



上海光華學院劍橋國際中心(光華劍橋)  
Guanghua Cambridge International School

# Cambridge IGCSE/G2 PHYSICS

## Multiple Choice Questions

Volume IGCSE/G2

**IV Electricity and Magnetism**  
**V Nuclear Physics**  
**VI Space Physics**

# Cambridge IGCSE/G2 PHYSICS

# Multiple Choice Questions

## **Grading Table**

## Preface

This book covers the entire syllabus of CIE Physics for IGCSE level. The main task of this book is to help you to test your understanding and prepare for the examinations.

This book has been written specifically for a student of Cambridge's 0625 syllabus by an experienced team with examiners who are very familiar with the syllabus and examinations.

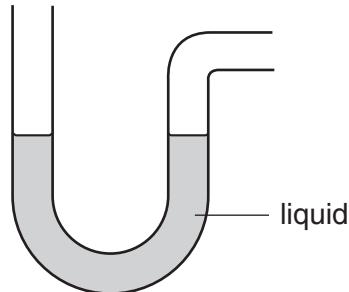
All of the questions are chosen from past papers. When tackling questions, it is a good idea to make a first attempt without referring to your textbook or to your notes. This will help to reveal any gap in your understanding. By sorting out any problems at early stage you will progress faster.

We hope that this book will help you to succeed in examinations and we also hope you will learn from the past to take physics to ever greater heights.

## Changes for the 2023-2025 Syllabus

Note that many of the questions are taken from past syllabuses which, on occasion, might contain subject material removed from later incarnations of the syllabus. These questions have not been removed from this book; rather, they have been marked with an open left bracket, as shown in the example below.

- 3 The diagram shows an instrument used to measure gas pressure.



What is the instrument called?

- A ammeter
- B barometer
- C manometer
- D thermometer

Questions marked as such can be ignored, insofar as the 2023-2025 examinations are concerned.

At the same time, some content has been added to the 2023-2025 syllabus. Attempts have been made to include questions covering this new material. Note that students can also consult the 2023-2025 textbook for further sample problems.

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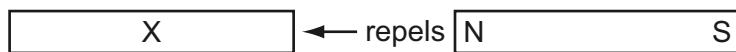
**Part IV**

# **Electricity and magnetism**

## Chapter 16. Magnets

### 16.1 Permanent magnets

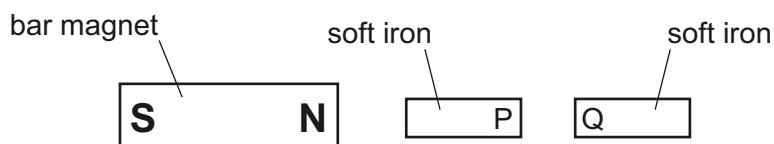
- 1 The N pole of a magnet repels one end of bar X.



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

- 2 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?

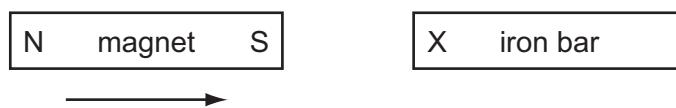
	P and Q	reason
A	attract	P and Q are like poles
B	attract	P and Q are unlike poles
C	repel	P and Q are like poles
D	repel	P and Q are unlike poles

- 3 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

- 4 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

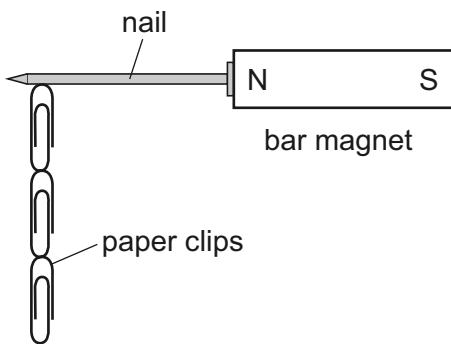
- 5 Which procedure may be used to demagnetise a steel bar?

- 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

- 6 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.

- 7 Four nails, **A**, **B**, **C** and **D**, are tested to find which makes the strongest permanent magnet.

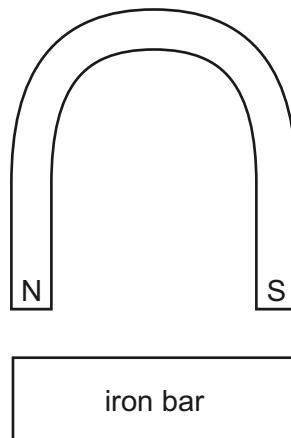


One of the nails is placed against a bar magnet and the number of paper clips which the nail can support is recorded. The bar magnet is then removed and the number of paper clips remaining attached to the nail is recorded. Each nail is tested in turn.

Which nail becomes the strongest permanent magnet?

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

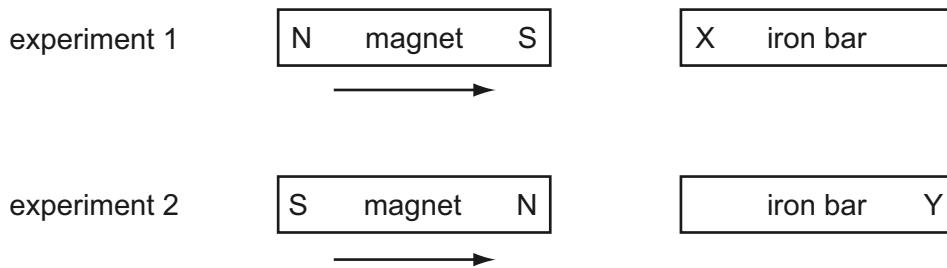
- 8 A horseshoe magnet is brought near to an unmagnetised iron bar.



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
B	N                    S	repulsion
C	S                    N	attraction
D	S                    N	repulsion

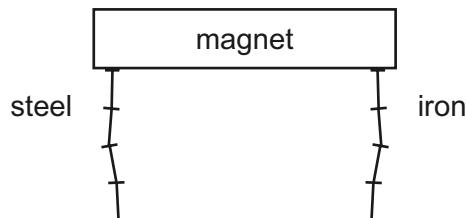
- 9** In two separate experiments, a magnet is brought near to an unmagnetised iron bar. This causes the bar to become magnetised.



Which magnetic poles are induced at X and at Y?

	pole induced at X	pole induced at Y
<b>A</b>	N	N
<b>B</b>	N	S
<b>C</b>	S	N
<b>D</b>	S	S

- 10** Which test could be used to find which end of a magnet is the north pole?
- A** putting it near a compass needle
  - B** putting it near a ferrous metal
  - C** putting it near a non-ferrous metal
  - D** putting it near a steel spoon
- 11** 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.



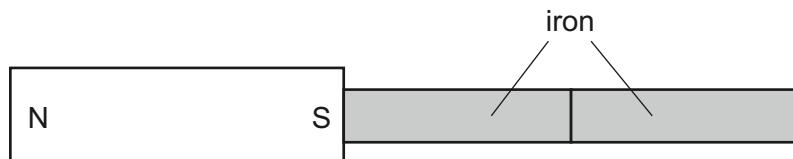
What happens to the chains?

- 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.

12 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.

13 A magnet attracts two pieces of iron.



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

- A 

N	S	S	N
---	---	---	---
- B 

N	S	N	S
---	---	---	---
- C 

S	N	S	N
---	---	---	---
- D 

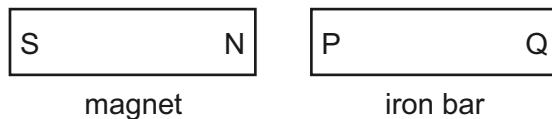
S	N	N	S
---	---	---	---

14 A permanent magnet is brought near to a piece of copper. The copper is not attracted by the magnet.

Why is there no attraction?

- A Copper is ferrous but is only attracted by an electromagnet.
- B Copper is ferrous but is not attracted by any type of magnet.
- C Copper is not ferrous and is only attracted by an electromagnet.
- D Copper is not ferrous and is not attracted by any type of magnet.

- 15 The north pole of a bar magnet is placed next to end P of an iron bar PQ, as shown. As a result, magnetic poles are induced in the iron bar.



What are the magnetic poles induced at P and at Q?

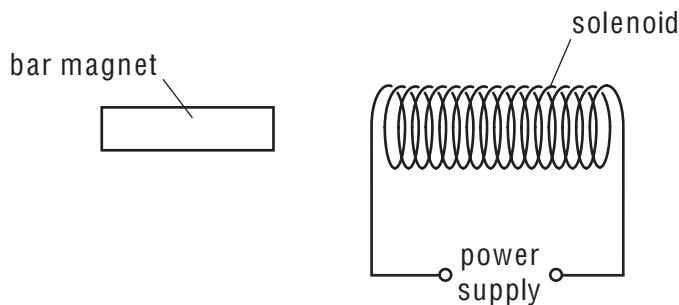
	magnetic pole at P	magnetic pole at Q
A	north	north
B	north	south
C	south	north
D	south	south

- 16 Two metal bars are held together. At least one of the bars is a magnet. The bars repel each other.

What does this show about the bars and why?

	what it shows	why
A	only one of the bars is a magnet	two magnets always attract each other
B	only one of the bars is a magnet	induced magnetism in the other bar makes it repel
C	they are both magnets	there must be like poles facing each other
D	they are both magnets	there must be opposite poles facing each other

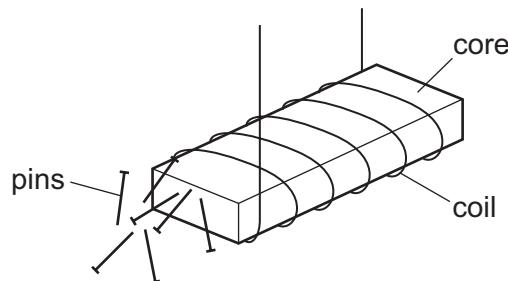
- 17 A solenoid carrying a current is used to demagnetise a bar magnet.



Which conditions achieve demagnetisation?

	current through solenoid	movement of bar magnet
A	a.c.	around the solenoid quickly
B	a.c.	through the solenoid slowly
C	d.c.	around the solenoid quickly
D	d.c.	through the solenoid slowly

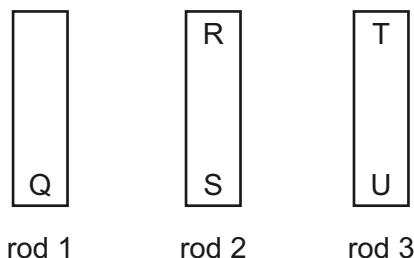
- 18 A strong electromagnet is used to attract pins.



What happens when the current in the coil is halved?

- A No pins are attracted.
- B Fewer pins are attracted.
- C The same number of pins is attracted.
- D Many more pins are attracted.

- 19 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.

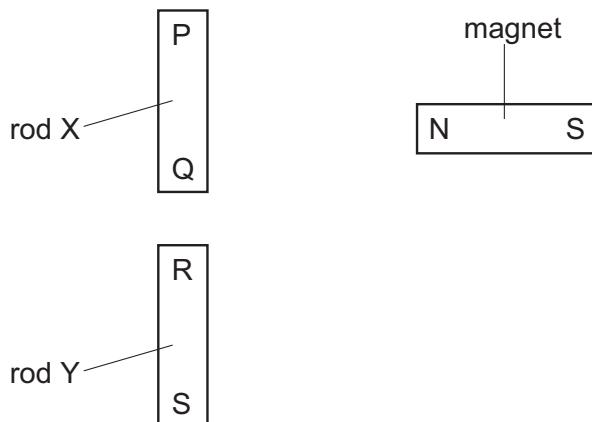
Which of the metal rods is a magnet?

- A rod 1 only  
B rod 1 and rod 2 only  
C rod 1 and rod 3 only  
D rod 3 only
- 20 A student investigates which end of a magnetic compass needle is attracted to a bar magnet.

What does the investigation show?

- A Both ends of the compass needle are attracted by the north pole of the magnet.  
B Both ends of the compass needle are attracted by the south pole of the magnet.  
C One end of the compass needle is attracted by the north pole and the other end by the south pole.  
D The compass needle is not attracted by either end of the magnet.

**21** Two rods X and Y look the same.



The N pole of a magnet is brought close, in turn, to each end of both rods. The results of these four actions are shown in the table.

end tested	result
P	attraction
Q	attraction
R	attraction
S	repulsion

Which of the rods is a permanent magnet?

- A** neither of the rods
- B** both of the rods
- C** rod X only
- D** rod Y only

**22** How many of the following methods could be used to demagnetise a piece of steel?

- heating it until it is red hot
- pulling it from a coil that is carrying an alternating current
- placing it in an east-west direction and hammering it
- putting it in a coil which is carrying a direct current

**A** 1

**B** 2

**C** 3

**D** 4

- 23 A student carries out four tests with a magnet.

Which result shown is **not** correct?

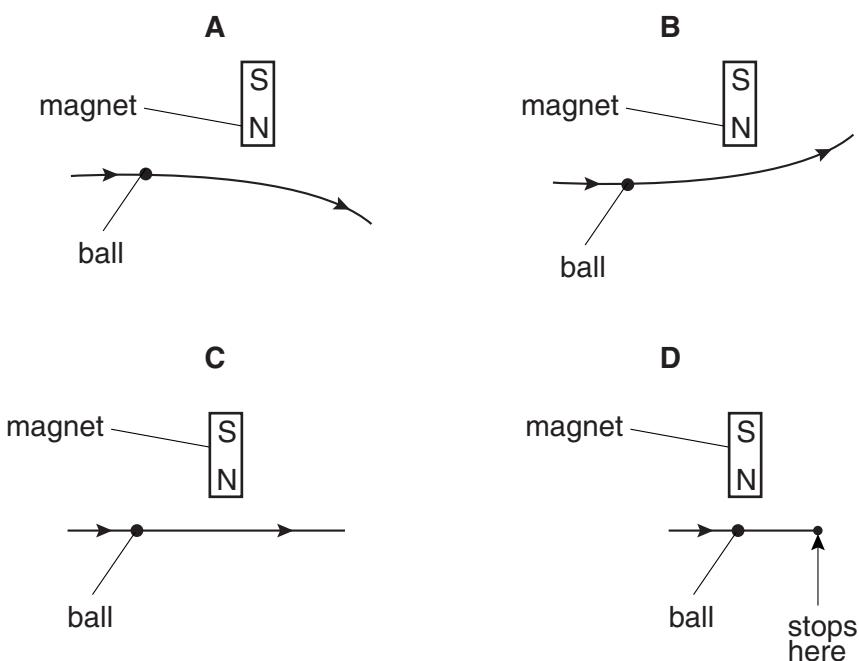
	arrangement		result
A	S magnet N	iron bar	attracts
B	S magnet N	S magnet N	attracts
C	N magnet S	copper bar	no effect
D	N magnet S	N magnet S	repels

- 24 How can a permanent magnet be demagnetised?

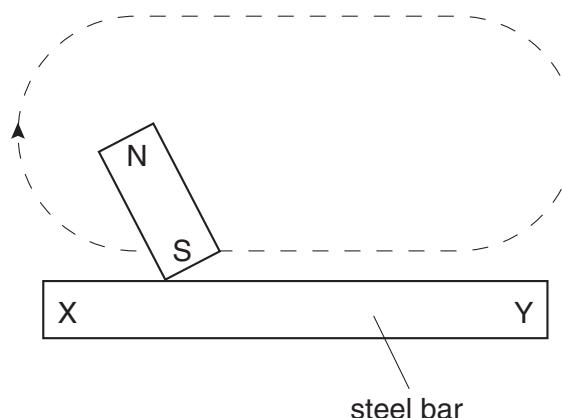
- A cool the magnet for a long time
- B hit the magnet repeatedly with a hammer
- C leave the magnet in a coil which carries direct current
- D pass a small current through the magnet

- 25 A steel ball on a horizontal wooden table rolls near the north pole of a bar magnet that is lying on the table.

Which diagram shows the most likely path of the ball, as seen from above the table?



- 26 A steel bar is magnetised by stroking it several times with the south pole of a magnet, as shown.



Which poles are formed at X and Y?

	X	Y
A	north	north
B	north	south
C	south	north
D	south	south

- 27 A metal rod XY is placed near a magnet. End X is attracted when it is placed near to the north pole of the magnet, and also when it is placed near to the south pole.



How does end Y behave when it is placed, in turn, near to the two poles of the magnet?

	Y near north pole	Y near south pole
A	attraction	attraction
B	attraction	repulsion
C	repulsion	attraction
D	repulsion	repulsion

- 28 A permanent magnet is placed close to a bar of soft iron PQ.



What happens?

- A P becomes a north pole.
- B P becomes a south pole.
- C PQ does not become magnetised.
- D The poles of the magnet are reversed.

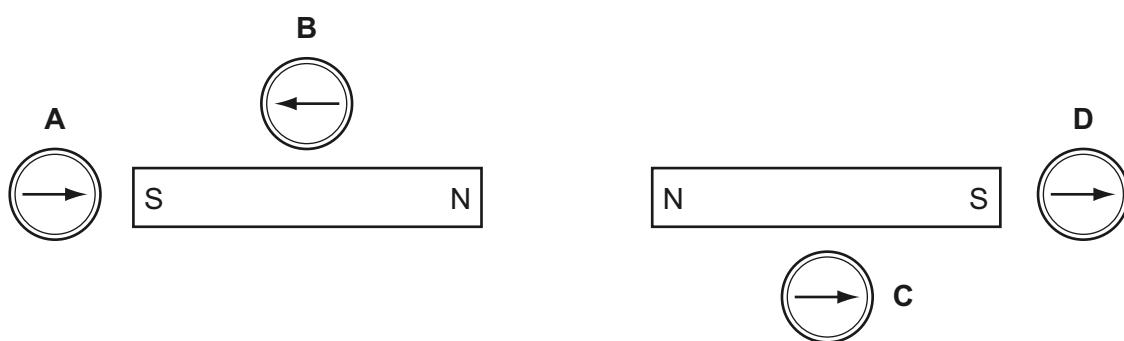
## 16.2 Magnetic fields

- 1 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

- 2 Four plotting compasses are placed in the magnetic field of two identical bar magnets as shown in the diagram.

Which compass is shown pointing in the wrong direction?

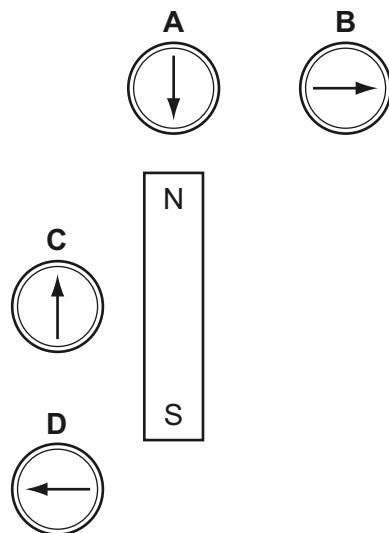


- 3 Which line in the table shows whether iron and steel are ferrous or non-ferrous materials?

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

- 4 Four plotting compasses are placed near a bar magnet.

Which plotting compass is shown pointing in the correct direction?



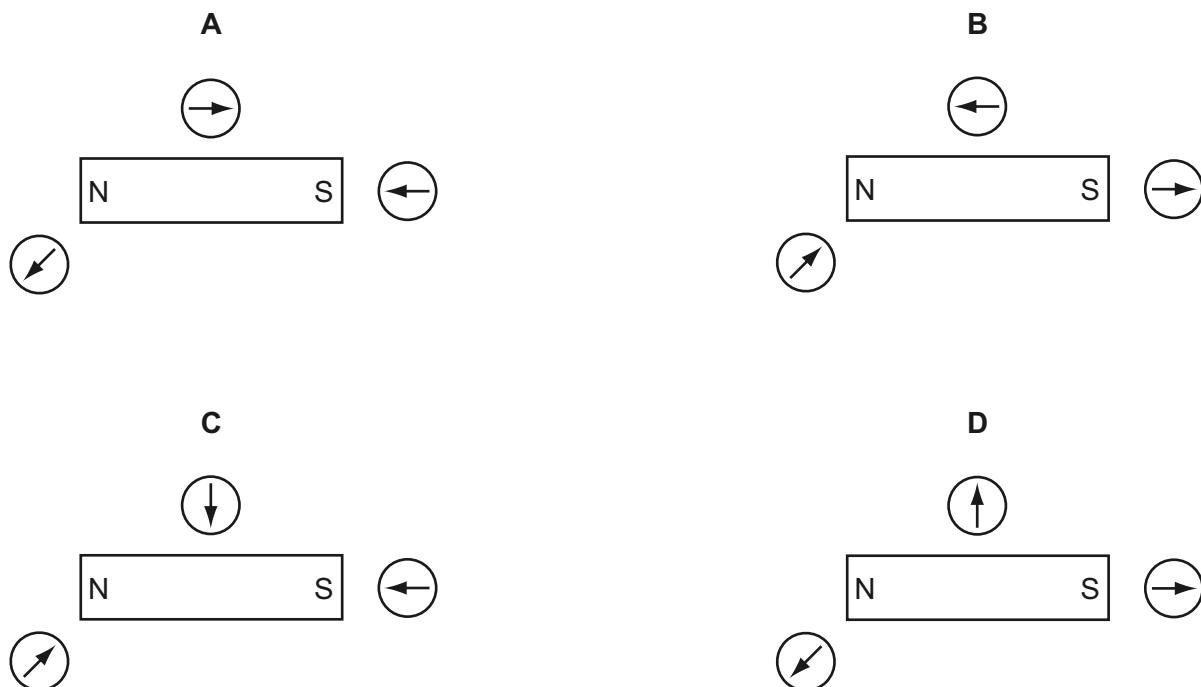
- 5 Small particles of metal are scattered near a bar magnet to show the pattern of the magnetic field.

Which metal is suitable?

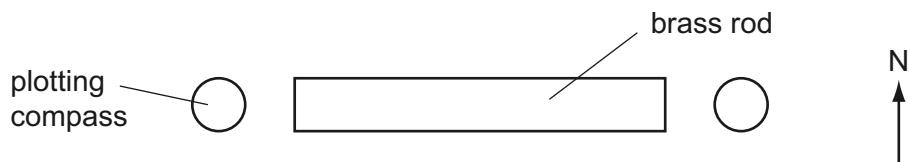
- A aluminium
- B brass
- C copper
- D iron

- 6 A student uses three small plotting compasses to investigate the magnetic field around a bar magnet.

Which diagram shows the directions in which the compass needles point?



- 7 A brass rod is positioned in an east-west direction and a plotting compass is placed at each end.

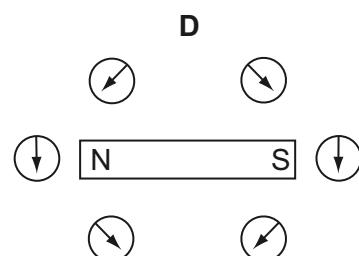
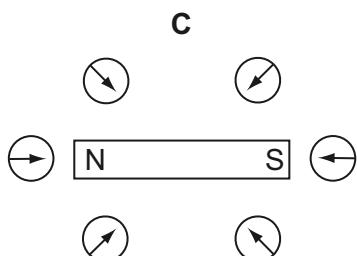
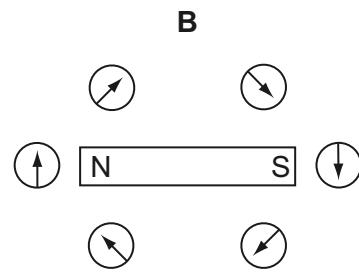
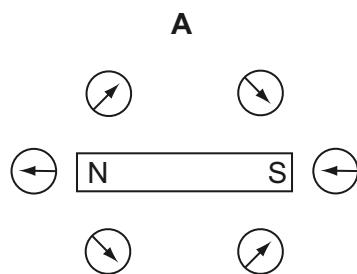


Which diagram shows the positions of the needles of the plotting compasses?

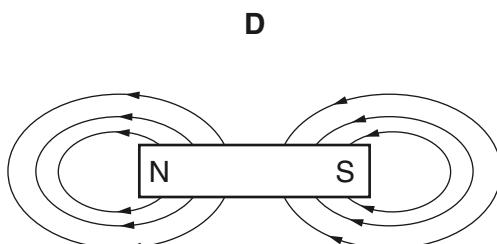
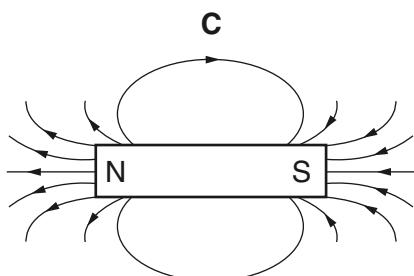
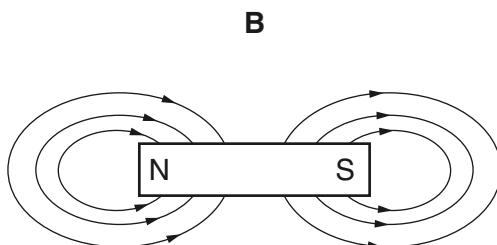
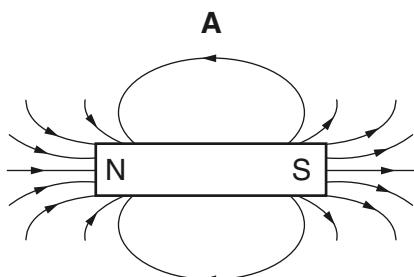
- A
- B
- C
- D

- 8** Six small compasses are placed around a bar magnet.

Which diagram shows the directions in which the compass needles point?



- 9** Which diagram best shows the pattern of field lines around a bar magnet?



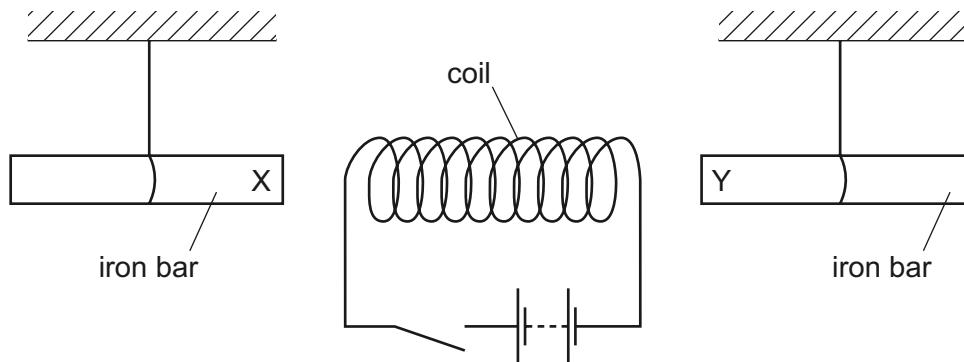
### 16.3 Electromagnets

- 1 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

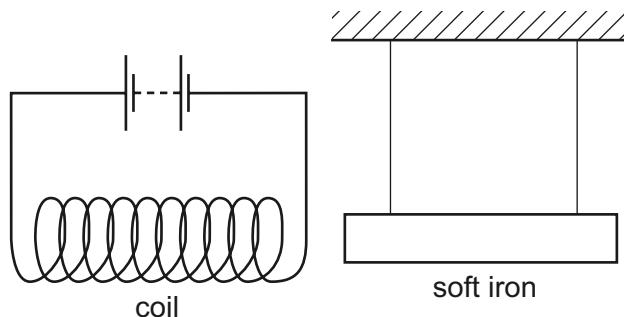
- 2 The diagram shows a coil connected to a battery and a switch. Two unmagnetised iron bars hang freely near opposite ends of the coil.



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.

- 3 A coil is connected to a battery and a soft iron bar is hung near to it.

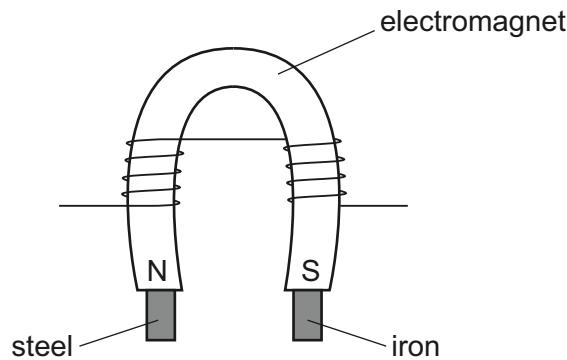


The current is then reversed by reversing the battery connections.

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

	with the battery as shown	with the battery reversed
A	attracted to the coil	attracted to the coil
B	attracted to the coil	repelled from the coil
C	repelled from the coil	attracted to the coil
D	repelled from the coil	repelled from the coil

- 4 A piece of iron and a piece of steel are picked up by an electromagnet as shown.



The current to the electromagnet is switched off.

What happens?

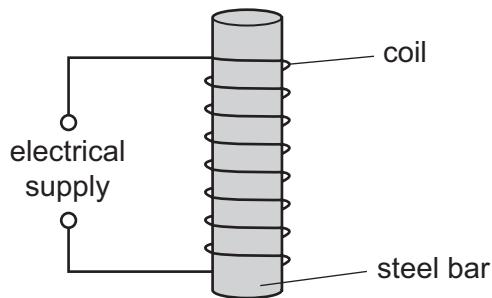
- A Both the iron and the steel remain magnetised.
- B Neither the iron nor the steel remain magnetised.
- C Only the iron remains magnetised.
- D Only the steel remains magnetised.

5 An electromagnet is used to separate magnetic metals from non-magnetic metals.

Why is steel unsuitable as the core of the electromagnet?

- A It forms a permanent magnet.
- B It has a high density.
- C It has a high thermal capacity.
- D It is a good conductor of electricity.

6 A student wishes to demagnetise a steel bar. He uses the apparatus shown.



Which type of electrical supply should the student use and what should he do with the steel bar?

	supply	what to do with the steel bar
<b>A</b>	a.c.	keep it inside the coil
<b>B</b>	a.c.	slowly remove it from the coil
<b>C</b>	d.c.	keep it inside the coil
<b>D</b>	d.c.	slowly remove it from the coil

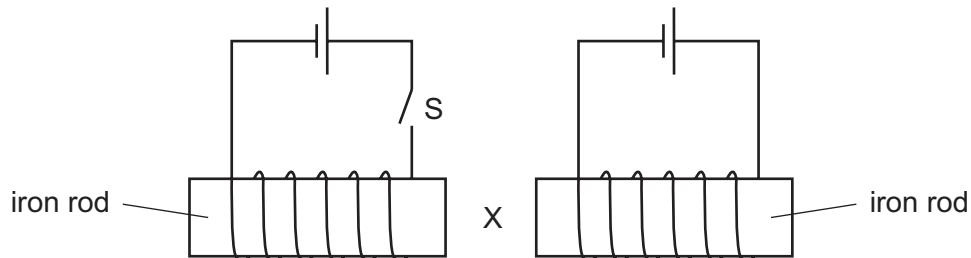
7 Which materials are suitable for making a permanent magnet and the core of an electromagnet?

	permanent magnet	core of an electromagnet
<b>A</b>	iron	iron
<b>B</b>	iron	steel
<b>C</b>	steel	iron
<b>D</b>	steel	steel

8 From which materials are the coil and the core of an electromagnet made?

	coil	core
A	copper	copper
B	copper	iron
C	iron	copper
D	iron	iron

9 Two circuits are set up as shown. The iron rods are placed close together, and are free to move.



What happens to the size of the gap at X when switch S is closed?

- A It decreases.
  - B It decreases then increases.
  - C It increases.
  - D It does not change.
- 10 Which material is used for the core of an electromagnet?

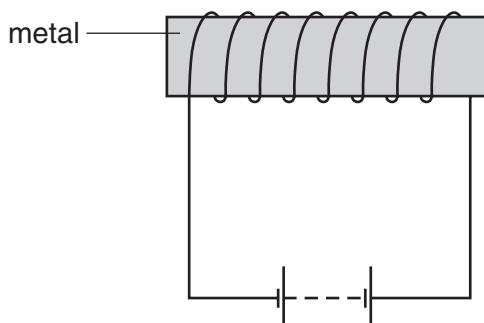
- A aluminium
- B copper
- C iron
- D steel

11 An electromagnet is used to separate magnetic metals from non-magnetic metals.

Why is steel unsuitable as the core of the electromagnet?

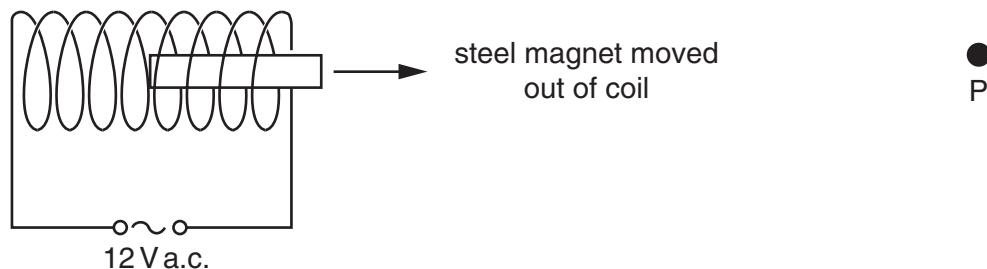
- A It is a good conductor of electricity.
- B It forms a permanent magnet.
- C It has a high density.
- D It has a high thermal capacity.

- 12 A student wishes to use a magnetising coil to make a permanent magnet from a piece of metal.



Which metal should she use?

- A** aluminium
  - B** copper
  - C** iron
  - D** steel
- 13 A piece of magnetised steel is placed inside a coil of wire that has a large alternating current passing through it. The magnet is slowly moved out of the coil to position P.



How has the steel changed when it reaches P?

- A** It has become demagnetised.
- B** There has been no change.
- C** It has become a stronger magnet.
- D** The poles have changed ends.

14 Which materials are suitable to make a permanent magnet and the core of an electromagnet?

	permanent magnet	core of an electromagnet
<b>A</b>	iron	iron
<b>B</b>	iron	steel
<b>C</b>	steel	iron
<b>D</b>	steel	steel

## Chapter 17. Static electricity

### 17.1 Charging and discharging

- 1 A polythene rod repels an inflated balloon hanging from a nylon thread.

What charges must the rod and the balloon carry?

