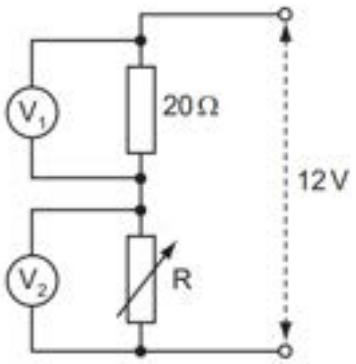

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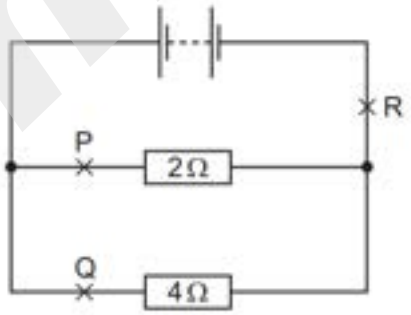

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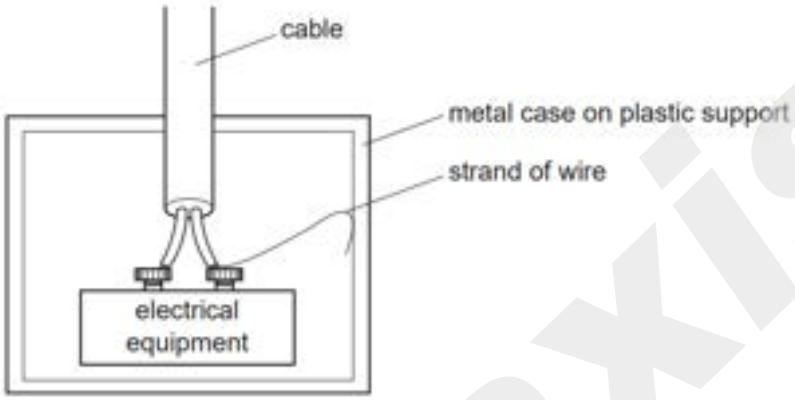

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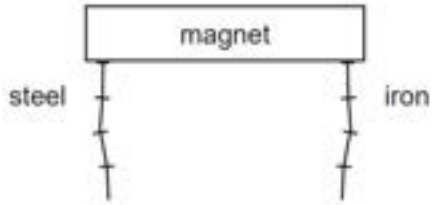
34 A chain of steel nails and a chain of iron nails hang from a strong magnet. The chains are then carefully removed from the magnet.



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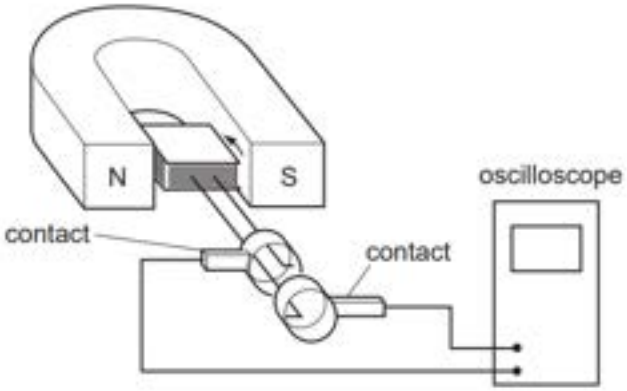

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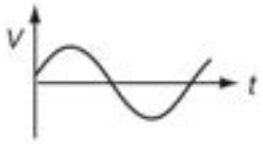

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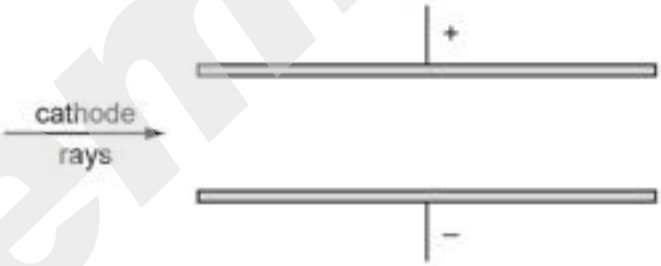

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October/November 2010 (13)

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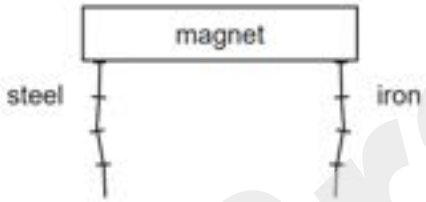

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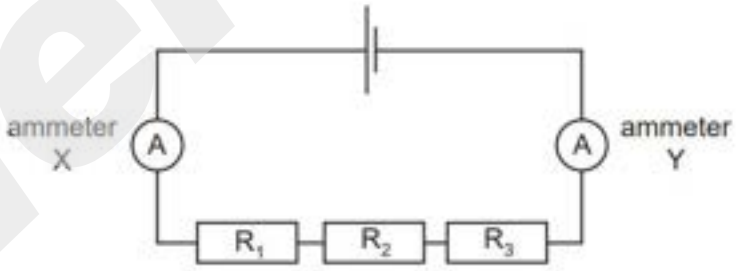

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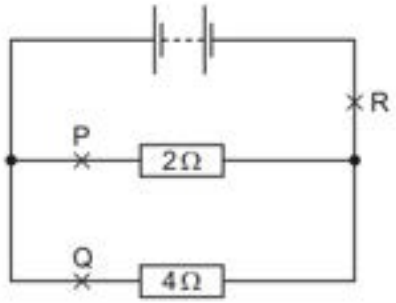

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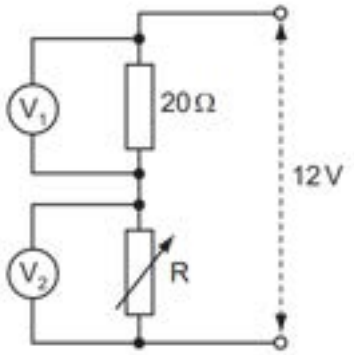

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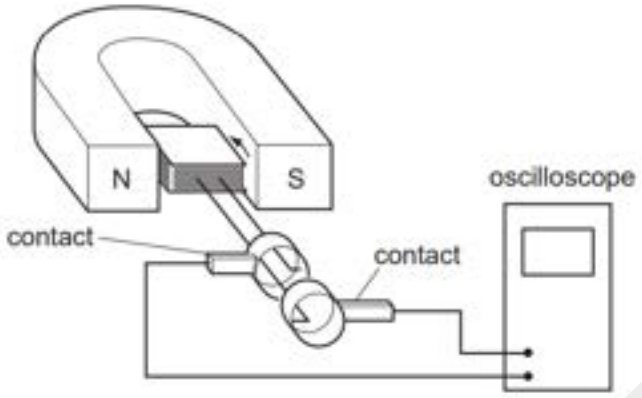

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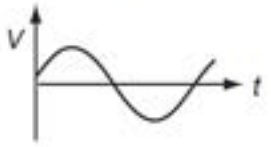

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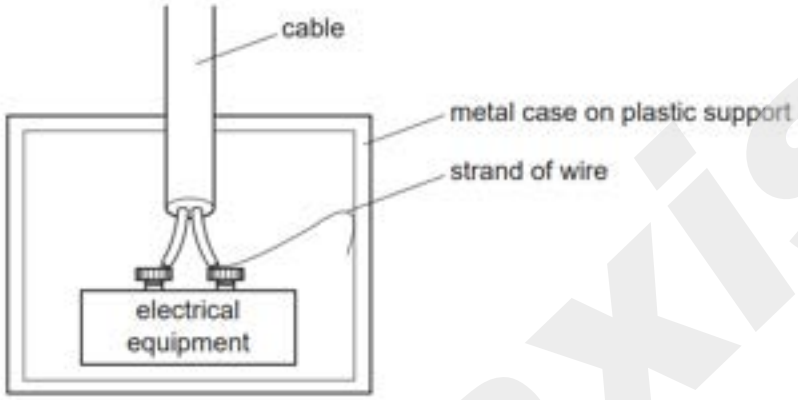

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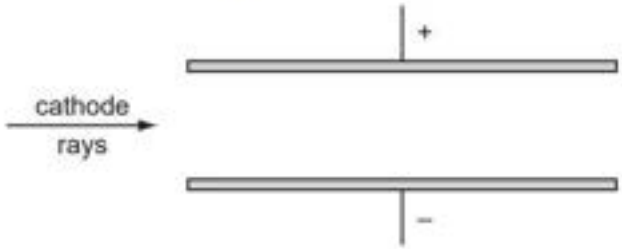

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May/June 2011 (11)

27 Which statement describes a property of a magnet?

A It attracts ferrous materials.

B It could have only one pole (north or south).

C It points in a random direction when suspended.

D It repels non-ferrous materials.

28 Which procedure may be used to demagnetise a steel bar?

A cooling it in a freezer

B earthing it with a copper wire

C placing it in a solenoid carrying a large direct current (d.c.)

D striking it repeatedly with a hammer

29 In which unit is potential difference measured?

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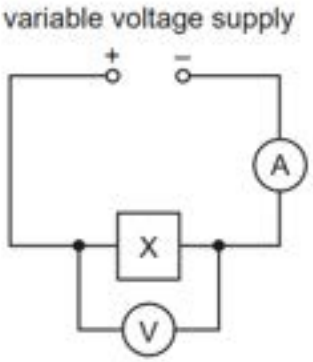
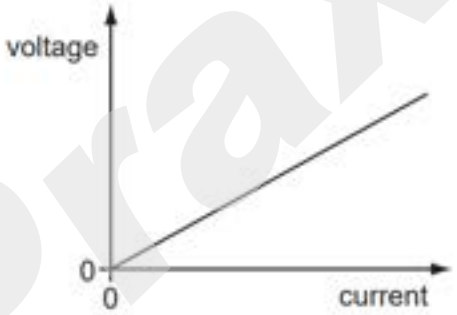
The voltage-current graph for X is as shown.





What is the component X?

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B a closed switch

C an open switch

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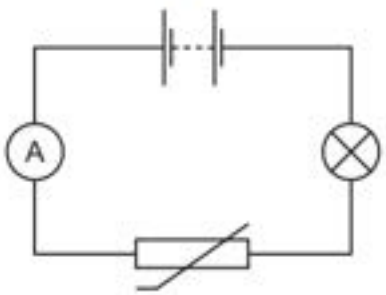

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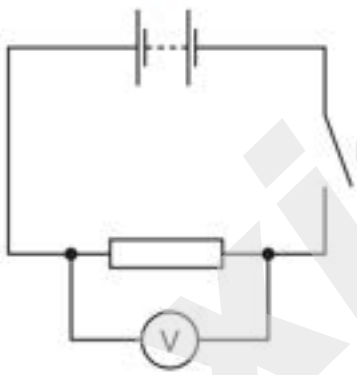

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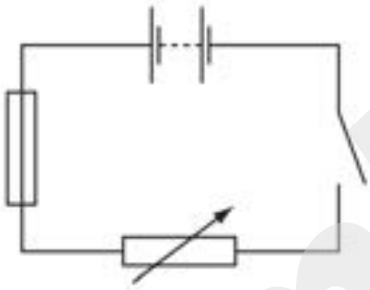

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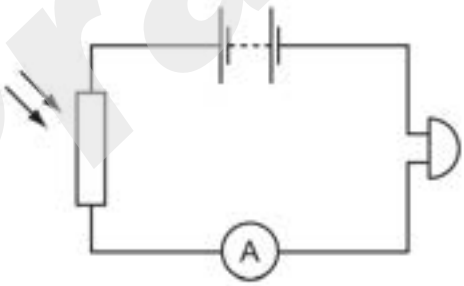


32 A thermistor is used in a circuit to control a piece of equipment automatically.

What might this circuit be used for?

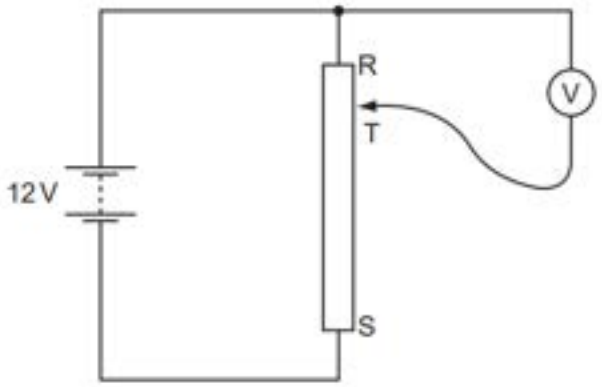
A lighting an electric lamp as it becomes darker

B ringing an alarm bell if a locked door is opened

C switching on a water heater at a pre-determined time

D turning on an air conditioner when the temperature rises

33 A student connects a variable potential divider (potentiometer) circuit.



What happens to the reading on the voltmeter as the sliding terminal T is moved from R to S?

A It decreases from 12 V to 0 V.

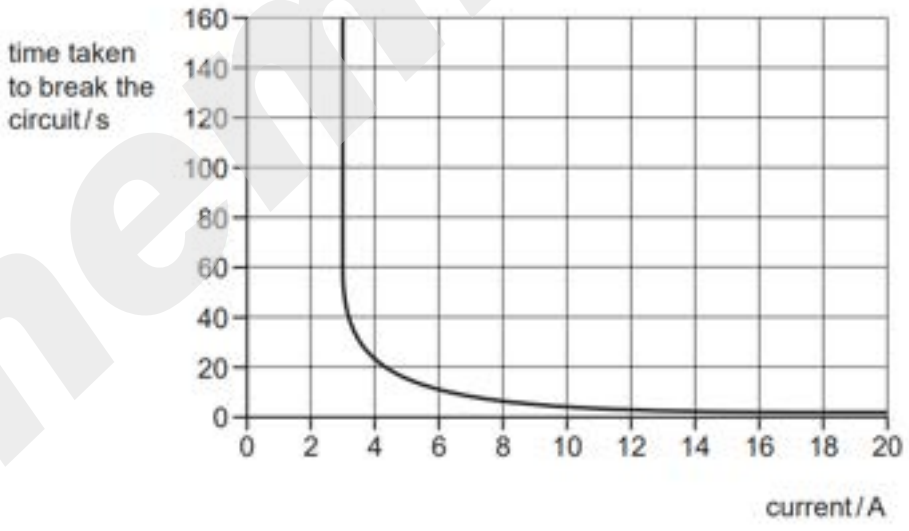
B It increases from 0 V to 12 V.

C It remains at 0 V.

D It remains at 12 V.

34 A circuit-breaker is designed to protect a circuit which usually carries a current of 2 A.

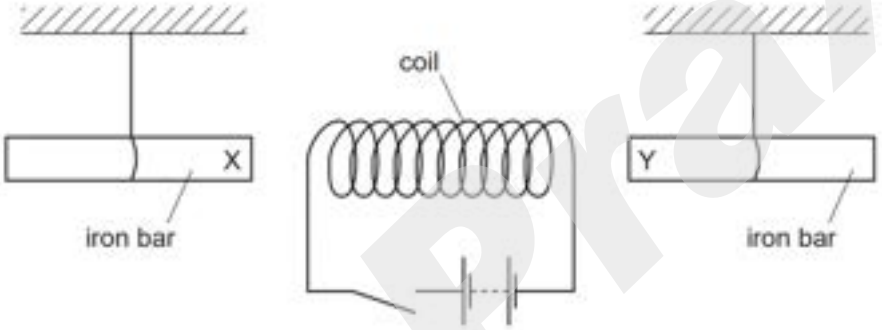
The time taken to break the circuit depends on the current, as shown in the graph.



