Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
Winter 2003

SCIENCE: DOUBLE AWARD (MODULAR) **346010**
PHYSICS (MODULAR)
Electricity (Module 10)

ASSESSMENT and QUALIFICATIONS ALLIANCE

Thursday 27 November 2003 Morning Session

In addition to this paper you will require:
- a black ball-point pen;
- an answer sheet.

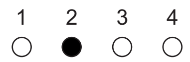
You may use a calculator.

Time allowed: 30 minutes

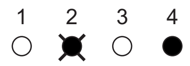
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title "Electricity" printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only. Rough work may be done on the question paper.

Instructions for recording answers

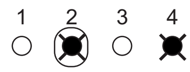
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information
- The maximum mark for this paper is 36.

Advice
- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.

The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **FIVE**.

In these questions match the words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

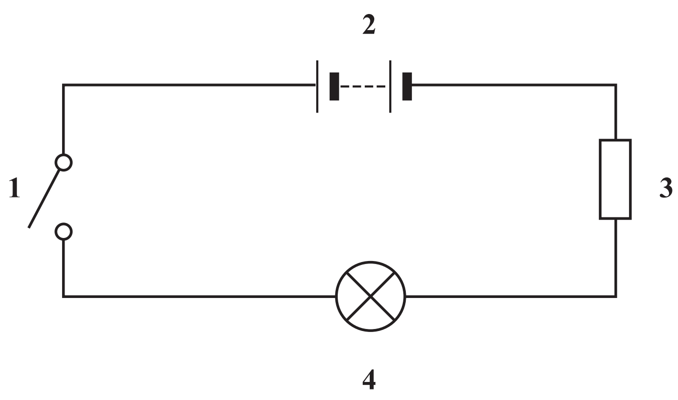
Match words from the list with the numbers **1– 4** in the circuit diagram.

battery

lamp

resistor

switch



QUESTION TWO

The diagram shows the inside of a 3-pin plug.

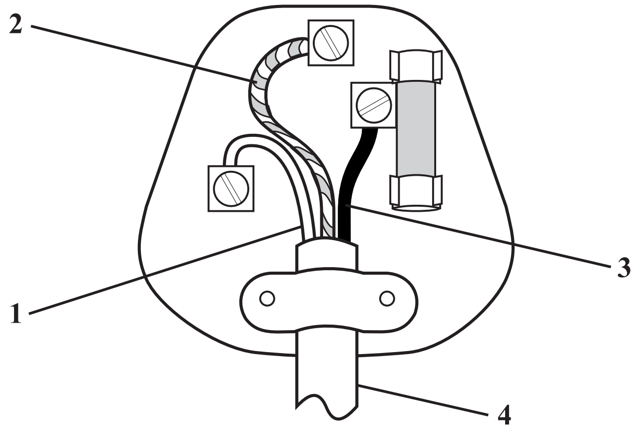
Match words from the list with the numbers **1–4** on the diagram.

blue plastic

brown plastic

green and yellow plastic

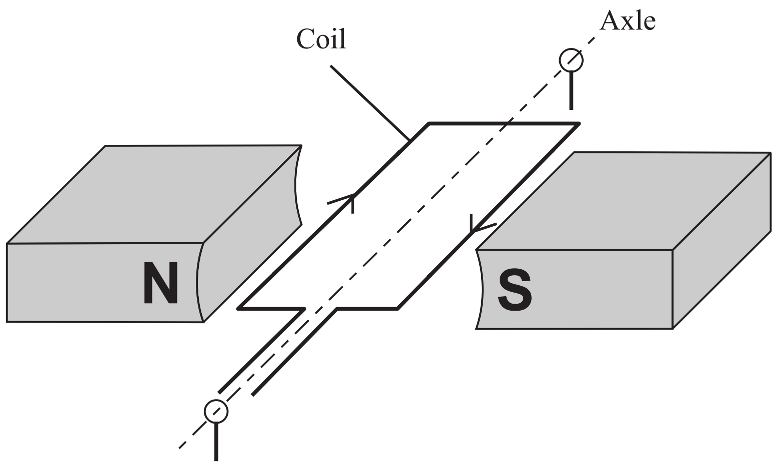
white plastic



TURN OVER FOR THE NEXT QUESTION

QUESTION THREE

The diagram shows part of a simple motor.



Match words from the list with the spaces **1–4** in the sentences.

decreases

increases

reverses

stays the same

When the strength of the magnetic field is increased the speed of rotation . . . . . **1** . . . .

When the current is decreased, the speed of rotation . . . . . **2** . . . .

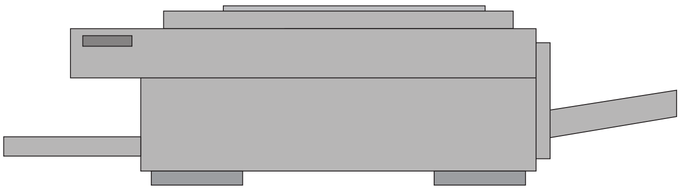
If the direction of the current in the coil is changed, the direction of rotation . . . . . **3** . . . .

The direction of the current in the coil **and** the direction of the magnetic field are **both** reversed.

The direction of rotation now . . . . . **4** . . . .

QUESTION FOUR

The diagram shows a small photocopier.