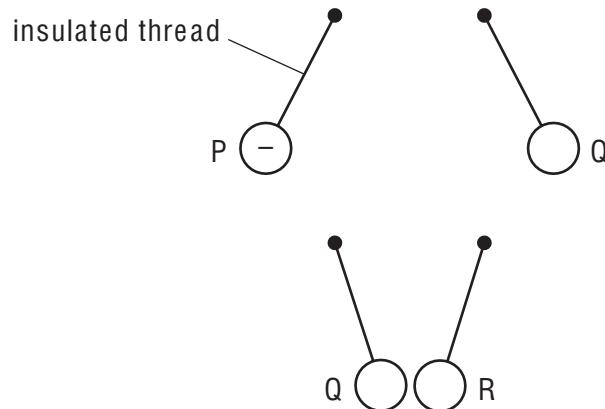
- A The rod and the balloon carry opposite charges.
- B The rod and the balloon carry like charges.
- C The rod is charged but the balloon is not.
- D The balloon is charged but the rod is not.

- 2 ~~A polythene rod repels an inflated balloon hanging from a nylon thread.~~

What charges must the rod and the balloon carry?

- A The rod and the balloon carry opposite charges.
- B The rod and the balloon carry like charges.
- C The rod is charged but the balloon is not.
- D The balloon is charged but the rod is not.

- 3 Three charged balls, P, Q and R, are suspended by insulated threads. Ball P is negatively charged.



What are the charges on Q and on R?

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

- 4 When a plastic comb is placed next to a small piece of aluminium foil hanging from a nylon thread, the foil is repelled by the comb.

Why is this?

- A The comb is charged and the foil is uncharged.
- B The comb is uncharged and the foil is charged.
- C The comb and the foil have charge of opposite signs.
- D The comb and the foil have charge of the same sign.

## 17.2 Explaining static electricity

- 1 A plastic rod is rubbed with a dry cloth and becomes positively charged.

Why has the rod become positively charged?

- A It has gained electrons.
- B It has gained neutrons.
- C It has lost electrons.
- D It has lost neutrons.

- 2 A polythene rod repels an inflated balloon hanging from a nylon thread.

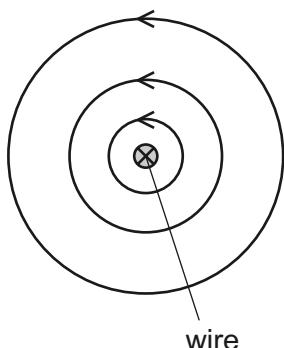
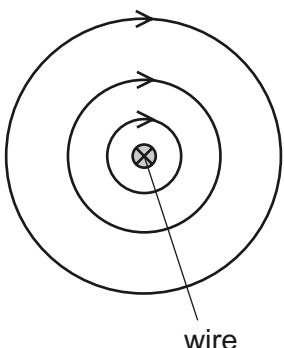
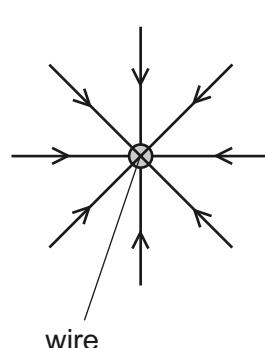
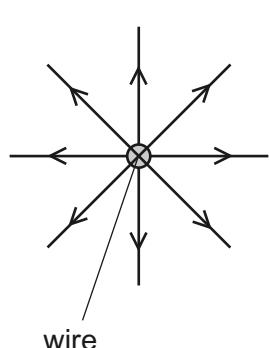
What charges must the rod and the balloon carry?

- A The rod and the balloon carry opposite charges.
- B The rod and the balloon carry like charges.
- C The rod is charged but the balloon is not.
- D The balloon is charged but the rod is not.

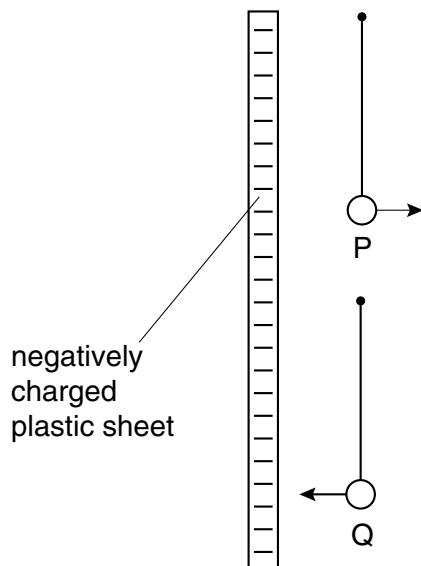
### 17.3 Electric fields

- 1 The diagrams show a straight wire carrying a current into the paper.

Which diagram shows the magnetic field pattern due to this current?

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

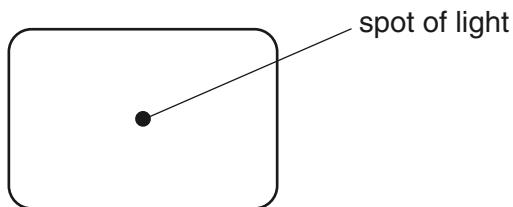
- 2 Two very light, charged balls P and Q are hung, one above the other, from nylon threads. When a negatively charged plastic sheet is placed alongside them, P is repelled and Q is attracted.



What are the original charges on P and on Q?

	charge on P	charge on Q
<b>A</b>	negative	negative
<b>B</b>	negative	positive
<b>C</b>	positive	negative
<b>D</b>	positive	positive

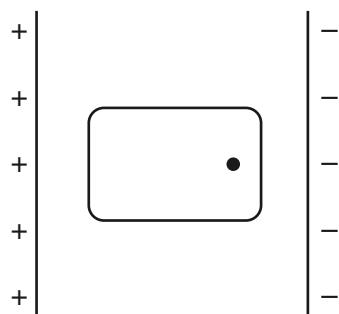
- 3 The diagram below shows the screen of a cathode-ray oscilloscope tube.



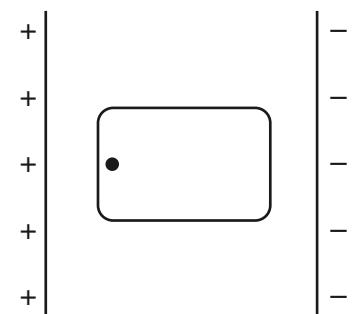
The tube is placed between a pair of charged plates.

Which diagram shows the new position of the spot?

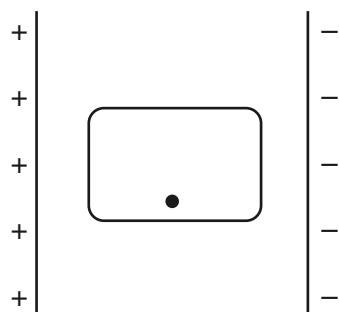
A



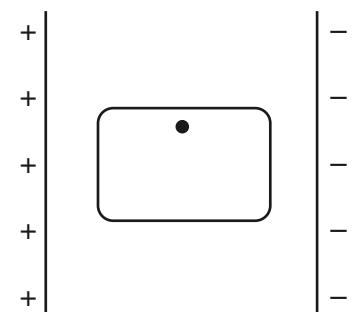
B



C

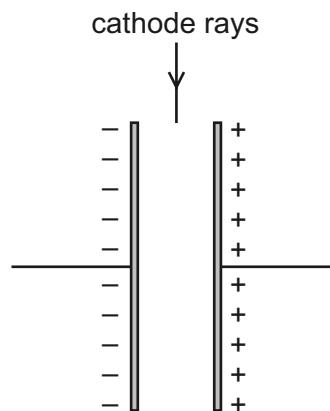


D



## 17.4 Electric force

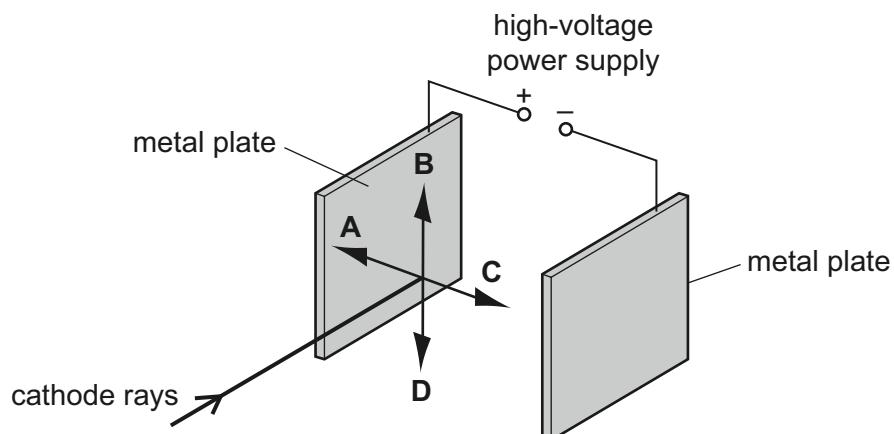
- 1 A beam of cathode rays passes between two parallel, charged metal plates in a vacuum.



In which direction is the beam deflected?

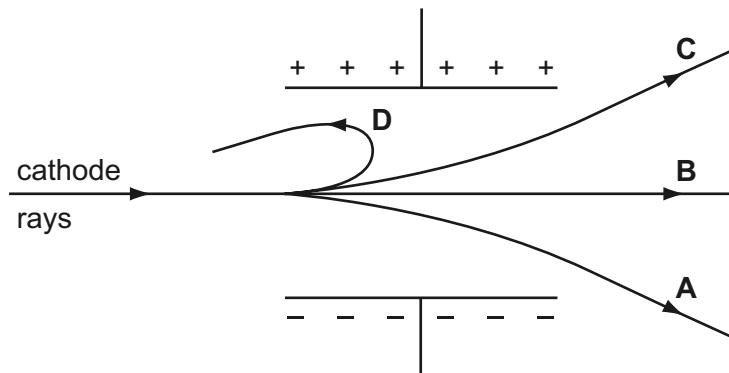
- A into the page
  - B out of the page
  - C to the left of the page
  - D to the right of the page
- 2 Two parallel metal plates in a vacuum are connected to the terminals of a high-voltage power supply. A beam of cathode rays is passed into the space between the two plates, as shown.

In which direction does the beam of cathode rays deflect?



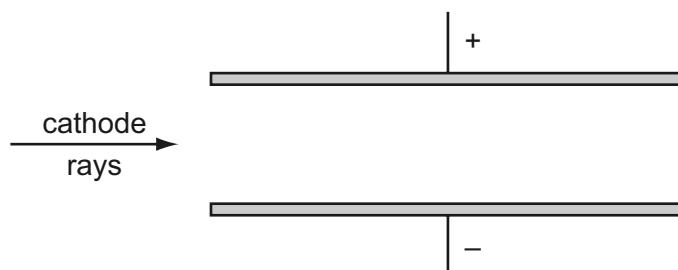
- 3 A beam of cathode rays passes between two parallel metal plates connected to a high-voltage d.c. power supply.

Which path does the beam follow?



- 4 An electric field is set up between two parallel plates.

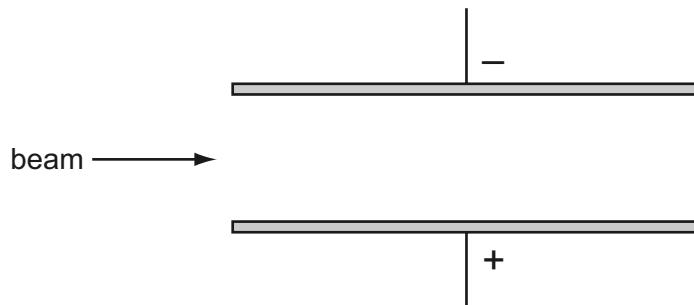
Cathode rays are directed into this field, parallel to the plates.



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

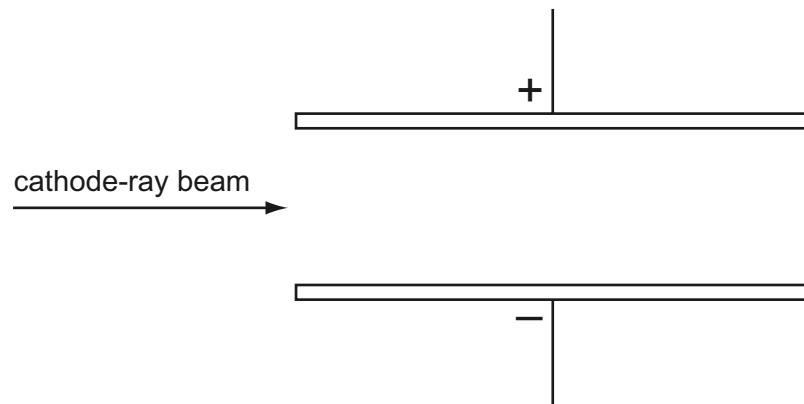
- A downwards
- B upwards
- C into the page
- D out of the page

- 5 The diagram shows a beam of cathode rays entering an electric field.



In which direction is the beam deflected by the field?

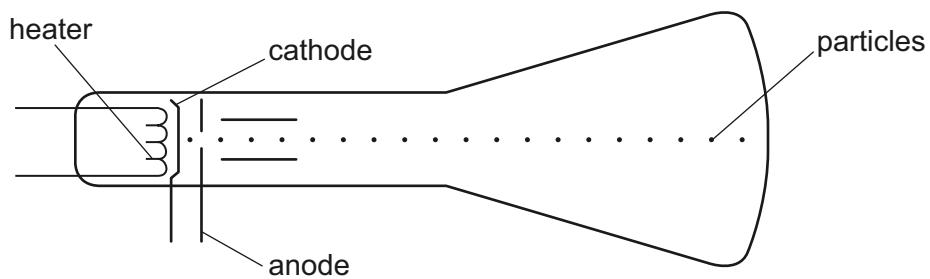
- A downwards
  - B upwards
  - C into the page
  - D out of the page
- 6 Which particle does **not** experience a force due to an electric field?
- A  $\alpha$ -particle
  - B electron
  - C neutron
  - D proton
- 7 A cathode-ray beam passes through an electric field between charged parallel plates.



In which direction is the beam deflected?

- A towards the negative plate
- B towards the positive plate
- C into the page
- D out of the page

- 8 Particles are emitted by a heated cathode in a cathode-ray tube.



What are these particles?

- A atoms
- B electrons
- C neutrons
- D protons

## Chapter 18. Electrical quantities

### 18.1 Electrical current

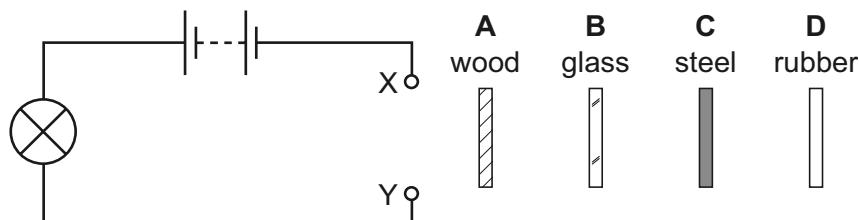
- 1 Which is the worst electrical conductor?
  - A aluminium
  - B carbon (graphite)
  - C iron
  - D sulfur
- 2 Which of these is an electric current?
  - A a beam of atoms
  - B a beam of electrons
  - C a beam of molecules
  - D a beam of neutrons
- 3 When there is an electric current in a metal wire, what flows through the wire?
  - A atoms
  - B electrons
  - C neutrons
  - D protons
- 4 How many of the following materials conduct electricity?

aluminium  
silver  
iron  
plastic

**A** 1      **B** 2      **C** 3      **D** 4

- 5 A circuit is set up with a gap between two terminals X and Y. The four strips of material shown in the diagram are connected in turn across the gap.

Which strip completes the circuit so that the lamp lights?



## 18.2 Voltage

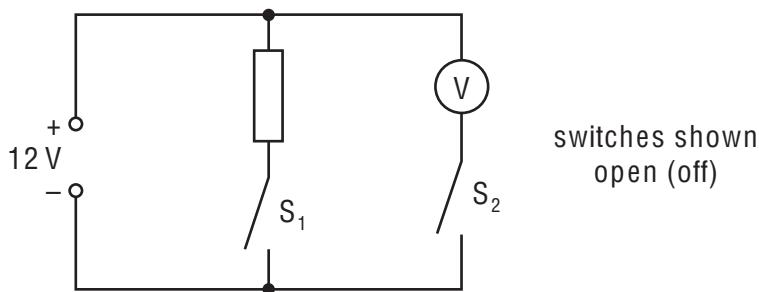
1 In which unit is potential difference measured?

- A** ampere
- B** ohm
- C** volt
- D** watt

2 In which unit is EMF measured?

- A** ampere
- B** ohm
- C** volt
- D** watt

3 In the circuit shown, the switches  $S_1$  and  $S_2$  may be open (off) or closed (on).



Which line in the table shows the voltmeter reading for the switch positions given?

	$S_1$	$S_2$	voltmeter reading/V
<b>A</b>	open	open	12
<b>B</b>	closed	closed	12
<b>C</b>	open	closed	0
<b>D</b>	closed	open	12

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

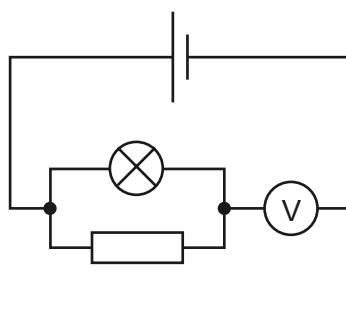
She has the resistor, the battery and some connecting wires.

What else does she need?

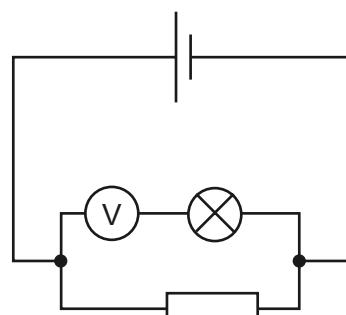
- A a voltmeter only
- B an ammeter only
- C an ammeter and a voltmeter
- D a force meter (newton meter) and a voltmeter

- 5 In which circuit does the voltmeter read the potential difference across the lamp?

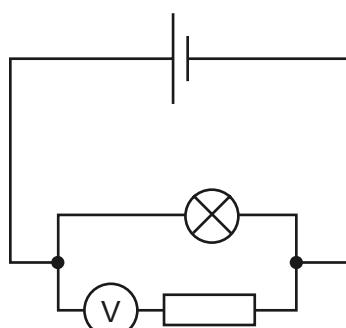
A



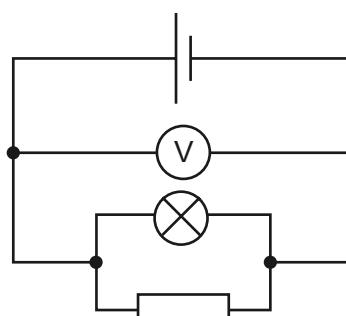
B



C

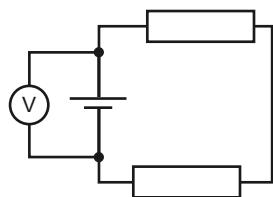


D

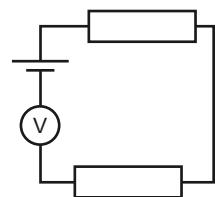


- 6 Which circuit shows how a voltmeter is connected to measure the potential difference across the cell?

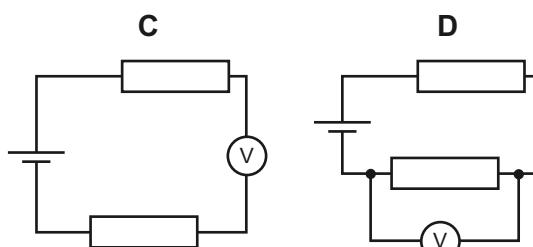
A



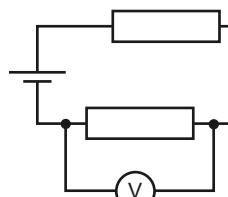
B



C



D

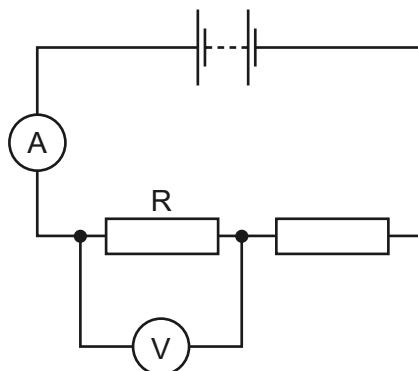


7 Which two electrical quantities are measured in volts?

- A** current and e.m.f.
- B** current and resistance
- C** e.m.f. and potential difference
- D** potential difference and resistance

### 18.3 Electrical resistance

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



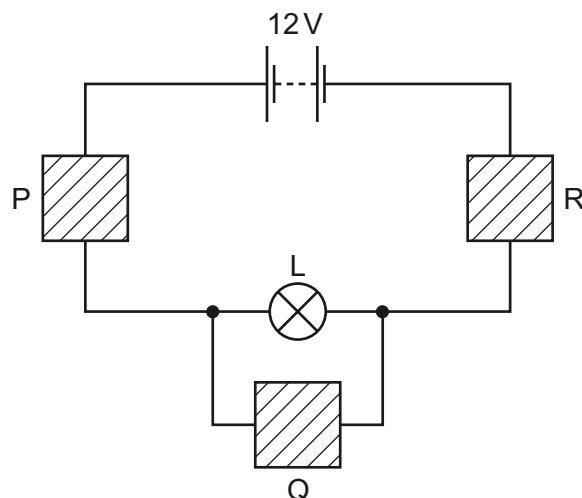
The reading on the ammeter is 2.0 A and the reading on the voltmeter is 8.0 V.

What is the resistance of resistor R?

- A  $0.25\Omega$       B  $4.0\Omega$       C  $10\Omega$       D  $16\Omega$

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

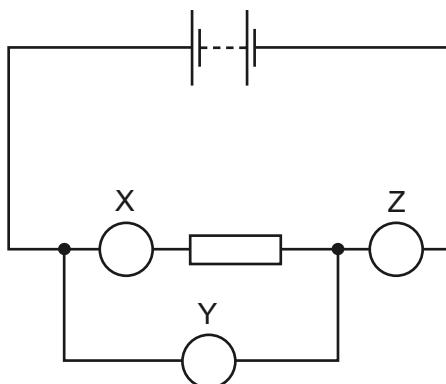
Blocks P, Q and R represent the different components used.



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

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



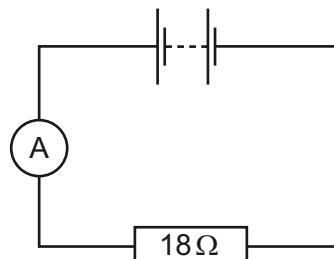
What are meters X, Y and Z?

	X	Y	Z
<b>A</b>	ammeter	ammeter	ammeter
<b>B</b>	ammeter	voltmeter	ammeter
<b>C</b>	voltmeter	ammeter	voltmeter
<b>D</b>	voltmeter	voltmeter	voltmeter

- 4** Which symbols are used for the units of current and of resistance?

	unit of current	unit of resistance
<b>A</b>	A	W
<b>B</b>	A	$\Omega$
<b>C</b>	C	W
<b>D</b>	C	$\Omega$

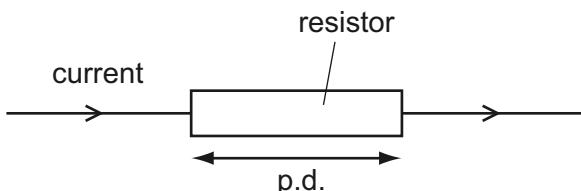
- 5** An ammeter and an  $18\ \Omega$  resistor are connected in series with a battery. The reading on the ammeter is 0.50 A. The resistance of the battery and the ammeter can be ignored.



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

- A** 9.0 N      **B** 9.0 V      **C** 36 N      **D** 36 V

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

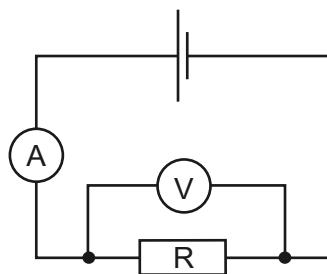


The p.d. and the resistance of the resistor can both be changed.

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

- 7 A circuit is set up to measure the resistance of a resistor R. The meter readings are 2.0 A and 3.0 V.



What is the resistance of the resistor R?

- A  $0.67\Omega$       B  $1.5\Omega$       C  $5.0\Omega$       D  $6.0\Omega$

- 8 The table shows the lengths and diameters of four copper wires.

Which wire has the **least** resistance?

	length/m	diameter/mm
A	0.50	1.0
B	0.50	2.5
C	0.75	1.0
D	0.75	2.5

- 9 A student uses a length of wire as a resistor. He discovers that the resistance of the wire is too small.

To be certain of making a resistor of higher value, he should use a piece of wire that is

- A longer and thicker.
- B longer and thinner.
- C shorter and thicker.
- D shorter and thinner.

- 10 A pupil measures the potential difference across a device and the current in it.

Which calculation gives the resistance of the device?

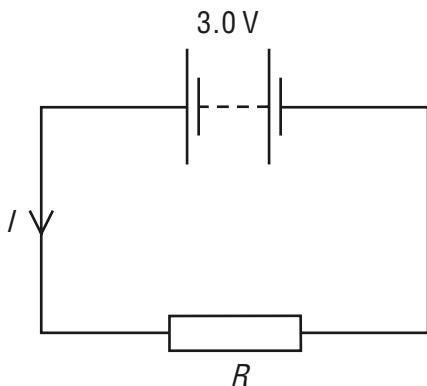
- A current + potential difference
- B current ÷ potential difference
- C potential difference ÷ current
- D potential difference × current

- 11 The table shows the voltage and current ratings for four electric heaters.

Which heater has the least resistance?

	voltage/V	current/A
A	110	5.0
B	110	10.0
C	230	5.0
D	230	10.0

- 12 The circuit shows a current  $I$  in a resistor of resistance  $R$ .



Which line gives possible values of  $I$  and of  $R$ ?

	$I/A$	$R/\Omega$
A	1.5	1.5
B	1.5	2.0
C	6.0	2.0
D	4.0	12.0

- 13 Four wires are made from the same material.

Which wire has the greatest resistance?

	length of wire / cm	diameter of wire / mm
A	50	0.1
B	50	0.2
C	100	0.1
D	100	0.2

- 14 A student uses a length of wire as a resistor. He discovers that the resistance of the wire is too small.

To be certain of making a resistor of higher value, he should use a piece of wire that is

- A longer and thicker.
- B longer and thinner.
- C shorter and thicker.
- D shorter and thinner.

15 What are the symbols used for the units of current and resistance?

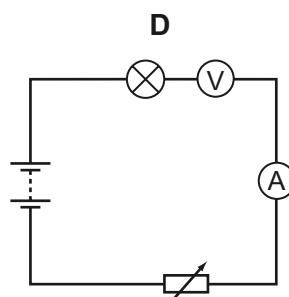
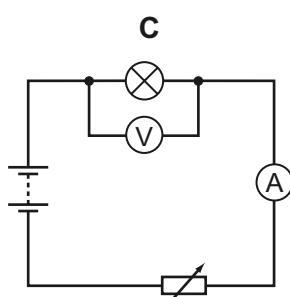
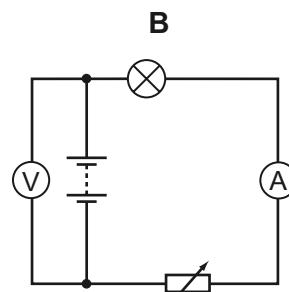
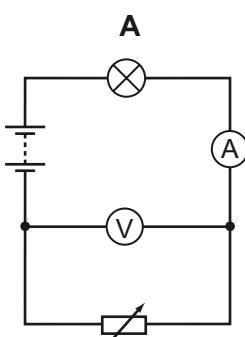
	unit of current	unit of resistance
A	A	W
B	A	$\Omega$
C	V	W
D	V	$\Omega$

16 The table shows the voltage and current ratings for four electric heaters.

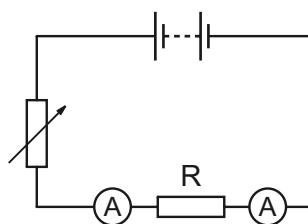
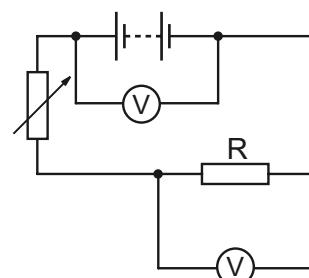
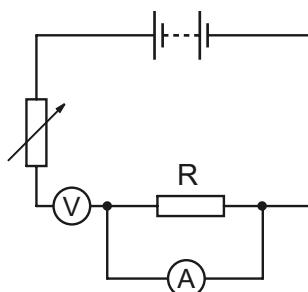
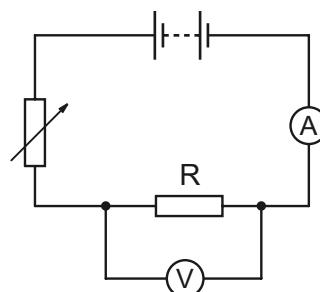
Which heater has the least resistance?

	voltage/V	current/A
A	110	5.0
B	110	10
C	230	5.0
D	230	10

17 Which circuit should be used to find the resistance of a lamp?



18 Which circuit could be used to find the resistance of resistor R?

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

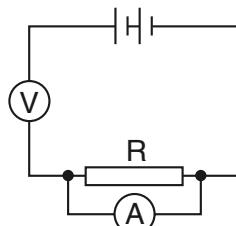
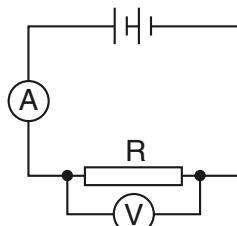
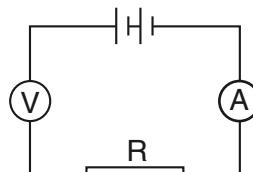
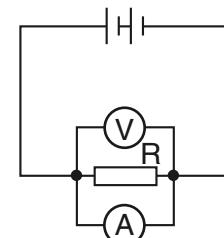
19 A pupil measures the potential difference across a device and the current in it.

Which calculation gives the resistance of the device?

- A** current + potential difference
- B** current ÷ potential difference
- C** potential difference ÷ current
- D** potential difference x current

20 A student wants to find the resistance of resistor R using a voltmeter and an ammeter.

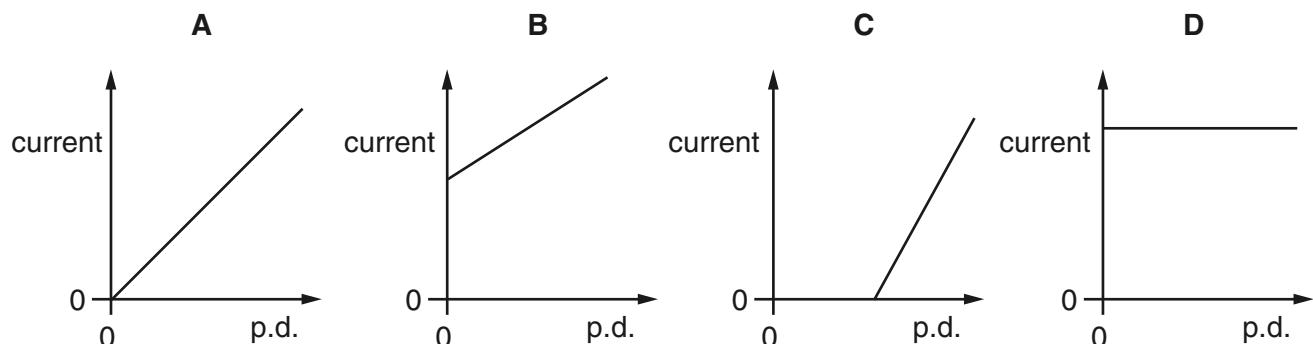
Which circuit should the student use?

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

- 21 When the potential difference (p.d.) across a piece of resistance wire is changed, the current through the wire also changes.

The temperature of the wire is kept the same.

Which graph shows how the p.d. and current are related?



- 22 The table shows the voltage and current ratings for four light bulbs.

Which bulb has the greatest resistance when used normally?

	voltage / V	current / A
<b>A</b>	2	0.5
<b>B</b>	3	0.2
<b>C</b>	6	12
<b>D</b>	12	1.0

- 23 Which of the following pieces of copper wire has the greatest electrical resistance?

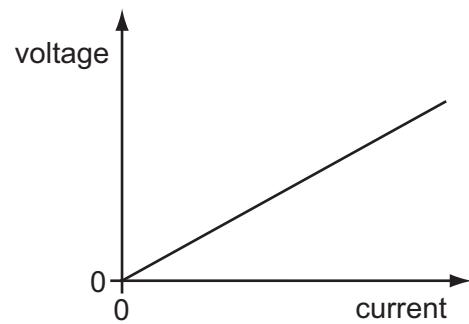
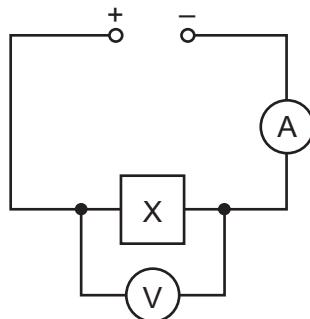
	length / m	diameter / mm
<b>A</b>	5.0	0.05
<b>B</b>	5.0	0.10
<b>C</b>	50	0.05
<b>D</b>	50	0.10

### 18.4 I-V curve

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

The voltage-current graph for X is as shown.

variable voltage supply



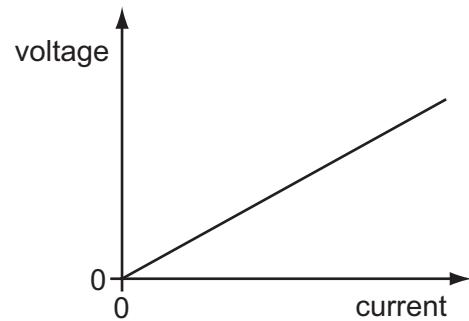
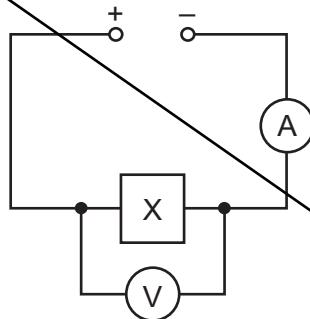
What is the component X?