What happens when the current in the circuit is 2 A and what happens when the current 18 A?

	when the current is 2 A	when the current is 18 A
A	the circuit breaks in less than 5 seconds	the circuit breaks in less than 5 seconds
B	the circuit breaks in less than 5 seconds	the circuit does not break
C	the circuit does not break	the circuit breaks in less than 5 seconds
D	the circuit does not break	the circuit does not break

35 The diagram shows a coil connected to a battery and a switch. Two unmagnetised iron bars hang freely near opposite ends of the coil.



What happens to the iron bars when the switch is closed?

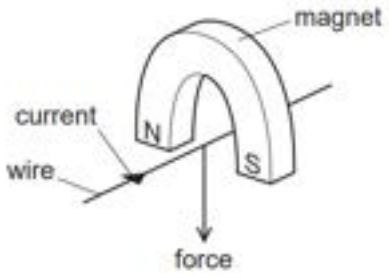
A Both X and Y move away from the coil.

B Both X and Y move towards the coil.

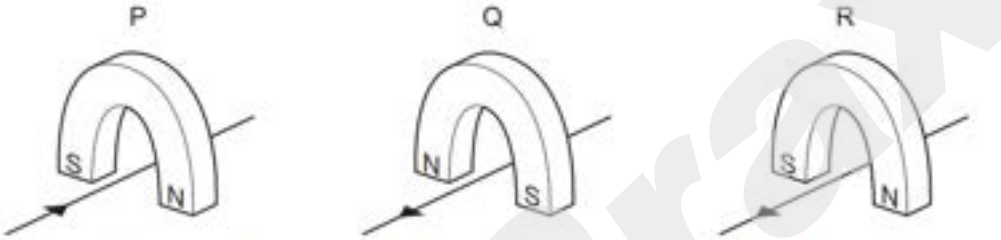
C X moves towards the coil, Y moves away from the coil.

D Y moves towards the coil, X moves away from the coil.

36 A wire passes between the poles of a horseshoe magnet. There is a current in the wire in the direction shown, and this causes a force to act on the wire.



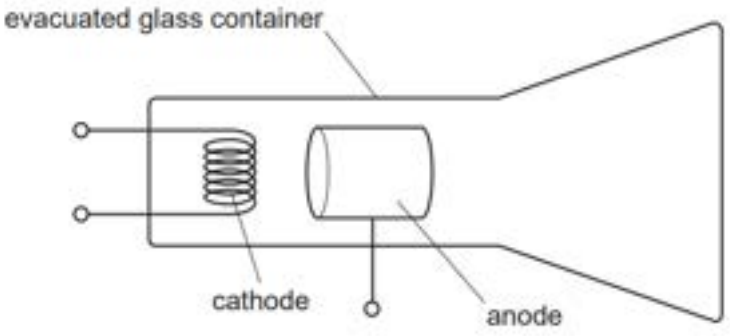
Three other arrangements, P, Q and R, of the wire and magnet are set up as shown.



Which arrangement or arrangements will cause a force in the same direction as the original arrangement?

A P, Q and R **B** P and Q only **C** P only **D** R only

37 The diagram shows a device to produce cathode rays.



Which part of the device is heated and why?

	part heated	reason
A	anode	to emit electrons
B	anode	to emit protons
C	cathode	to emit electrons
D	cathode	to emit protons

May/June 2011 (12)

27 The diagram shows a magnet being brought near to an unmagnetised iron bar. This causes the iron bar to become magnetised.

Which magnetic pole is induced at X and how is the iron bar affected?

	pole induced	effect on iron bar
A	north	attracted
B	north	repelled
C	south	attracted
D	south	repelled

28 A student wishes to make a permanent magnet. She has an iron rod and a steel rod.

Which rod should she use to make the permanent magnet, and is this rod a hard magnetic material or a soft magnetic material?

	rod	type of magnetic material
A	iron	hard
B	iron	soft
C	steel	hard
D	steel	soft

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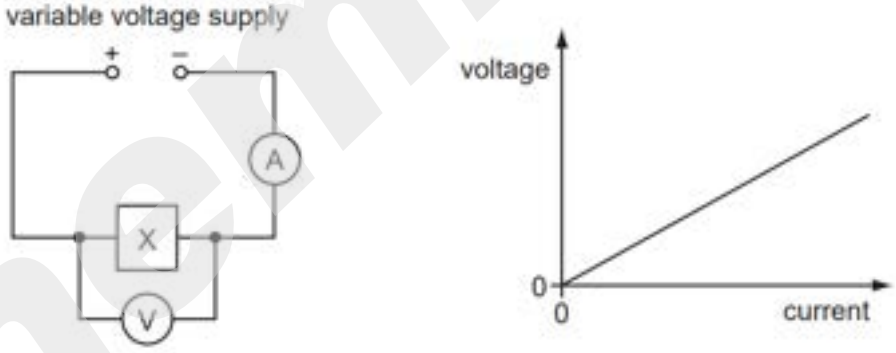

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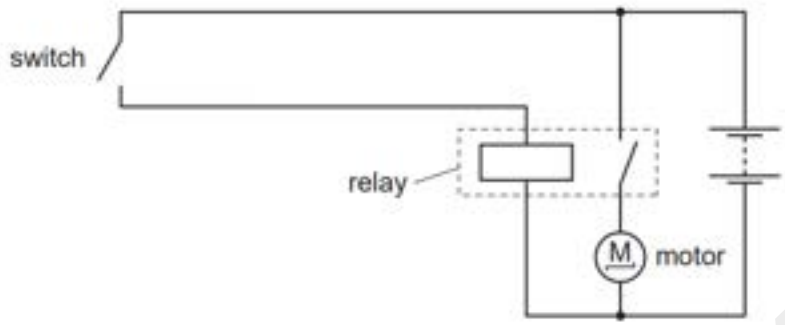
31 A relay is used to operate a large electric motor using a switch some distance from the motor.



What is the purpose of the relay?

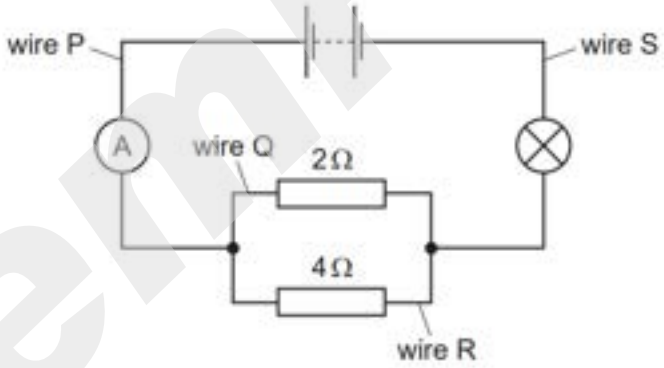
A to allow a large current in the relay coil to control a smaller current in the motor

B to allow a small current in the relay coil to control a larger current in the motor

C to allow the current in the relay coil to pass to the motor

D to disconnect the battery from the motor automatically if too much current flows

32 The circuit diagram includes two resistors connected in parallel.



Which statement is correct?

A The current in wire P is equal to the current in wire Q.

B The current in wire Q is equal to the current in wire R.

C The current in wire R is equal to the current in wire S.

D The current in wire S is equal to the current in wire P.

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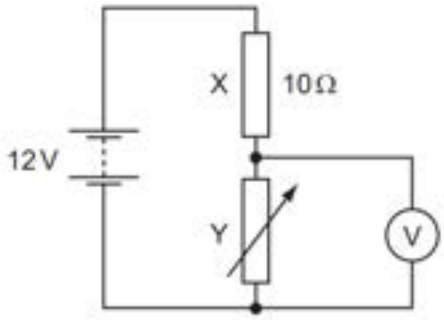
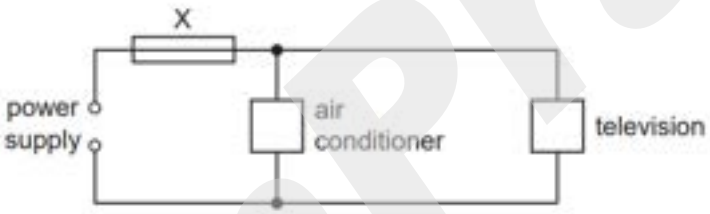


The resistance of resistor X is 10Ω.

When the resistance of the variable resistor Y is 20Ω, what is the reading on the voltmeter?

A 4.0V **B** 6.0V **C** 8.0V **D** 12V

34 An air conditioner and a television are both connected to the same electrical circuit.



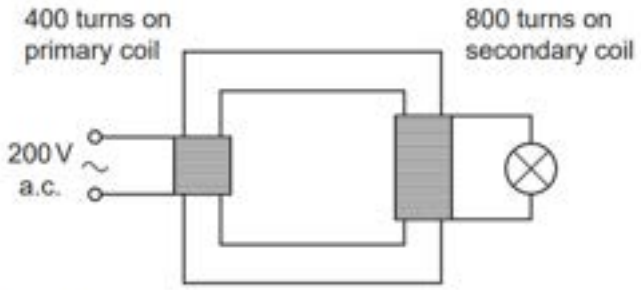
The current in the air conditioner is 4.0A and the current in the television is 6.0A.

Several different fuses are available.

Which fuse should be connected at X?

A 3A **B** 5A **C** 10A **D** 13A

35 The diagram shows a transformer. The input voltage and the number of turns on each coil are shown.



What is the output voltage?

A 100 V **B** 200 V **C** 400 V **D** 800 V

36 Which device uses slip rings?

A a cathode-ray tube

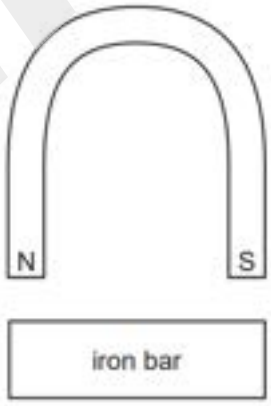
B a d.c. motor

C an a.c. generator

D a solenoid

October/November 2011 (11)

25 A horseshoe magnet is brought near to an unmagnetised iron bar.



Which row in the table shows the magnetic poles induced in the iron bar and the direction of the forces between the bar and the magnet?

	magnetic poles induced in iron bar	force between iron bar and magnet
A	N S	attraction
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C	S N	attraction
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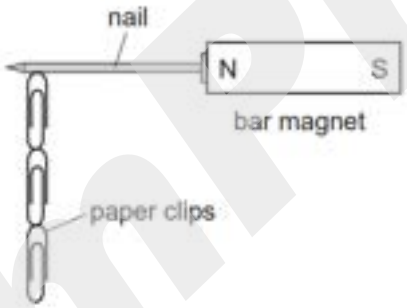
26 Four nails, **A**, **B**, **C** and **D**, are tested to find which makes the strongest permanent magnet.



One of the nails is placed against a bar magnet and the number of paper clips which the nail can support is recorded. The bar magnet is then removed and the number of paper clips remaining attached to the nail is recorded. Each nail is tested in turn.

Which nail becomes the strongest permanent magnet?

nail	number of paper clips attached to the nail	
	bar magnet present	bar magnet removed
A	2	0
B	2	1
C	4	3
D	5	2

27 Which symbols are used for the units of current and of resistance?

	unit of current	unit of resistance
A	A	W
B	A	Ω
C	C	W
D	C	Ω

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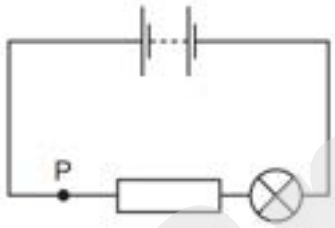

Which change to the circuit would increase the current in the lamp?

A adding another resistor in parallel with the one in the circuit

B adding another resistor in series with the one in the circuit

C decreasing the electromotive force (e.m.f.) of the battery in the circuit

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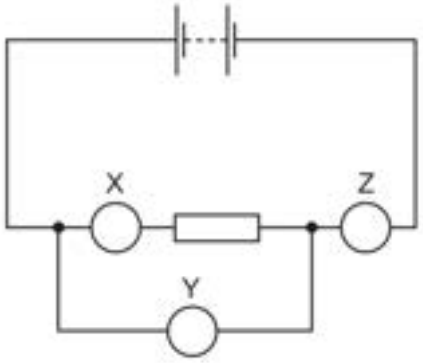
29 The diagram shows an electric circuit containing three meters, X, Y and Z, all connected correctly.

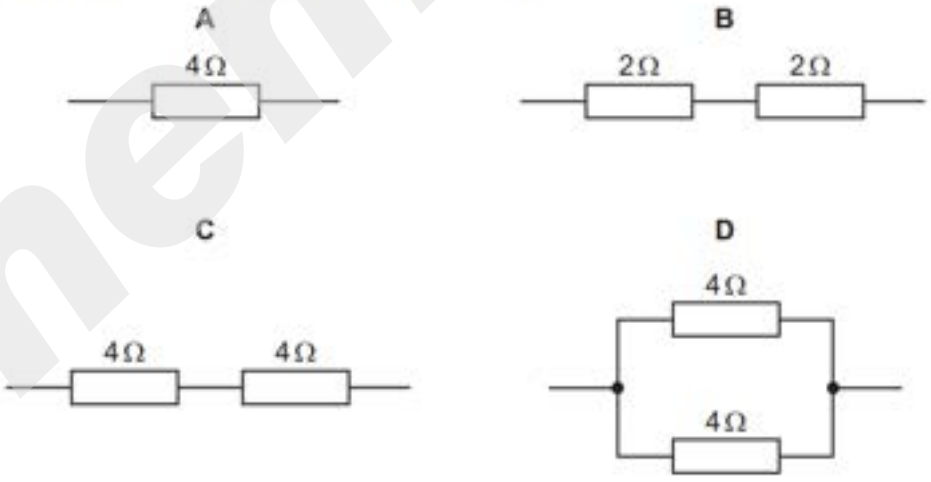


What are meters X, Y and Z?

	X	Y	Z
A	ammeter	ammeter	ammeter
B	ammeter	voltmeter	ammeter
C	voltmeter	ammeter	voltmeter
D	voltmeter	voltmeter	voltmeter

30 The diagrams show four arrangements of resistors.

Which arrangement has the **s**mallest total resistance?



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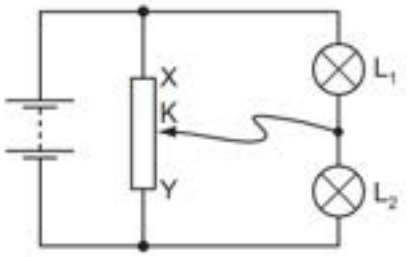

The contact K is halfway between X and Y and the lamps are equally bright.