- A a lamp
- B a closed switch
- C an open switch
- D a resistor of constant resistance

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

The voltage-current graph for X is as shown.

variable voltage supply



What is the component X?

- A a capacitor
- B a closed switch
- C an open switch
- D a resistor of constant resistance

### 18.5 Electrical energy

- 1 An electric heater is connected to the mains 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.

## Chapter 19. Electric circuits

### 19.1 Circuit components

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

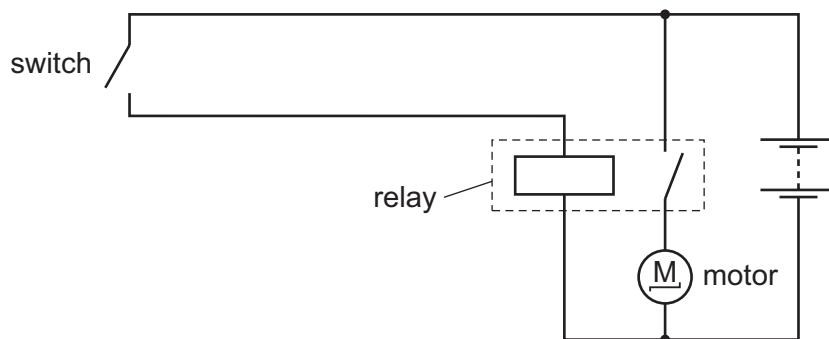
Which type of force is produced by the small current to activate the relay?

- A electrical
- B frictional
- C gravitational
- D magnetic

- 2 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

- 3 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

- 4 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

- 5 Which circuit includes a capacitor and what does the capacitor do in this circuit?

	circuit	what the capacitor does
A	potential divider	stores current
B	potential divider	stores energy
C	time delay	stores current
D	time delay	stores energy

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

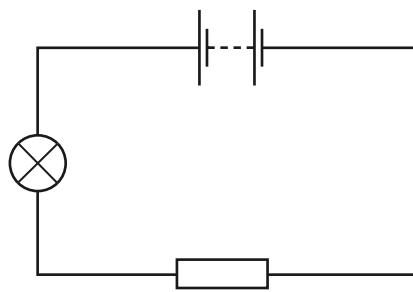
- A a closed switch
- B a potentiometer
- C a resistor
- D a thermistor

- 7 A lamp is connected in four circuits in turn, each using identical batteries.

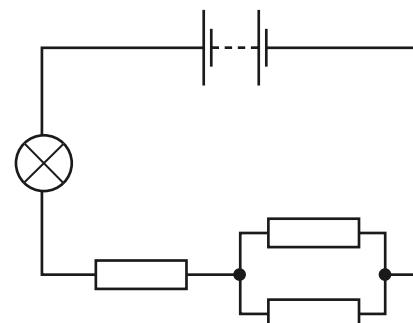
The resistors are all identical.

In which circuit will the lamp be brightest?

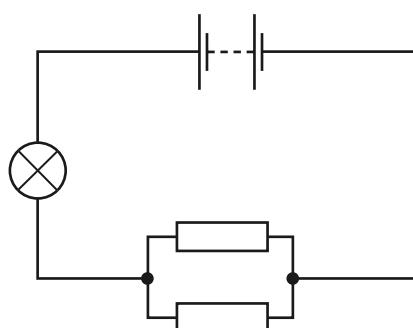
**A**



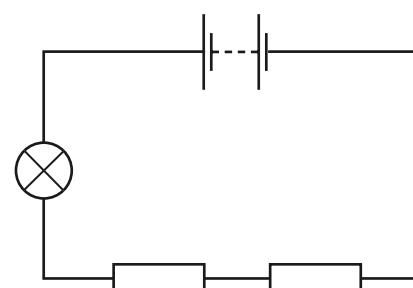
**B**



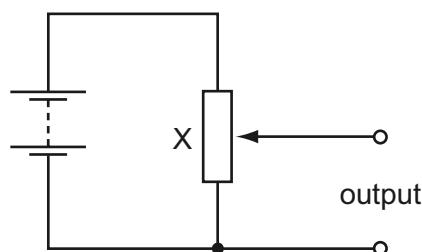
**C**



**D**



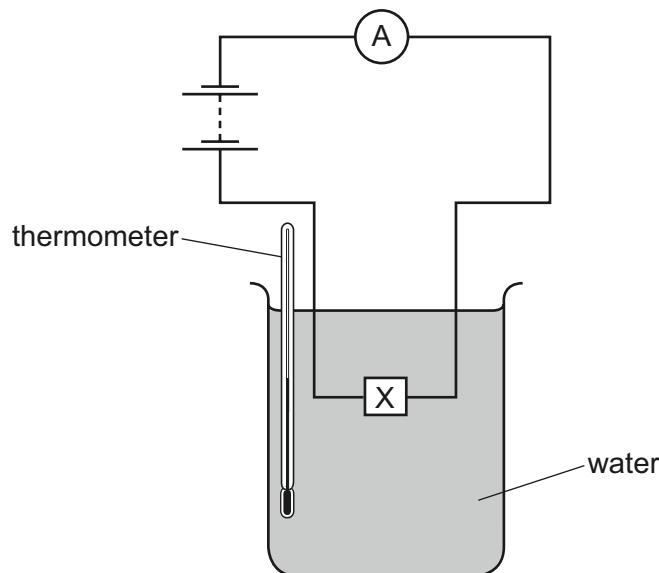
- 8 The circuit shown is a potential divider.



What is component X?

- A** a light-dependent resistor
- B** a relay
- C** a thermistor
- D** a variable resistor

- 9 Which device is designed to allow a small direct current (d.c.) to control a large direct current (d.c.)?
- A a generator  
B a motor  
C a relay  
D a transformer
- 10 An electrical component X is placed in water, as shown.

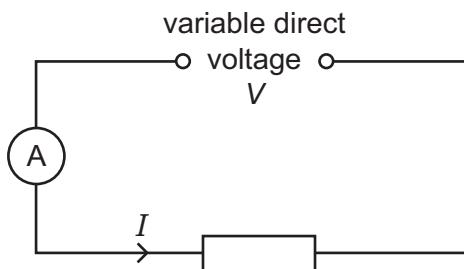


When the temperature of the water is increased, the reading on the ammeter increases.

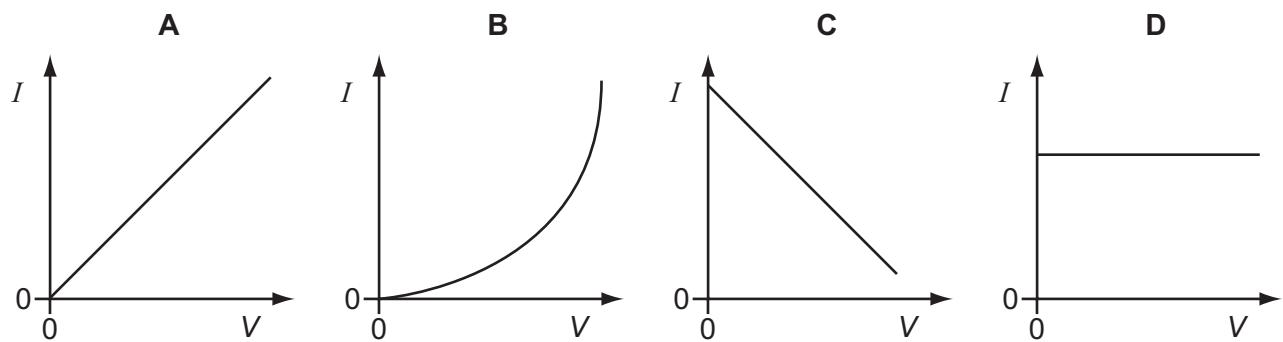
What is component X?

- A a capacitor  
B a light-dependent resistor  
C a relay  
D a thermistor

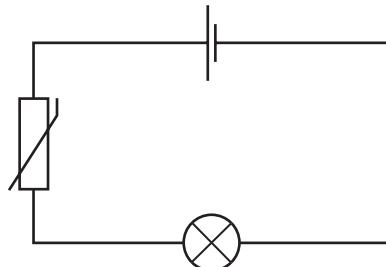
- 11 Using the circuit shown, the current  $I$  is found for various voltages  $V$ . The temperature of the resistor does not change.



Which graph shows the results obtained?



- 12 When the thermistor in the circuit below is heated, the lamp becomes brighter.



Why does this happen?

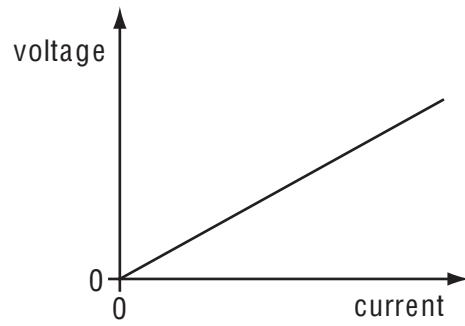
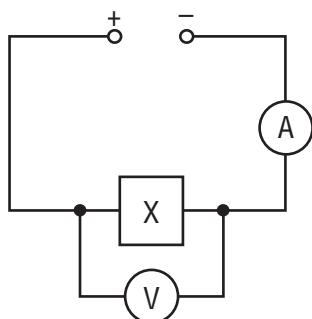
- A** The resistance of the lamp decreases.
  - B** The resistance of the lamp increases.
  - C** The resistance of the thermistor decreases.
  - D** The resistance of the thermistor increases.
- 13 Which circuit symbol represents a component used to store energy?



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

The voltage-current graph for X is as shown.

variable voltage supply

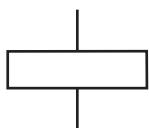


What is the component X?

- A a lamp
- B a closed switch
- C a metallic resistor
- D an open switch

15 What is the symbol for a fuse?

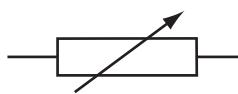
A



B



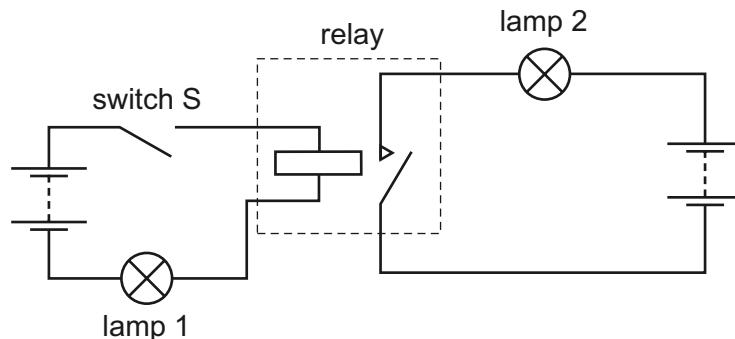
C



D



- 16 The circuit contains a relay.

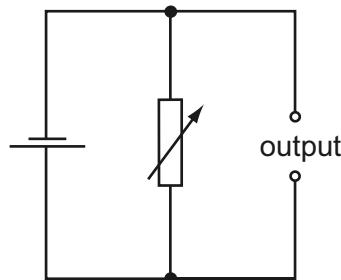


When switch S is closed, what is the state of the lamps?

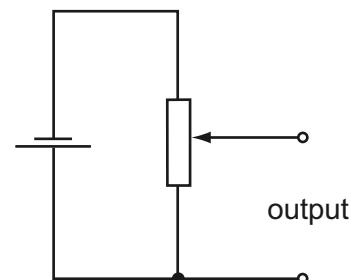
	lamp 1	lamp 2
A	on	on
B	on	off
C	off	on
D	off	off

- 17 Which circuit is a variable potential divider (potentiometer)?

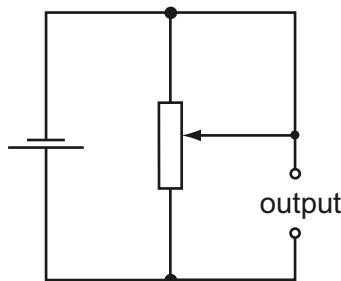
A



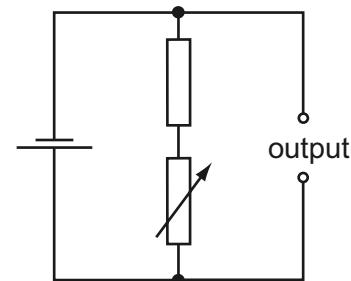
B



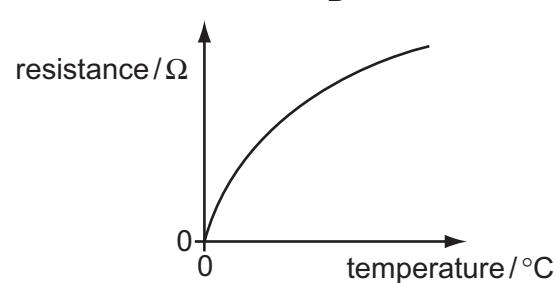
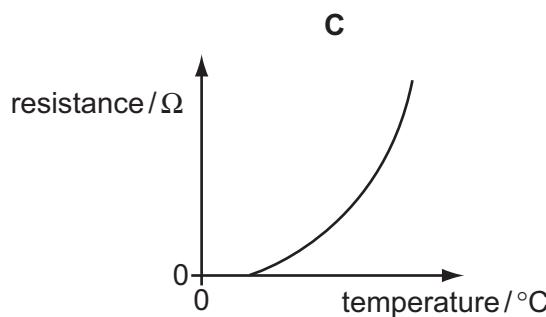
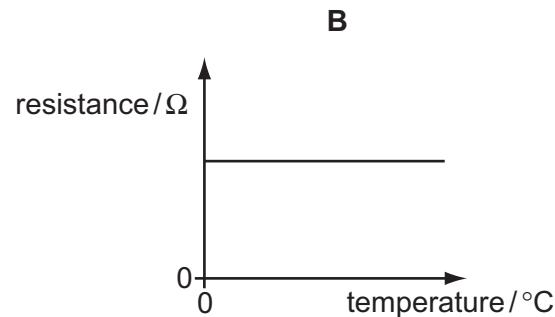
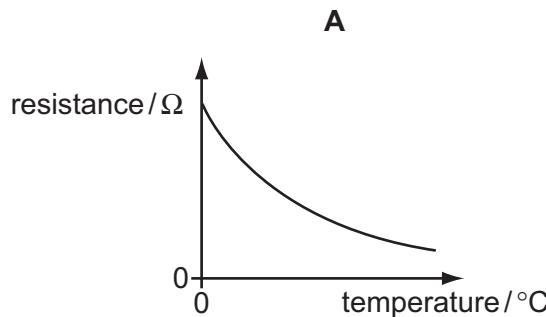
C



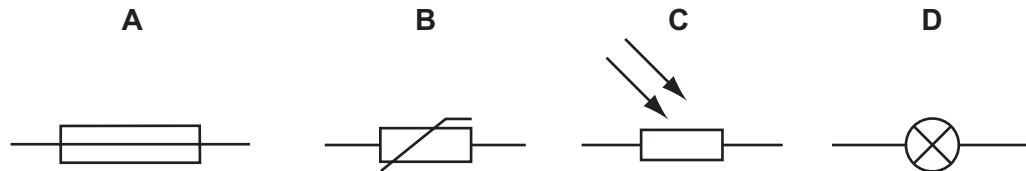
D



18 Which graph shows how the resistance of a thermistor changes with temperature?



19 Which symbol represents an electrical component used to store energy?

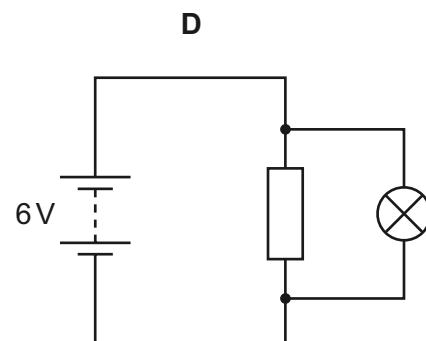
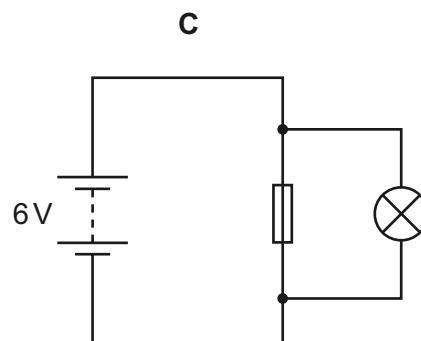
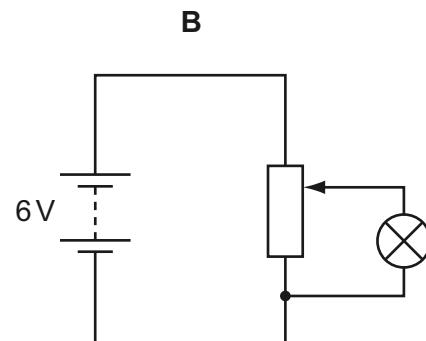
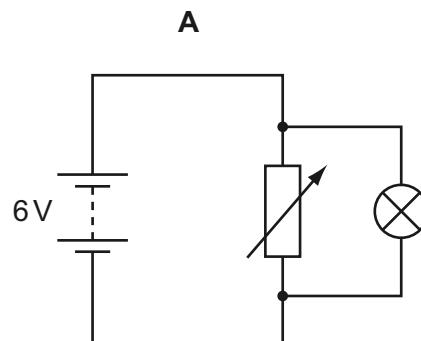


20 Which component can store energy for use in time delay circuits?

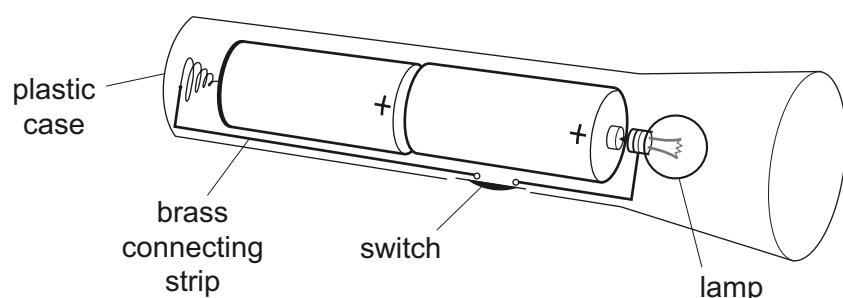
- A** capacitor
- B** potentiometer
- C** resistor
- D** thermistor

- 21 A lamp is to be connected in a circuit so that the p.d. across it can be varied from 0 to 6 V.

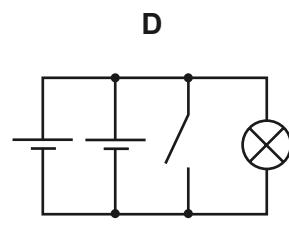
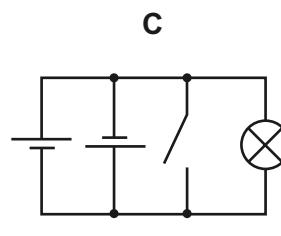
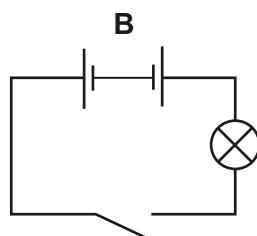
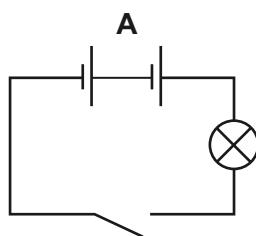
Which circuit would be most suitable?



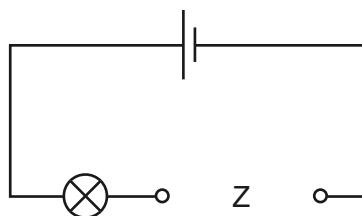
- 22 The diagram shows a torch containing two 2 V cells, a switch and a lamp.



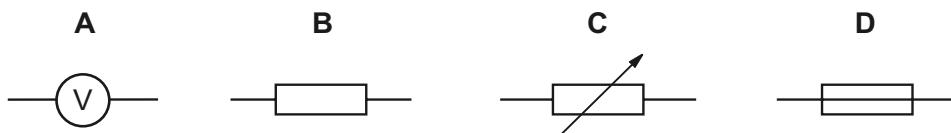
What is the circuit diagram for the torch?



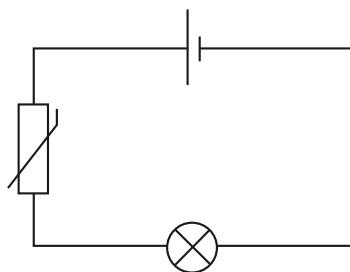
- 23 An electrical component is to be placed in the circuit at Z, to allow the brightness of the lamp to be varied from bright to dim.



What should be connected at Z?



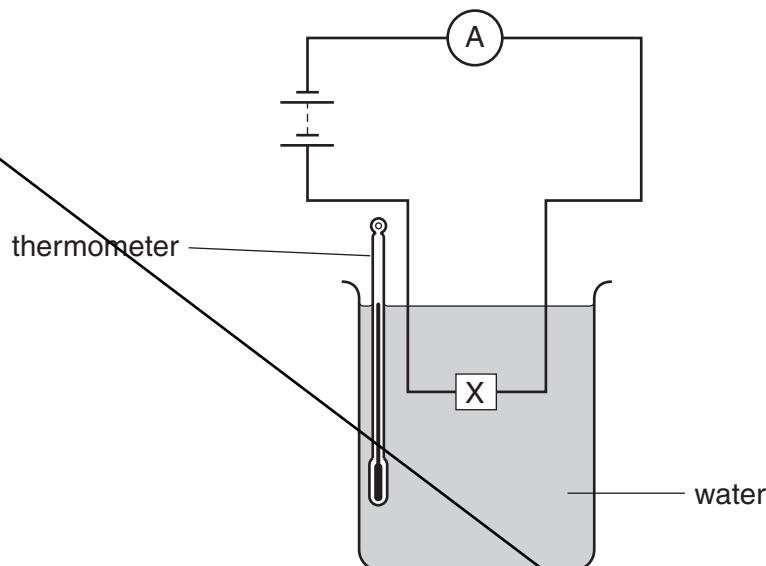
- 24 When the thermistor in the circuit below is heated, the lamp becomes brighter.



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.

- 25 An electrical component X is placed in water, as shown.



When the temperature of the water is increased, the reading on the ammeter increases.

What is component X?

- A a capacitor
- B a light-dependent resistor
- C a reed relay
- D a thermistor

- 26 Which electrical component would **not** normally be found in a battery-operated torch (flashlight)?

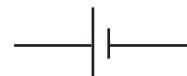
A



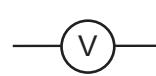
B



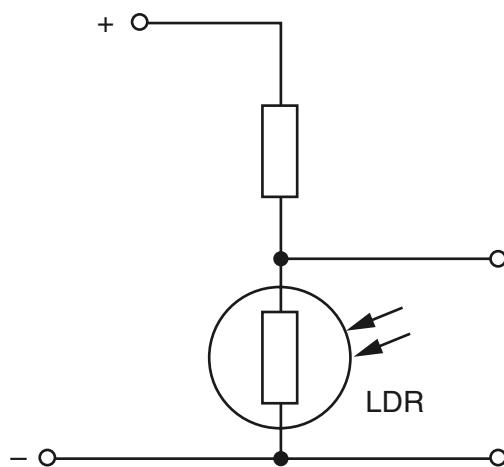
C



D



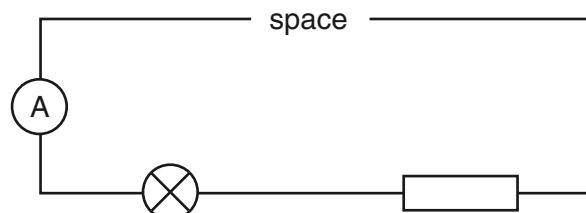
- 27 The diagram shows part of a circuit used to switch street lamps on and off automatically.



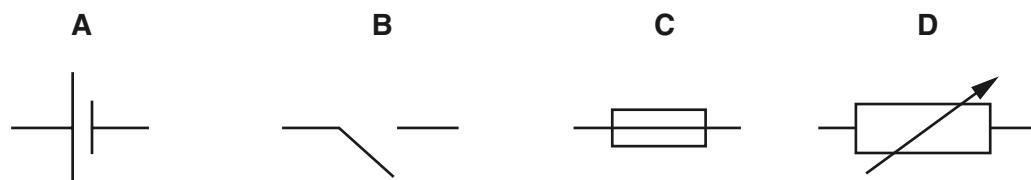
What is the effect on the light-dependent resistor (LDR) when it gets dark?

	resistance of LDR	p.d. across LDR
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 28 The diagram shows an incomplete circuit.



Which component should be connected in the space to make the lamp light?



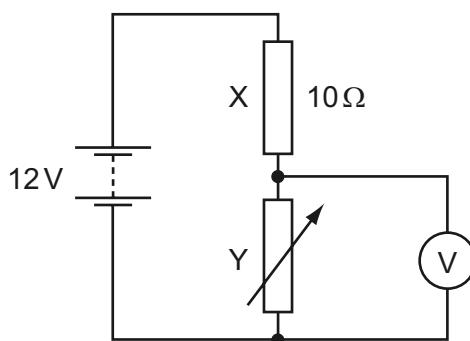
**29** Which of these components only allows current to flow in one direction **and** emits light?

Choose **one** answer.

- A** LDR
- B** LED
- C** thermistor
- D** filament lamp

## 19.2 Combination of resistors

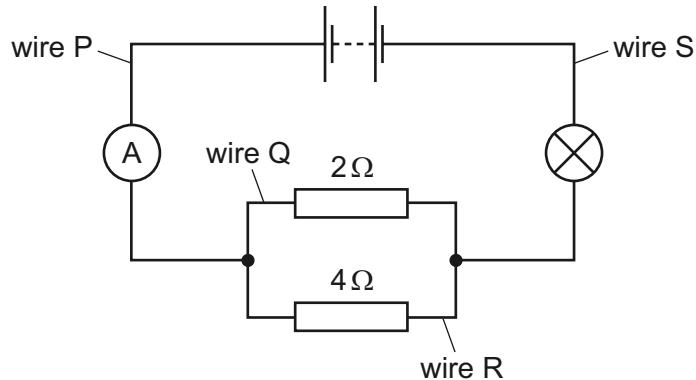
- 1 A circuit is connected for use as a potential divider.



The resistance of resistor X is  $10\Omega$ .

When the resistance of the variable resistor Y is  $20\Omega$ , what is the reading on the voltmeter?

- A 4.0V      B 6.0V      C 8.0V      D 12V
- 2 The circuit diagram includes two resistors connected in parallel.



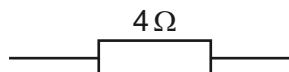
Which statement is correct?

- 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.

- 3 The diagrams show four arrangements of resistors.

Which arrangement has the **smallest** total resistance?

A



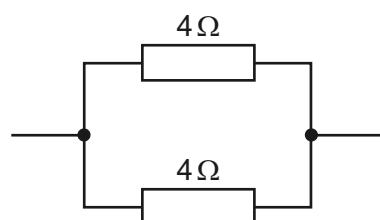
B



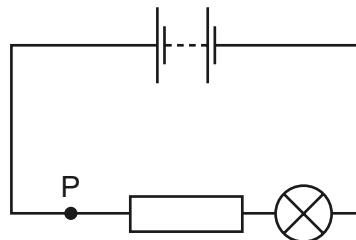
C



D



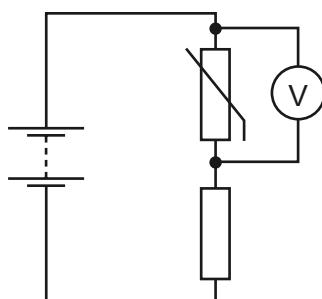
- 4 The diagram shows a lamp in a circuit.



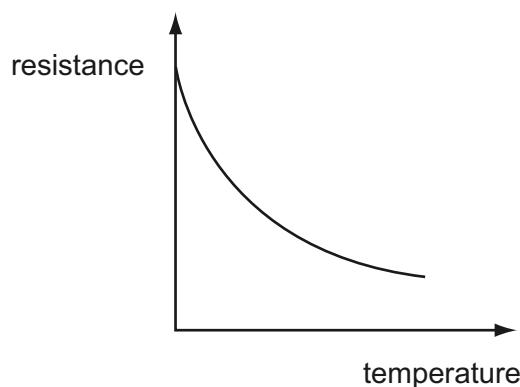
Which change to the circuit would increase the current in the lamp?

- 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
- D moving the lamp to point P in the circuit

- 5 The diagram shows a thermistor in a potential divider. A voltmeter is connected across the thermistor.



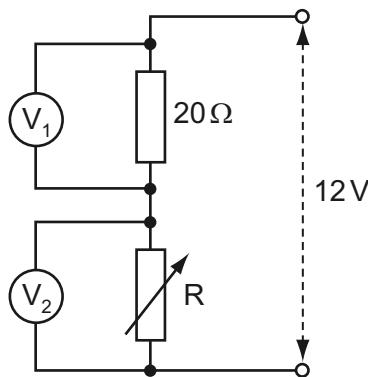
The graph shows how the resistance of the thermistor changes with temperature.



As the thermistor becomes warmer, what happens to its resistance and what happens to the reading on the voltmeter?

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

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

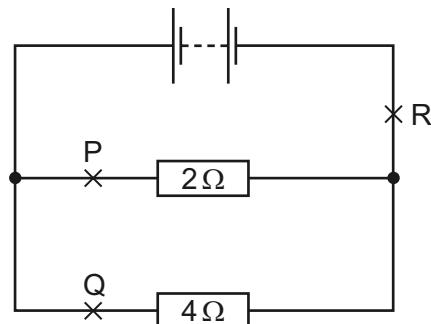


When  $R$  has a value of  $20\Omega$ , the voltmeter readings are equal.

How do these readings change when the value of  $R$  is reduced to  $10\Omega$ ?

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

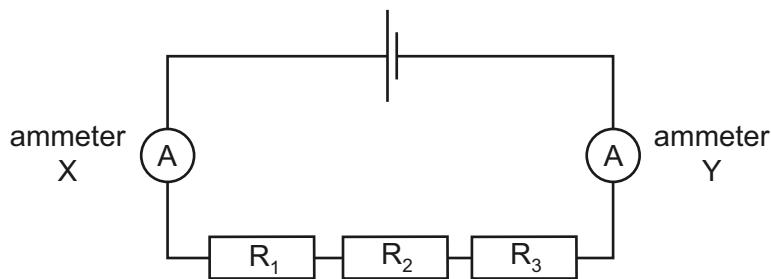
- 7 A circuit contains two resistors connected in parallel with a battery.



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

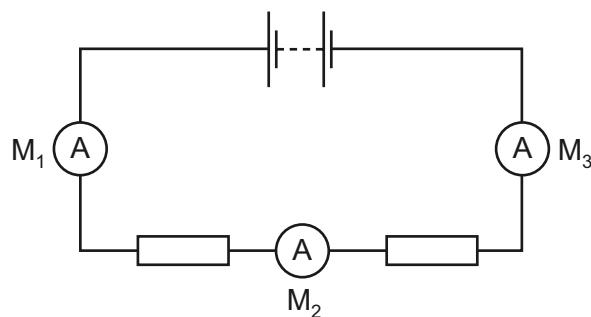
- A The current at P is the greatest.
- B The current at Q is the greatest.
- C The current at R is the greatest.
- D The current is the same at points P, Q and R.

- 8 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
- 9 The diagram shows a battery connected to two identical resistors. Three ammeters  $M_1$ ,  $M_2$  and  $M_3$  are connected in the circuit.



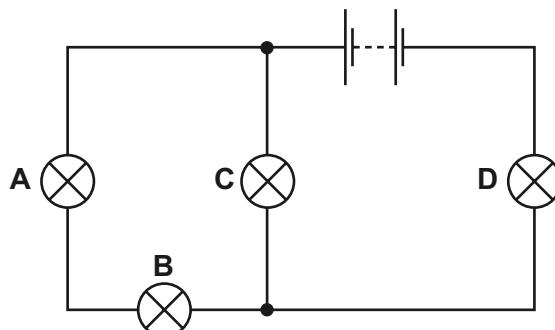
Meter  $M_1$  reads 1.0 A.

What are the readings on  $M_2$  and on  $M_3$ ?

	reading on $M_2/A$	reading on $M_3/A$
<b>A</b>	0.5	0.0
<b>B</b>	0.5	0.5
<b>C</b>	0.5	1.0
<b>D</b>	1.0	1.0

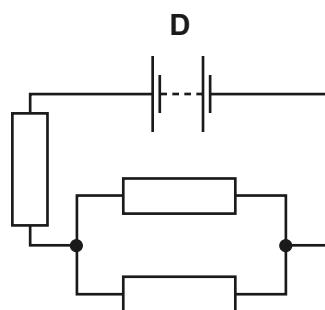
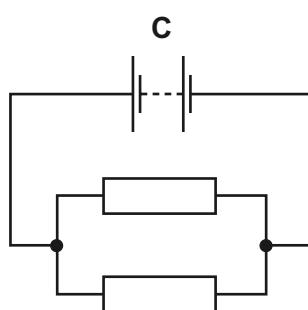
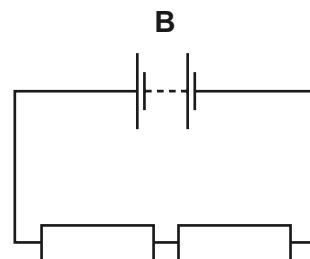
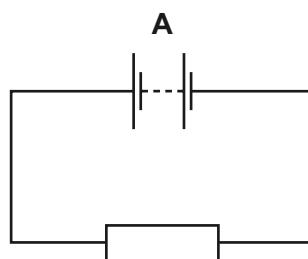
- 10 In the circuit below, one of the lamps breaks, causing all the other lamps to go out.

Which lamp breaks?

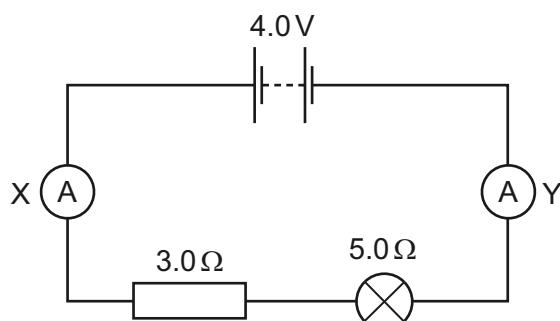


- 11 In the circuits shown, all the resistors are identical.

Which circuit has the **least** resistance?



- 12 In the circuit shown, ammeter X reads 0.5A.



What does ammeter Y read?

**A** 0

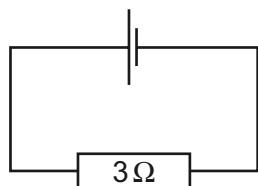
**B** 0.5A

**C** 3.5A

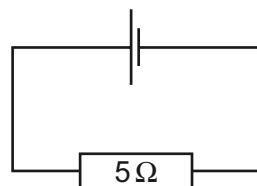
**D** 4.0A

- 13 The diagram shows four different circuits.

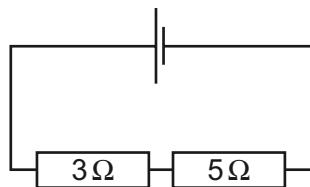
P



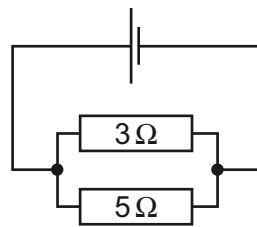
Q



R



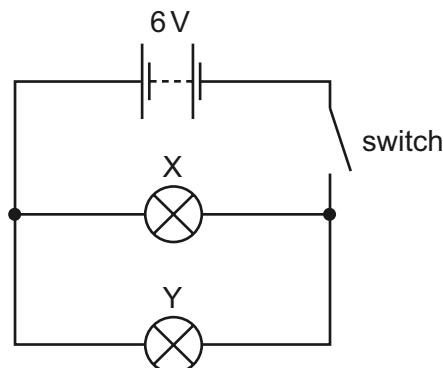
S



What is the order of increasing resistance of these circuits?

	lowest resistance → highest resistance			
<b>A</b>	P	Q	R	S
<b>B</b>	R	S	P	Q
<b>C</b>	S	P	Q	R
<b>D</b>	P	R	Q	S

- 14 In the circuit below, X and Y are identical 6 V lamps.



What happens when the switch is closed (the current is switched on)?

- A X lights more brightly than Y.
  - B Y lights more brightly than X.
  - C X and Y both light with full brightness.
  - D X and Y both light with half brightness.
- 15 Diagram 1 shows a potential divider circuit containing two  $100\Omega$  resistors.

One of the resistors is changed to  $90\Omega$ , as shown in diagram 2.

diagram 1

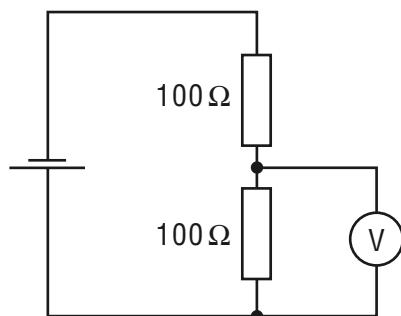
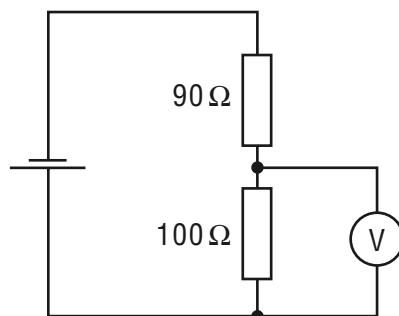


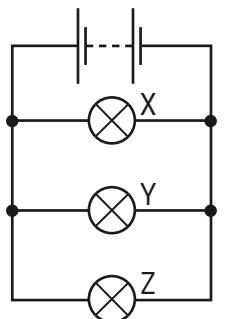
diagram 2



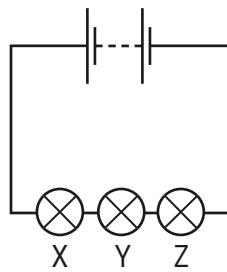
How does the reading on the voltmeter change when this is done?

- A It becomes zero.
- B It decreases a little.
- C It increases a little.
- D It stays the same.

- 16** The diagrams show two ways in which three lamps may be connected.



circuit 1

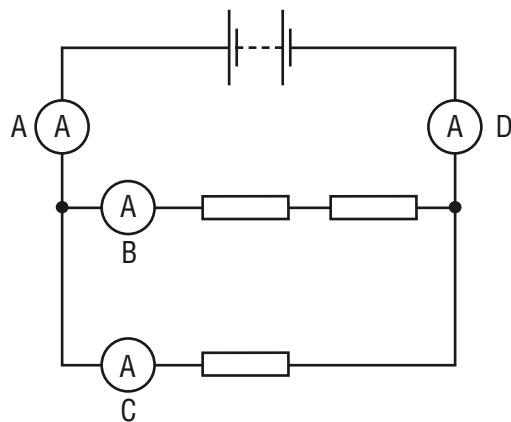


circuit 2

Which statement is correct?

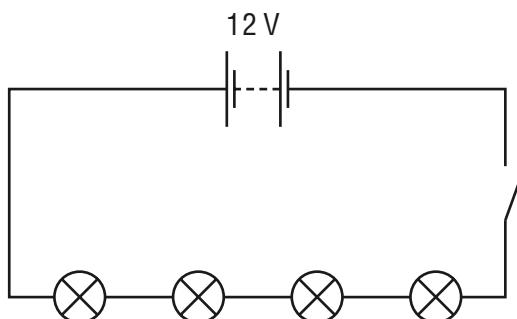
- A** If lamp Y breaks in circuit 1, both the other lamps will go out.
  - B** If lamp Y breaks in circuit 2, both the other lamps will go out.
  - C** If lamp Y breaks in circuit 1, lamp Z will go out, but lamp X will remain on.
  - D** If lamp Y breaks in circuit 2, lamp Z will go out, but lamp X will remain on.
- 17** The diagram shows a battery connected to three identical resistors. Four ammeters **A**, **B**, **C** and **D** are connected in the circuit.

Which ammeter shows the smallest reading?



- 18 Four lamps are connected in a circuit as shown in the diagram.

Each lamp is designed to operate at 12V.



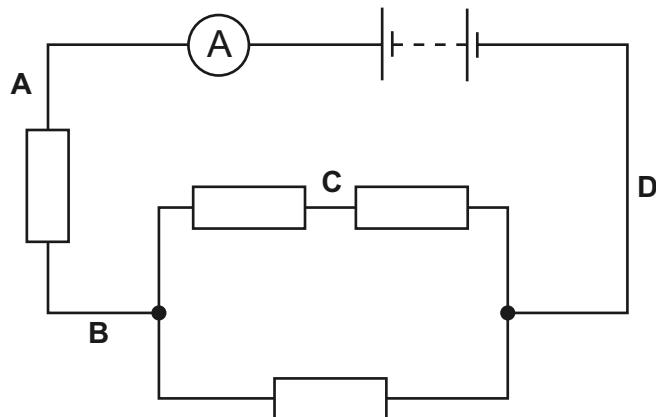
The circuit is now switched on.

Which statement is correct?

- A Each lamp can be switched off independently.
  - B If one lamp breaks all the others will stay alight.
  - C The current is the same in all the lamps.
  - D The lamps will all light at normal brightness.
- 19 Four resistors and an ammeter are connected to a battery as shown.

The ammeter reads 2A.

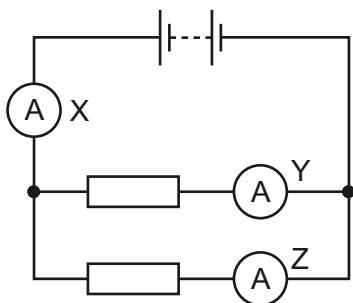
Which of the four labelled points in the circuit is the only one where the current is less than 2A?



- 20 Why are the electric lamps in a house lighting circuit normally connected in parallel?

- A The current in every circuit must be the same.
- B The lamps are always switched on and off at the same time.
- C The voltage across each lamp must be the mains voltage.
- D When one of the lamps blows, all the others go out.

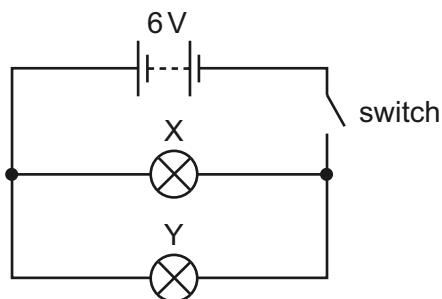
- 21** The diagram shows a circuit with three ammeters, X, Y and Z.



Which set of readings is possible?

	X	Y	Z
<b>A</b>	2A	3A	5A
<b>B</b>	3A	2A	5A
<b>C</b>	3A	3A	3A
<b>D</b>	5A	2A	3A

- 22** In the circuit below, X and Y are identical 6V lamps.

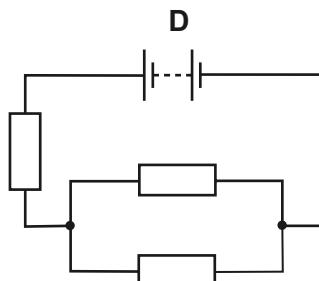
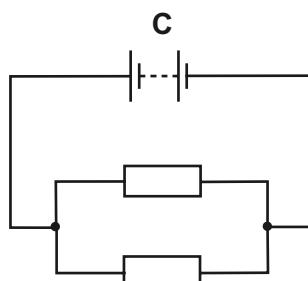
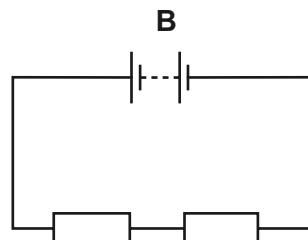
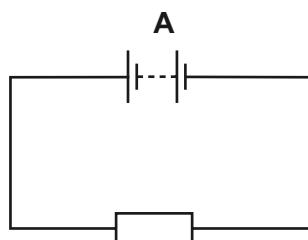


What happens when the switch is closed?

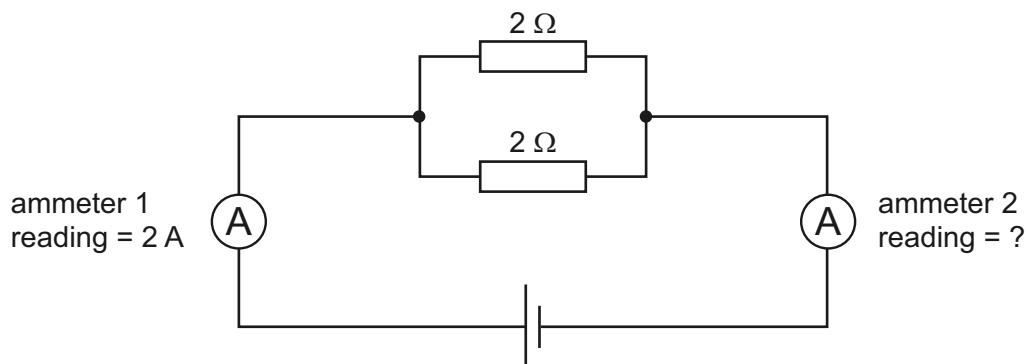
- A** X lights more brightly than Y.
- B** Y lights more brightly than X.
- C** X and Y light with equal brightness.
- D** Neither X nor Y light.

- 23 In the circuits shown, all the resistors are identical.

Which circuit has the **least** resistance?



- 24 In the circuit shown, the reading on ammeter 1 is 2 A.



What is the reading on ammeter 2?

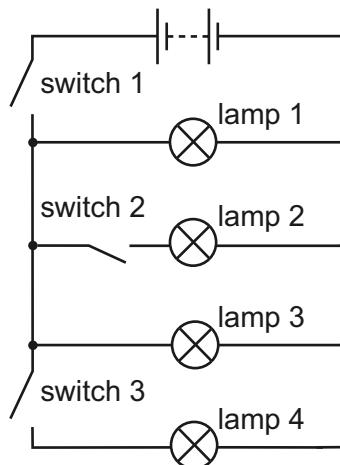
A 0 A

B 1 A

C 2 A

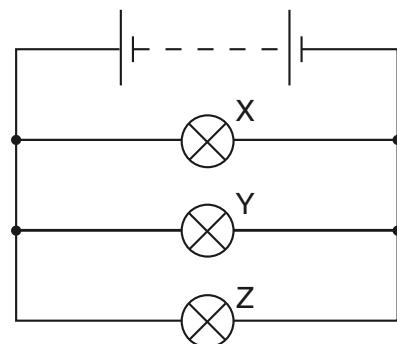
D 4 A

- 25 The circuit shown contains four lamps and three switches.

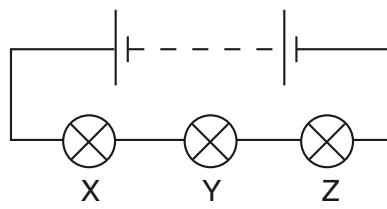


Which switches must be closed to light only lamps 1 and 3?

- A switch 1 only  
 B switch 1 and switch 2 only  
 C switch 1 and switch 3 only  
 D switch 2 and switch 3 only
- 26 The diagrams show two ways in which three lamps may be connected.



circuit 1



circuit 2

Which statement is correct?

- A If lamp Y breaks in circuit 1, both the other lamps will go out.  
 B If lamp Y breaks in circuit 2, both the other lamps will go out.  
 C If lamp Y breaks in circuit 1, lamp Z will go out, but lamp X will remain on.  
 D If lamp Y breaks in circuit 2, lamp Z will go out, but lamp X will remain on.

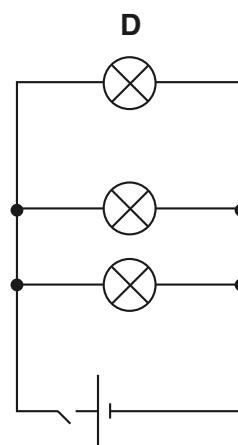
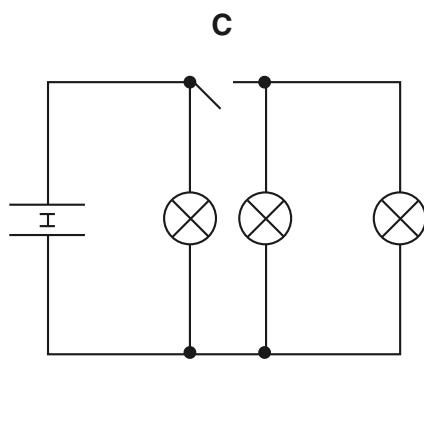
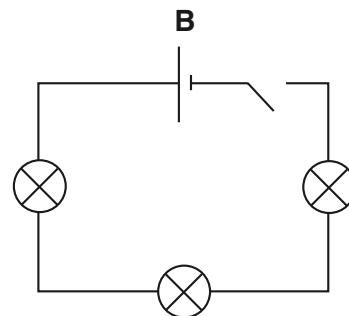
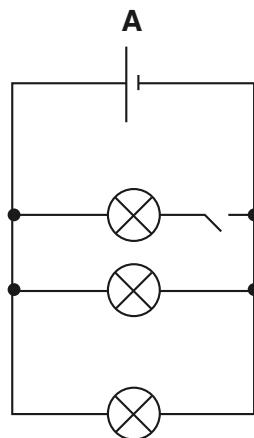
- 27 A  $3.0\Omega$  lamp and a  $6.0\Omega$  lamp are connected in series.

What is the total resistance of the combination?

- A  $0.5\Omega$
- B  $2.0\Omega$
- C  $9.0\Omega$
- D  $18.0\Omega$

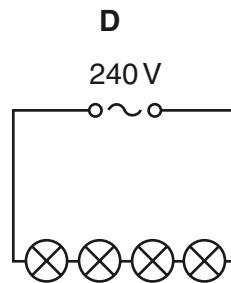
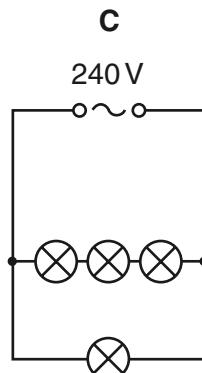
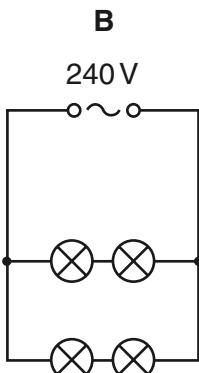
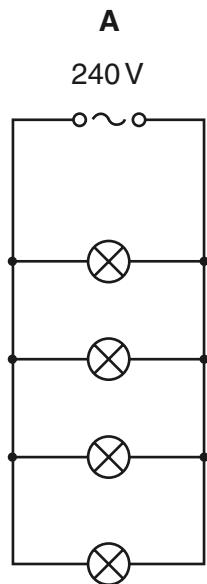
- 28 Four students are asked to draw a circuit showing three lamps working in parallel, a cell, and a switch that controls all three lamps.

Which student is correct?

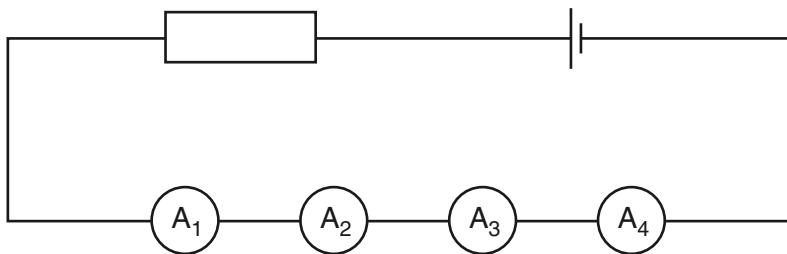


- 29 Four lamps are labelled '60 W 240 V'.

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



- 30 Two faulty ammeters and two perfect ammeters are connected in series in the circuit shown.



The readings on the ammeters are

A<sub>1</sub> 2.9 A

A<sub>2</sub> 3.1 A

A<sub>3</sub> 3.1 A

A<sub>4</sub> 3.3 A

Which two ammeters are faulty?

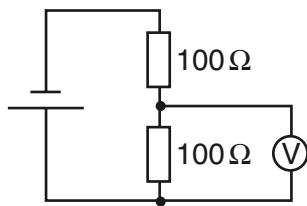
**A** A<sub>1</sub> and A<sub>2</sub>

**B** A<sub>1</sub> and A<sub>4</sub>

**C** A<sub>2</sub> and A<sub>3</sub>

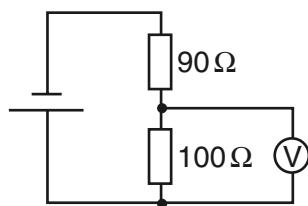
**D** A<sub>3</sub> and A<sub>4</sub>

- 31 Diagram 1 shows a potential divider circuit containing two  $100\ \Omega$  resistors.



**Diagram 1**

One of the resistors is changed to  $90\ \Omega$ , as shown in diagram 2.

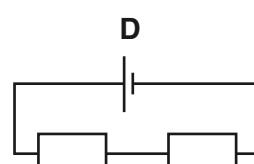
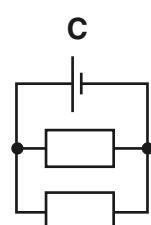
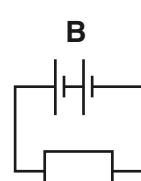
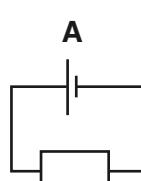


**Diagram 2**

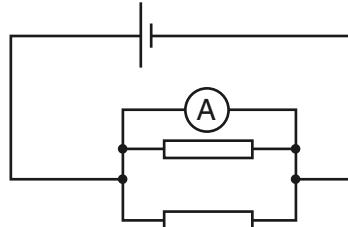
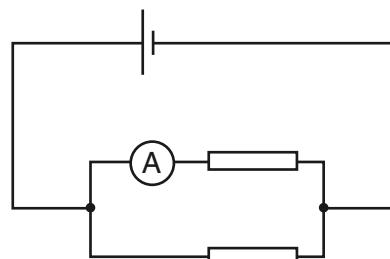
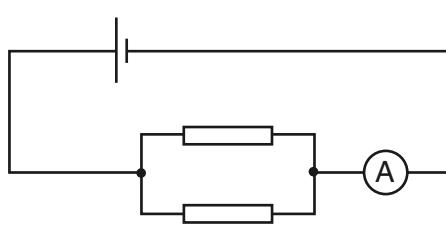
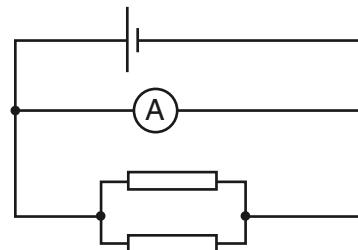
How does the reading on the voltmeter change when this is done?

- A It becomes zero.
  - B It decreases a little.
  - C It increases a little.
  - D It stays the same.
- 32 In the following circuits, the resistors have the same value and the cells are identical.

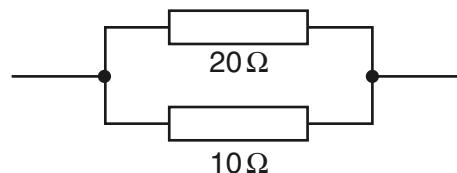
Which circuit has the smallest resistance?



33 In which circuit does the ammeter read the total current through both resistors?

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

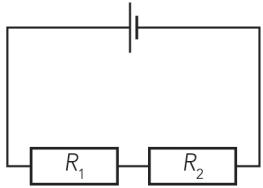
34 A  $20\Omega$  resistor and a  $10\Omega$  resistor are connected in parallel.



What is their combined resistance?

- A** less than  $10\Omega$
- B**  $10\Omega$
- C**  $20\Omega$
- D** more than  $20\Omega$

**35** The circuit shows two resistors,  $R_1$  and  $R_2$  in series.



What is the ratio of potential differences across  $R_1$  and  $R_2$ ?

- A** The same as the ratio  $R_1 : R_2$ .
- B** 1 : 1
- C** The same as the ratio  $R_2 : R_1$ .
- D** 2 : 1

### 19.3 Electrical safety

- 1 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?

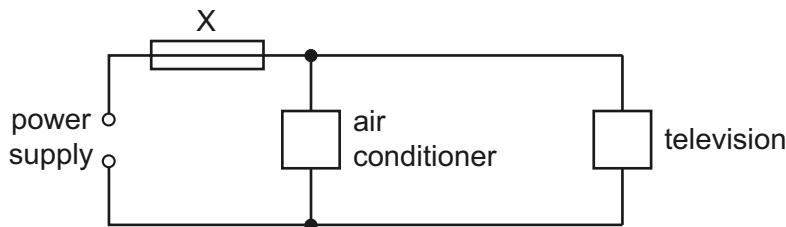
- A Use thicker copper wires.
- B Use thinner copper wires.
- C Use thicker insulation.
- D Use thinner insulation.

- 2 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.

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



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

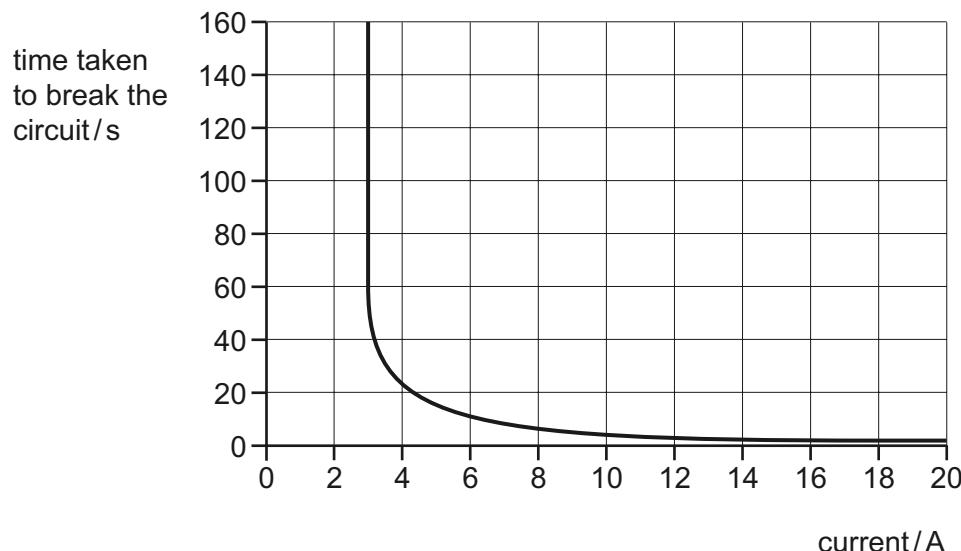
Several different fuses are available.

Which fuse should be connected at X?

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

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

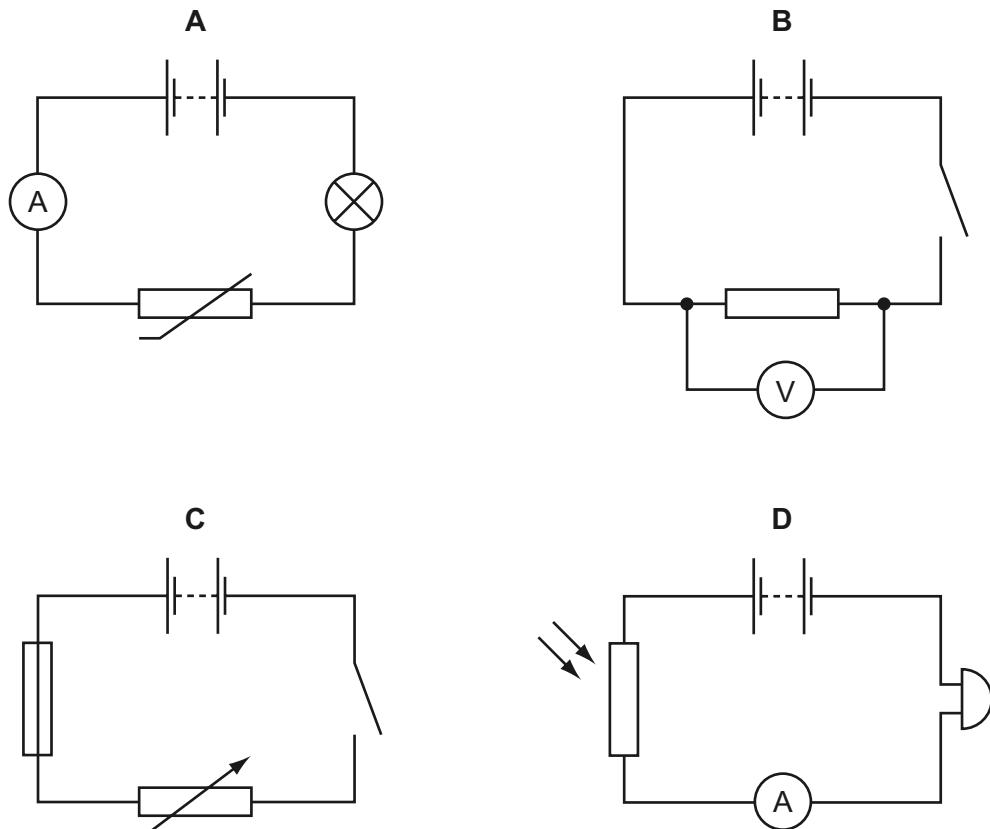
The time taken to break the circuit depends on the current, as shown in the graph.



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
<b>A</b>	the circuit breaks in less than 5 seconds	the circuit breaks in less than 5 seconds
<b>B</b>	the circuit breaks in less than 5 seconds	the circuit does not break
<b>C</b>	the circuit does not break	the circuit breaks in less than 5 seconds
<b>D</b>	the circuit does not break	the circuit does not break

- 5 Which circuit contains a fuse?

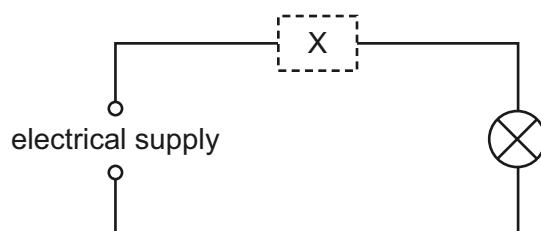


- 6 A fuse and a relay each use an effect of an electric current.

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

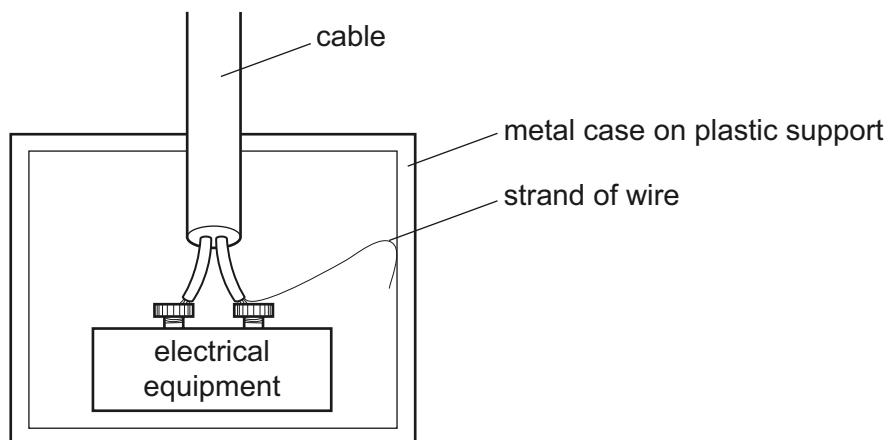
	effect used by a fuse	effect used by a relay
A	heating effect	heating effect
B	heating effect	magnetic effect
C	magnetic effect	heating effect
D	magnetic effect	magnetic effect

- 7 In this circuit, a component at X automatically protects the wiring from overheating if there is a fault.



Which components are suitable to use at X?

- A a circuit-breaker, a fuse or a switch
  - B only a circuit-breaker or a fuse
  - C only a circuit-breaker or a switch
  - D only a fuse
- 8 Some electrical equipment is connected to a 230 V supply. It is kept inside a metal case which is not earthed. The case is fixed to a plastic support. A strand of wire has become loose and touches the metal case as shown.



Which statement about this situation is correct?

- A An electric current is passing through the metal case.
- B A fuse in the live wire will blow.
- C Someone touching the case would receive an electric shock.
- D The metal case is at 0V.

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

How does a fuse affect a circuit when the current in it becomes higher than the correct value for the appliance?

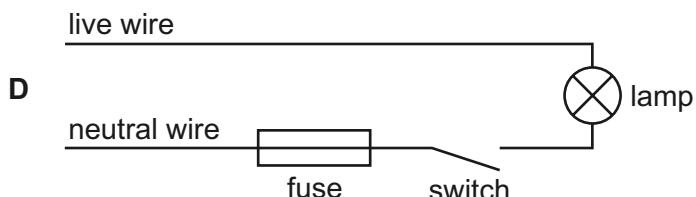
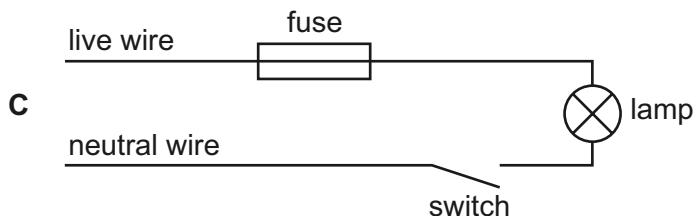
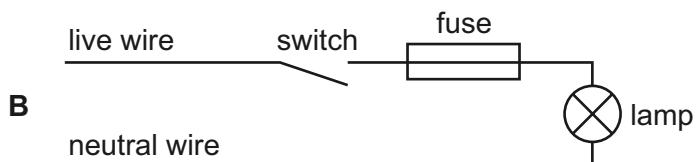
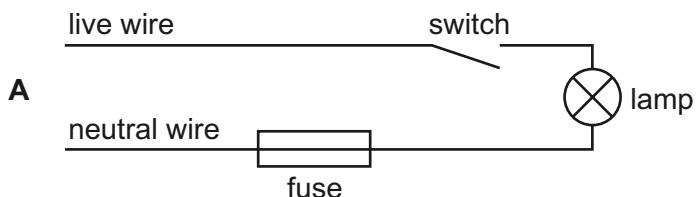
- A It completely stops the current.
- B It reduces the current to the correct value for the appliance.
- C It sends the current to the outer case of the appliance.
- D It sends the excess current to the earth wire.

10 After some building work in a house, a bare (uninsulated) live wire is left protruding from a wall.

What is the greatest hazard?

- A a fire
- B a fuse will blow
- C an electric shock
- D no current will flow

- 11** Which diagram shows the correct positions for both the switch and the fuse?



- 12** On a building site, metal scaffolding is firmly embedded in the damp ground. A builder holds a mains-operated electric drill in one hand. With his other hand he holds on to the scaffolding.

The power cable of the drill is damaged where it enters the metal casing of the drill.

What danger does this present to the builder?

- A** A current could pass through the builder and electrocute him.
- B** A current in the scaffolding could heat it up and burn him.
- C** The large current could blow the fuse and damage the drill.
- D** The large current could make the motor spin too quickly.

- 13** A certain electrical appliance is powered from a mains supply. The appliance normally uses a current of 3 A, but the current briefly rises to 4 A at the instant the appliance is switched on. The cable to the appliance is designed for currents up to 6 A.

The fuses available to protect the cable are rated at 1 A, 3 A, 5 A and 13 A.

Which fuse should be used?