What will happen to the brightness of the lamps when contact K is moved a short distance towards X?

	lamp L_1	lamp L_2
A	brighter	brighter
B	brighter	dimmer
C	dimmer	brighter
D	dimmer	dimmer

32 A fuse and a relay each use an effect of an electric current.

Which effect of an electric current is used by a fuse and which effect is used by a relay?

	effect used by a fuse	effect used by a relay
A	heating effect	heating effect
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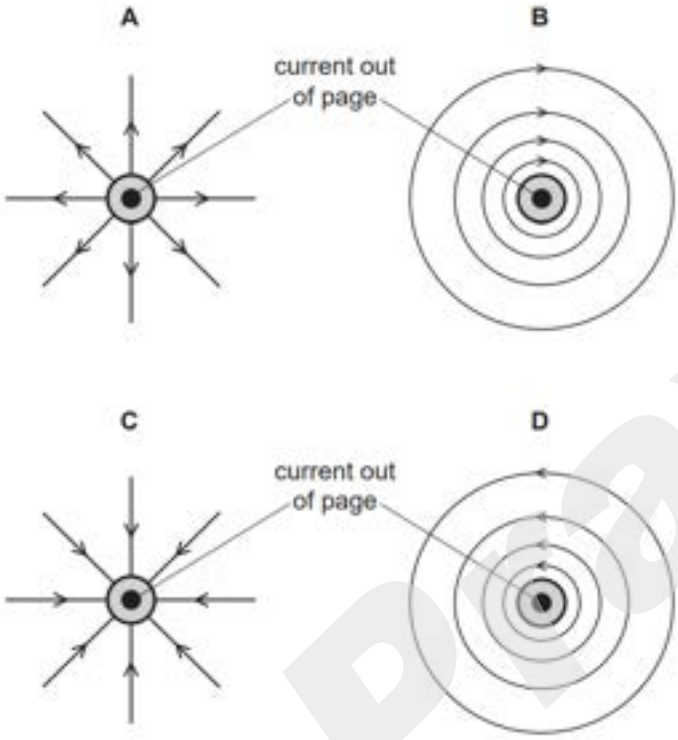

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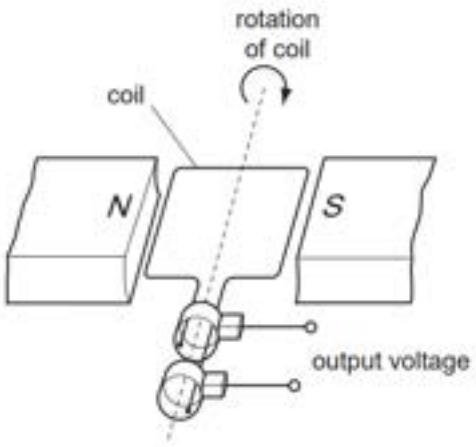

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When does the output voltage become –10 V?

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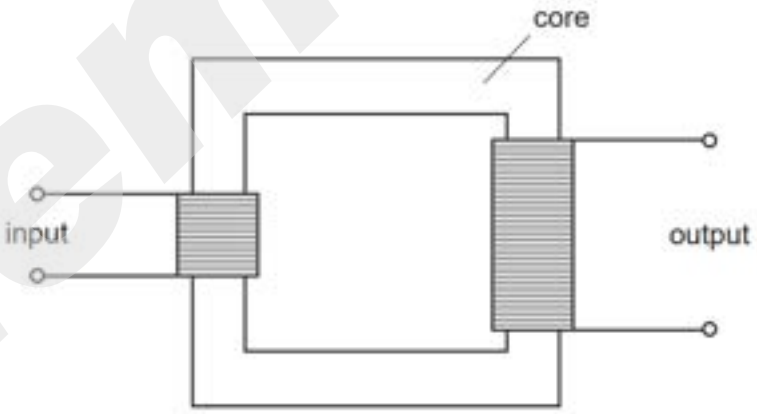

From which material should the core be made?

A aluminium

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October/November 2011 (12)

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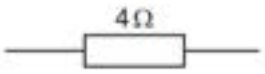
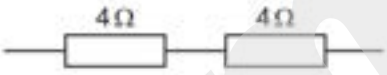
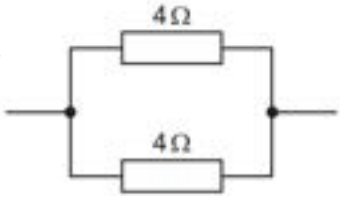


B

C



D



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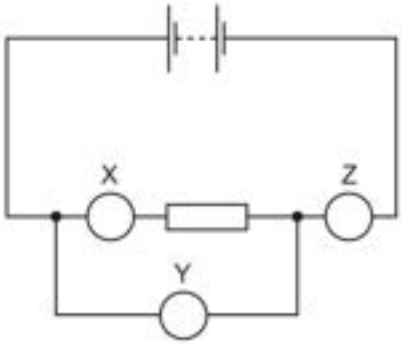

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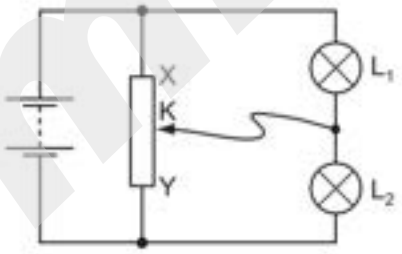

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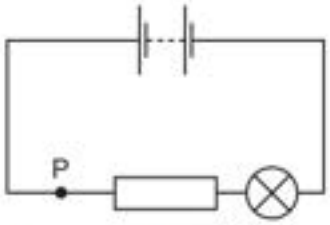

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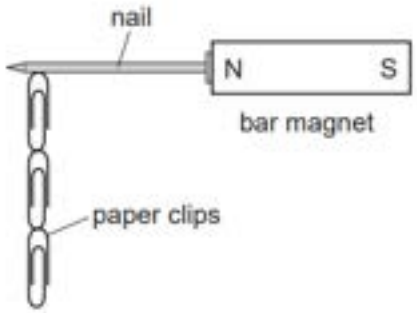

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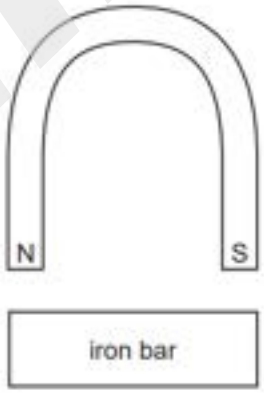

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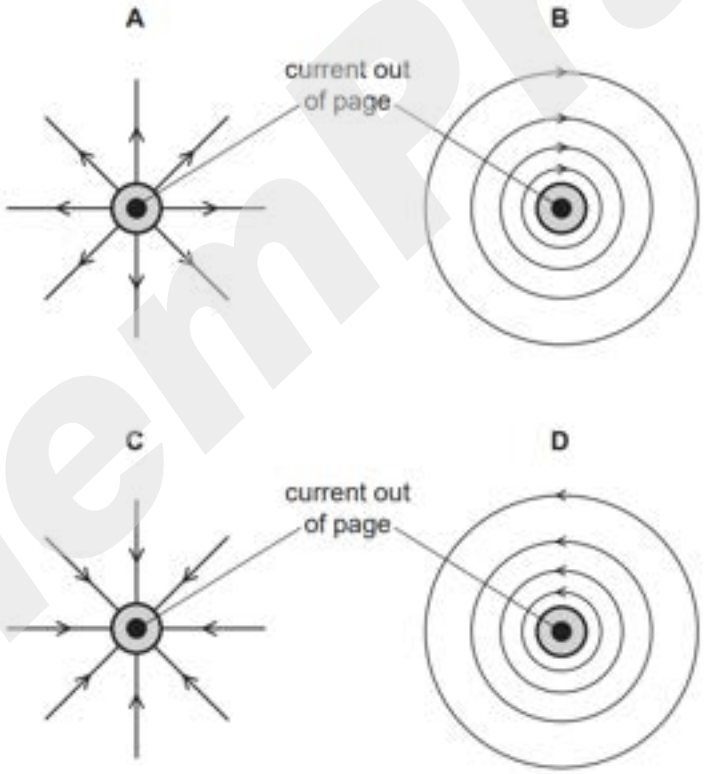

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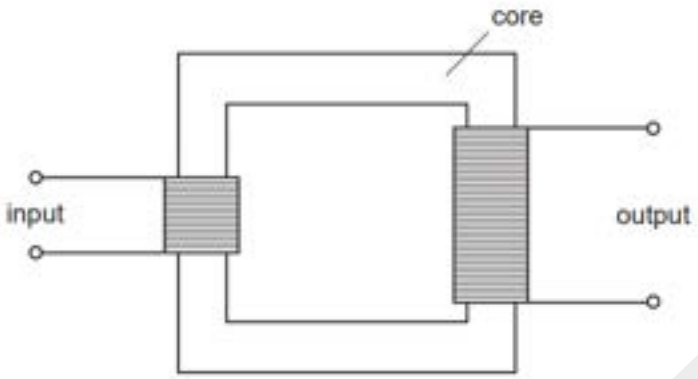

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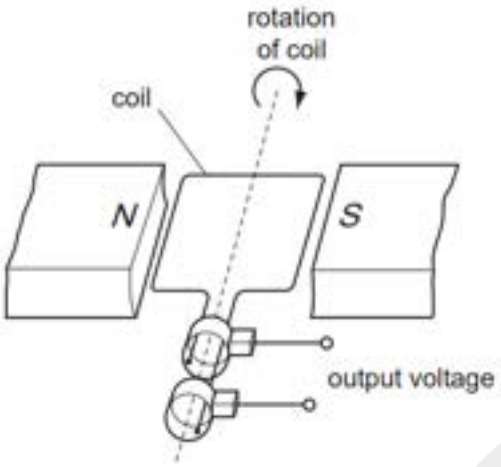

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When does the output voltage become –10 V?

A when the coil has turned 90°

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C when the coil has turned 270°

D when the coil has turned 360°

October/November 2011 (12)

20 What is the unit of wavelength?

A hertz

B metre

C metre per second

D second

21 Which row correctly describes light waves and radio waves?

	light waves	radio waves
A	longitudinal	longitudinal
B	longitudinal	transverse
C	transverse	longitudinal
D	transverse	transverse

May/June 2012 (11)

27 Which statement describes a property of a magnet?

A It attracts ferrous materials.

B It could have only one pole (north or south).

C It points in a random direction when suspended.

D It repels non-ferrous materials.

28 Which procedure may be used to demagnetise a steel bar?

A cooling it in a freezer

B earthing it with a copper wire

C placing it in a solenoid carrying a large direct current (d.c.)

D striking it repeatedly with a hammer

29 In which unit is potential difference measured?

A ampere

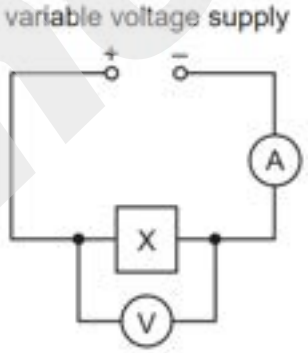
B ohm

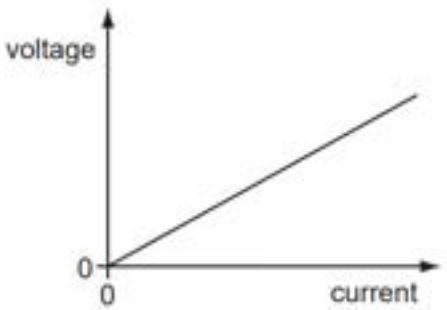
C volt

D watt

30 The circuit shown in the diagram contains an unknown component X, hidden in a box.

The voltage-current graph for X is as shown.





What is the component X?

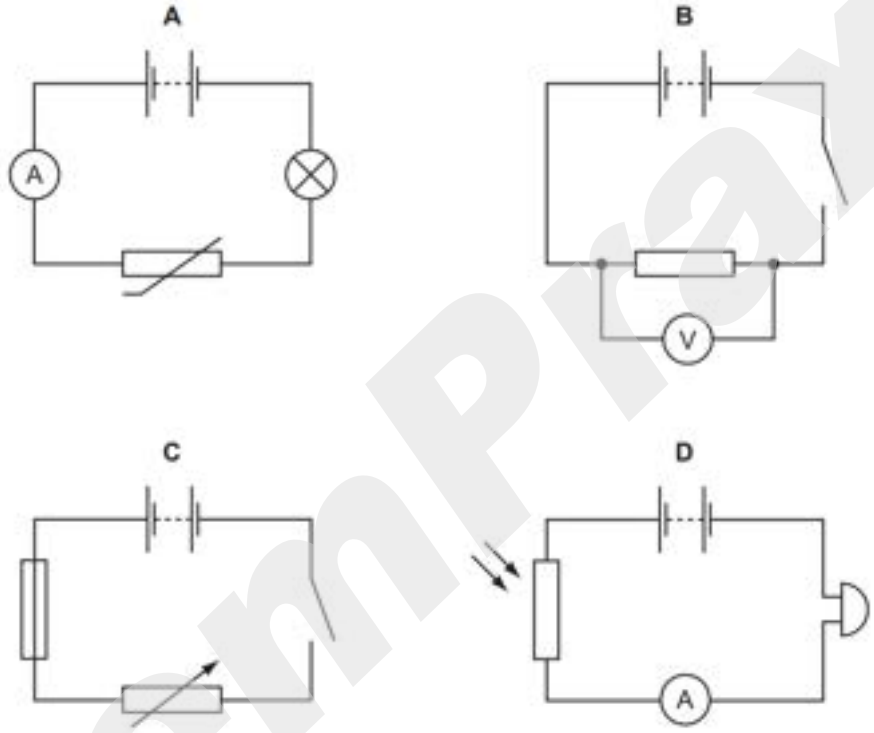
A a capacitor

B a closed switch

C an open switch

D a resistor of constant resistance

31 Which circuit contains a fuse?



32 A thermistor is used in a circuit to control a piece of equipment automatically.

What might this circuit be used for?

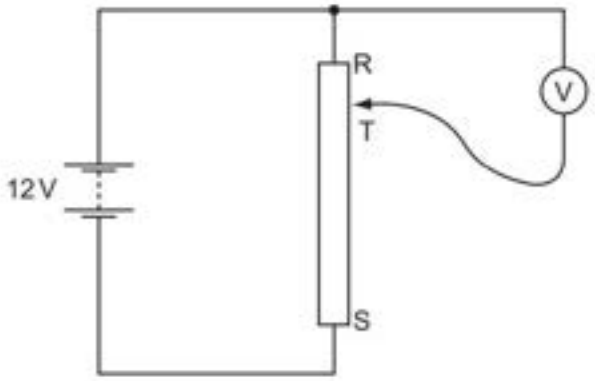
A lighting an electric lamp as it becomes darker

B ringing an alarm bell if a locked door is opened

C switching on a water heater at a pre-determined time

D turning on an air conditioner when the temperature rises

33 A student connects a variable potential divider (potentiometer) circuit.



What happens to the reading on the voltmeter as the sliding terminal T is moved from R to S?

A It decreases from 12 V to 0 V.