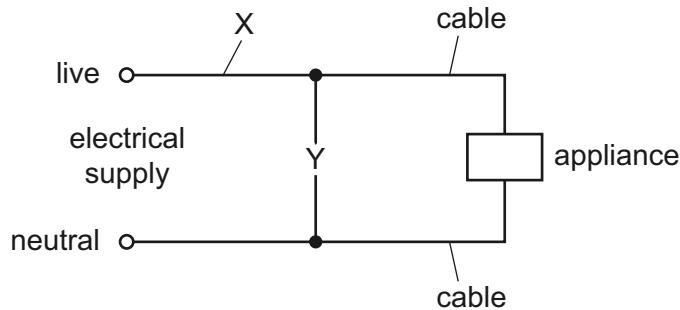
- A** 1 A      **B** 3 A      **C** 5 A      **D** 13 A

- 14** The current in a lamp at full brightness is 0.25 A. The flexible cable to the lamp is designed for currents up to 5.0 A, so it can safely carry the 0.25 A taken by the lamp.

Which fuse should be inserted in the plug at the other end of the flexible cable?

- A** 0.2 A      **B** 1.0 A      **C** 5.0 A      **D** 10.0 A

- 15** Either a fuse or a circuit-breaker can be used to protect electrical cables from large currents that could cause overheating.



If a fuse is used, in which position in the circuit should it be connected, and if a circuit-breaker is used, in which position should it be connected?

	position of fuse	position of circuit-breaker
<b>A</b>	X	X
<b>B</b>	X	Y
<b>C</b>	Y	X
<b>D</b>	Y	Y

- 16** A mains circuit can safely supply a current of 40 A.

A hairdryer takes 2 A. It is connected to the circuit by a lead which can safely carry up to 5 A.

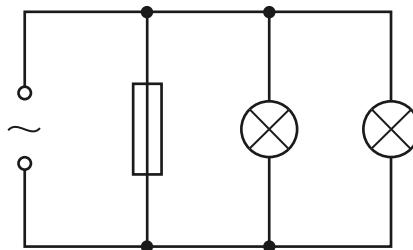
Which fuse is best to use in the plug fitted to the hairdryer lead?

- A** 1 A fuse      **B** 3 A fuse      **C** 10 A fuse      **D** 50 A fuse

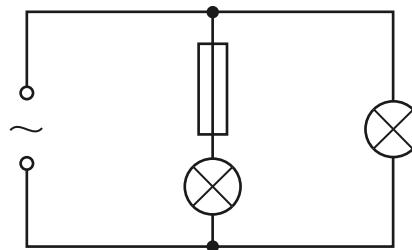
- 17 A student makes four circuits.

In which circuit are both lamps protected by the fuse?

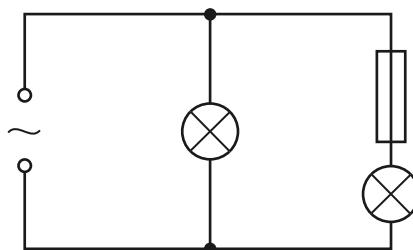
A



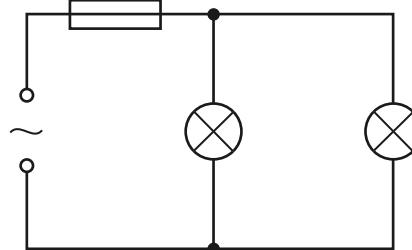
B



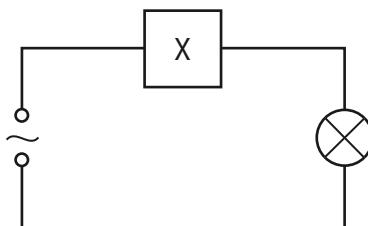
C



D



- 18 The device X in this circuit is designed to cut off the electricity supply automatically if too much current flows.



What is device X?

- A** a fuse
- B** a switch
- C** a resistor
- D** an ammeter

**19** A mains electrical circuit uses insulated copper cable and the cable overheats.

To prevent the cable overheating, how should the cable be changed, and why?

- A** Use thicker copper cable which has less resistance.
- B** Use thicker insulation which stops the heat escaping.
- C** Use thinner copper cable which has more resistance.
- D** Use thinner insulation which allows less heat to escape.

**20** A householder asks an electrician to install a mains electrical socket in her bathroom so that she may use a hairdryer there. The electrician refuses to do this because it would be dangerous.

Why would installing the socket be dangerous?

- A** The current drawn by the hairdryer would cause overheating in the cables.
- B** The handling of electrical equipment in damp conditions could cause an electric shock.
- C** The hot air produced by the hairdryer would cause the fuse to melt.
- D** The temperature in the bathroom would damage the insulation.

**21** A cable in a house is carrying too much current.

What is the greatest danger?

- A** appliances not working
- B** electric shock
- C** fire
- D** low power

**22** Circuit-breakers are used with electrical appliances as safety devices.

Which description is correct for a circuit-breaker?

	position	action when overloaded
<b>A</b>	connected in the live wire	melts
<b>B</b>	connected in the live wire	operates an electromagnet
<b>C</b>	connected to the casing of the appliance	melts
<b>D</b>	connected to the casing of the appliance	operates an electromagnet

23 An electric power tool is being used outdoors in a shower of rain.

What is the greatest hazard to the user?

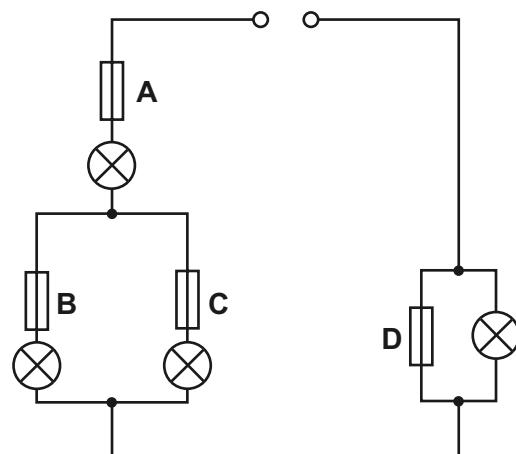
- A The cable gets hot and causes burns.
- B The circuit-breaker cuts off the current.
- C The current passes through water and causes a shock.
- D The tool rusts.

24 Why is a fuse used in an electrical circuit in a house?

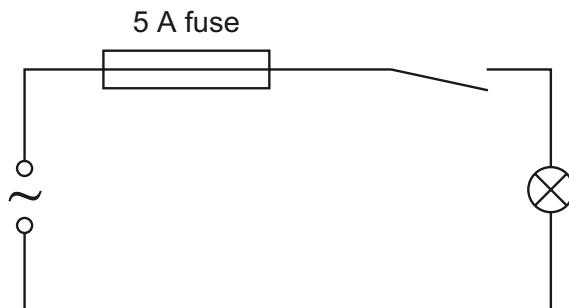
- A to increase the circuit resistance
- B to keep the power used to a minimum value
- C to prevent a short-circuit from occurring
- D to stop the cables from carrying too much current

25 In the circuit shown, one of the fuses blows and all the lamps go out.

Which fuse blows?



26 A student makes the circuit shown.



The fuse has blown and stopped the current.

What could have caused this?

- A The current rating of the fuse was too high.
- B The current was too large.
- C The lamp was loose.
- D The voltage was too small.

27 A mains circuit can safely supply a current of 40 A.

A hair-drier takes 2 A. It is connected to the circuit by a lead which can carry up to 5 A.

Which of these fuses would be best to use in the plug fitted to the hair-drier lead?

- A 1 A fuse
- B 3 A fuse
- C 10 A fuse
- D 50 A fuse

28 Why are electric circuits often fitted with fuses?

- A Fuses break the circuit if the current is too high.
- B Fuses only allow the current through in the correct direction.
- C Fuses return any excess current to earth.
- D Fuses use up any spare current.

29 Which statement is correct?

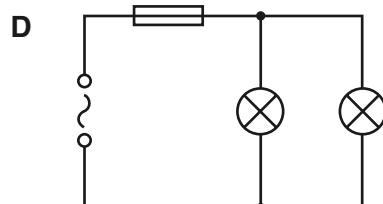
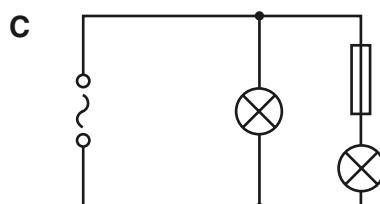
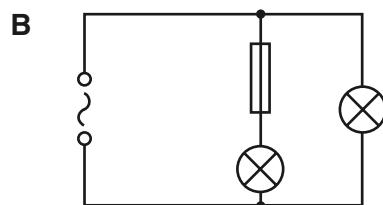
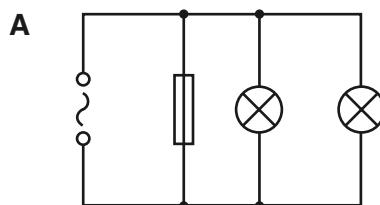
- A A fuse is included in a circuit to prevent the current becoming too high.
- B A fuse should be connected to the neutral wire in a plug.
- C An electric circuit will only work if it includes a fuse.
- D An earth wire is needed to prevent the fuse blowing.

30 Why is a circuit breaker or a fuse used in a mains electric circuit?

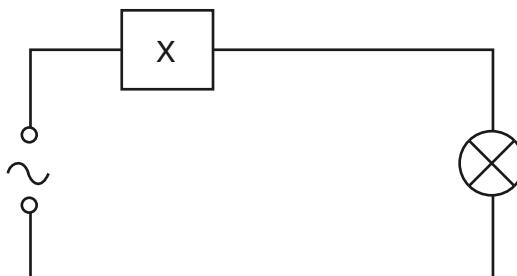
- A It allows spare current to be returned to the mains.
- B It improves the insulation of the wiring.
- C It protects the mains wiring from current overload.
- D It saves energy by reducing the current.

31 A student makes four circuits.

In which circuit are both lamps protected by the fuse?



32 The device X in this circuit is designed to cut off the electricity supply automatically if too much current flows.

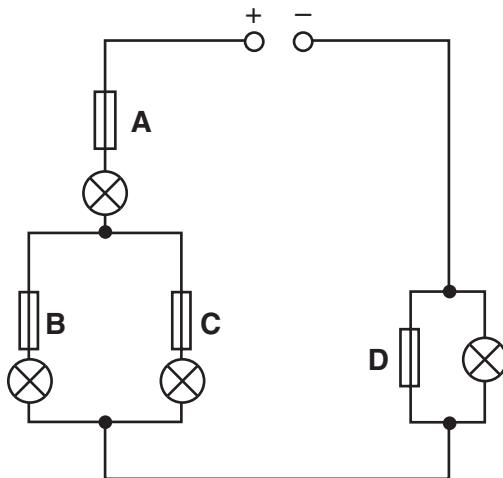


What is device X?

- A a fuse
- B a relay
- C a resistor
- D an ammeter

- 33 In the circuit shown, one of the fuses blows and all the lamps go out.

Which fuse blows?



- 34 A mains extension lead has four sockets in a row. The mains voltage is 230 V.

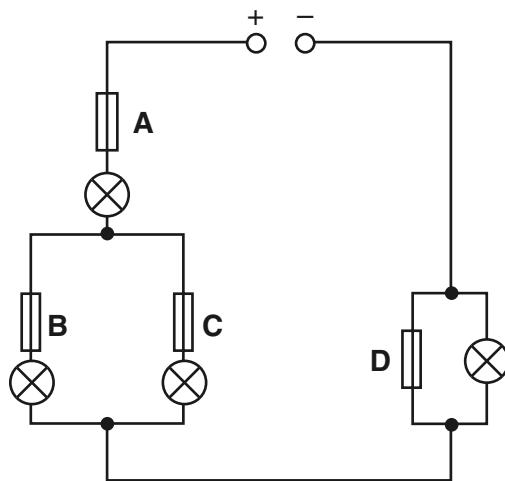
What is the risk in connecting four high-power appliances to this extension lead?

- A The mains voltage can be exceeded, causing overheating.
- B The total current can be too large, causing overheating.
- C The fuse in one of the appliances can fail.
- D The four appliances can be too close together.

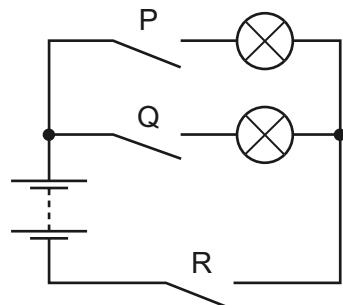
## 19.4 Analyzing circuits

- 1 In the circuit shown, one of the fuses blows and all the lamps go out.

Which fuse blows?



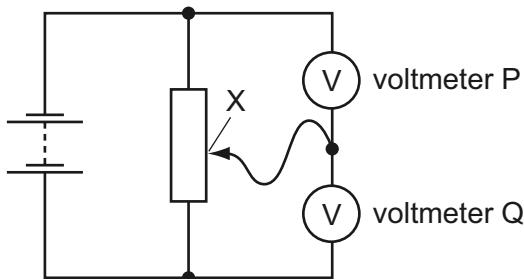
- 2 The diagram shows a circuit containing two identical lamps.



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

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

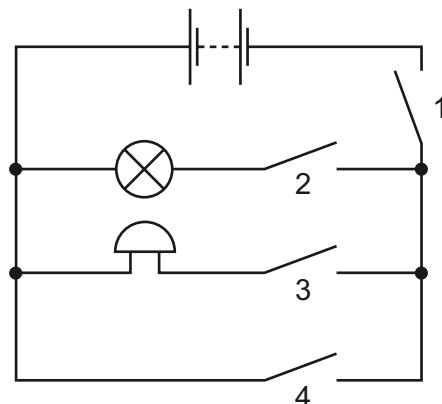


The sliding connection at point X is moved towards the top of the diagram.

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

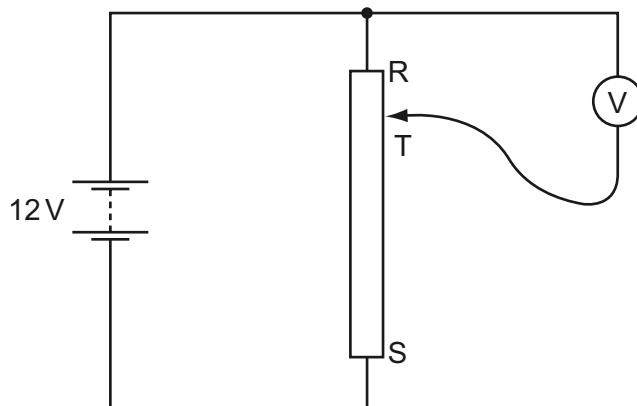
- 4 A student connects the circuit shown.



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

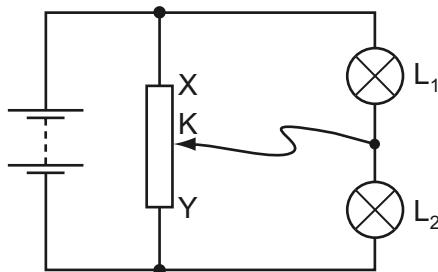
- A 1 and 2 only
- B 1 and 3 only
- C 1, 3 and 4 only
- D 2, 3 and 4 only

- 5 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.
- 6 The diagram shows a potential divider circuit with two identical lamps L<sub>1</sub> and L<sub>2</sub>.

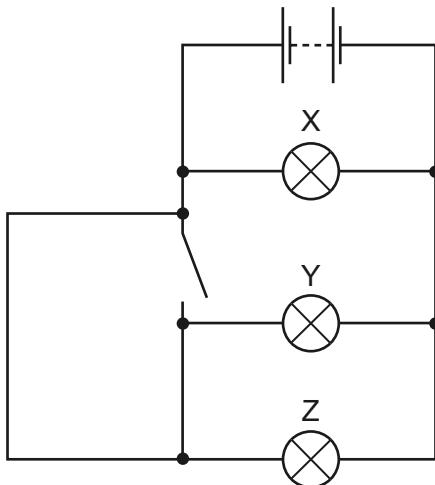


The contact K is halfway between X and Y and the lamps are equally bright.

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

	lamp L <sub>1</sub>	lamp L <sub>2</sub>
<b>A</b>	brighter	brighter
<b>B</b>	brighter	dimmer
<b>C</b>	dimmer	brighter
<b>D</b>	dimmer	dimmer

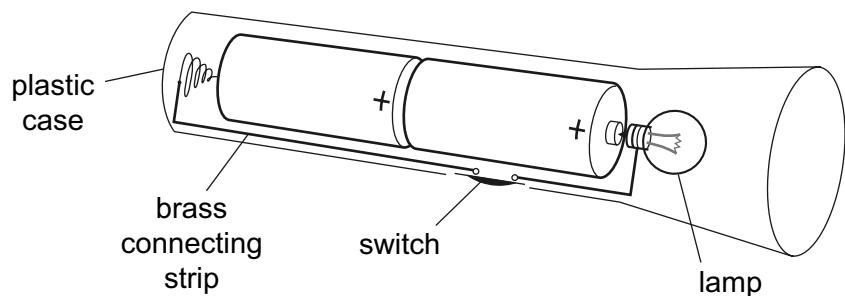
- 7 A student sets up the circuit shown. The switch is open (off).



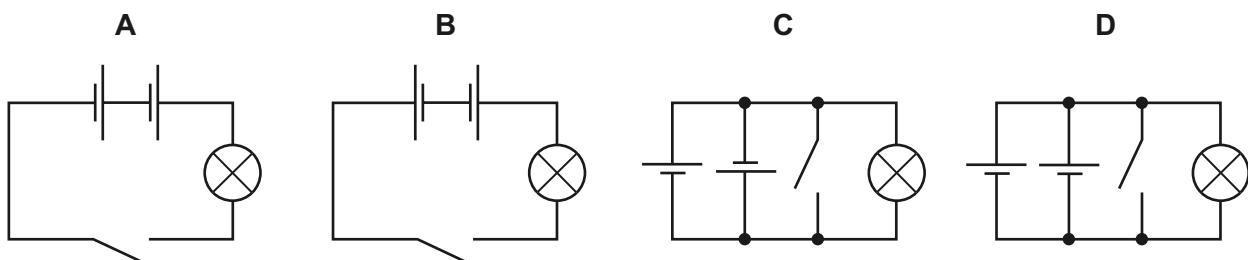
Which lamps are on and which lamps are off?

	lamp X	lamp Y	lamp Z
<b>A</b>	off	off	off
<b>B</b>	on	off	off
<b>C</b>	on	off	on
<b>D</b>	on	on	on

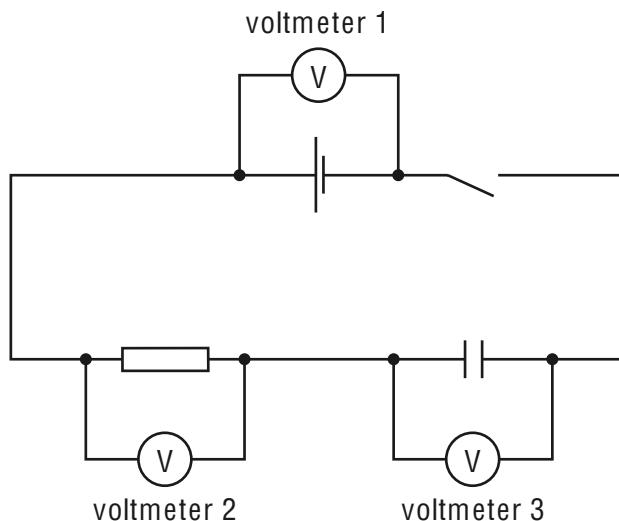
- 8 The diagram shows a torch containing two cells, a switch and a lamp.



What is the circuit diagram for the torch?

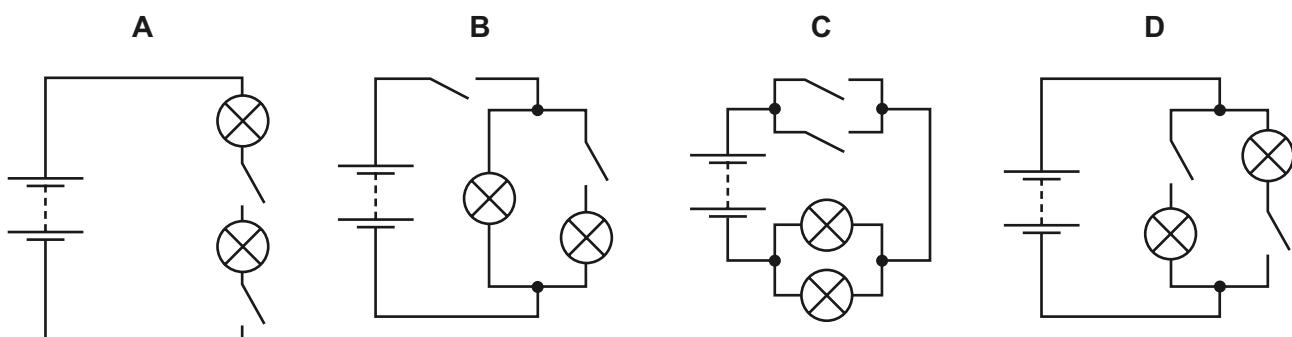


- 9 In the circuit shown, the switch is closed for a long time, then opened.



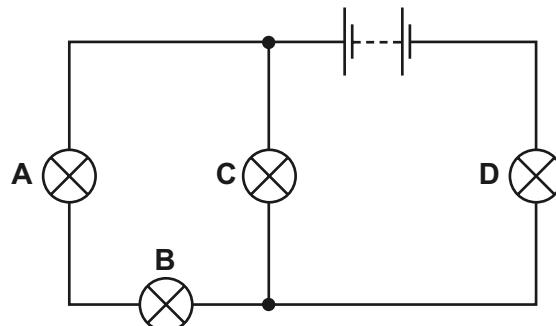
Immediately after the switch is opened, which voltmeters will read zero?

- A voltmeter 1 only  
B voltmeter 2 only  
C voltmeter 3 only  
D voltmeter 1, voltmeter 2 and voltmeter 3
- 10 Which diagram shows a circuit that will allow the lamps to be switched on and off independently?



- 11 In the circuit below, one of the lamps breaks, causing all the other lamps to go out.

Which lamp breaks?

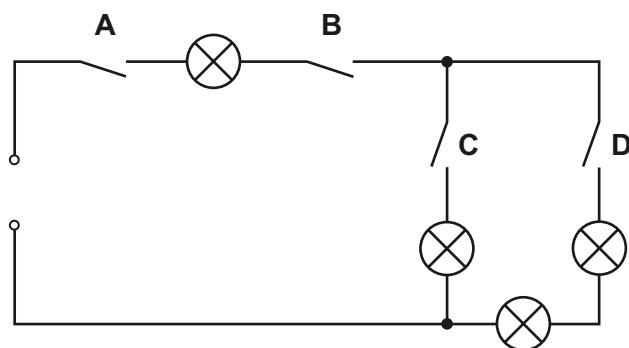


- 12 Four lamps and four switches are connected to a power supply as shown in the circuit diagram.

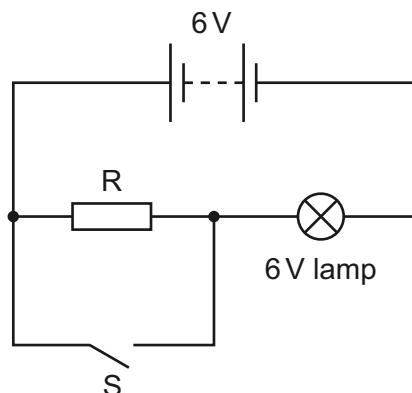
When all the switches are closed, all the lamps are lit.

When one of the switches is then opened, only **one** lamp goes out.

Which switch is opened?

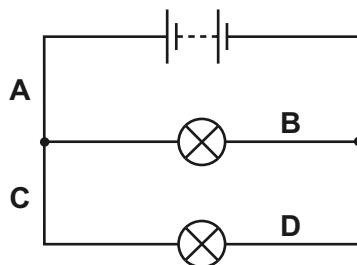


- 13 When the circuit shown is connected with switch S open, the 6 V lamp glows.

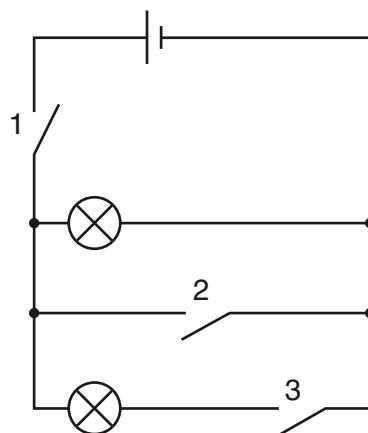


What happens to the brightness of the lamp when switch S is closed?

- A It becomes brighter.
  - B It remains the same.
  - C It becomes dimmer.
  - D It goes off.
- 14 In which position in the circuit shown should a switch be placed so that both lamps can be switched on or off at the same time?



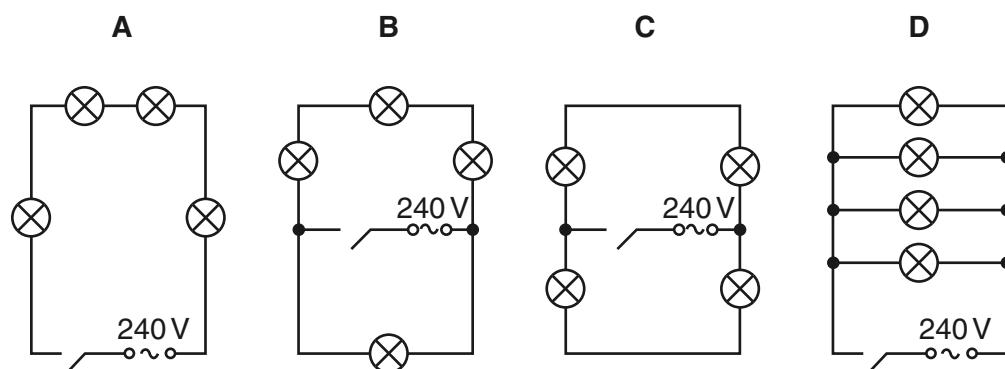
- 15 A student connects two lamps in the circuit shown.



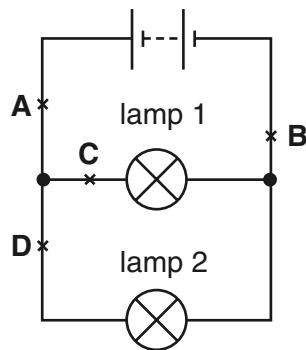
Which switches must he close to light both lamps?

- A** 1 and 2  
**B** 1, 2 and 3  
**C** 1 and 3  
**D** 2 and 3
- 16 A classroom has four lights, each fitted with a lamp marked 240 V, 100 W.

Which circuit is most suitable for the classroom?



17 The diagram shows a circuit, with four possible positions to place a switch.

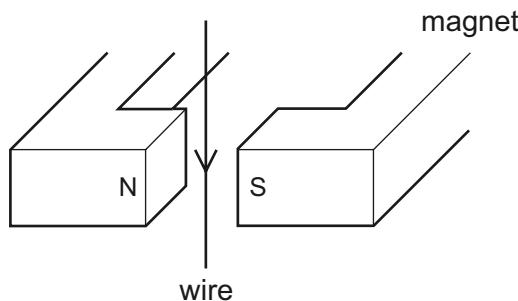


At which labelled point should a switch be placed so that lamp 1 remains on all the time and lamp 2 can be switched on and off?

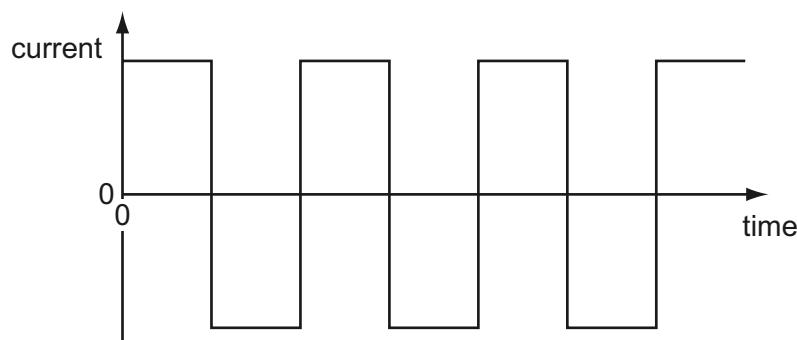
## Chapter 20. Electromagnetic forces

### 20.1 Magnetic effect

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



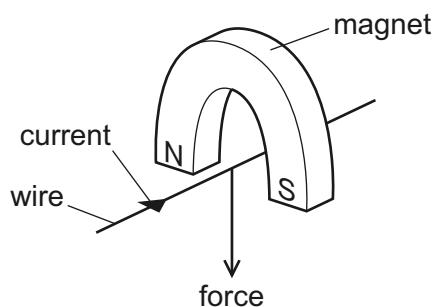
The current in the wire repeatedly changes between a constant value in one direction and a constant value in the opposite direction. This is shown on the graph.



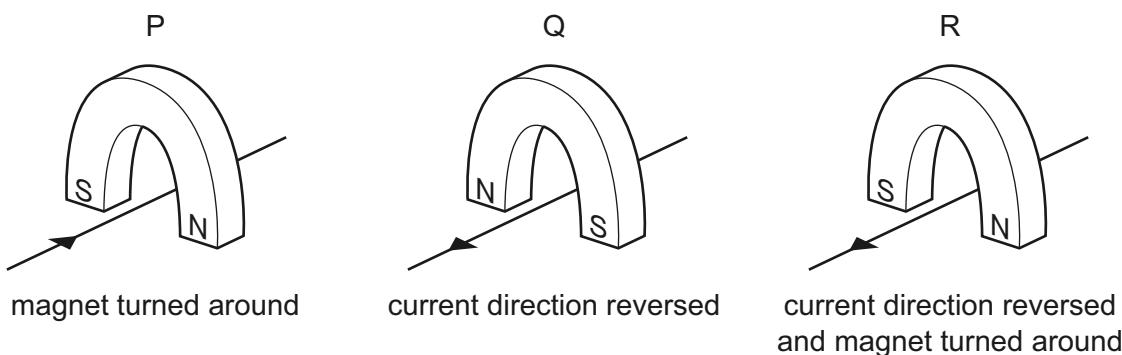
What is the effect on the wire?

- 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.

- 2 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.



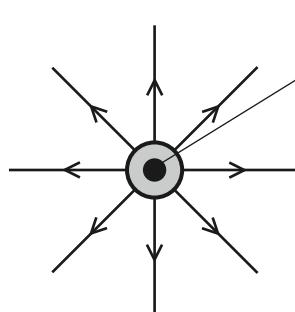
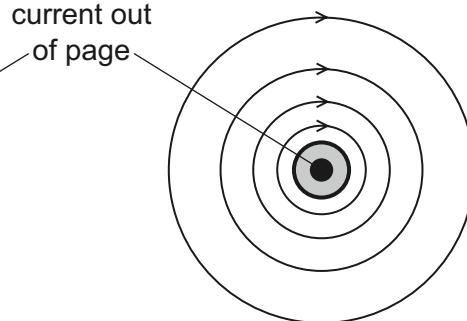
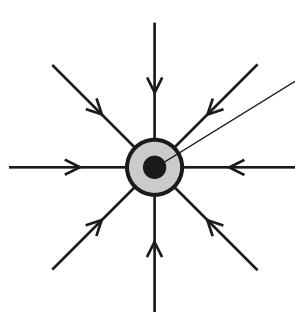
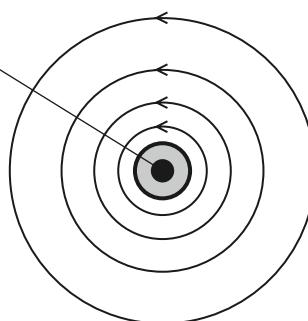
Three other arrangements, P, Q and R, of the wire and magnet are set up as shown.



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

- 3 Which diagram represents the direction of the magnetic field around a straight wire carrying a current out of the page?

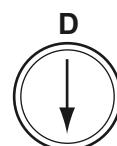
**A****B****C****D**

- 4 A wire perpendicular to the page carries an electric current in a direction out of the page. There are four compasses near the wire.

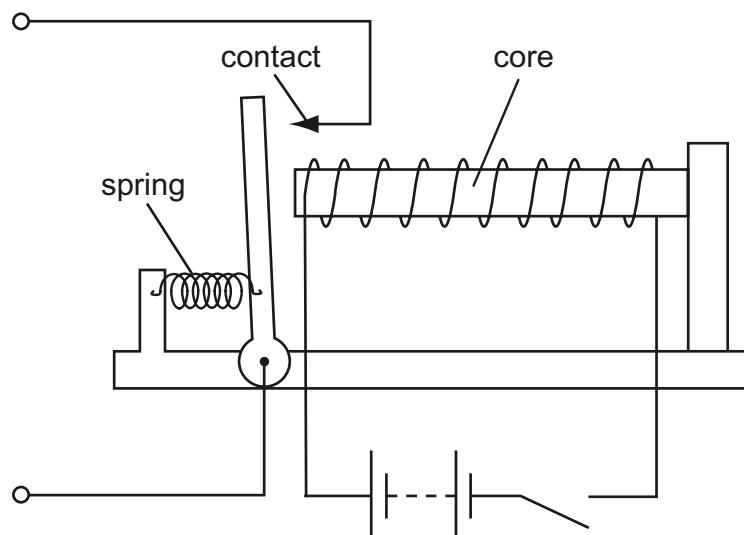
Which compass shows the direction of the magnetic field caused by the current?



wire with current out of page



- 5 A student sets up the apparatus shown in order to make a relay.