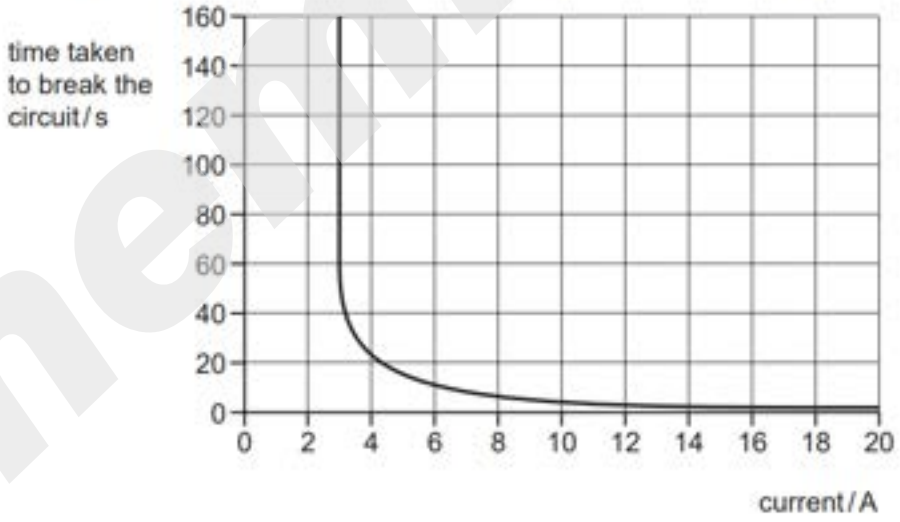
B It increases from 0 V to 12 V.

C It remains at 0 V.

D It remains at 12 V.

34 A circuit-breaker is designed to protect a circuit which usually carries a current of 2 A.

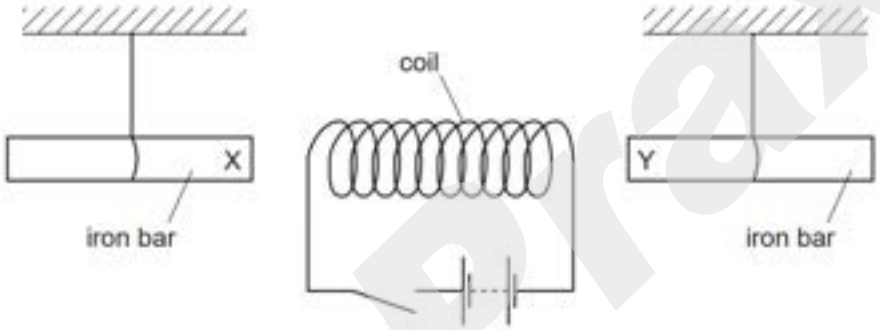
The time taken to break the circuit depends on the current, as shown in the graph.



What happens when the current in the circuit is 2A and what happens when the current 18A?

	when the current is 2A	when the current is 18A
A	the circuit breaks in less than 5 seconds	the circuit breaks in less than 5 seconds
B	the circuit breaks in less than 5 seconds	the circuit does not break
C	the circuit does not break	the circuit breaks in less than 5 seconds
D	the circuit does not break	the circuit does not break

35 The diagram shows a coil connected to a battery and a switch. Two unmagnetised iron bars hang freely near opposite ends of the coil.



What happens to the iron bars when the switch is closed?

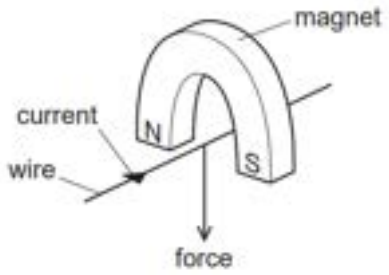
A Both X and Y move away from the coil.

B Both X and Y move towards the coil.

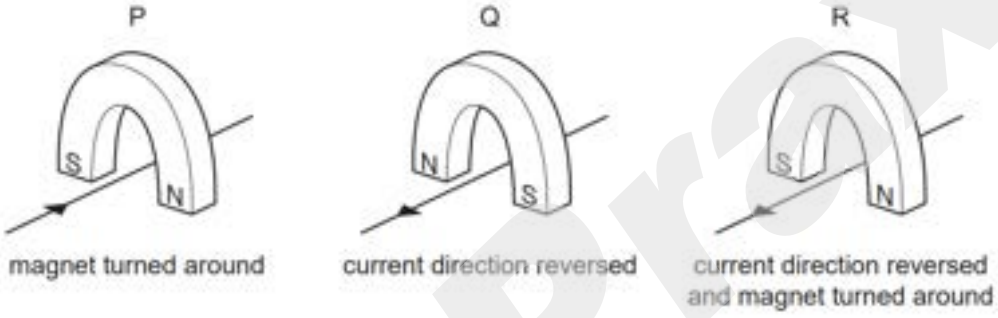
C X moves towards the coil, Y moves away from the coil.

D Y moves towards the coil, X moves away from the coil.

36 A wire passes between the poles of a horseshoe magnet. There is a current in the wire in the direction shown, and this causes a force to act on the wire.



Three other arrangements, P, Q and R, of the wire and magnet are set up as shown.



Which arrangement or arrangements will cause a force in the same direction as the original arrangement?

A P, Q and R **B** P and Q only **C** P only **D** R only

May/June 2012 (12)

27 The diagram shows a magnet being brought near to an unmagnetised iron bar. This causes the iron bar to become magnetised.

Which magnetic pole is induced at X and how is the iron bar affected?

	pole induced	effect on iron bar
A	north	attracted
B	north	repelled
C	south	attracted
D	south	repelled

28 A student wishes to make a permanent magnet. She has an iron rod and a steel rod.

Which rod should she use to make the permanent magnet, and is this rod a hard magnetic material or a soft magnetic material?

	rod	type of magnetic material
A	iron	hard
B	iron	soft
C	steel	hard
D	steel	soft

29 In which unit is potential difference measured?

A ampere

B ohm

C volt

D watt

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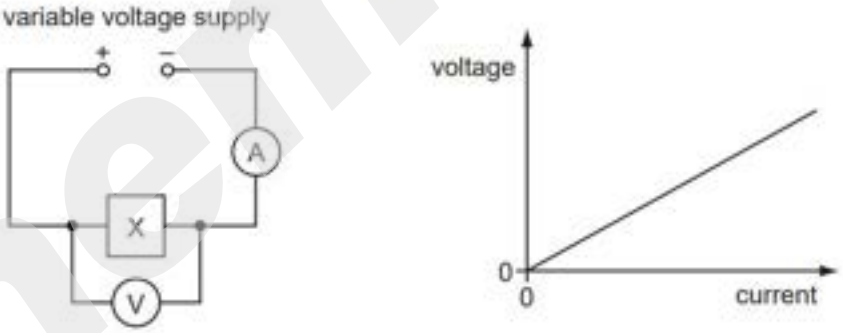
The voltage-current graph for X is as shown.



What is the component X?

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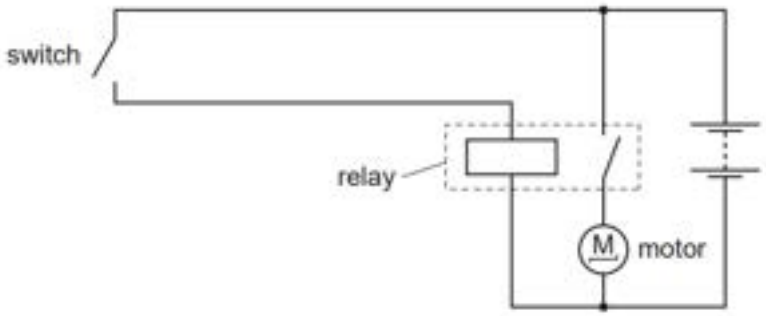
D a resistor of constant resistance

31 A relay is used to operate a large electric motor using a switch some distance from the motor.



What is the purpose of the relay?

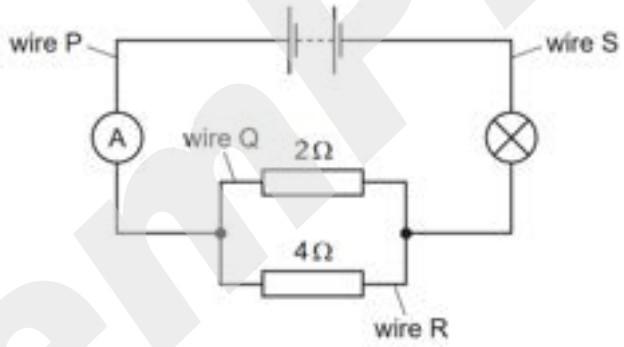
A to allow a large current in the relay coil to control a smaller current in the motor

B to allow a small current in the relay coil to control a larger current in the motor

C to allow the current in the relay coil to pass to the motor

D to disconnect the battery from the motor automatically if too much current flows

32 The circuit diagram includes two resistors connected in parallel.



Which statement is correct?

A The current in wire P is equal to the current in wire Q.

B The current in wire Q is equal to the current in wire R.

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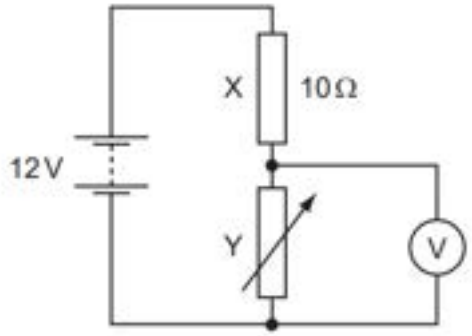

The resistance of resistor X is 10Ω.

When the resistance of the variable resistor Y is 20Ω, what is the reading on the voltmeter?

A 4.0V **B** 6.0V **C** 8.0V **D** 12V

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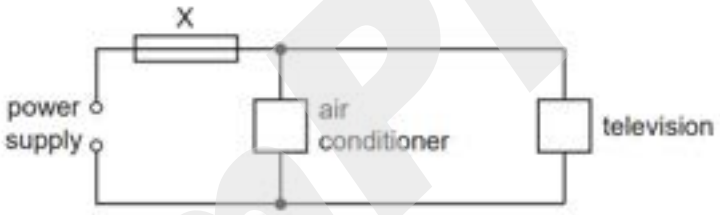

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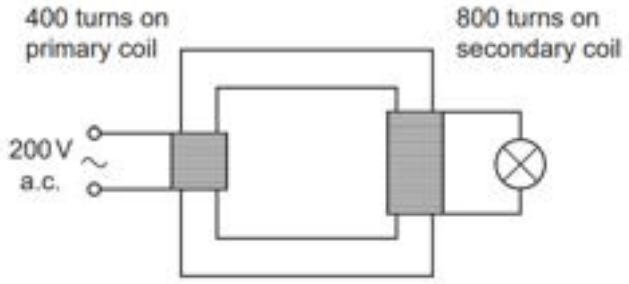
Which fuse should be connected at X?

A 3A **B** 5A **C** 10A **D** 13A

35 The diagram shows a transformer. The input voltage and the number of turns on each coil are shown.



What is the output voltage?

A 100 V **B** 200 V **C** 400 V **D** 800 V

36 Which device uses slip rings?

A a cathode-ray tube

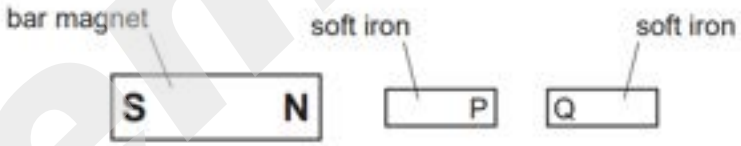
B a d.c. motor

C an a.c. generator

D a solenoid

October/November 2012 (11)

27 Two bars of soft iron are placed near a bar magnet.



Which row states and explains the behaviour of poles P and Q of the soft iron bars?

	P and Q	reason
A	attract	P and Q are like poles
B	attract	P and Q are unlike poles
C	repel	P and Q are like poles
D	repel	P and Q are unlike poles

28 Some electrical devices require a magnet which may be switched on and off many times in a second.

Which type of magnet may be used?

A an electromagnet only

B a permanent magnet only

C either a permanent magnet or an electromagnet

D neither a permanent magnet nor an electromagnet

29 Which of these is an electric current?

A a beam of atoms

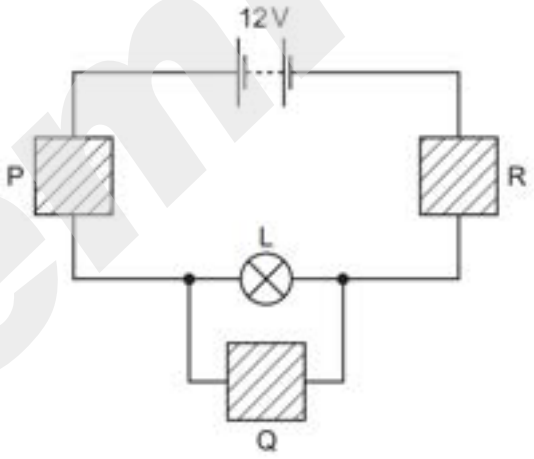
B a beam of electrons

C a beam of molecules

D a beam of neutrons

30 The diagram shows a circuit used to find the resistance of lamp L.

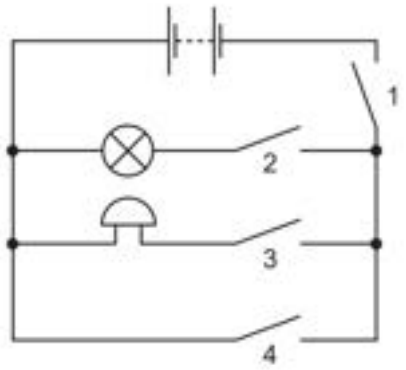
Blocks P, Q and R represent the different components used.



Which is a correct possible choice of components to use for P, Q and R?

	P	Q	R
A	ammeter	variable resistor	voltmeter
B	variable resistor	voltmeter	ammeter
C	voltmeter	ammeter	variable resistor
D	voltmeter	variable resistor	ammeter

31 A student connects the circuit shown.



Which switches must be closed for the bell to ring without lighting the lamp?

A 1 and 2 only

B 1 and 3 only

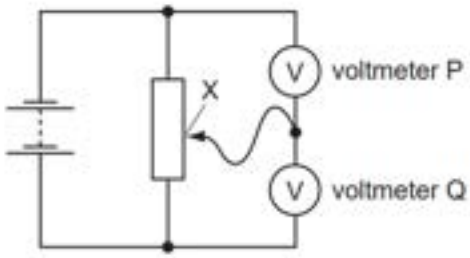
C 1, 3 and 4 only

D 2, 3 and 4 only

32 Which row shows a use of a capacitor and a use of a relay?

	use of a capacitor	use of a relay
A	switching circuit	voltage transformation
B	time-delay circuit	switching circuit
C	voltage transformation	switching circuit
D	voltage transformation	time-delay circuit

33 The diagram shows two voltmeters, P and Q, connected to a potential divider.



The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

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

34 An electric oven is connected to the mains supply using insulated copper wires. The wires become very warm.

What can be done to prevent so much heat being produced in the connecting wires?

A Use thicker copper wires.

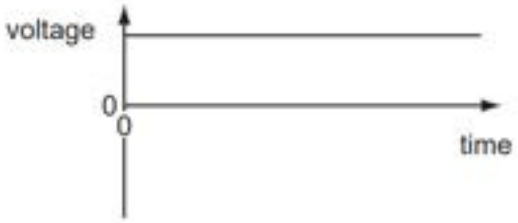
B Use thinner copper wires.

C Use thicker insulation.

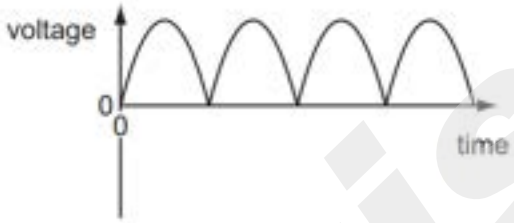
D Use thinner insulation.