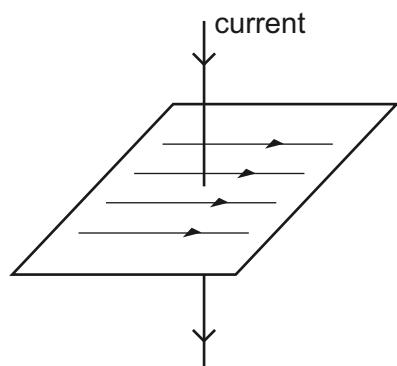
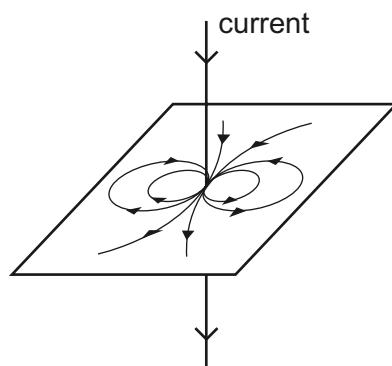
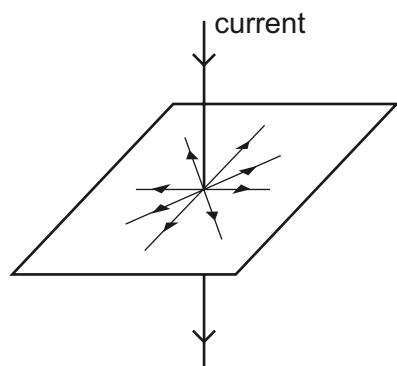
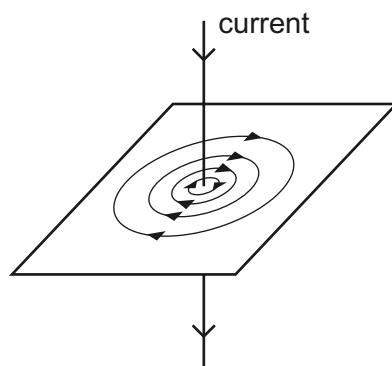


Which metal should be used to make the core?

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

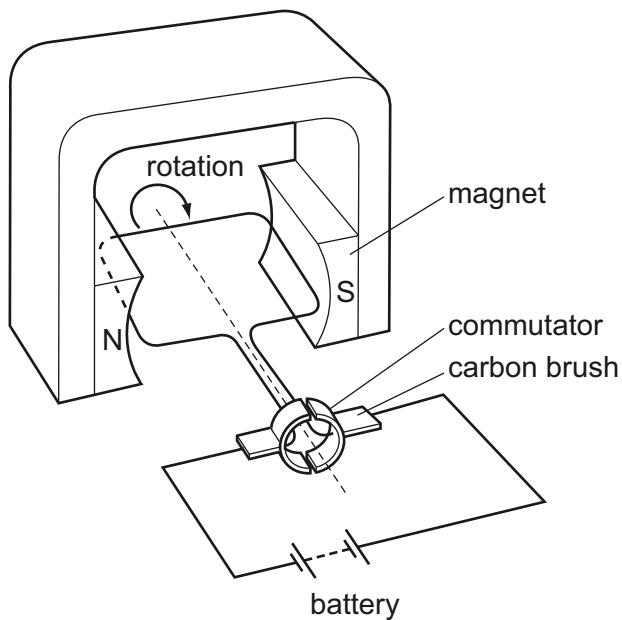
- 6 A straight wire carrying a current produces a magnetic field.

Which diagram shows the correct shape of the field?

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

## 20.2 Electric motor

- 1 The diagram shows an electrical device.

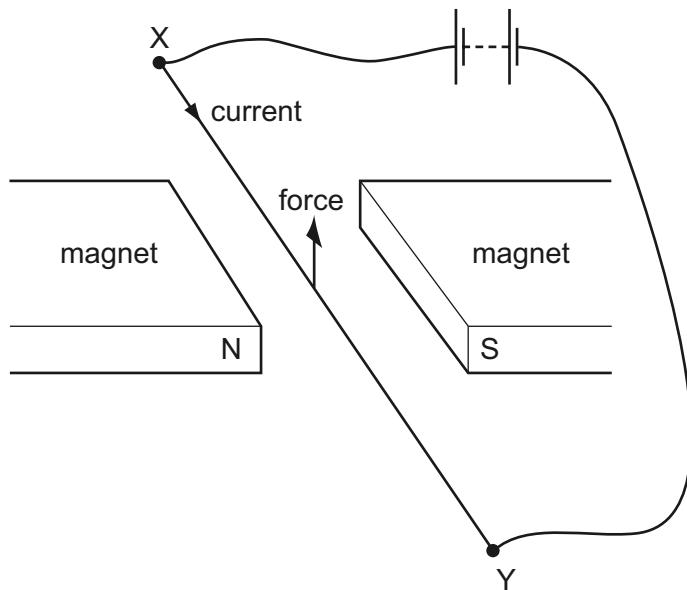


What is this electrical device?

- A** a d.c. motor
- B** an a.c. generator
- C** a magnetising coil
- D** a transformer

### 20.3 Electromagnetic force

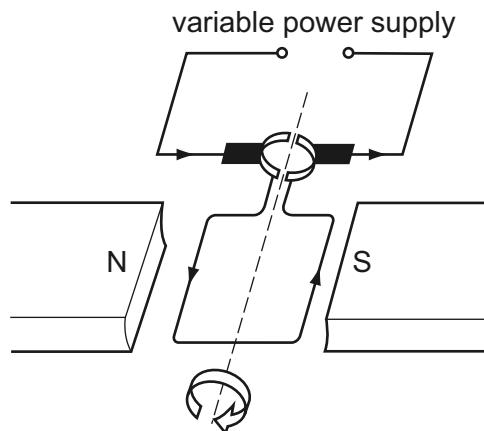
- 1 When the electric current in wire XY is in the direction shown, there is an upward force on the wire.



If the north and south poles of the magnet exchange positions, in which direction will the force on the wire act?

- A downwards
- B upwards
- C to the left
- D to the right

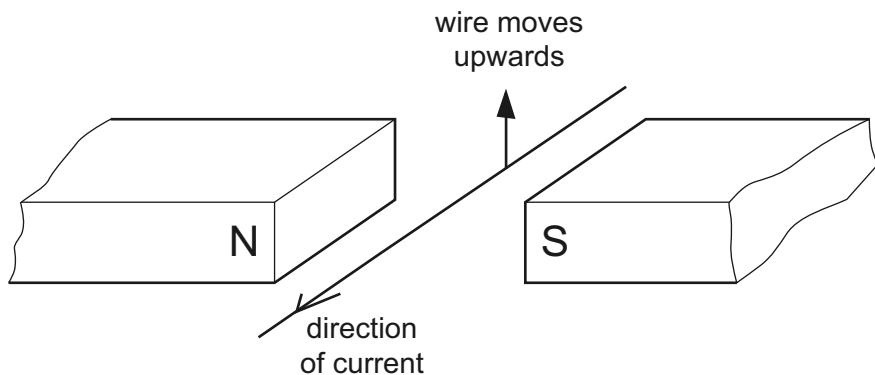
- 2** A current-carrying coil in a magnetic field experiences a turning effect.



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
- 3** A student carries out an experiment to see the effect of a magnetic field on a wire carrying a current.

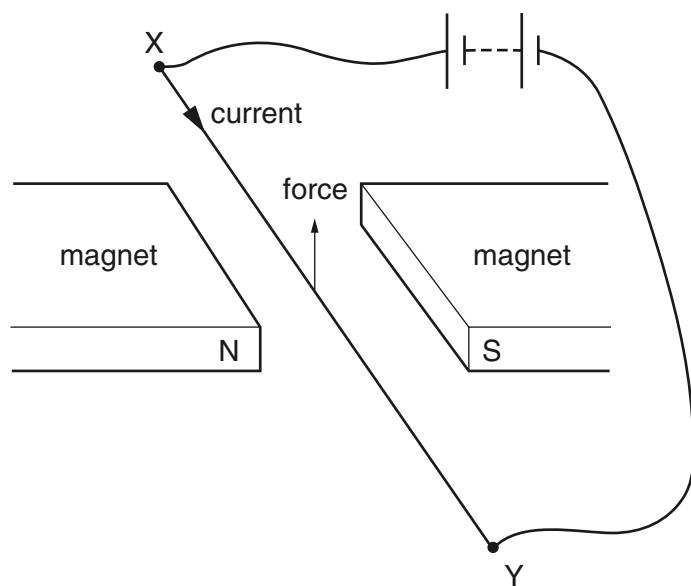
The wire moves upwards as shown.



What should the student do to make the wire move downwards?

- A** change the direction of the current
- B** move the poles of the magnet closer together
- C** send a smaller current through the wire
- D** use a stronger magnet

- 4 When the electric current in wire XY is in the direction shown, there is an upward force on the wire.



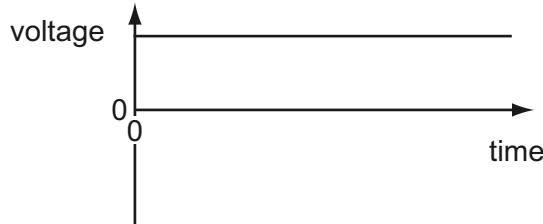
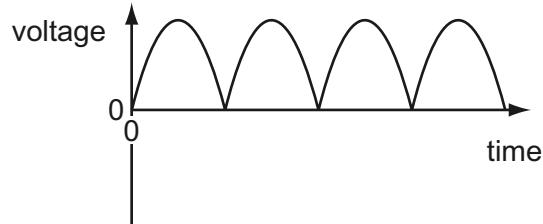
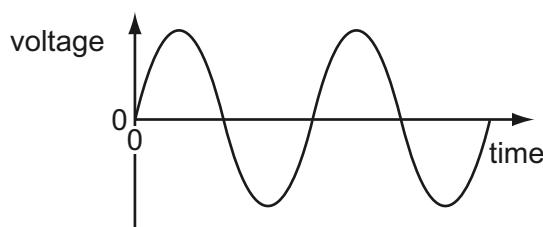
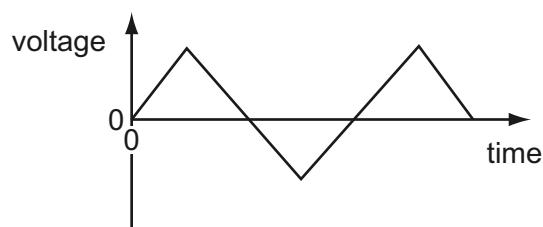
If the north and south poles of the magnet exchange positions, in which direction will the force on the wire act?

- A downwards
- B upwards
- C to the left
- D to the right

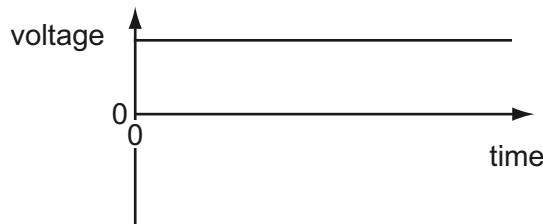
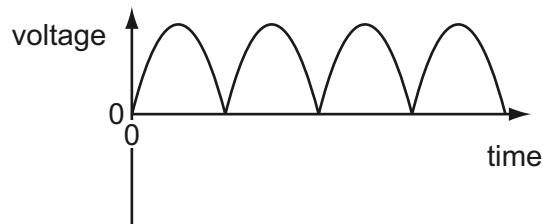
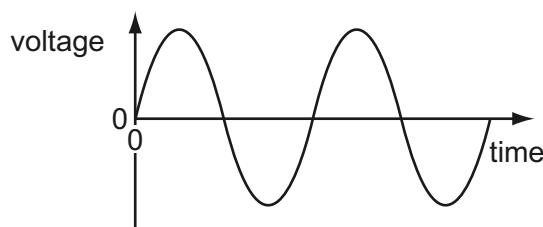
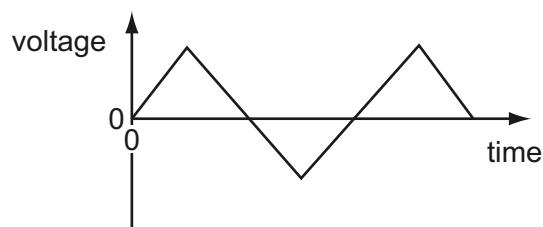
## Chapter 21. Electromagnetic induction

### 21.1 Generating electricity

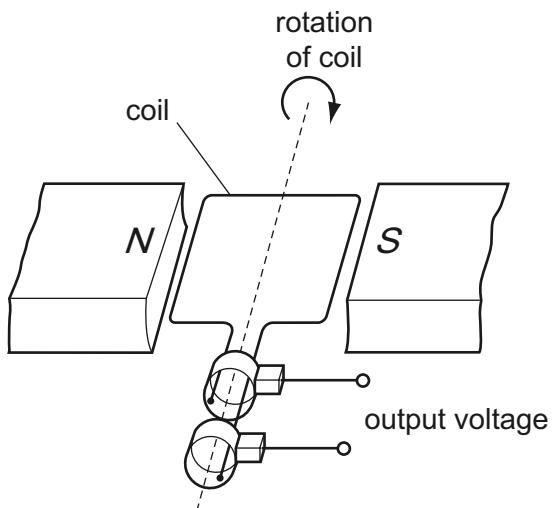
- 1 Which graph shows how the voltage of a simple a.c. generator varies with time?

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

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

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

- 3 Which device uses slip rings?
- A a cathode-ray tube  
B a d.c. motor  
C an a.c. generator  
D a solenoid
- 4 The diagram shows an a.c. generator.

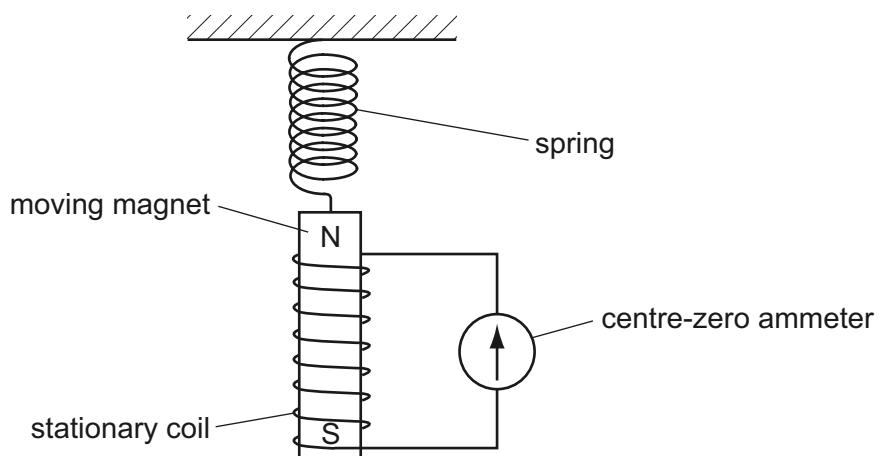


With the coil in the position shown, the output voltage is +10V.

When does the output voltage become -10V?

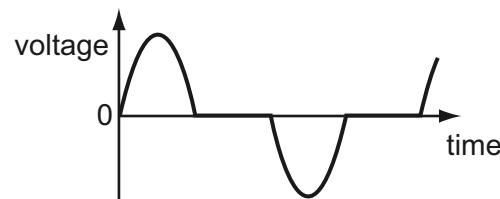
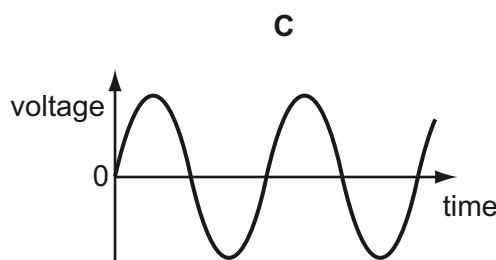
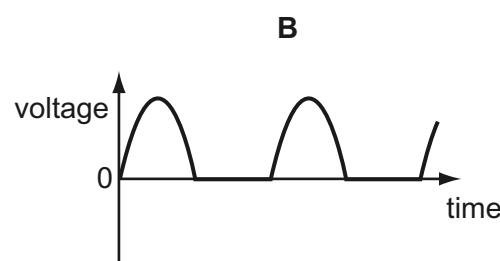
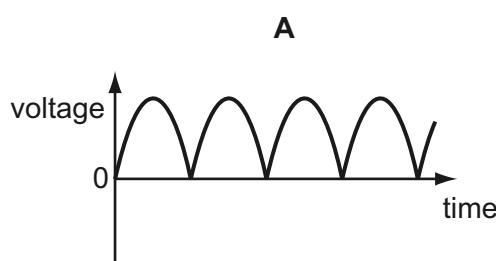
- A when the coil has turned  $90^\circ$   
B when the coil has turned  $180^\circ$   
C when the coil has turned  $270^\circ$   
D when the coil has turned  $360^\circ$

- 5 A magnet is suspended from a spring so that it can move freely inside a coil. The coil is connected to a sensitive centre-zero ammeter.

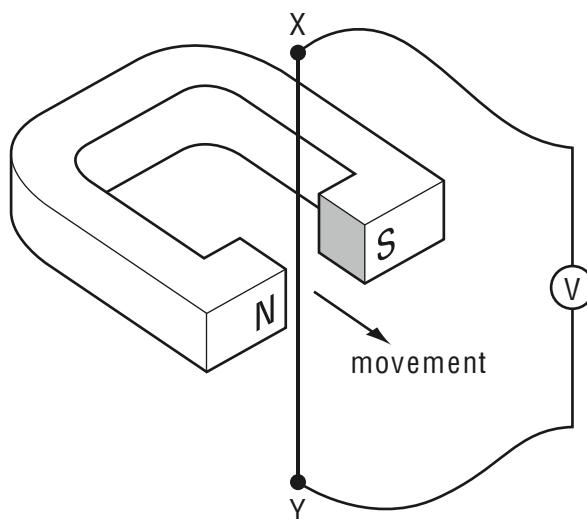


What does the ammeter show when the magnet repeatedly moves slowly up and down?

- A a reading constantly changing from left to right and right to left  
 B a steady reading to the left  
 C a steady reading to the right  
 D a steady reading of zero
- 6 Which graph shows how the output voltage varies with time for a simple a.c. generator?



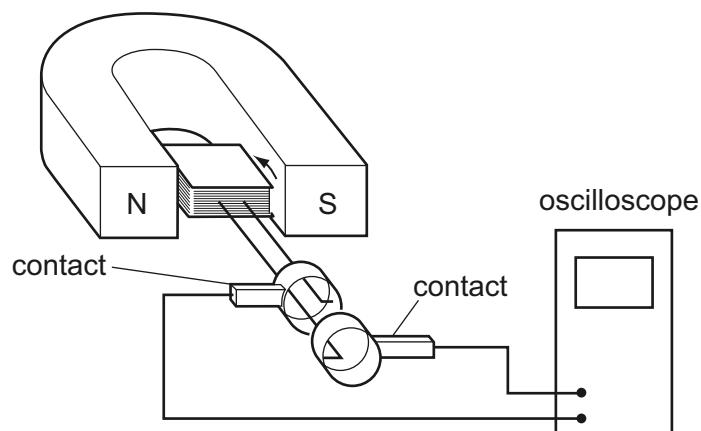
- 7 The wire XY shown in the diagram is connected to a sensitive voltmeter with a centre zero. XY is then moved quickly once through the magnetic field.



What is observed on the voltmeter?

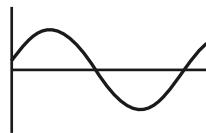
- A The needle moves briefly in one direction and then returns to the centre.
  - B The needle moves quickly in one direction and stays deflected.
  - C The needle vibrates rapidly from side to side whilst XY is moving.
  - D The needle stays still.
- 8 Which parts of an a.c. generator slide past each other when the generator is working?
- A brushes and coil
  - B coil and magnets
  - C magnets and slip rings
  - D slip rings and brushes

- 9** A coil is rotated steadily between the poles of a magnet. The coil is connected to an oscilloscope, which shows a graph of voltage output against time.

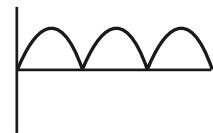


Which graph shows the voltage output against time?

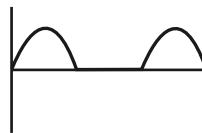
**A**



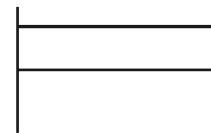
**B**



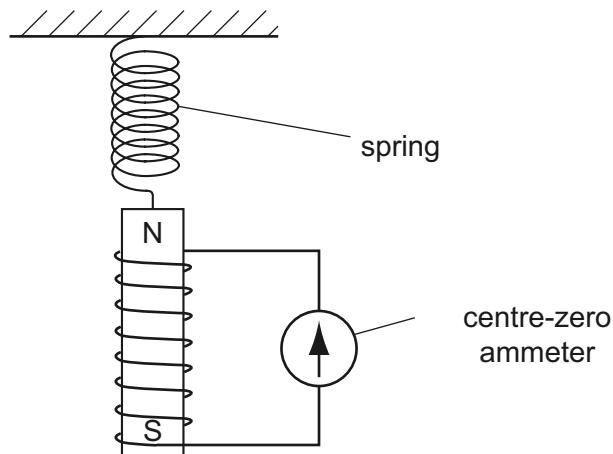
**C**



**D**



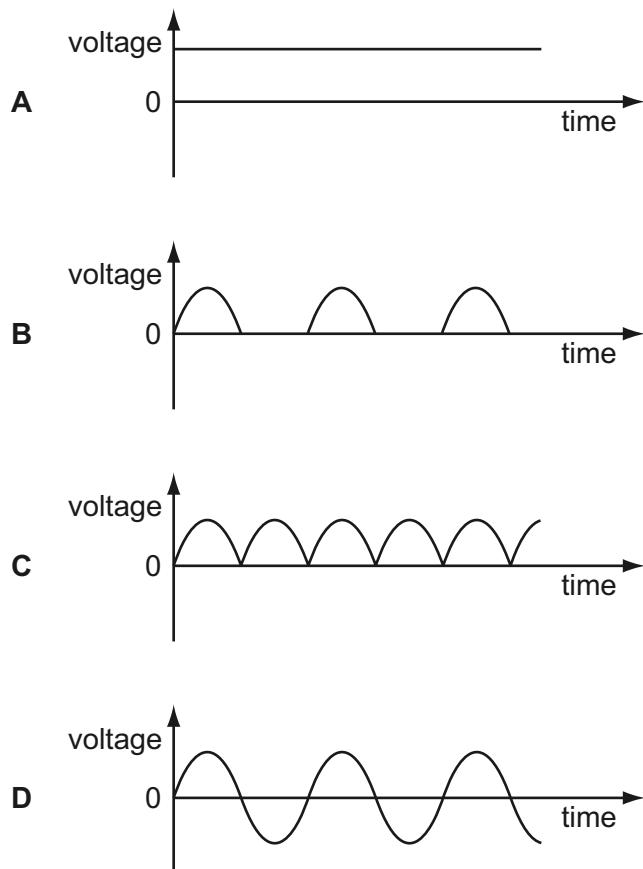
- 10** A magnet is suspended from a spring so that it can move freely inside a coil which is connected to a sensitive centre-zero ammeter.



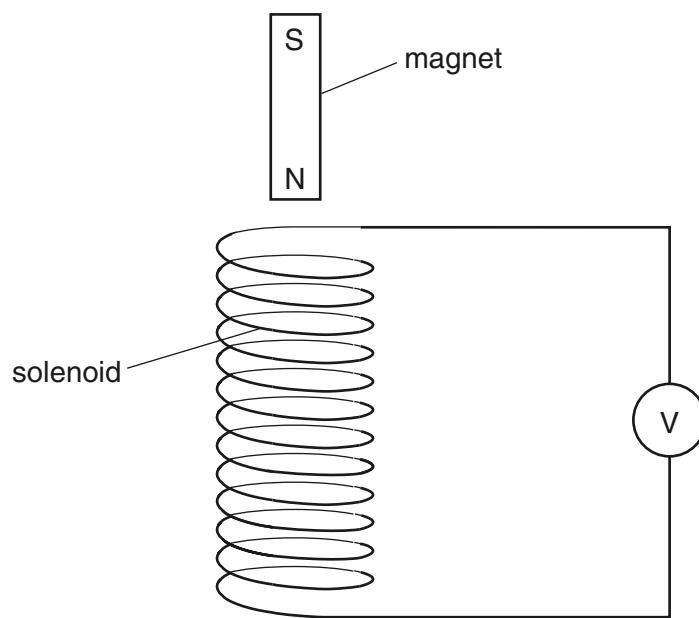
What does the ammeter show when the magnet vibrates slowly up and down?

- A** a reading constantly changing from left to right and right to left
- B** a steady reading to the left
- C** a steady reading to the right
- D** a steady zero reading

11 Which graph shows the output voltage from a simple a.c. generator?



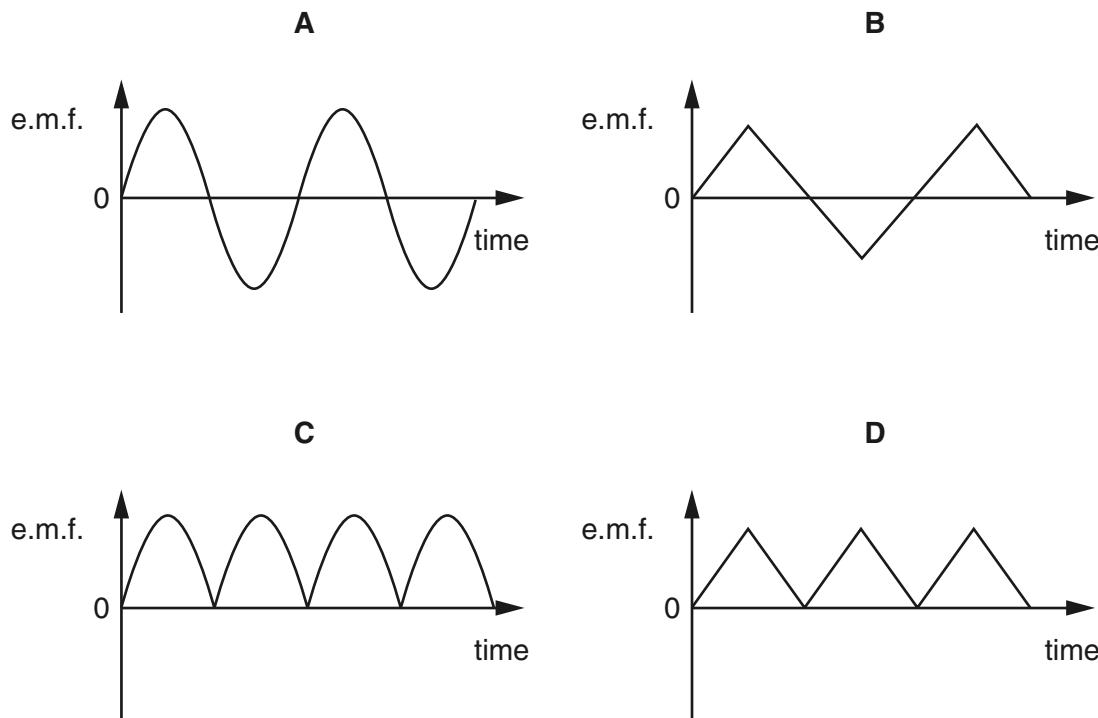
- 12 The diagram shows a solenoid connected to a sensitive voltmeter.



Which of the following would give a zero reading on the voltmeter?

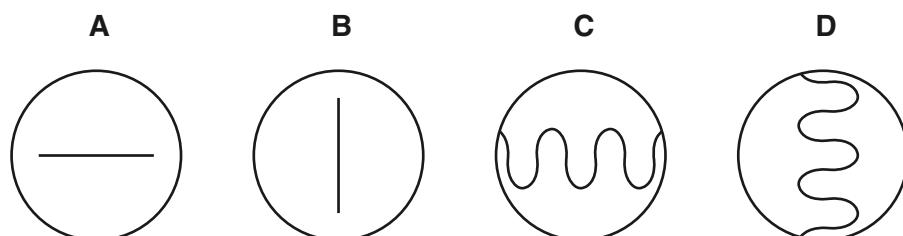
- A holding the magnet stationary inside the solenoid
- B moving the magnet away from the solenoid
- C moving the magnet towards the solenoid
- D moving the solenoid towards the magnet

13 Which graph shows the output of a simple a.c. generator?



14 An alternating potential difference (p.d.) is applied to the Y-plates of a cathode-ray oscilloscope. The time-base is turned off.

Which of the following patterns would appear on the screen?



## 21.2 Power lines

- 1 A village has to be supplied with electricity from a power station that is a long way from the village.

Which type of current should be used, and at which voltage?

	type of current	voltage
A	alternating current	high voltage
B	alternating current	low voltage
C	direct current	high voltage
D	direct current	low voltage

- 2 Two different systems are used to transmit equal amounts of electrical power from one building to another.

One system uses low voltage and the other uses high voltage. Both systems use identical wires.

Which line in the table is correct about which system wastes least energy and why?

	least energy wasted	why
A	high voltage system	the current in the wires is bigger
B	high voltage system	the current in the wires is smaller
C	low voltage system	the current in the wires is bigger
D	low voltage system	the current in the wires is smaller

- 3 How is electricity transmitted over large distances and why is it transmitted in this way?

	how	why
A	at high voltage	for safety
B	at high voltage	to reduce energy loss
C	at low voltage	for safety
D	at low voltage	to reduce energy loss

4 How is electricity transmitted over large distances and why is it transmitted in this way?

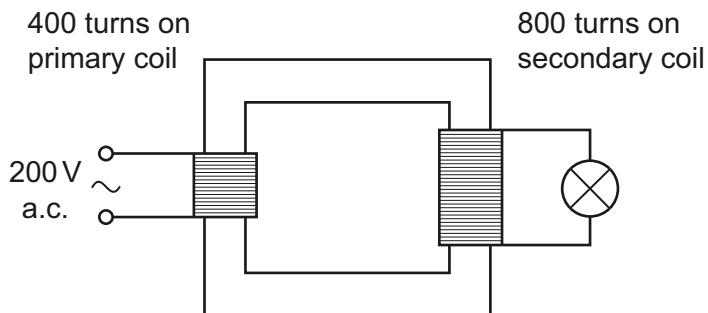
	how	why
<b>A</b>	at high voltage	for safety
<b>B</b>	at high voltage	to reduce energy loss
<b>C</b>	at low voltage	for safety
<b>D</b>	at low voltage	to reduce energy loss

5 When electricity is transmitted over long distances, energy is wasted. How can the wasted energy be kept as small as possible?

- A** Keep the current in the transmission lines as large as possible.
- B** Keep the power supplied to the transmission lines as large as possible.
- C** Keep the resistance of the transmission lines as large as possible.
- D** Keep the voltage supplied to the transmission lines as large as possible.

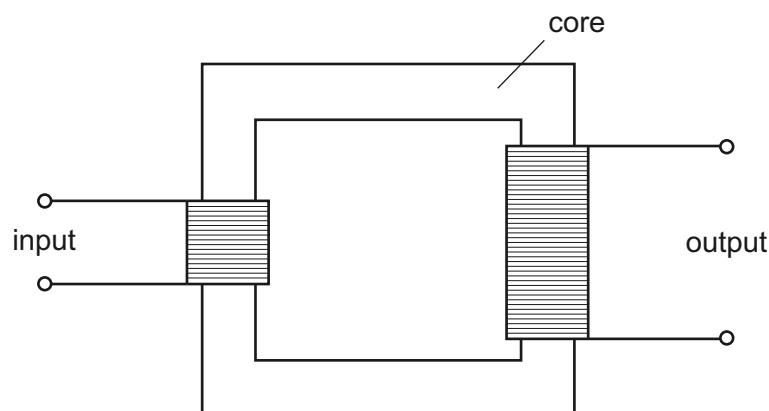
### 21.3 Transformers

- 1 In the construction of a transformer, which items must be included?
- an iron core and a permanent magnet
  - an iron core and two coils of wire
  - a steel core and a permanent magnet
  - a steel core and two coils of wire
- 2 The diagram shows a transformer. The input voltage and the number of turns on each coil are shown.



What is the output voltage?

- 100 V
  - 200 V
  - 400 V
  - 800 V
- 3 The diagram shows a simple transformer.

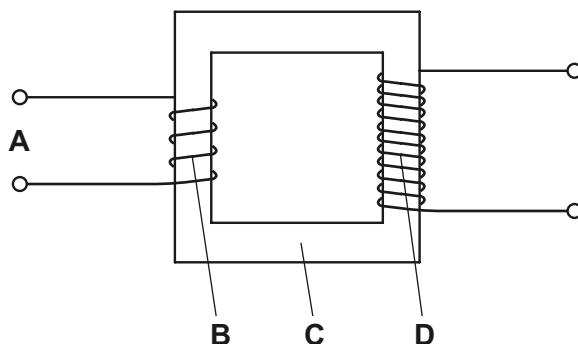


From which material should the core be made?

- aluminium
- copper
- iron
- steel

- 4 The diagram shows a simple step-down transformer used to decrease a voltage.

Which part is the primary coil?

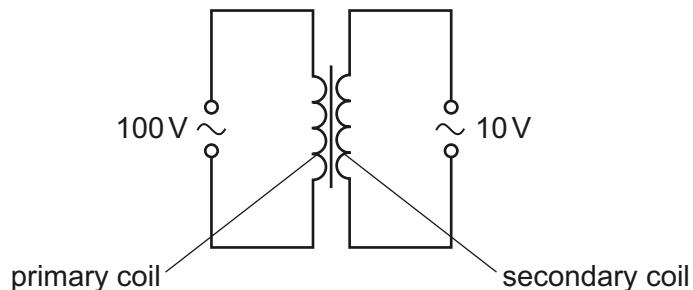


- 5 A transformer has 15 000 turns on its primary coil and 750 turns on its secondary coil.

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
- B to convert the 160 000 V d.c. supply from a power line to 8000 V for local power transmission
- C to use a 12V d.c. supply to operate a 240V razor
- D to use a 240V a.c. mains supply to operate a 12V motor

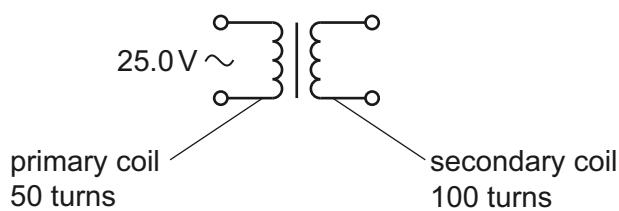
- 6 A transformer is to be used to provide a 10V output from a 100V supply.



What are suitable numbers of turns for the primary coil and for the secondary coil?