35 Which graph shows how the voltage of a simple a.c. generator varies with time?

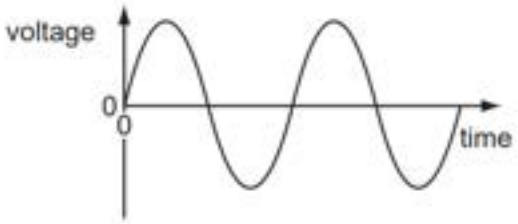
A



B

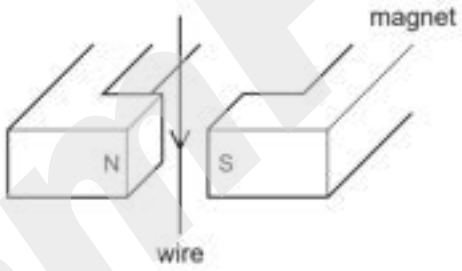


C

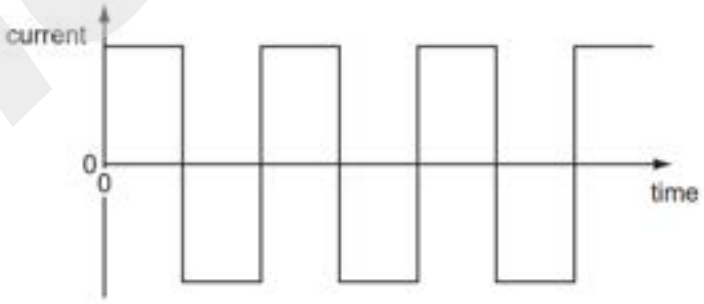


D

36 The diagram shows a wire in the magnetic field between two poles of a magnet.



The current in the wire repeatedly changes between a constant value in one direction and a constant value in the opposite direction. This is shown on the graph.



What is the effect on the wire?

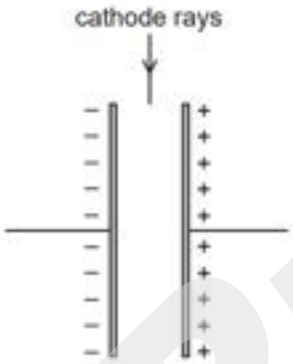
A The force on the wire alternates between one direction and the opposite direction.

B The force on the wire is constant in size and direction.

C There is no force acting on the wire at any time.

D There is only a force on the wire when the current reverses.

37 A beam of cathode rays passes between two parallel, charged metal plates in a vacuum.



In which direction is the beam deflected?

A into the page

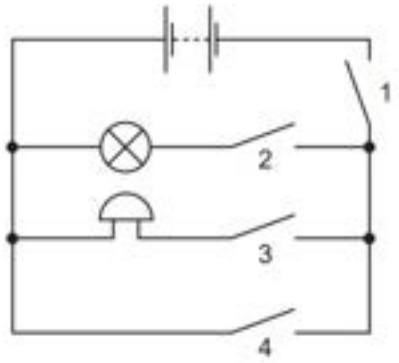
B out of the page

C to the left of the page

D to the right of the page

October/November 2012 (12)

28 A student connects the circuit shown.



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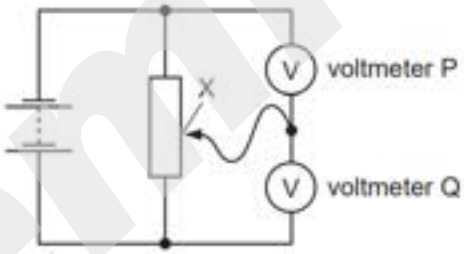

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What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
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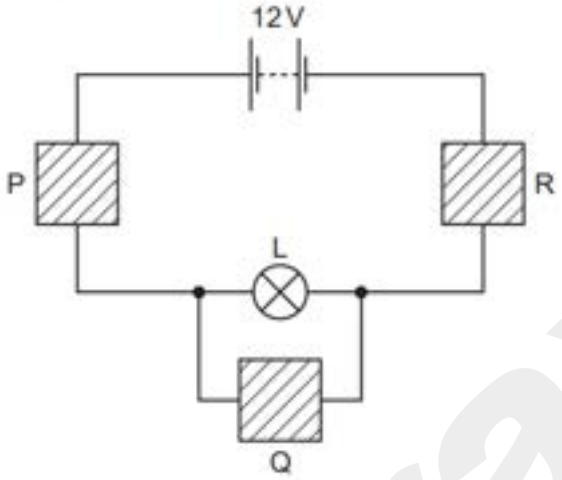
Blocks P, Q and R represent the different components used.



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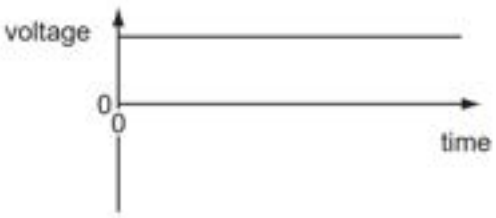
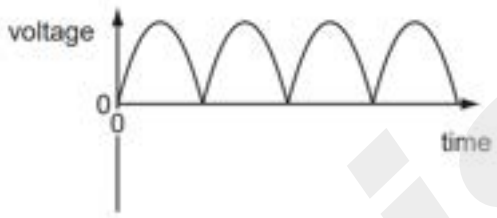
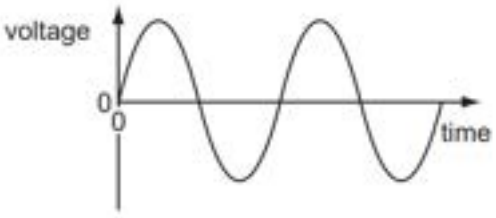


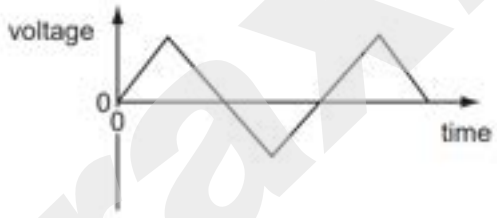
B



C



D



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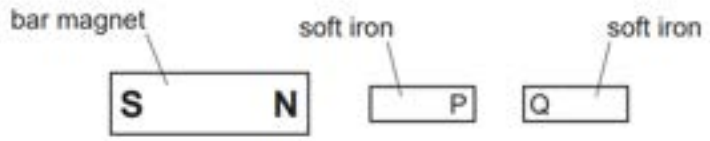

Which row states and explains the behaviour of poles P and Q of the soft iron bars?

	P and Q	reason
A	attract	P and Q are like poles
B	attract	P and Q are unlike poles
C	repel	P and Q are like poles
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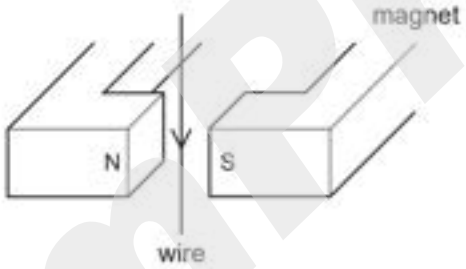
35 The diagram shows a wire in the magnetic field between two poles of a magnet.



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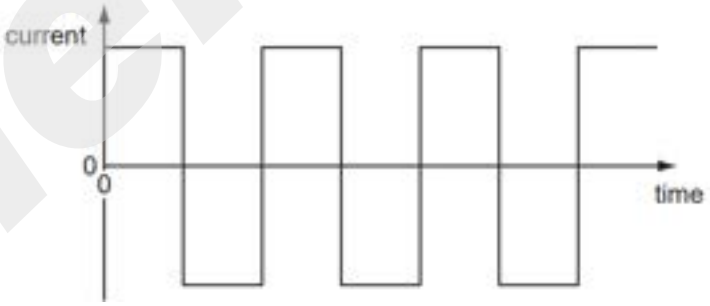

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36 An electric oven is connected to the mains supply using insulated copper wires. The wires become very warm.

What can be done to prevent so much heat being produced in the connecting wires?

A Use thicker copper wires.

B Use thinner copper wires.

C Use thicker insulation.

D Use thinner insulation.

October/November 2012 (13)

27 Which row shows whether iron and steel are ferrous or non-ferrous?

	iron	steel
A	ferrous	ferrous
B	ferrous	non-ferrous
C	non-ferrous	ferrous
D	non-ferrous	non-ferrous

28 The N pole of a magnet repels one end of bar X.

What happens when the **other** end of bar X is placed near to the poles of the magnet?

	other end near N pole	other end near S pole
A	attracts	attracts
B	attracts	repels
C	repels	attracts
D	repels	repels

29 Which is the worst electrical conductor?

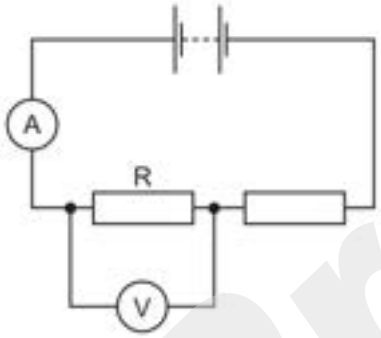
A aluminium

B carbon (graphite)

C iron

D sulfur

30 The circuit shows a 24 V battery connected to two resistors in series.



The reading on the ammeter is 2.0 A and the reading on the voltmeter is 8.0 V.

What is the resistance of resistor R?

A 0.25 Ω B 4.0 Ω C 10 Ω D 16 Ω

31 A relay allows a small current in one circuit to control a different circuit.

Which type of force is produced by the small current to activate the relay?

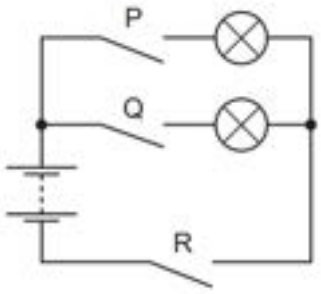
A electrical

B frictional

C gravitational

D magnetic

32 The diagram shows a circuit containing two identical lamps.



Which switches must be closed to light both of the lamps?

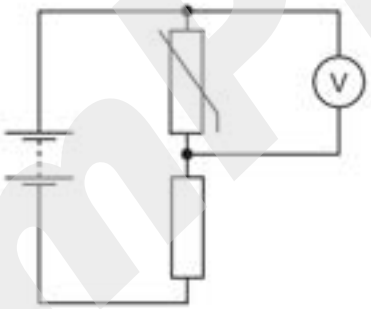
A P and Q only

B P and R only

C Q and R only

D P, Q and R

33 The diagram shows a potential divider circuit.



The temperature of the thermistor increases.

What happens to the resistance of the thermistor, and what happens to the reading on the voltmeter?

	resistance of thermistor	voltmeter reading
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

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What can be done to prevent so much heat being produced in the connecting wires?

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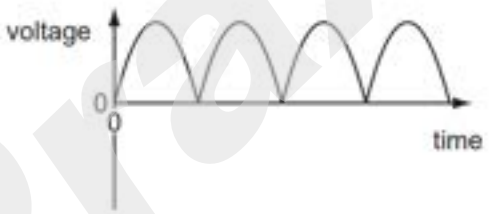
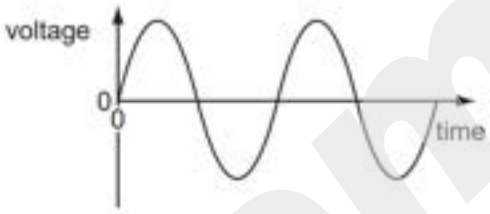
A

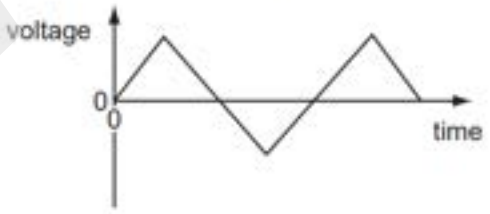
B



C



D



36 In the construction of a transformer, which items must be included?

A an iron core and a permanent magnet

B an iron core and two coils of wire

C a steel core and a permanent magnet

D a steel core and two coils of wire

May/June 2013 (11)

26 Which statement about magnetism is correct?

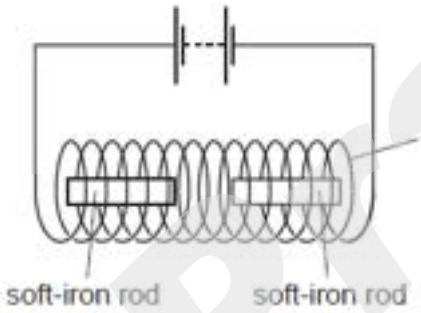
A Aluminium is a ferrous metal.

B A steel magnet can be demagnetised by heating it.

C The core of an electromagnet is usually made of steel.

D The magnetic field lines around a bar magnet are evenly spaced.

27 Two soft-iron rods are placed end to end inside a coil which is connected to a battery.



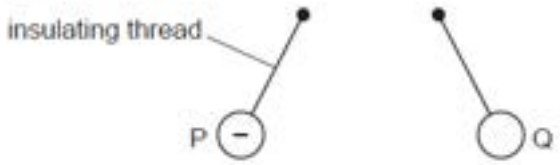
The connections from the battery to the coil are now reversed.

What happens to the soft-iron rods in each case?

	battery connections as shown	battery connections reversed
A	rods attract	rods attract
B	rods attract	rods repel
C	rods repel	rods attract
D	rods repel	rods repel

28 Three charged balls, P, Q and R are suspended by insulating threads. Ball P is negatively charged.

Ball Q is brought close to ball P.



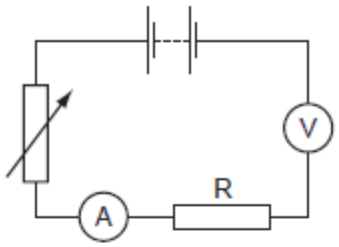
Ball Q is now brought close to ball R.

What are the charges on ball Q and on ball R?

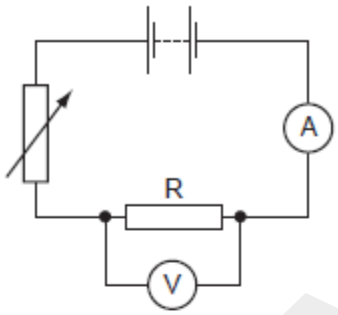
	ball Q	ball R
A	positive	positive
B	positive	negative
C	negative	positive
D	negative	negative

29 Which circuit could be used to determine the resistance of the resistor R?

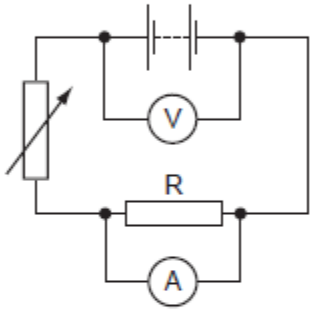
A



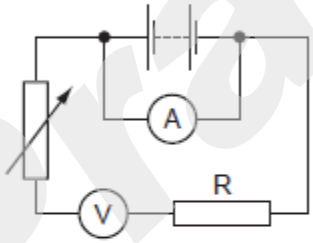
B



C



D



30 Which copper wire would have the smallest resistance?

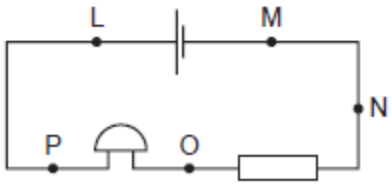
A a long, thick wire

B a long, thin wire

C a short, thick wire

D a short, thin wire

31 The diagram shows an electrical circuit.



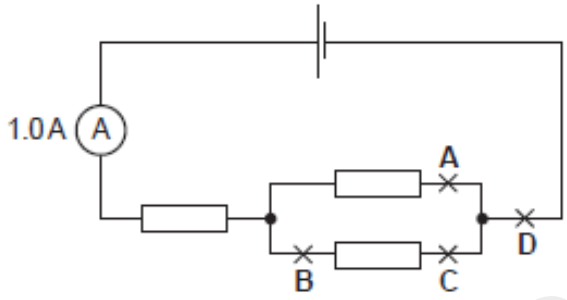
Between which two points must a voltmeter be connected to find the potential difference across the bell?