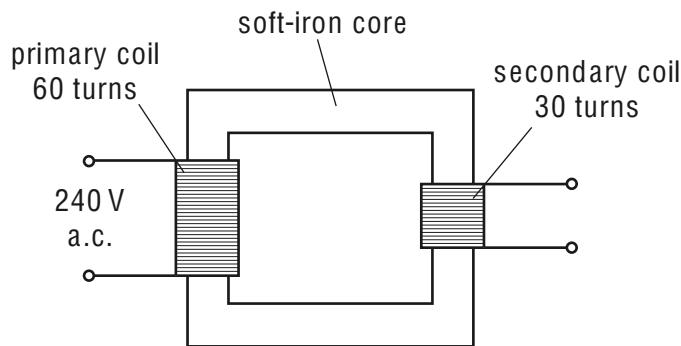
	number of turns on the primary coil	number of turns on the secondary coil
A	100	1000
B	200	110
C	400	490
D	800	80

- 7 A transformer has 50 turns on its primary coil and 100 turns on its secondary coil. An alternating voltage of 25.0 V is connected across the primary coil.



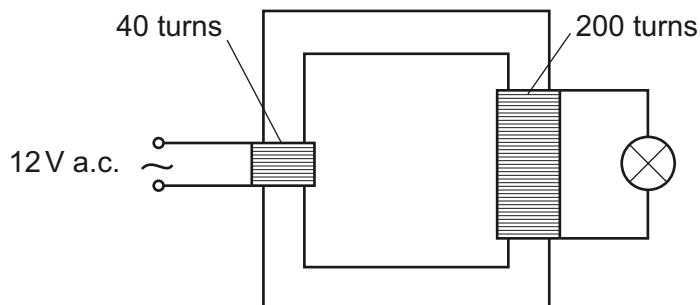
What is the voltage across the secondary coil?

- A** 12.5 V      **B** 50.0 V      **C** 175 V      **D** 200 V
- 8 The diagram shows a transformer connected to a 240 V a.c. supply.



What is the potential difference across the secondary coil of the transformer?

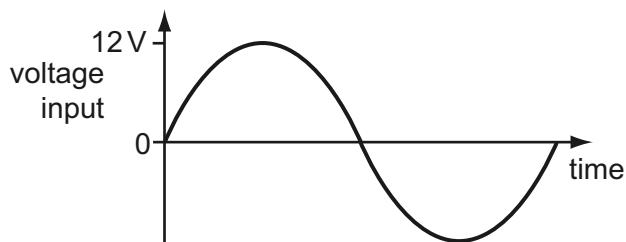
- A** 30 V      **B** 120 V      **C** 240 V      **D** 480 V
- 9 The diagram shows a lamp connected to a transformer.



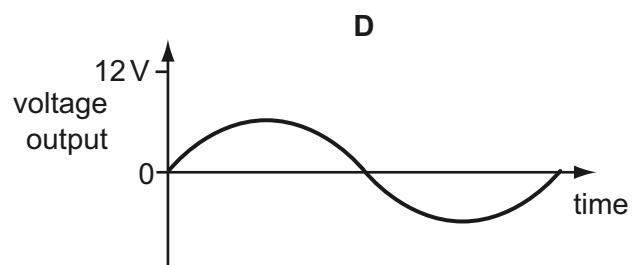
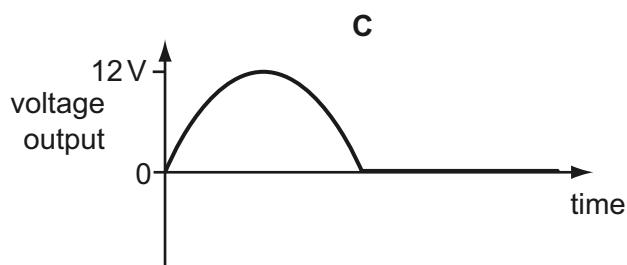
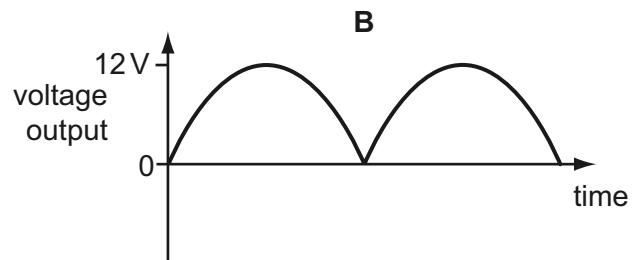
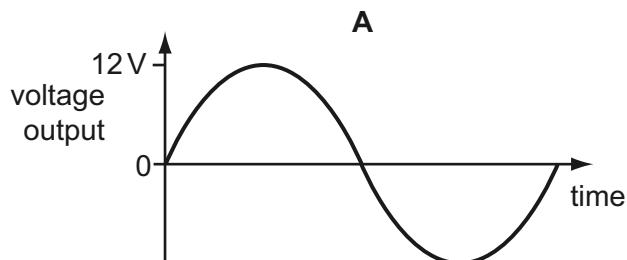
What is the potential difference across the lamp?

- A** 2.4 V      **B** 12 V      **C** 60 V      **D** 240 V

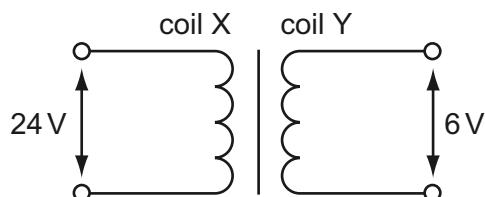
- 10 The graph shows the voltage input to a step-down transformer.



Which diagram shows the voltage output from the transformer?



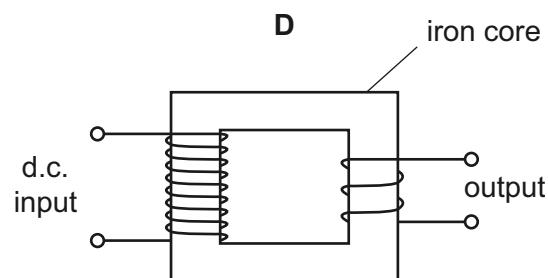
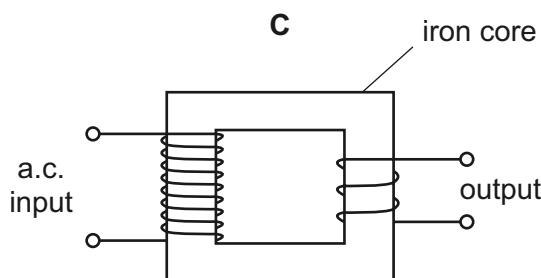
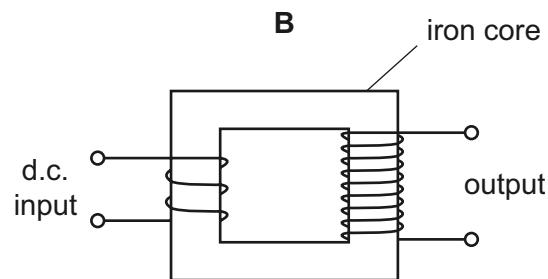
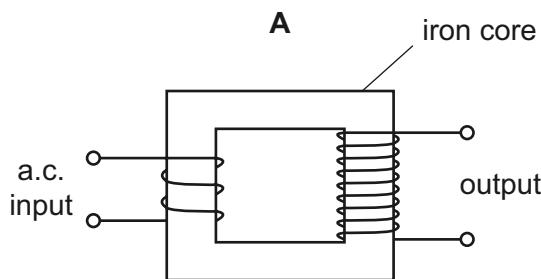
- 11 A transformer is to be used to produce a 6V output from a 24V input.



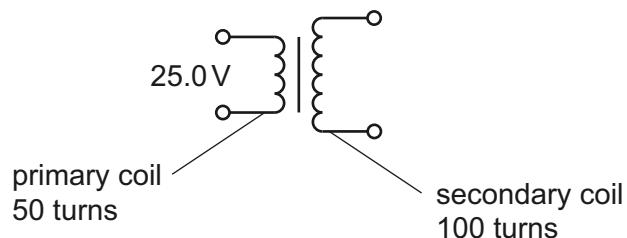
What are suitable numbers of turns for coil X and for coil Y?

	number of turns on coil X	number of turns on coil Y
<b>A</b>	240	60
<b>B</b>	240	240
<b>C</b>	240	960
<b>D</b>	960	60

- 12 Which arrangement may be used to step up a voltage?



- 13 A transformer has 50 turns on its primary coil and 100 turns on its secondary coil. An a.c. voltage of 25.0 V is connected across the primary coil.



What is the voltage across the secondary coil?

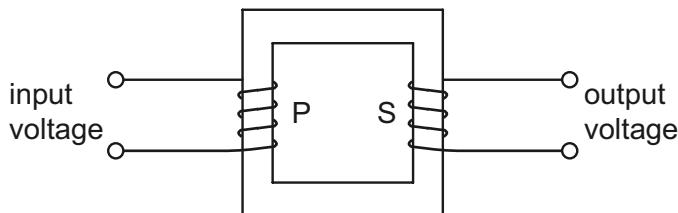
**A** 12.5 V

**B** 50.0 V

**C** 175 V

**D** 200 V

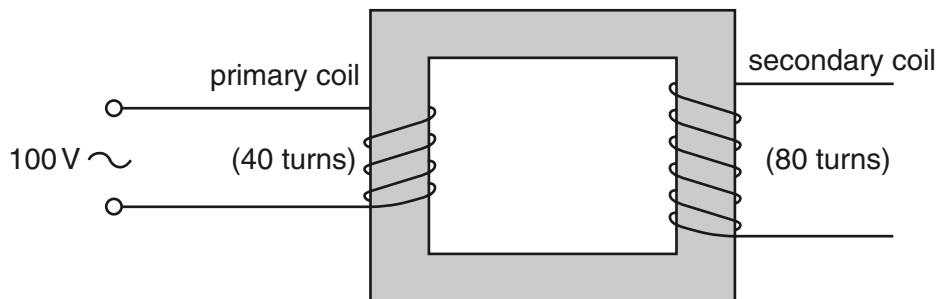
- 14 The diagram represents a transformer.



Which arrangement could be used to make the output voltage higher than the input voltage?

	number of turns on primary coil P	number of turns on secondary coil S	type of input
A	100	50	a.c.
B	100	50	d.c.
C	50	100	a.c.
D	50	100	d.c.

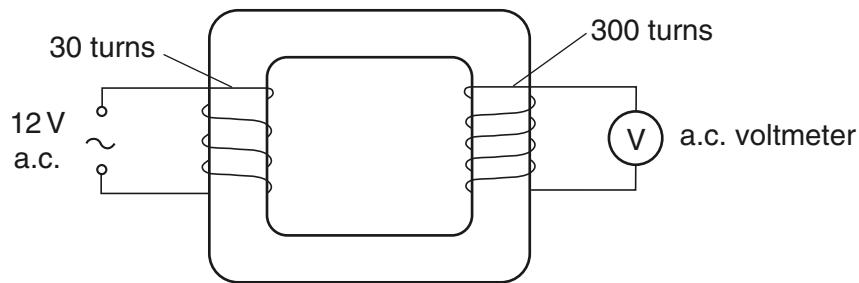
- 15 The diagram shows a transformer with an alternating voltage of 100 V applied to the primary coil.



What is the voltage produced across the secondary coil?

- A 50 V      B 100 V      C 200 V      D 8000 V

16 The diagram shows a transformer.



What is the voltmeter reading?

- A** 1.2 V    **B** 12 V    **C** 120 V    **D** 1200 V

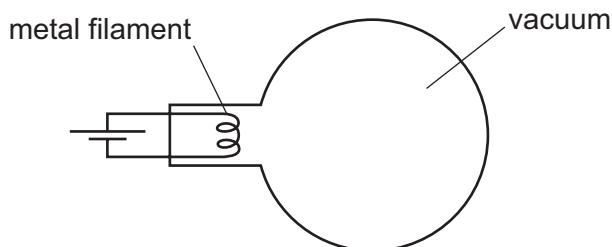
**Part V**

# **Atomic physics**

## Chapter 22. The nuclear atom

### 22.1 Atomic structure

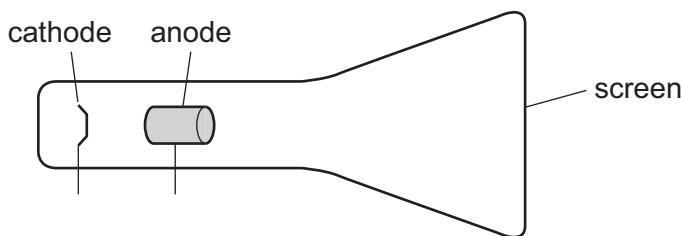
- 1 The metal filament shown is heated by passing a current through it. This makes it hot and it releases electrons.



What is the name of this process of releasing electrons?

- A convection
- B evaporation
- C radioactive emission
- D thermionic emission

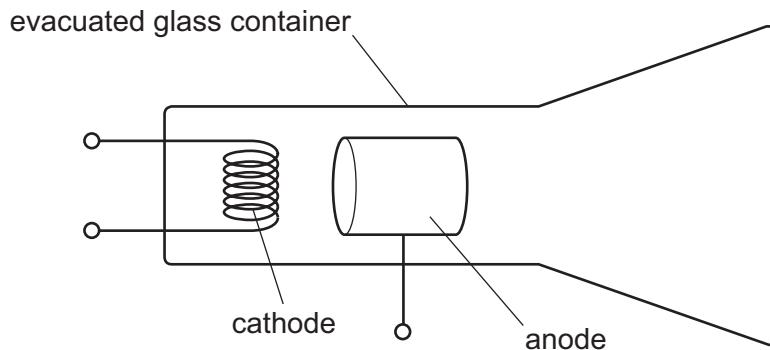
- 2 The diagram shows some parts of a cathode-ray tube which is producing cathode rays.



Which is a correct description of the cathode?

- A negative and cool
- B negative and hot
- C positive and cool
- D positive and hot

- 3** The diagram shows a device to produce cathode rays.



Which part of the device is heated and why?

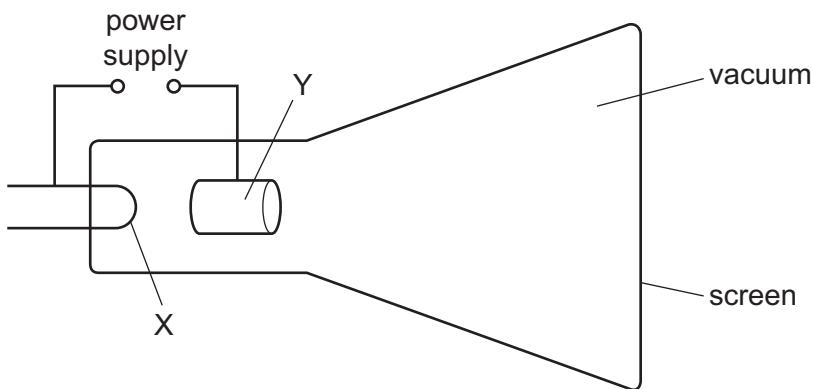
	part heated	reason
<b>A</b>	anode	to emit electrons
<b>B</b>	anode	to emit protons
<b>C</b>	cathode	to emit electrons
<b>D</b>	cathode	to emit protons

- 4** Cathode rays are emitted in a vacuum tube. They consist of particles that are found in atoms.

What is the name of the particles and how are the cathode rays produced?

	name of particles	how the cathode rays are produced
<b>A</b>	electrons	electromagnetic induction
<b>B</b>	electrons	thermionic emission
<b>C</b>	protons	electromagnetic induction
<b>D</b>	protons	thermionic emission

- 5 The diagram shows a cathode-ray tube.



What are the correct labels for X and for Y?

	X	Y
A	negative anode	positive cathode
B	negative cathode	positive anode
C	positive anode	negative cathode
D	positive cathode	negative anode

- 6 A cathode-ray tube has an anode and an earthed cathode.

Which row shows the charge on the **anode** and the temperature of the **cathode**?

	anode charge	cathode temperature
A	negative	cool
B	negative	hot
C	positive	cool
D	positive	hot

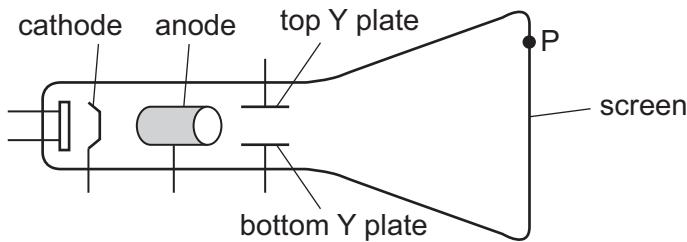
- 7 What are cathode rays?

- A a beam of electrons
- B a beam of neutrons
- C a beam of protons
- D electromagnetic waves

8 To create cathode rays in a vacuum, what might be a suitable potential difference to connect between the cathode and anode?

- A 6 V a.c.
- B 6 V d.c.
- C 600 V a.c.
- D 600 V d.c.

9 The diagram shows a cathode-ray tube.



A student wants the cathode rays to make a spot at P on the screen.

Which parts of the cathode-ray tube should be positive?

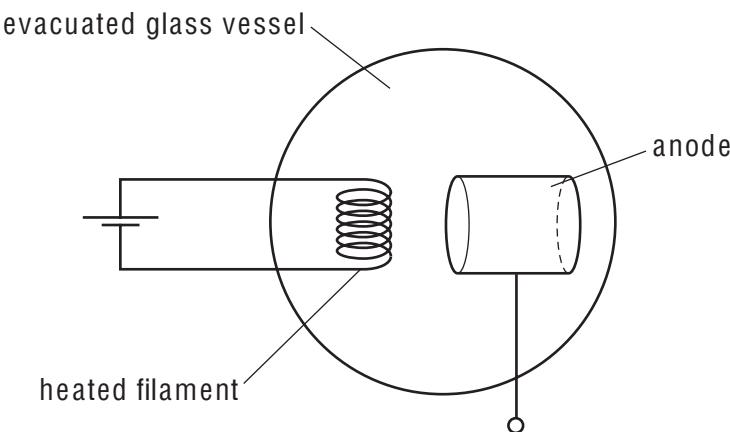
- A anode and top Y plate
- B anode and bottom Y plate
- C cathode and top Y plate
- D cathode and bottom Y plate

10 In a cathode-ray tube, a hot tungsten cathode releases particles by thermionic emission.

What are these particles?

- A  $\alpha$ -particles
- B electrons
- C protons
- D tungsten atoms

- 11 In order to produce a beam of cathode rays, a heated filament is placed near to an anode in an evacuated glass vessel.



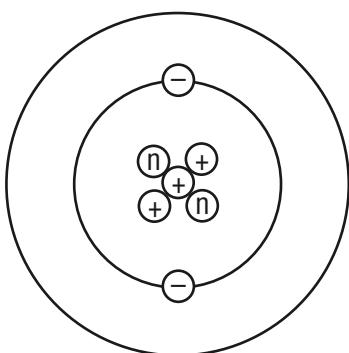
What is the type of charge on the anode and why is this charge chosen?

	charge	reason
A	negative	to attract electrons
B	negative	to repel electrons
C	positive	to attract electrons
D	positive	to repel electrons

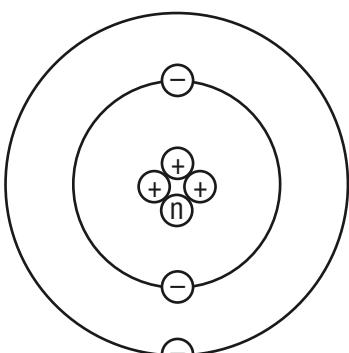
- 12 An atom of the element lithium has a nucleon number of 7 and a proton number of 3.

Which diagram represents a neutral atom of lithium?

A



B



key

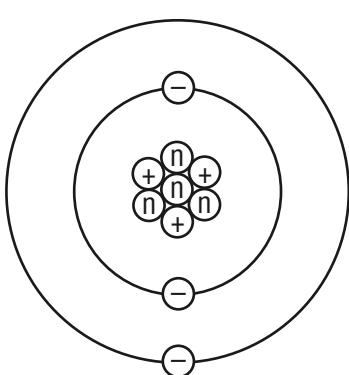
(n) = a neutron

(+) = a proton

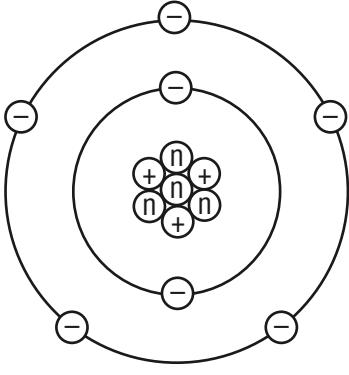
(-) = an electron

(not to scale)

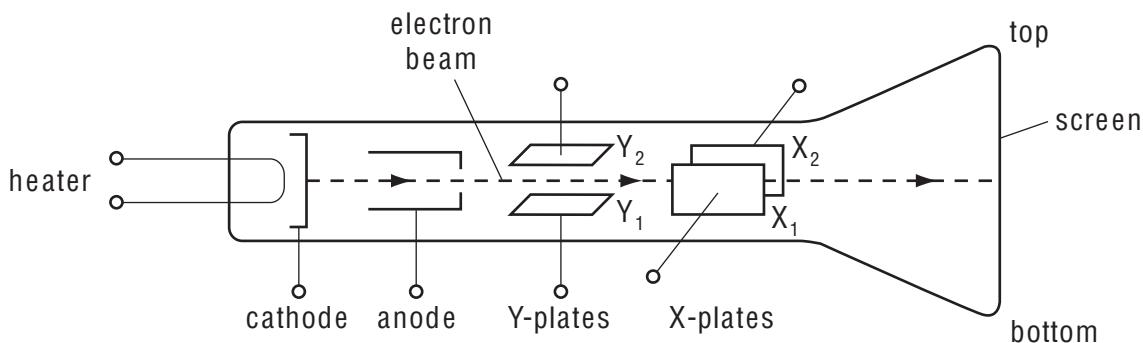
C



D



- 13 The diagram shows a cathode-ray tube.



What must be done to deflect the electron beam upwards?

- A make  $X_1$  more positive than  $X_2$
- B make  $X_2$  more positive than  $X_1$
- C make  $Y_1$  more positive than  $Y_2$
- D make  $Y_2$  more positive than  $Y_1$

- 14 A cathode-ray tube has an anode and an earthed cathode.

Which line in the table shows the charge and the temperature of the **anode**?

	anode charge	anode temperature
A	negative	cool
B	negative	hot
C	positive	cool
D	positive	hot

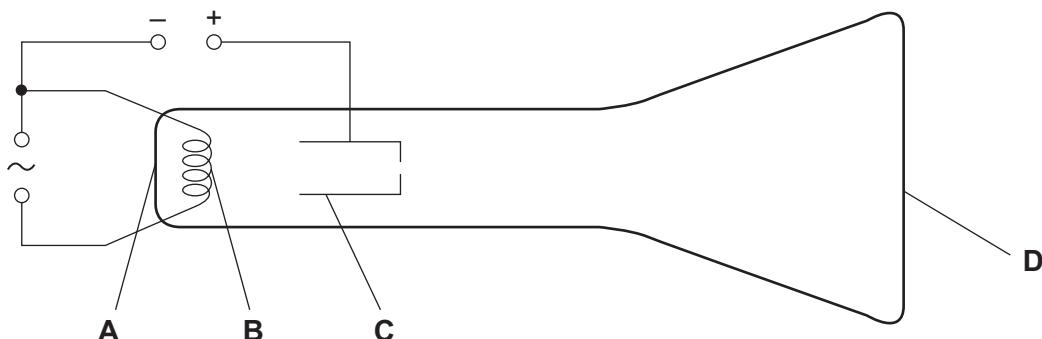
- 15 Charged particles are emitted from the cathode of an oscilloscope.

What is the name and the charge of these particles?

	name of particles	charge of particles
A	electrons	negative
B	electrons	positive
C	protons	negative
D	protons	positive

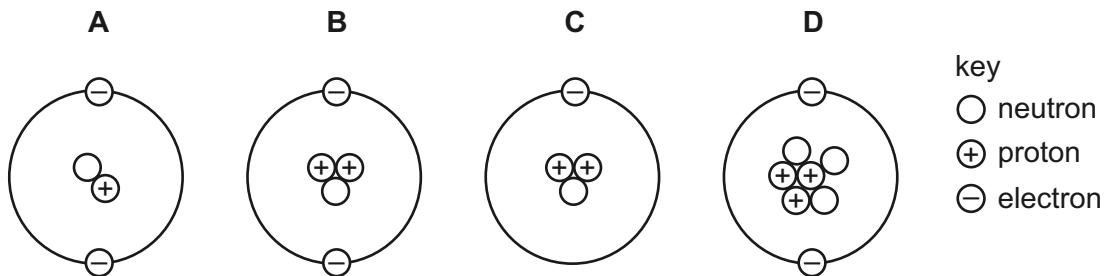
16 The diagram shows a simple cathode-ray tube.

Which part emits the electrons?



## 22.2 Protons, neutrons and electrons

- 1 Which statement about a carbon nucleus represented by  $^{14}_6\text{C}$  is correct?
- A It contains 6 neutrons.  
B It contains 6 electrons.  
C It contains 8 protons.  
D It contains 14 nucleons.
- 2 Which statement about a neutral atom of  $^{226}_{88}\text{Ra}$  is correct?
- A It has an equal number of neutrons and protons.  
B It has more electrons than neutrons.  
C It has more electrons than protons.  
D It has more neutrons than protons.
- 3 Which diagram could represent the structure of a neutral atom?



- 4 A nuclide of substance X has the symbol  $^{26}_{12}\text{X}$ .

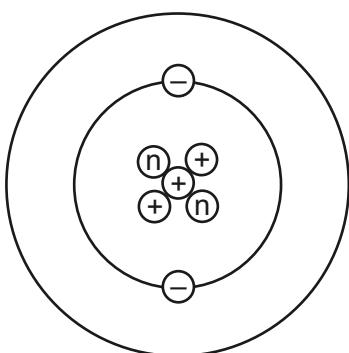
How many electrons are there in a neutral atom of substance X?

- A 12      B 14      C 26      D 38

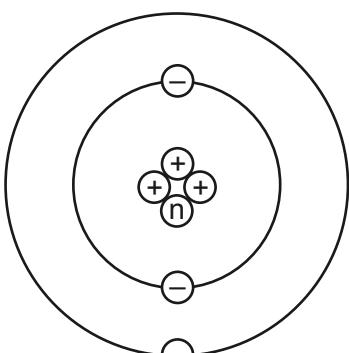
- 5 An atom of the element lithium has a nucleon number of 7 and a proton number of 3.

Which diagram represents a neutral atom of lithium?

A



B



key

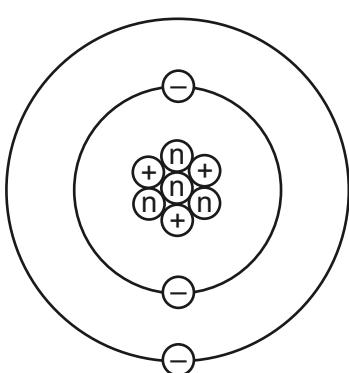
(n) = a neutron

(+) = a proton

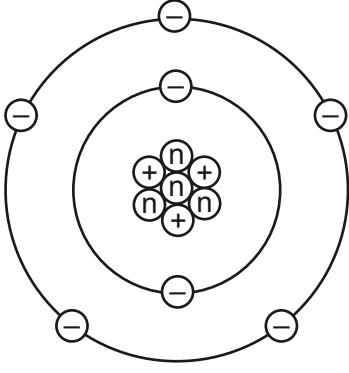
(-) = an electron

(not to scale)

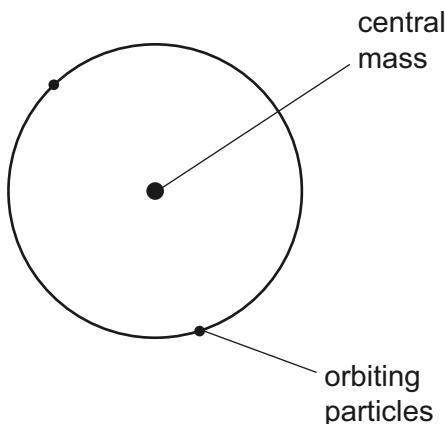
C



D



- 6 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

	central mass	orbiting particles
A	neutron	$\alpha$ -particles
B	neutron	electrons
C	nucleus	$\alpha$ -particles
D	nucleus	electrons

- 7 The nuclide notation for radium-226 is  $^{226}_{88}\text{Ra}$ .

How many electrons orbit the nucleus of a neutral atom of radium-226?

- A 0      B 88      C 138      D 226
- 8 How many neutrons and how many protons are contained in a nucleus of  $^{238}_{92}\text{U}$ ?

	neutrons	protons
A	92	146
B	146	92
C	146	238
D	238	92

- 9  $^{16}_7\text{N}$  is the symbol for a particular nuclide of nitrogen.

How many nucleons does this nuclide contain?

- A 7      B 9      C 16      D 23

- 10** A uranium  $^{238}_{92}\text{U}$  nucleus emits an  $\alpha$ -particle.

What are the new nucleon and proton numbers?

	nucleon number	proton number
<b>A</b>	238	88
<b>B</b>	236	90
<b>C</b>	234	92
<b>D</b>	234	90

- 11** A particular nuclide has the symbol  $^{37}_{17}\text{Cl}$ .

What is true for atoms of this nuclide?

- A** There are 17 nucleons in the nucleus.
- B** There are 17 protons in the nucleus.
- C** There are 37 electrons in the nucleus.
- D** There are 37 neutrons in the nucleus.

- 12** The data below relates to the nucleus of a particular neutral atom of nitrogen.

proton number       $Z = 7$

nucleon number       $A = 17$

Which row represents the correct number of neutrons and electrons in this atom?

	number of neutrons	number of electrons
<b>A</b>	10	7
<b>B</b>	10	10
<b>C</b>	17	7
<b>D</b>	17	10

13 There are three nuclides of hydrogen.

nuclide 1	nuclide 2	nuclide 3
$^1_1\text{H}$	$^2_1\text{H}$	$^3_1\text{H}$

Which of these nuclides have the same number of protons in their nuclei?

- A 1 and 2 only
- B 2 and 3 only
- C all of them
- D none of them

14 Which statement is true of all neutral atoms?

- A The number of electrons equals the number of nucleons.
- B The number of neutrons equals the number of protons.
- C The number of nucleons equals the number of neutrons.
- D The number of protons equals the number of electrons.

15 Which particle does **not** experience a force due to an electric field?

- A  $\alpha$ -particle
- B electron
- C neutron
- D proton

16 The nucleus of a neutral atom of lithium is represented by  $^7_3\text{Li}$ .

How many protons, electrons and neutrons does the atom contain?

	protons	electrons	neutrons
<b>A</b>	7	7	3
<b>B</b>	3	7	3
<b>C</b>	3	4	4
<b>D</b>	3	3	4

17 Which particles are found in the nucleus of an atom?

- A neutrons and protons only
- B neutrons only
- C protons and electrons only
- D protons, electrons and neutrons

18 In the symbol below, A is the nucleon number and Z is the proton number.



What is represented by the symbol?

- A an electron
- B a neutron
- C a nuclide
- D an X-ray

19 How many neutrons are in a nucleus of  ${}^{14}_6 C$ ?

- A 0
- B 6
- C 8
- D 14

20 Which particles are emitted during thermionic emission?

- A electrons
- B ions
- C neutrons
- D protons

21 How many nucleons are in a nucleus of  ${}^{39}_{19} K$ ?

- A 19
- B 20
- C 39
- D 58

22 A nucleus of substance X has the symbol  ${}^{26}_{12} X$ .

How many electrons orbit around the nucleus of a neutral atom of substance X?

- A 12
- B 14
- C 26
- D 38

- 23** Which line in the table shows the structure of the nucleus of a helium atom  ${}_2^4\text{He}$ ?

	electrons	neutrons	protons
<b>A</b>	2	2	0
<b>B</b>	2	0	2
<b>C</b>	0	2	2
<b>D</b>	2	2	2

- 24** An atom of lithium contains three protons and three electrons.

The nucleon number (mass number) of the atom is 7.

How many neutrons are there in the atom?

- A** 3      **B** 4      **C** 7      **D** 10

- 25** Which line in the table gives the numbers of protons and neutrons in the nuclide  ${}_3^7\text{Li}$ ?

	protons	neutrons
<b>A</b>	3	4
<b>B</b>	3	7
<b>C</b>	4	3
<b>D</b>	7	3

- 26**  ${}_{10}^{22}\text{Ne}$  represents an atom of neon.

How many neutrons does it have?

- A** 10      **B** 12      **C** 22      **D** 32

## Chapter 23. Radioactivity

### 23.1 Radioactivity all around

- 1 When measuring the emissions from a radioactive rock brought into the laboratory, a teacher mentions that background radiation must be taken into account.

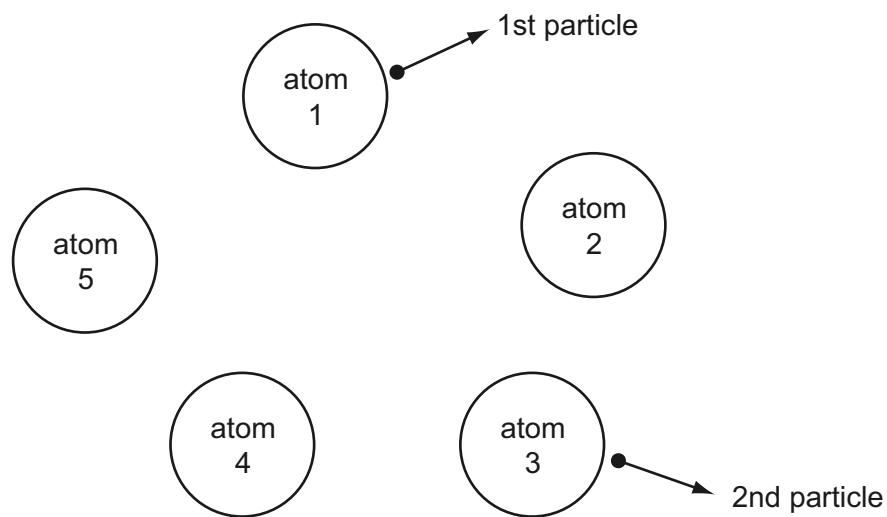
What is this background radiation?