A L and M **B** M and N **C** N and O **D** O and P

32 The reading on the ammeter in the circuit is 1.0 A.

A second ammeter is connected in the circuit. It also reads 1.0 A.

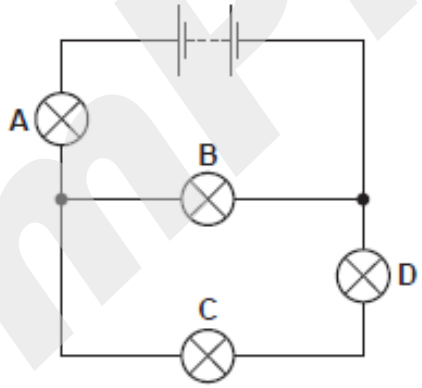
At which labelled point is it connected?



33 The circuit shows a battery and four lamps. All the lamps are lit.

One lamp fails and all the lamps go out.

Which lamp failed?



34 A desk lamp should have a 3A fuse fitted, but a 13A fuse has been fitted by mistake.

The lamp is not faulty.

The lamp is switched on. What happens?

A The fuse blows.

B The fuse does not blow but the lamp does not light.

C The lamp draws too much current and the supply cables could melt.

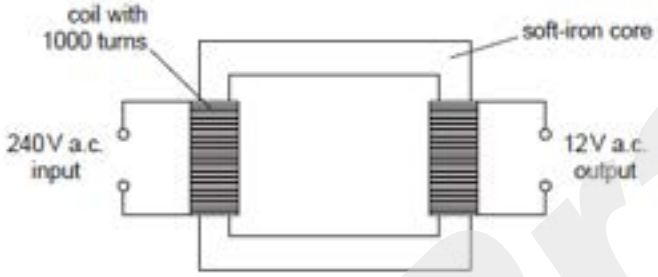
D The lamp works normally.

35 An electric current can produce a heating effect and a magnetic effect.

Which row shows the effect that a relay uses, together with one application of a relay?

	effect used by a relay	one application of a relay
A	heating effect	allowing a small current to switch on a large current
B	heating effect	changing the voltage of an alternating current
C	magnetic effect	allowing a small current to switch on a large current
D	magnetic effect	changing the voltage of an alternating current

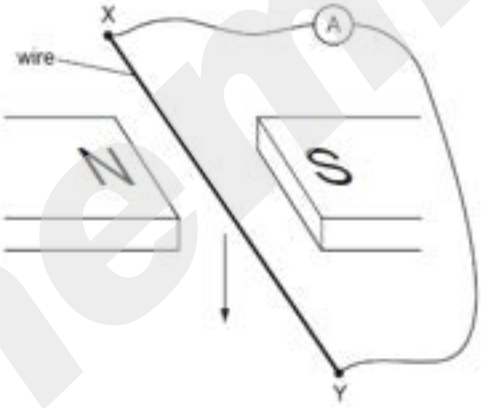
36 The diagram shows a mains transformer that has an output voltage of 12V.



How many turns of wire are in the secondary coil?

A 12 **B** 20 **C** 50 D 20000

37 The diagram shows an experiment to demonstrate electromagnetic induction.



X and Y are joined, in turn, by four wires, each made of a different material.

Each wire is then moved quickly downwards between the magnets.

Which material will **not** give rise to an induced current in the wire?

A aluminium

B copper

C iron

D nylon

October/November 2013 (11)

26 A hard magnetic material can be used to make a permanent magnet.

A soft magnetic material can be used to make a temporary magnet.

Which row shows whether iron and steel are hard or soft magnetic materials?

	iron	steel
A	hard	hard
B	hard	soft
C	soft	hard
D	soft	soft

27 How can a permanent magnet be demagnetised?

A cool the magnet for a long time

B hit the magnet repeatedly with a hammer

C leave the magnet in a coil which is connected to a battery

D shine bright light onto the magnet

28 Which equation can be used to calculate the resistance R of a resistor?

A $V = I \div R$ **B** $I = V \times R$ **C** $R = V \times I$ **D** $V = I \times R$

29 A student wishes to measure first the electromotive force (e.m.f.) of a battery, and then the potential difference (p.d.) across a resistor.

She has the resistor, the battery and some connecting wires.

What else does she need?

A a force meter (newton meter) and a voltmeter

B an ammeter and a voltmeter

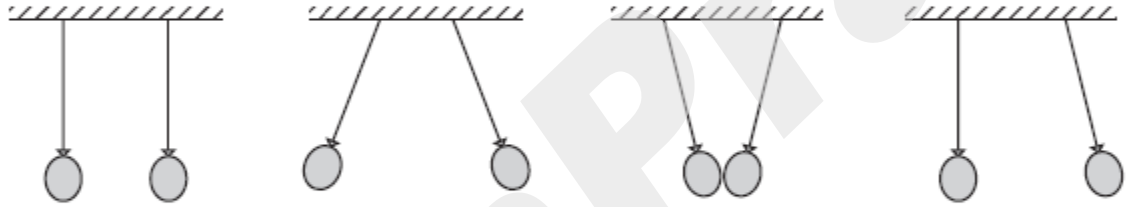
C an ammeter only

D a voltmeter only

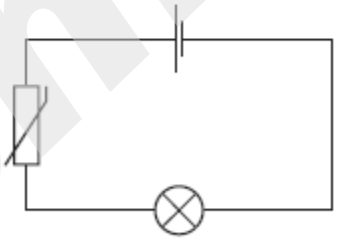
30 Two similar balloons hang side by side, on insulating threads, a short distance apart. They are both rubbed with the same dry cloth and become charged.

Which diagram shows how the balloons hang after charging?

A B C D



31 When the thermistor in the circuit below is heated, the current in the lamp increases.



Why does this happen?

A The resistance of the lamp decreases.

B The resistance of the lamp increases.

C The resistance of the thermistor decreases.

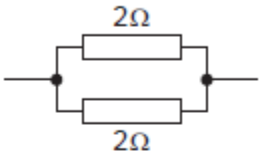
D The resistance of the thermistor increases.

32 A student connects various resistors in parallel pairs.

Underneath each diagram is a statement about the total resistance of each pair of resistors.

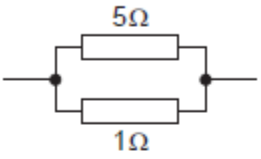
Which statement is correct?

A



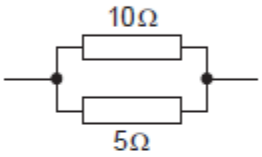
The total resistance is 4Ω.

B



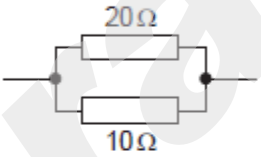
The total resistance is between 1Ω and 5Ω.

C



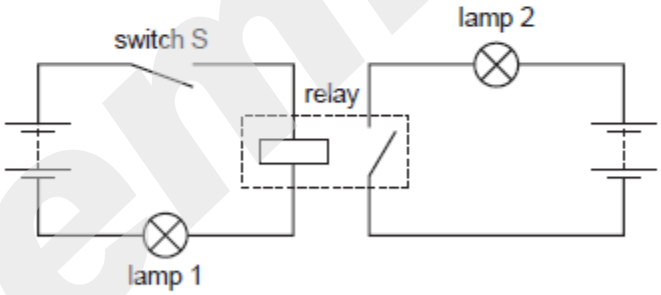
The total resistance is less than 5Ω.

D



The total resistance is more than 20Ω.

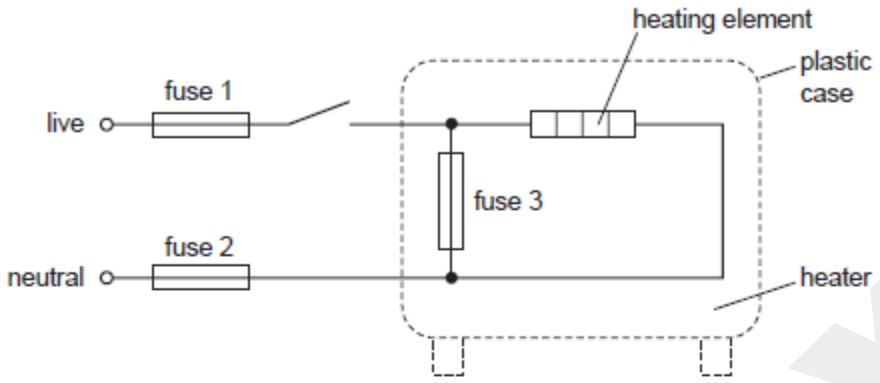
33 The circuit shown contains a relay.
Both lamps are initially off.



When switch S is closed, the relay operates. What is the state of the lamps?

	lamp 1	lamp 2
A	on	on
B	on	off
C	off	on
D	off	off

34 The diagram shows the connections to an electric heater. Three fuses have been added to the circuit.



Which of the fuses are correctly placed?

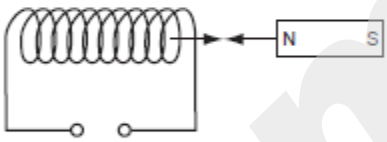
A fuse 1, fuse 2 and fuse 3

B fuse 1 and fuse 2 only

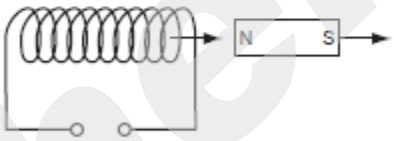
C fuse 1 only

D fuse 2 only

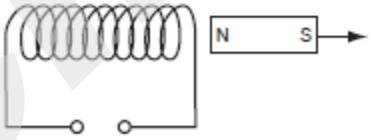
35 Which diagram shows a movement that will **not** produce the changing magnetic field needed to induce an e.m.f. in the coil?

A 

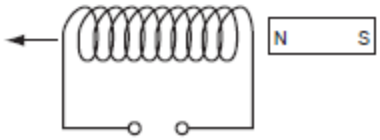
moving a magnet and a coil towards each other at the same speed

B 

moving a magnet and a coil in the same direction at the same speed

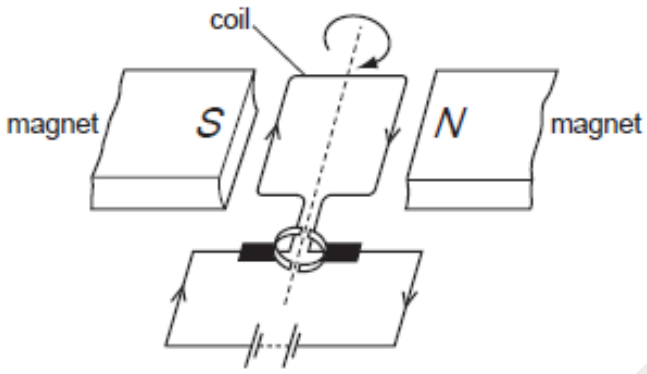
C 

moving a magnet away from a fixed coil

D 

moving a coil away from a fixed magnet

36 The diagram shows a simple d.c. electric motor which is rotating.



Which change will make the motor rotate more quickly?

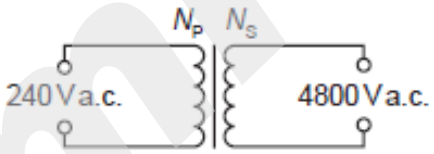
A increasing the number of turns on the coil

B removing the magnets

C reversing the battery

D reversing the polarity of the magnets

37 A transformer is needed to convert a supply of 240 V a.c. into 4800 V a.c.



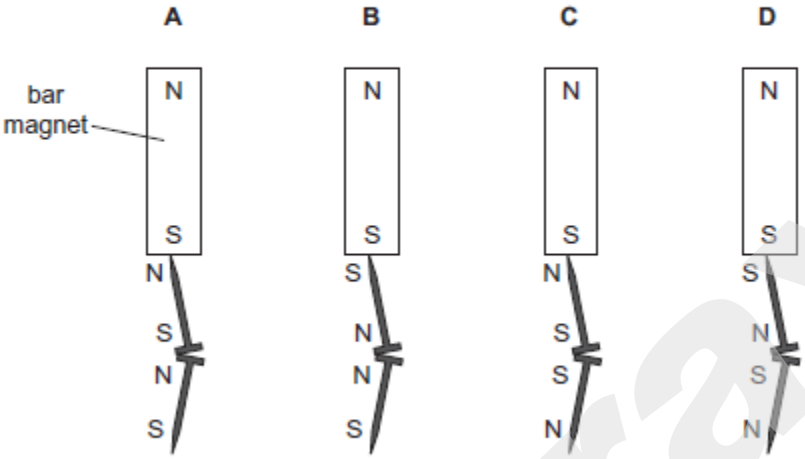
Which pair of coils would be suitable for this transformer?

	number of turns on primary coil N_P	number of turns on secondary coil N_S
A	50	1000
B	240	48 000
C	480	24
D	2000	100

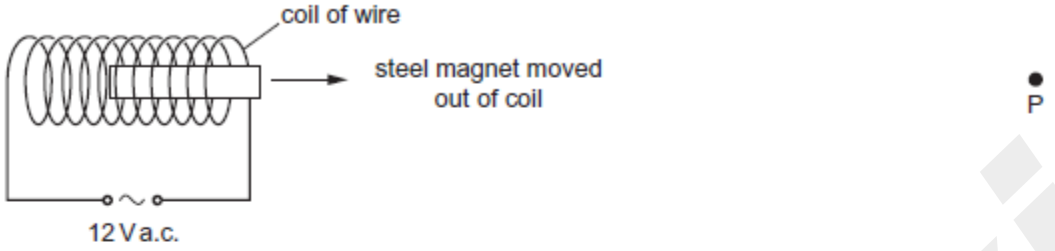
May/June 2014 (11)

25 Two iron nails hang from a bar magnet.

Which diagram shows the magnetic poles induced in the nails?



26 A steel magnet is placed inside a coil of wire. There is a large alternating current in the coil. The magnet is slowly moved out of the coil to position P.



How has the steel changed, if at all, when it reaches position P?

A It has become a stronger magnet.

B It has become demagnetised.

C The poles have changed ends.

D There has been no change.

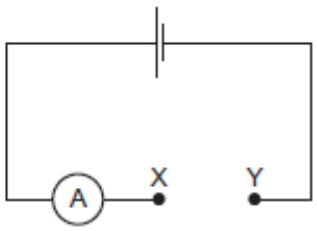
27 A plastic rod and a dry cloth are uncharged.

The rod is now rubbed with the cloth and they both become charged. The rod becomes negatively charged because some charged particles move from the cloth to the rod.