- A infra-red radiation from warm objects in the laboratory
- B infra-red radiation from the Sun
- C ionising radiation from the radioactive rock brought into the laboratory
- D ionising radiation in the laboratory when the radioactive rock is not present

- 2 Which material is commonly used as a lining for a box for storing radioactive samples?

- A aluminium
- B copper
- C lead
- D uranium

- 3 The diagram shows five atoms in a radioactive substance. The atoms each give out an  $\alpha$ -particle.



Atom 1 is the first to give out a particle. Atom 3 is the second to give out a particle.

Which atom will give out the next particle?

- A atom 2
- B atom 4
- C atom 5
- D impossible to tell

4 A sample of a radioactive isotope is decaying.

Which atoms will decay first?

- A impossible to know, because radioactive decay is random
- B impossible to know, unless the age of the material is known
- C atoms near the centre, because they are surrounded by more atoms
- D atoms near the surface, because the radiation can escape more easily

## 23.2 The microscopic picture

1 Which of the following is **not** a charged particle?

- A  $\alpha$ -particle
- B  $\beta$ -particle
- C neutron
- D proton

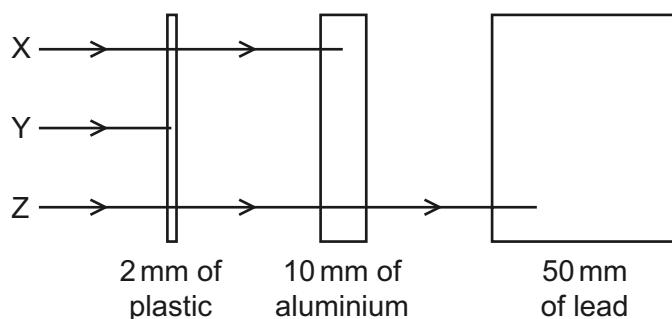
2 How do the ionising effect and the penetrating ability of  $\alpha$ -particles compare with those of  $\beta$ -particles and  $\gamma$ -rays?

	ionising effect	penetrating ability
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

3 How does the ionising effect of  $\alpha$ -particles compare with that of  $\beta$ -particles and  $\gamma$ -rays?

	compared with $\beta$ -particles	compared with $\gamma$ -rays
A	$\alpha$ -particles are less strongly ionising	$\alpha$ -particles are less strongly ionising
B	$\alpha$ -particles are less strongly ionising	$\alpha$ -particles are more strongly ionising
C	$\alpha$ -particles are more strongly ionising	$\alpha$ -particles are less strongly ionising
D	$\alpha$ -particles are more strongly ionising	$\alpha$ -particles are more strongly ionising

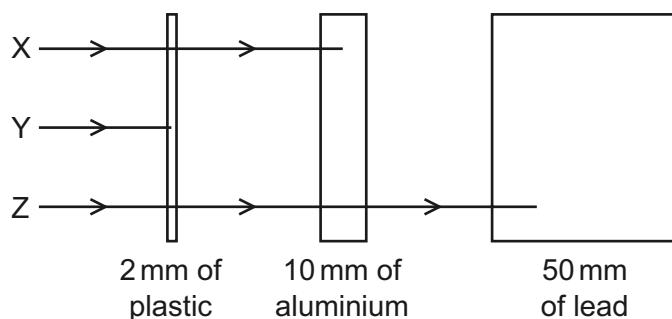
- 4 The diagram shows the paths of three different types of radiation, X, Y and Z.



Which row in the table correctly identifies X, Y and Z?

	X	Y	Z
A	$\alpha$ -particles	$\beta$ -particles	$\gamma$ -rays
B	$\beta$ -particles	$\alpha$ -particles	$\gamma$ -rays
C	$\beta$ -particles	$\gamma$ -rays	$\alpha$ -particles
D	$\gamma$ -rays	$\alpha$ -particles	$\beta$ -particles

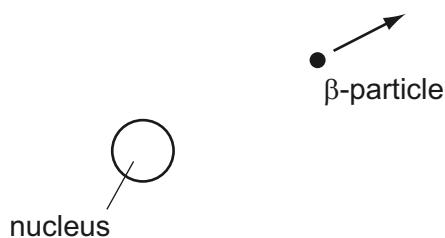
- 5 The diagram shows the paths of three different types of radiation, X, Y and Z.



Which row in the table correctly identifies X, Y and Z?

	X	Y	Z
A	$\alpha$ -particles	$\beta$ -particles	$\gamma$ -rays
B	$\beta$ -particles	$\alpha$ -particles	$\gamma$ -rays
C	$\beta$ -particles	$\gamma$ -rays	$\alpha$ -particles
D	$\gamma$ -rays	$\alpha$ -particles	$\beta$ -particles

- 6 A radioactive nucleus emits a  $\beta$ -particle.

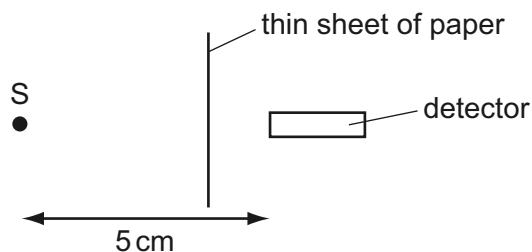


What happens to the proton number (atomic number) of the nucleus?

- A It stays the same.
  - B It increases by 1.
  - C It decreases by 2.
  - D It decreases by 4.
- 7 A scientist needs to use a source of  $\gamma$ -rays as safely as possible.  
Which action will **not** reduce the amount of radiation that reaches the scientist?
- A keeping the distance between the source and the scientist as large as possible
  - B keeping the temperature of the source as low as possible
  - C keeping the time for which the scientist uses the source as small as possible
  - D placing a lead screen between the scientist and the source
- 8 Which row shows the relative ionising effects and penetrating abilities of  $\alpha$ -particles and  $\beta$ -particles?

	ionising effect	penetrating ability
<b>A</b>	$\alpha$ greater than $\beta$	$\alpha$ greater than $\beta$
<b>B</b>	$\alpha$ greater than $\beta$	$\alpha$ less than $\beta$
<b>C</b>	$\alpha$ less than $\beta$	$\alpha$ greater than $\beta$
<b>D</b>	$\alpha$ less than $\beta$	$\alpha$ less than $\beta$

- 9 S is a radioactive source emitting  $\alpha$ -particles,  $\beta$ -particles and  $\gamma$ -rays. A detector is placed 5 cm away from S. A thin sheet of paper is placed as shown in the diagram.

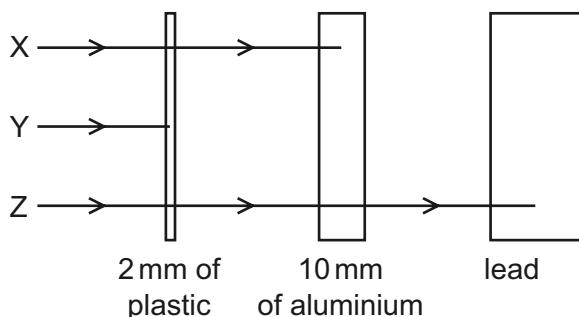


Which radiations can be detected?

- A  $\alpha$ -particles and  $\beta$ -particles only
  - B  $\alpha$ -particles and  $\gamma$ -rays only
  - C  $\beta$ -particles and  $\gamma$ -rays only
  - D  $\alpha$ -particles,  $\beta$ -particles and  $\gamma$ -rays
- 10 Which row describes the properties of  $\alpha$ -particles?

	ionizing effect	radiation stopped by aluminium?
A	large	no
B	large	yes
C	small	no
D	small	yes

- 11 The diagram shows the paths of three different types of radiation, X, Y and Z.



Which row in the table correctly identifies X, Y and Z?

	X	Y	Z
A	$\alpha$ -particles	$\beta$ -particles	$\gamma$ -rays
B	$\beta$ -particles	$\alpha$ -particles	$\gamma$ -rays
C	$\beta$ -particles	$\gamma$ -rays	$\alpha$ -particles
D	$\gamma$ -rays	$\alpha$ -particles	$\beta$ -particles

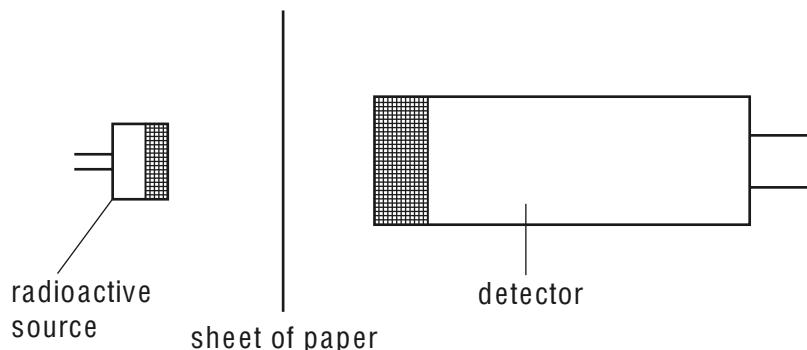
- 12 A radioactive nucleus contains 138 neutrons. The nucleus emits an  $\alpha$ -particle.

How many neutrons are in the nucleus after it has emitted the  $\alpha$ -particle?

- A 134      B 136      C 138      D 139
- 13 What is a  $\beta$ -particle and from which part of a radioactive atom is it emitted?

	$\beta$ -particle	emitted from
A	electron	nucleus
B	electron	outer orbits
C	helium nucleus	nucleus
D	helium nucleus	outer orbits

- 14 A sheet of paper is placed between a radioactive source and a detector.



Which types of radiation can pass through the paper?

- A  $\alpha$ -particles and  $\beta$ -particles only  
 B  $\alpha$ -particles and  $\gamma$ -rays only  
 C  $\beta$ -particles and  $\gamma$ -rays only  
 D  $\alpha$ -particles,  $\beta$ -particles and  $\gamma$ -rays
- 15 What are the most penetrating and the least penetrating types of radiation?

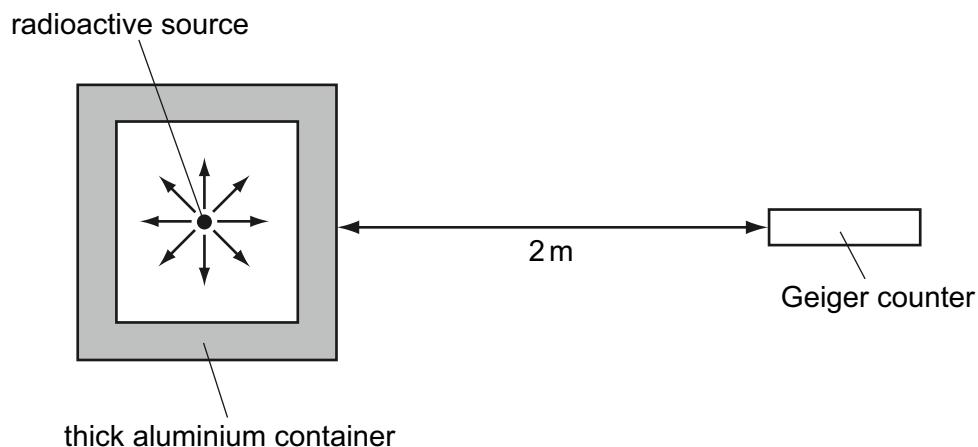
	most penetrating	least penetrating
A	$\alpha$ -particles	$\beta$ -particles
B	$\beta$ -particles	$\alpha$ -particles
C	$\gamma$ -rays	$\alpha$ -particles
D	$\gamma$ -rays	$\beta$ -particles

- 16 Which line in the table describes the nature of an  $\alpha$ -particle and of a  $\gamma$ -ray?

	$\alpha$ -particle	$\gamma$ -ray
A	helium nucleus	electromagnetic radiation
B	helium nucleus	electron
C	proton	electromagnetic radiation
D	proton	electron

- 17 A Geiger counter detects radiation from radioactive sources.

A radioactive source is inside a thick aluminium container as shown.



Which type of radiation from this source is being detected?

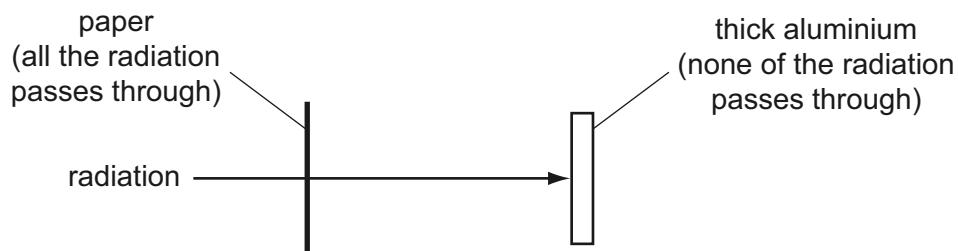
- A  $\alpha$ -particles
  - B  $\beta$ -particles
  - C  $\gamma$ -rays
  - D radio waves
- 18 An unstable nucleus has 145 neutrons and 92 protons. It emits a  $\beta$ -particle.

How many neutrons and protons does the nucleus have after emitting the  $\beta$ -particle?

	neutrons	protons
A	144	92
B	144	93
C	145	91
D	145	93

**19****17**

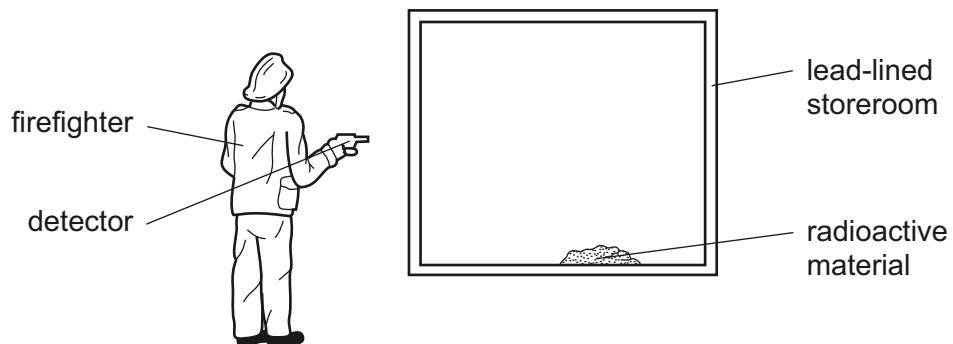
A radioactive source emits radiation that can pass through a sheet of paper but not through thick aluminium.



What does this show about the radiation?

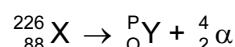
- A** It is  $\alpha$ -particles.
  - B** It is  $\beta$ -particles.
  - C** It is  $\gamma$ -rays.
  - D** It is a mixture of  $\alpha$ -particles and  $\gamma$ -rays.
- 20** Which type of radiation has the greatest ionising effect?
- A**  $\alpha$ -particles
  - B**  $\beta$ -particles
  - C**  $\gamma$ -rays
  - D** all have the same ionising effect

- 21 During a fire in a laboratory storeroom, some radioactive material was spilled. A firefighter detected radiation through the lead-lined walls of the storeroom. The radiation was emitted by the radioactive material.



Which type of radiation was being detected?

- A  $\alpha$ -particles
  - B  $\beta$ -particles
  - C  $\gamma$ -rays
  - D X-rays
- 22 The equation shows the decay of the nuclide X.



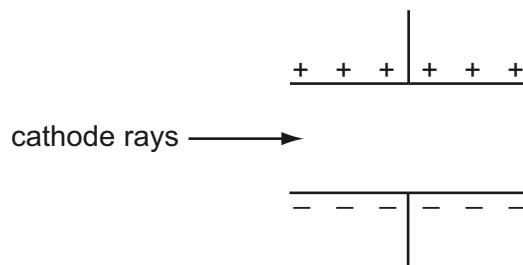
What are the values of P and Q?

	P	Q
A	230	90
B	230	86
C	222	90
D	222	86

- 23 Which line correctly describes  $\alpha$ -particles?

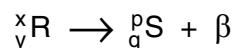
	electric charge	penetrates 1 cm of aluminium?
A	negative	yes
B	negative	no
C	positive	yes
D	positive	no

- 24 A beam of cathode rays passes through an electric field between two parallel plates.



In which direction is the beam deflected?

- A into the page
  - B out of the page
  - C towards the bottom of the page
  - D towards the top of the page
- 25 A radioactive nucleus R decays with the emission of a  $\beta$ -particle as shown.



Which equation is correct?

- A  $x = p$
  - B  $y = q$
  - C  $p = x - 1$
  - D  $q = y - 1$
- 26 Which line in the table describes the nature of an  $\alpha$ -particle and a  $\gamma$ -ray?

	$\alpha$ -particle	$\gamma$ -ray
A	helium nucleus	electromagnetic radiation
B	helium nucleus	electron
C	proton	electromagnetic radiation
D	proton	electron

27 In a cathode-ray tube, particles are given off from a hot cathode by thermionic emission.

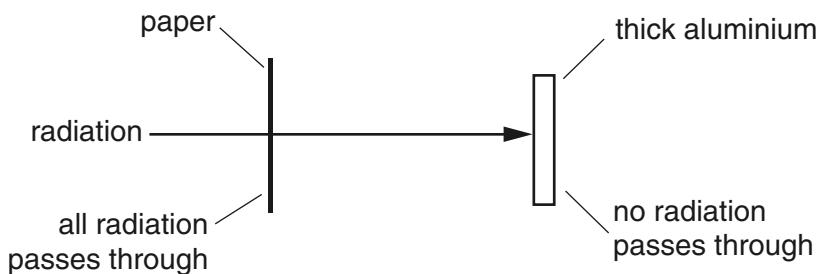
Which particles are given off?

- A atoms
- B electrons
- C ions
- D protons

28 Which type of radiation can be stopped by a sheet of paper?

- A  $\alpha$ -particles
- B  $\beta$ -particles
- C  $\gamma$ -rays
- D X-rays

29 A radioactive source emits radiation that can pass through a sheet of paper but not through thick aluminium.



What does this show about the radiation?

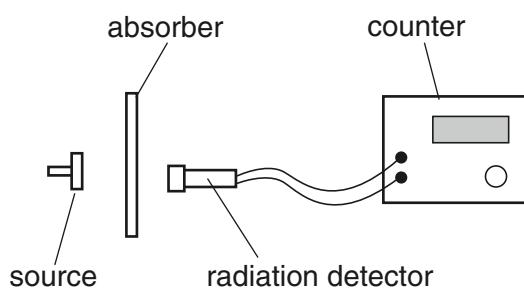
- A It is alpha-particles.
- B It is beta-particles.
- C It is gamma-rays.
- D It is a mixture of alpha-particles and gamma-rays.

- 30 Charged particles are emitted from the cathode of an oscilloscope.

What is the name and charge of these particles?

	name of particles	charge of particles
<b>A</b>	electrons	negative
<b>B</b>	electrons	positive
<b>C</b>	protons	negative
<b>D</b>	protons	positive

- 31 The diagram shows a radioactivity experiment.



When a piece of paper is used as the absorber, the count rate drops to the background count rate.

What radiation is the source emitting?

- A** alpha only
- B** beta only
- C** gamma only
- D** alpha, beta and gamma

- 32 What is a beta-particle?

- A** a helium nucleus
- B** a high-energy electron
- C** four protons
- D** two neutrons

- 33 Alpha-particles, beta-particles, gamma-rays and infra-red radiation may all be emitted from a solid.

Which of these are included in the electromagnetic spectrum?

- A alpha-particles and beta-particles
- B alpha-particles and gamma-rays
- C beta-particles and infra-red radiation
- D gamma-rays and infra-red radiation

### 23.3 Radioactive decay

- 1 A student is investigating how the radiation from a radioactive source changes with time.

The table shows the results from the detector.

time / min	count-rate / counts per min
0	340
2	180
4	100
6	60
8	40

The experiment is repeated by other students, who also measure the count-rate every two minutes.

The half-life of the source is known to be exactly two minutes.

Why is the measured count-rate **always** higher than half the previous value?

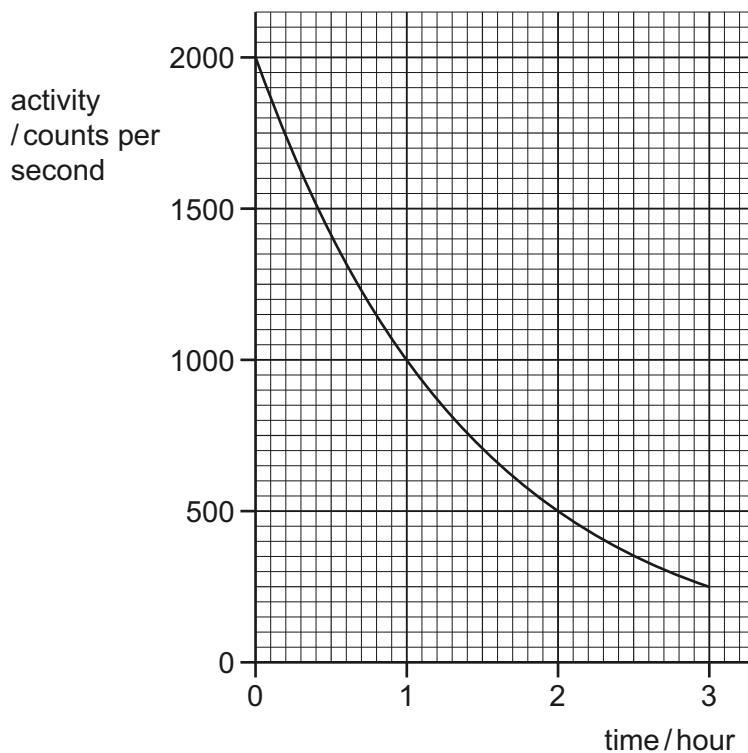
- A Radioactive emissions occur randomly with time.
- B The detector used is very close to the source.
- C There is background radiation present.
- D The radioactive source is decaying.

- 2 The table shows the count rates obtained from four radioactive sources. The measurements were taken at noon on four consecutive days.

Which source has the longest half-life?

	count rate / counts per second			
	day 1	day 2	day 3	day 4
A	100	48	27	11
B	200	142	99	69
C	300	297	292	290
D	400	202	99	48

- 3 The graph shows the activity of a radioactive source over a period of time.



What is the half-life of the source?

- A  $\frac{1}{2}$  hour      B 1 hour      C  $1\frac{1}{2}$  hours      D 3 hours
- 4 A powder contains 400 mg of a radioactive material that emits  $\alpha$ -particles.

The half-life of the material is 5 days.

What mass of that material remains after 10 days?

- A 0 mg      B 40 mg      C 100 mg      D 200 mg
- 5 A radioactive element has a half-life of 70 s.

The number of emissions per second,  $N$ , of a sample of the element is measured at a certain time.

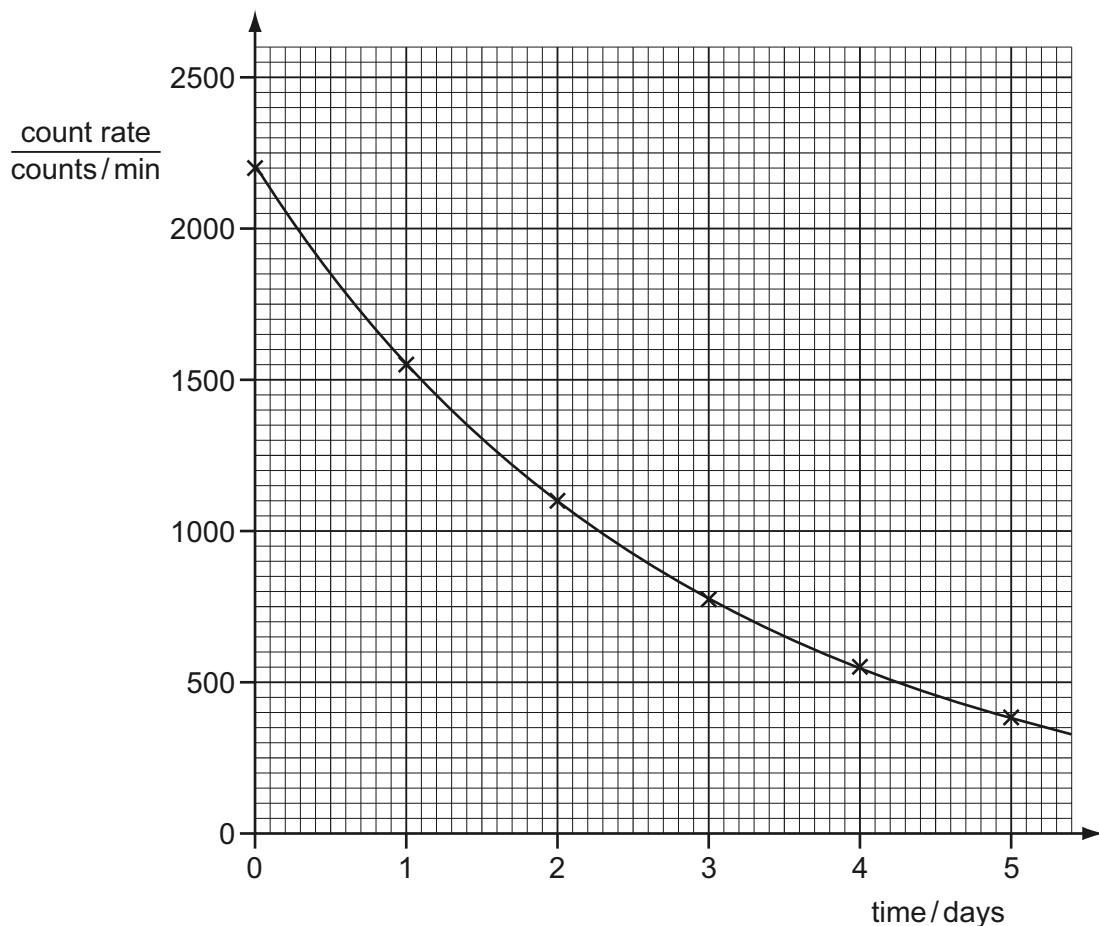
What was the number of emissions per second 70 s earlier?

- A 0      B  $N/2$       C  $N$       D  $2N$
- 6 A radioactive substance has a half-life of 2 weeks. At the beginning of an investigation the substance emits 3000  $\beta$ -particles per minute.

How many  $\beta$ -particles will it emit per minute after 6 weeks?

- A 0      B 375      C 500      D 1500

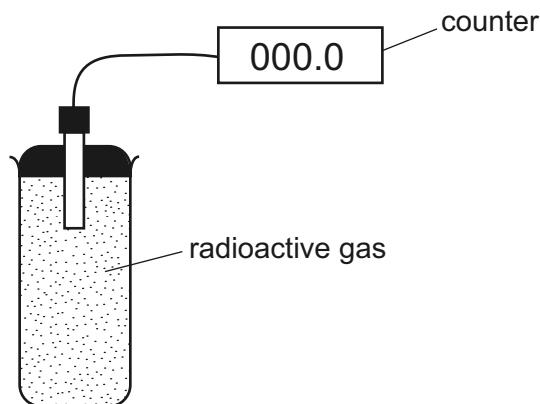
- 7 Which statement explains the meaning of the half-life of a radioactive substance?
- A half the time taken for half the substance to decay  
B half the time taken for the substance to decay completely  
C the time taken for half the substance to decay  
D the time taken for the substance to decay completely
- 8 The graph shows the decay curve for one particular radioactive nuclide.



What is the half-life of this nuclide?

- A 1.0 day      B 1.5 days      C 2.0 days      D 2.5 days

- 9 The diagram shows an experiment to monitor the radiation from a radioactive gas. The counter readings are corrected for background radiation.



The table shows how the counter reading varies with time.

time / seconds	0	20	40	60	80	100	120	140	160	180
counter reading / counts per minute	140	105	82	61	44	36	27	20	15	10

What is the half-life of the gas?

- A between 20 and 40 seconds  
B between 40 and 60 seconds  
C between 60 and 140 seconds  
D between 140 and 180 seconds
- 10 A sample of radioactive uranium has mass 1 g. Another sample of the same material has mass 2 g.

Which property is the same for both samples?

- A the amount of radiation emitted per second  
B the half-life  
C the number of uranium atoms  
D the volume

- 11 A sample of radioactive isotope is decaying.

The nuclei of which atoms will decay first?

- A impossible to know, because radioactive decay is random
- B impossible to know, unless the age of the material is known
- C atoms near the centre, because they are surrounded by more atoms
- D atoms near the surface, because the radiation can escape more easily

- 12 The half-life of a radioactive substance is 5 hours. A sample is tested and found to contain 0.48 g of the substance.

How much of the substance was present in the sample 20 hours before the sample was tested?

- A 0.03 g
- B 0.12 g
- C 1.92 g
- D 7.68 g

- 13 The count rates of four radioactive sources were measured at the same time on three consecutive days.

Which source has a half-life of two days?

	Monday	Tuesday	Wednesday
A	100	50	25
B	200	140	100
C	300	300	300
D	400	200	100

- 14 A powder contains 400 mg of a radioactive material that emits  $\alpha$ -particles.

The half-life of the material is 5 days.

What mass of that material remains after 10 days?

- A 0 mg
- B 40 mg
- C 100 mg
- D 200 mg

- 15 A small amount of a radioactive isotope contains 72 billion unstable nuclei. The half-life of the isotope is 4 hours.

How many unstable nuclei would remain after 12 hours?

- A 6 billion
- B 9 billion
- C 18 billion
- D 24 billion

- 16** The half-life of a radioactive substance is 5 hours. A sample is tested and found to contain 0.48 g of the substance.

How much of the substance was present in the sample 20 hours before the sample was tested?

- A** 0.03 g
- B** 0.12 g
- C** 1.92 g
- D** 7.68 g

## Part VI

# Space Physics

### Chapter 24. Earth and the Solar System

## 24.1 The Earth

- 1 The orbit of the Moon around the Earth is modelled as a circular path of radius  $3.8 \times 10^5$  km.

The orbital period is 29.5 days (710 hours).

What is the orbital speed of the Moon?

- A  $5.4 \times 10^2$  km/h
- B  $1.1 \times 10^3$  km/h
- C  $1.7 \times 10^3$  km/h
- D  $3.4 \times 10^3$  km/h

- 2 Which of these causes seasons on Earth? Choose **one** answer.

- A the Moon orbiting the Earth
- B the pull of gravity from the Sun
- C the Earth's axis is tilted
- D the Earth takes 365 days to orbit the Sun

How long does the Moon take to orbit the Earth?

- A 1 day
- B 1 week
- C 1 month
- D 1 year

## 24.2 The Solar System

- 1 Which type of object listed below orbits the Sun?

  - A an interstellar cloud of gas and dust
  - B a comet
  - C a galaxy
  - D another star
  
- 2 One model for the formation of the Solar System is the accretion model.  
Which of these is evidence that contradicts the accretion model?

  - A The planets all orbit the Sun in the same plane.
  - B The planets all orbit the Sun in the same direction.
  - C Venus and Uranus spin in the opposite direction to the other planets.
  - D The Sun has most of the mass of the Solar System and is at the centre of the Solar System.
  
- 3 What does the gravitational field strength of a planet depend on?

  - I the mass of the planet
  - II how long the planet takes to orbit the Sun
  - III the height above the surface of the planet
  - IV the speed of the planet's orbit around the Sun
  - V the distance of the planet from the Sun

**A** I, III and V  
**B** I and II  
**C** I and III  
**D** I and IV
  
- 4 What can you say about Earth's kinetic energy and the Sun-Earth potential energy when Earth is closest to the Sun?

  - A kinetic energy is maximum; potential energy is maximum
  - B kinetic energy is maximum; potential energy is minimum
  - C kinetic energy is minimum; potential energy is maximum
  - D kinetic energy is minimum; potential energy is minimum

5 Which expression below best relates a planet's orbital radius R and length of year T ?

A  $T = k R$

B  $T = k R^{-1}$

C  $T^2 = k R^3$

D  $T^3 = k R^2$

## Chapter 25. Stars and the Universe

## 25.1 The Sun as a Star

1 Which process happens inside the Sun, releasing energy?

A Electron Excitation

C Nuclear fission

B Nuclear fusion

D Diffusion

2 Which frequencies of electromagnetic waves are emitted from the Sun?

A Infrared

C X-rays

B Ultraviolet

D All of the above

3 Which best describes the main composition of the Sun?

A Hydrogen

C Electrons

B Helium

D Plasma

## 25.2 Stars

## 25.3 The Universe

1 Which statement describes redshift?

- A All the light emitted from all distant galaxies is at the red end of the spectrum.
- B All the light emitted by a star in the Milky Way is at the red end of the spectrum.
- C The light from all the stars in the Milky Way is moved towards the red end of the spectrum.
- D The light from stars in all distant galaxies is moved towards the red end of the spectrum.

2 Which statement does **not** describe redshift?

- A All the light emitted from all distant galaxies is at the red end of the spectrum.
- B The light arriving at the Earth from a receding star is always redshifted.
- C During redshift, the wavelength of the observed light is longer than it is if the redshift had not occurred.
- D The light from stars in all distant galaxies is moved towards the red end of the spectrum.

3 What does the Universe contain? Choose **one** answer.

- |                         |                                  |
|-------------------------|----------------------------------|
| A the Solar System only | C galaxies only                  |
| B the Milky Way only    | D everything that we can observe |

4 There is microwave radiation in space that comes from all directions.

What is thought to be the origin of this radiation?

- A Microwaves emitted from other galaxies.
- B Light from shortly after the Big Bang that has been redshifted.
- C Ultraviolet radiation from distant galaxies that is redshifted.
- D Microwaves emitted from stars that are running out of fuel.

5 How far away is the next closest galaxy to Earth?

- |                          |                                 |
|--------------------------|---------------------------------|
| A around 2.5 light years | C around 25 000 light years     |
| B around 25 light years  | D around 25 000 000 light years |