What is the charge on the cloth and which particles moved in the charging process?

	charge on cloth	particles that moved
A	negative	electrons
B	negative	neutrons
C	positive	electrons
D	positive	neutrons

28 The diagram shows an incomplete circuit.



Four wires of different length and thickness are connected in turn between point X and point Y. All four wires are made of the same metal.

Which wire will cause the greatest reading on the ammeter?

A long and thick

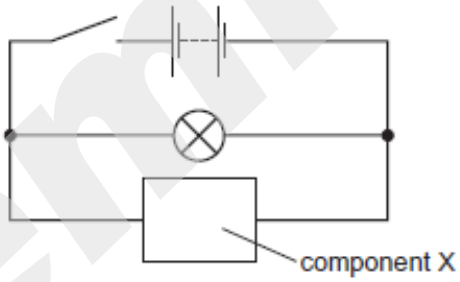
B long and thin

C short and thick

D short and thin

29 The diagram shows a circuit containing a battery, a lamp, a switch and another component X. The switch is initially closed and the lamp is lit.

The switch is now opened and the lamp remains lit for several seconds before slowly going out.



What is component X?

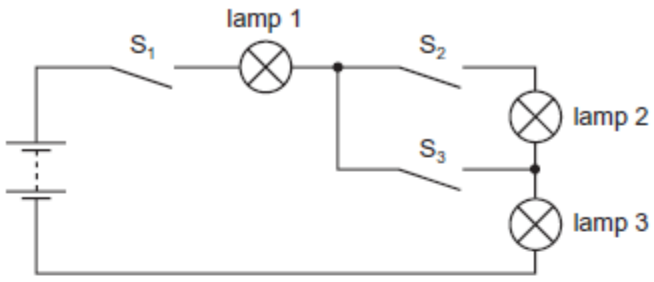
A a capacitor

B a light-dependent resistor

C a thermistor

D a variable resistor

30 The diagram shows a circuit containing three lamps and three switches S_1, S_2 and S_3.



Lamp 1 and lamp 3 are lit, but lamp 2 is not lit.

Which switch or switches is/are closed?

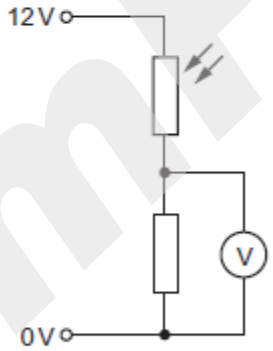
A S_1 only

B S_1 and S_2

C S_1 and S_3

D S_2 and S_3

31 The diagram shows part of an electric circuit.

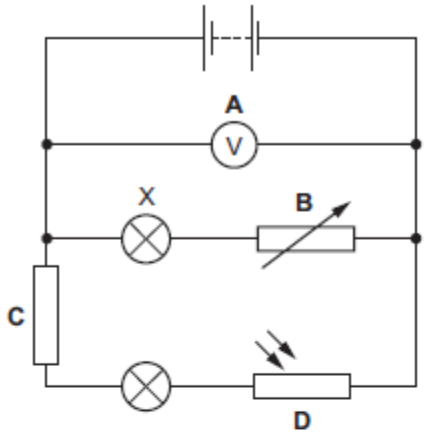


The light falling on the light-dependent resistor (LDR) increases in brightness.

What happens to the resistance of the LDR and what happens to the reading on the voltmeter?

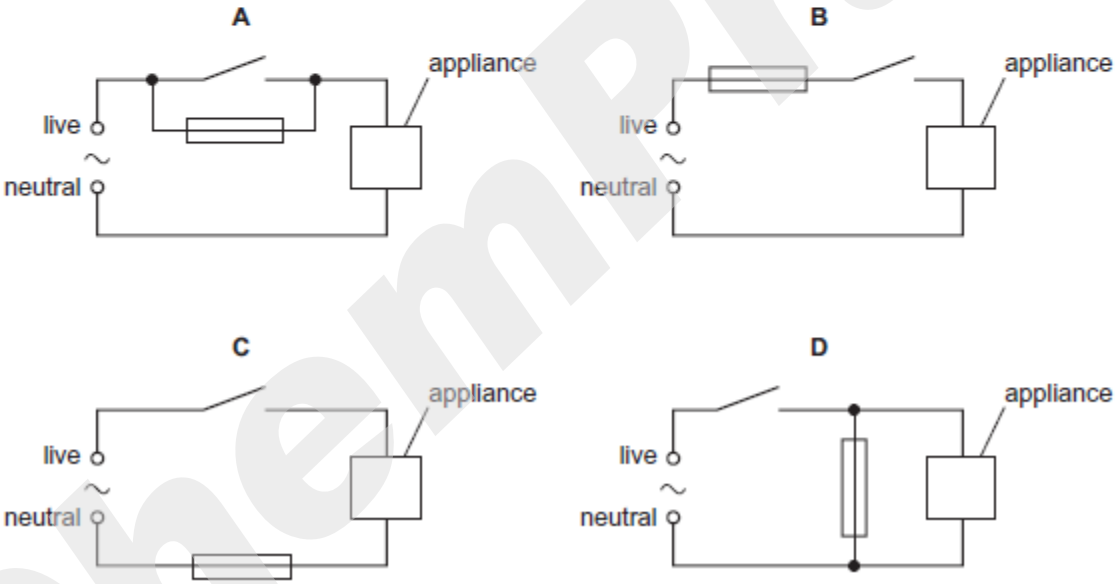
	resistance of LDR	reading on voltmeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

32 Which labelled component in the circuit shown controls the brightness of lamp X?

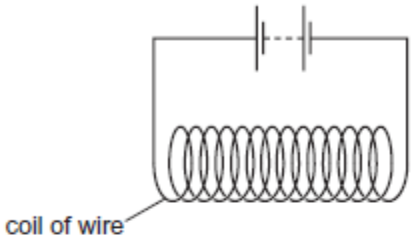


33 An appliance is connected to a mains supply. Its circuit also contains a switch and a fuse.

Which circuit shows the fuse in the correct position?

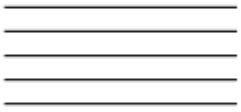


34 An electric current is passed through a coil of wire.



Which diagram shows the shape of the magnetic field produced in the middle of the coil?

A

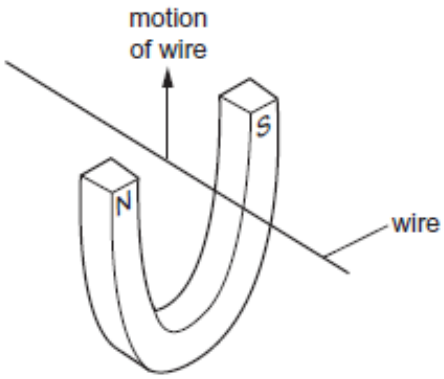


B

C

D

35 When a wire is moved upwards between the poles of a magnet, an electromotive force (e.m.f.) is induced across the ends of the wire.



Which device uses a moving wire to induce an e.m.f.?

A a cathode-ray tube

B a generator

C a transformer

D an electromagnet

36 An input voltage of 10 V is supplied to the primary coil of a transformer. An output voltage of 40 V is produced across the secondary coil.

The 10 V supply at the primary coil is now replaced with a 40 V supply.

What is the new output voltage across the secondary coil?

A 10 V **B** 40 V **C** 70 V **D** 160 V

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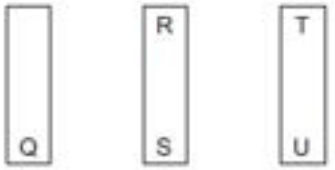
October/November 2014 (11)

26 The ends of three metal rods are tested by holding end Q of rod 1 close to the others in turn.



The results are as follows.

End Q: attracts end R,
attracts end S,
attracts end T,
repels end U.

Which of the metal rods is a magnet?

A rod 1 only

B rod 1 and rod 2

C rod 1 and rod 3

D rod 3 only

27 A permanent magnet is made from metal and an electromagnet uses a metal core.

Which metal is suitable for each of these purposes?

	permanent magnet	core of electromagnet
A	iron	iron
B	iron	steel
C	steel	iron
D	steel	steel

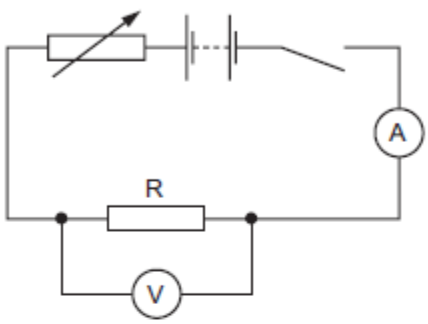
28 Which row gives the unit for energy and the unit for electromotive force (e.m.f.)?

	energy	e.m.f.
A	J	N
B	J	V
C	W	N
D	W	V

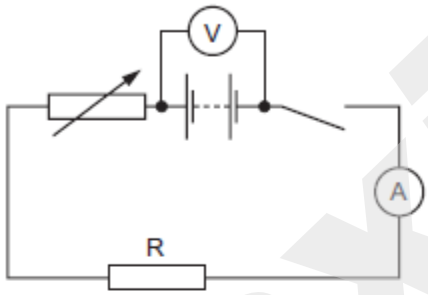
29 A student carries out an experiment to investigate the resistance of a resistor R. She takes a series of readings of potential difference (p.d.) and current, and plots a graph of her results.

Which circuit should she use?

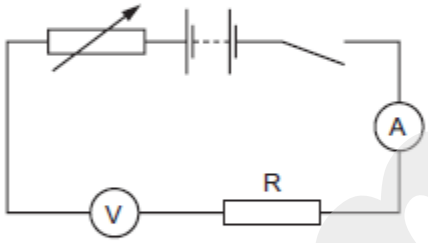
A



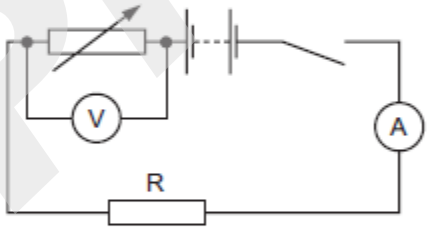
B



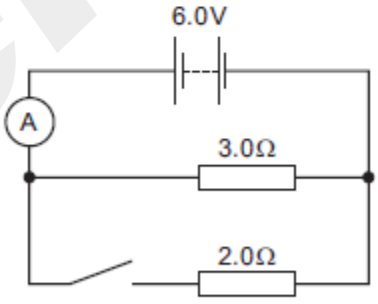
C



D



30 The diagram shows a circuit with a 3.0Ω resistor and a 2.0Ω resistor connected in parallel.



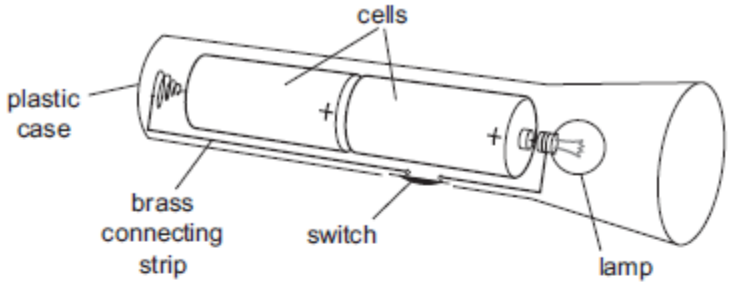
The switch is open, and the ammeter reads 2.0A.

The switch is now closed and the ammeter reads the total current in both resistors.

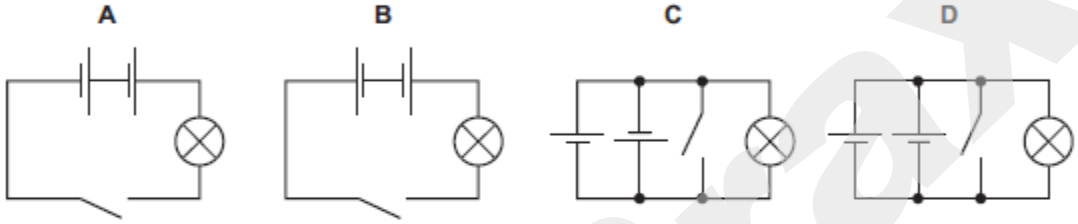
What is the ammeter reading with the switch closed?

A 1.2A **B** 3.0A **C** 4.0A **D** 5.0A

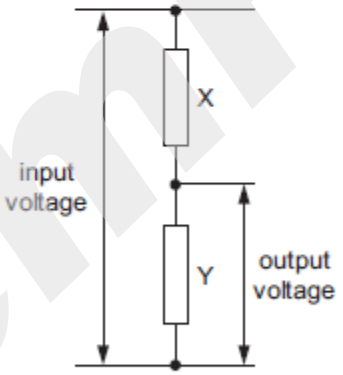
31 The diagram shows a torch containing two cells, a switch and a lamp.



Which is the circuit diagram for the torch?



32 An engineer uses the potential divider shown in the diagram. He needs the output voltage to be one tenth ($\frac{1}{10}$) of the input voltage.



Which pair of values could he use for the two resistors X and Y?

	X / kΩ	Y / kΩ
A	1.0	9.0
B	1.0	10.0
C	9.0	1.0
D	10.0	1.0

33 The current in a kettle is 10 A and it is protected by a 13 A fuse.

The owner of the kettle replaces the 13A fuse with a 3 A fuse.

What happens when the kettle is switched on?

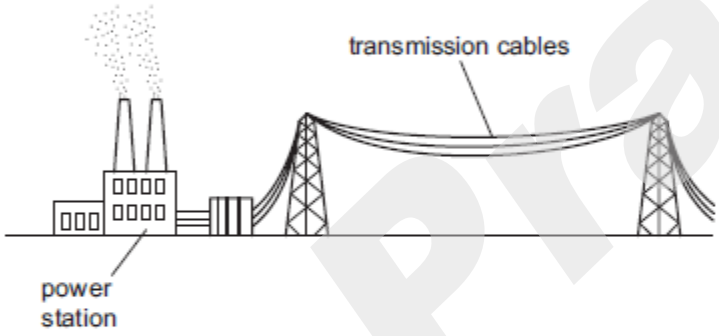
A The fuse blows and the kettle is damaged.

B The fuse blows and the kettle is undamaged.

C The fuse does not blow and the kettle works correctly.

D The fuse does not blow but the kettle fails to work.

34 The diagram shows cables used in the transmission of electrical energy. High voltages are used for the transmission.



Why are high voltages used for the transmission of electrical energy?

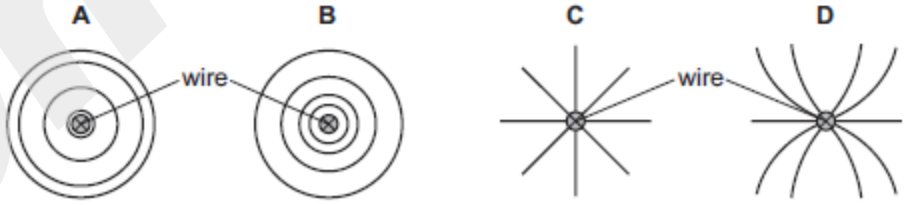
A Fear of high voltages stops people from interfering with the cables.

B Heat loss in the cables is smaller than if low voltages are used.

C High voltages increase the current in the cables.

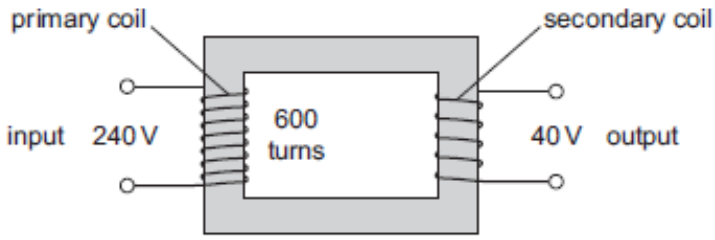
D High voltages produce large magnetic fields, so less insulation is needed.

35 Which diagram shows the magnetic field pattern around a wire that is carrying a current perpendicular to the page?



36 The diagram shows a simple transformer with an input of 240 V and an output of 40 V.

There are 600 turns on the primary coil.



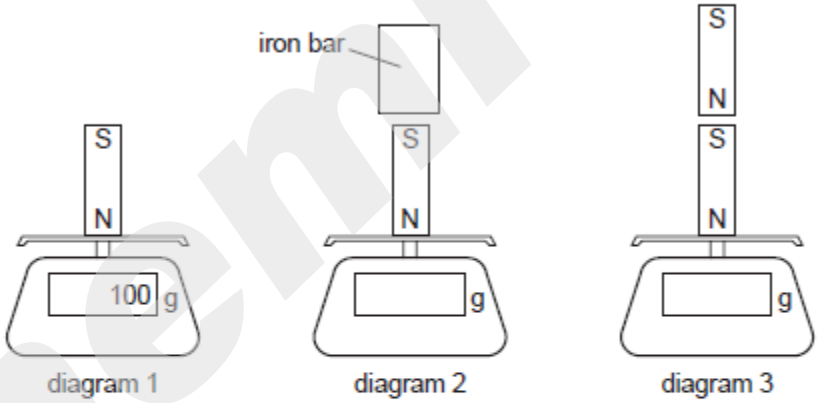
How many turns are there on the secondary coil?

A 100 **B** 320 **C** 400 **D** 3600

May/June 2015 (11)

25 A magnet is placed on a balance. The balance reading changes when an iron bar or another magnet is held close to the first magnet.

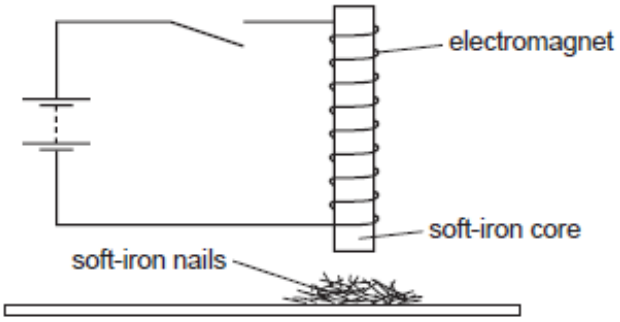
The arrangements are shown in the diagrams.



Which row gives the balance reading in diagram 2 and in diagram 3?

	balance reading in diagram 2 /g	balance reading in diagram 3 /g
A	less than 100	less than 100
B	less than 100	more than 100
C	more than 100	less than 100
D	more than 100	more than 100

26 An electromagnet with a soft-iron core is connected to a battery and an open switch. The soft-iron core is just above some small soft-iron nails.



The switch is now closed, left closed for a few seconds, and then opened.

What do the soft-iron nails do as the switch is closed, and what do they do when the switch is then opened?

	as switch is closed	as switch is opened
A	nails jump up	nails fall down
B	nails jump up	nails stay up
C	nails stay down	nails jump up
D	nails stay down	nails stay down

27 The diagram shows a piece of metal resistance wire.

Which wire, made of the same metal, has a smaller resistance?

A a wire of the same length with a larger diameter

B a wire of the same length with a smaller diameter

C a wire of greater length with the same diameter

D a wire of greater length with a smaller diameter

28 What is the unit of electromotive force (e.m.f.)?

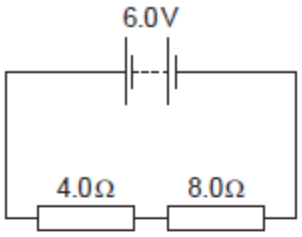
A ampere

B joule

C volt

D watt

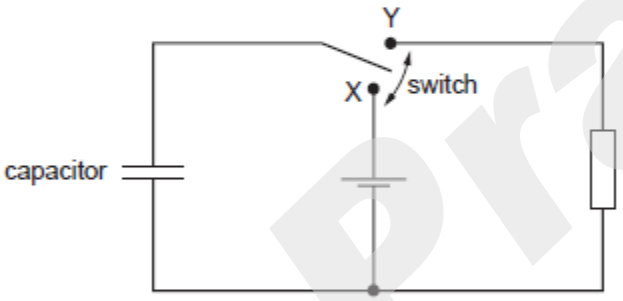
29 The circuit diagram shows a 4.0Ω resistor and an 8.0Ω resistor connected to a 6.0V battery.



What is the current in the battery?

A 0.50A **B** 0.75A **C** 1.5A **D** 2.0A

30 The diagram shows a circuit which includes an uncharged capacitor and a switch.

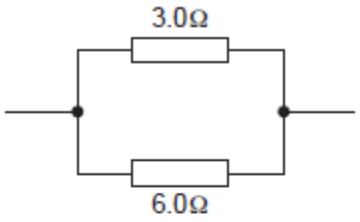


The switch can be moved between position X and position Y.

What happens to the capacitor when the switch is moved to position X, and what happens when the switch is then moved to position Y?

	switch at X	switch at Y
A	capacitor charges	capacitor charges
B	capacitor charges	capacitor discharges
C	capacitor discharges	capacitor charges
D	capacitor discharges	capacitor discharges

31 The diagram shows a 3.0Ω resistor and a 6.0Ω resistor connected in parallel.



What is the total resistance of this arrangement?

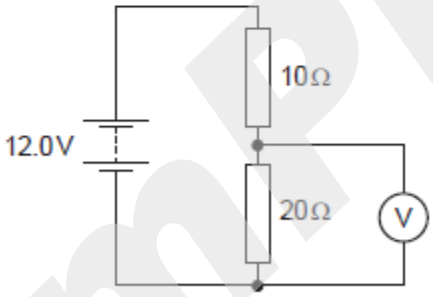
A less than 3.0Ω

B 3.0Ω

C 4.5Ω

D more than 6.0Ω

32 The diagram shows a 10Ω resistor and a 20Ω resistor connected in a potential divider circuit.

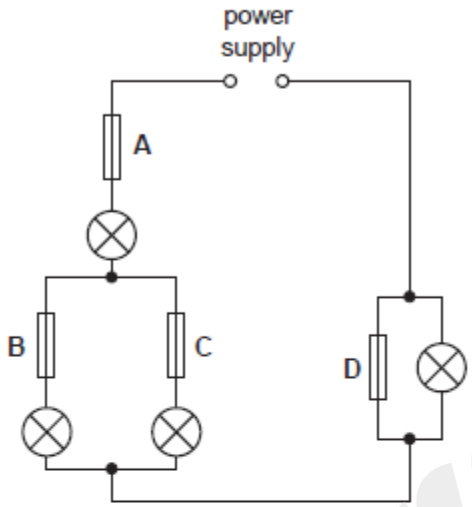


What is the reading on the voltmeter?

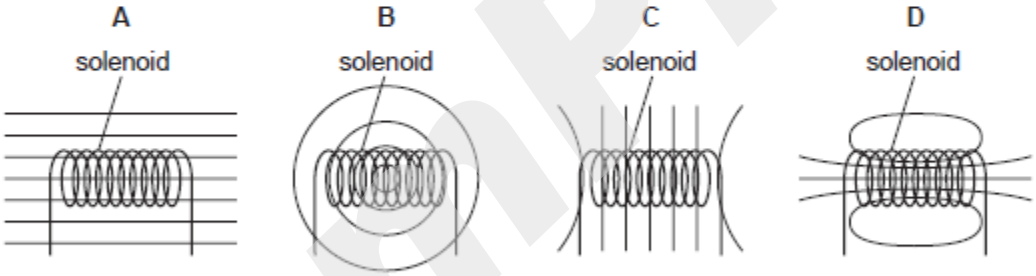
A 4.0V **B** 6.0V **C** 8.0V **D** 12.0V

33 In the circuit shown, only one of the fuses has blown, but none of the lamps is lit.

Which fuse has blown?



34 Which diagram shows the pattern of the magnetic field produced by a current-carrying solenoid?



35 What is an advantage of transmitting electricity at a high voltage?

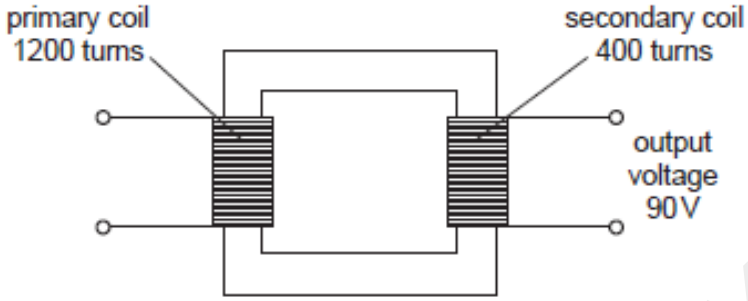
A It is faster.

B It is safer.

C Less energy is wasted.

D Less equipment is needed.

36 A transformer has 1200 turns on its primary coil and 400 turns on its secondary coil. An output voltage of 90 V is induced across the secondary coil.



What is the input voltage of the transformer?

A 30 V **B** 90 V **C** 270 V **D** 1200 V

25 Which row states whether each metal is ferrous or non-ferrous?

	ferrous	non-ferrous
A	aluminium	copper
B	copper	iron
C	iron	steel
D	steel	aluminium

26 Which procedure may be used to demagnetise a steel bar?

A cooling it in a freezer for several hours

B earthing it with a copper wire for several seconds

C removing it slowly from a coil carrying an alternating current (a.c.)

D rubbing it in one direction with a woollen cloth

27 What is the unit of electrical power?

A ampere

B joule

C volt

D watt

28 Some resistors are made using one type of wire. Two different lengths of wire are available. Each length is available in two different diameters.

Which wire has the highest resistance?

A the wire with the greater length and the larger diameter

B the wire with the greater length and the smaller diameter

C the wire with the smaller length and the larger diameter

D the wire with the smaller length and the smaller diameter

29 Four students are each given an identical resistor and asked to find its resistance. They each measure the potential difference across the resistor and the current in it.

One student makes a mistake.

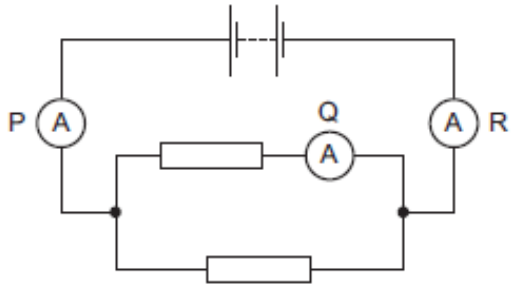
Which row shows the results of the student that makes a mistake?

	potential difference / V	current / A
A	1.2	0.500
B	2.4	1.100
C	1.5	0.625
D	3.0	1.250

30 What is the circuit symbol for a variable resistor?

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

31 The diagram shows a circuit containing three ammeters P, Q and R.



Which statement about the readings on the ammeters is correct?

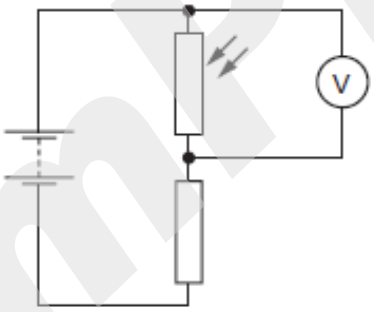
A The reading on P is equal to the reading on Q.

B The reading on P is equal to the reading on R.

C The reading on Q is greater than the reading on P.

D The reading on Q is greater than the reading on R.

32 The diagram shows a light-dependent resistor (LDR) connected in a potential divider circuit.



The brightness of the light falling on the LDR is increased.

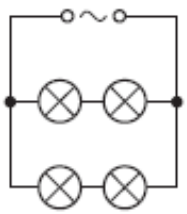
Which row shows what happens to the resistance of the LDR, and what happens to the reading on the voltmeter?

	resistance of LDR	reading on voltmeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

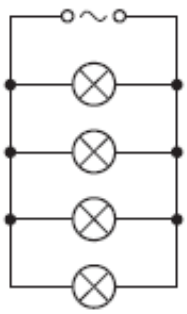
33 Four lamps are each labelled '60 W 230V'.

In which circuit are the lamps connected so that they operate at normal brightness?

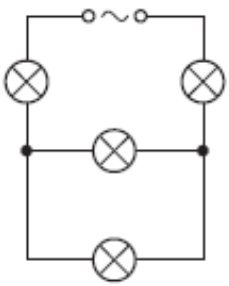
A



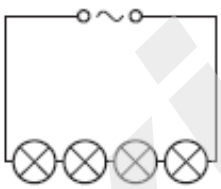
B



C



D



34 A step-up transformer is used before electricity is transmitted by overhead cables.

Which statement explains why the step-up transformer is used?

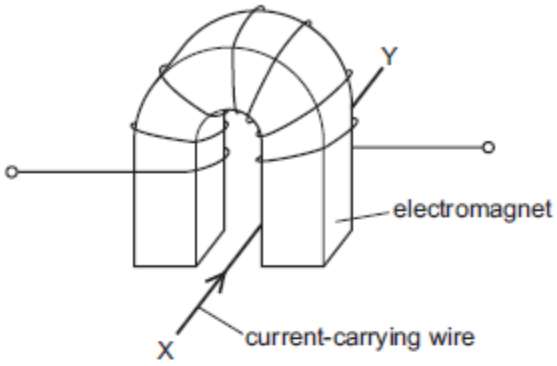
A It increases the current to increase the speed at which the electricity travels.

B It increases the current to reduce energy loss in the cables.

C It increases the voltage to increase the speed at which the electricity travels.

D It increases the voltage to reduce energy loss in the cables.

35 A current-carrying wire XY lies in the magnetic field between the two poles of a U-shaped electromagnet. A force acts on the wire XY because of the magnetic field.



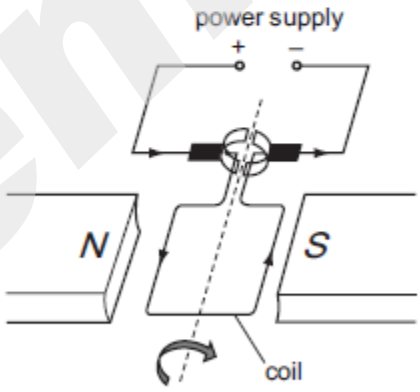
Each of the following actions is carried out separately.

- The current in the wire XY is reversed.
- The magnetic field is reversed.
- Both the current in the wire XY and the magnetic field are reversed at the same time.

How many of these actions cause the direction of the force on the wire XY to be reversed?

A 0 **B** 1 **C** 2 **D** 3

36 A current-carrying coil in a magnetic field experiences a turning effect.



How can the turning effect be increased?

A Increase the number of turns on the coil.

B Reduce the size of the current.

C Reverse the direction of the magnetic field.

D Use thinner wire for the coil.