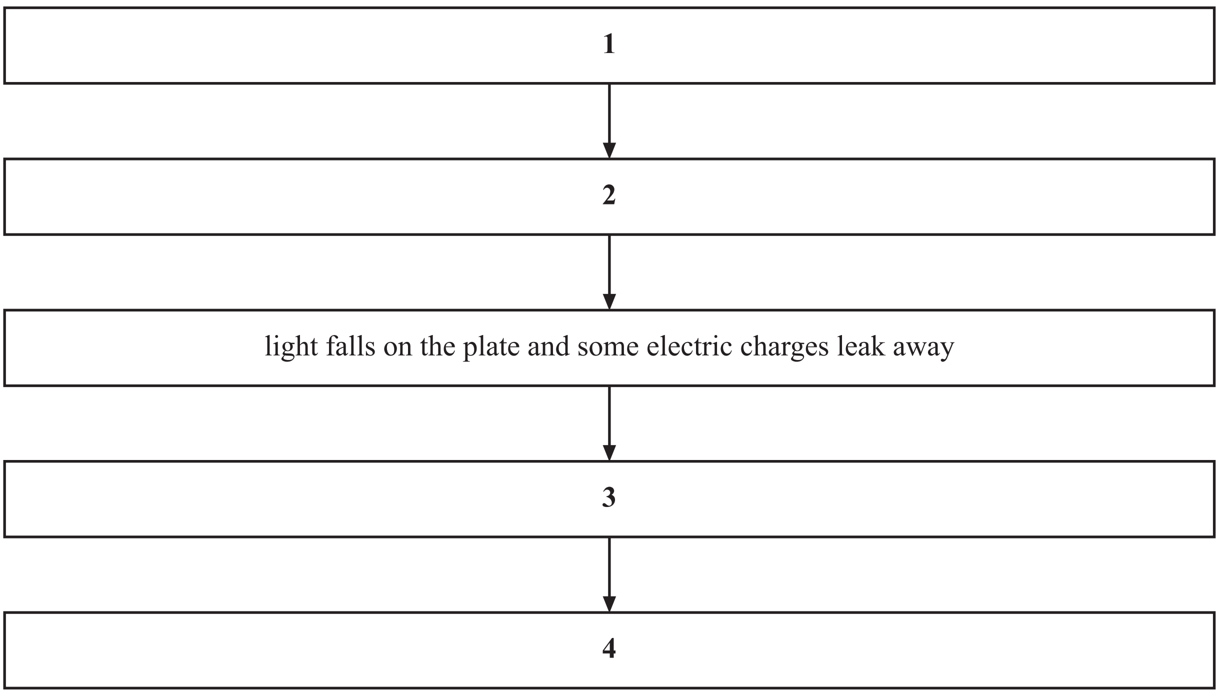
Explain how the photocopier works by matching statements **P**, **Q**, **R** or **S** from the list with each of the boxes **1–4** in the flow diagram.

P **an image of the original is projected onto the plate**

Q **black powder is transferred from the plate to paper**

R **the copy plate is electrically charged**

S **the parts which are still charged attract black powder**



QUESTION FIVE

This question is about how the resistance of different electrical components can change.

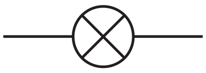
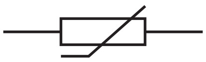
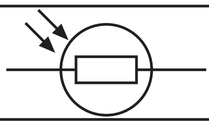
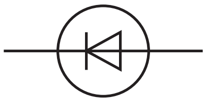
Match phrases **D**, **E**, **F** or **G** from the list with the numbers **1–4** in the table.

D **resistance decreases as the light intensity increases**

E **resistance decreases as the temperature increases**

F **resistance depends on the direction of the current**

G **resistance increases as the temperature increases**

Symbol of the component	How the resistance changes
	**1**
	**2**
	**3**
	**4**

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

SECTION B

Questions **SIX** and **SEVEN**.

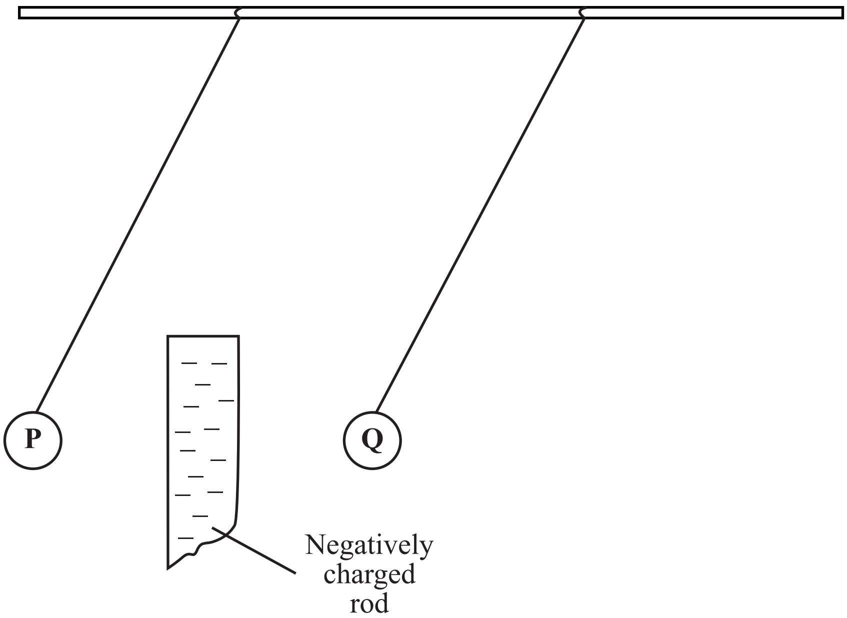
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

The diagram shows two metal balls, **P** and **Q**, hanging from nylon threads.
P is repelled and **Q** is attracted by a negatively charged rod.



Which **two** of the following statements could be correct?

P is negatively charged

P is positively charged

P is uncharged

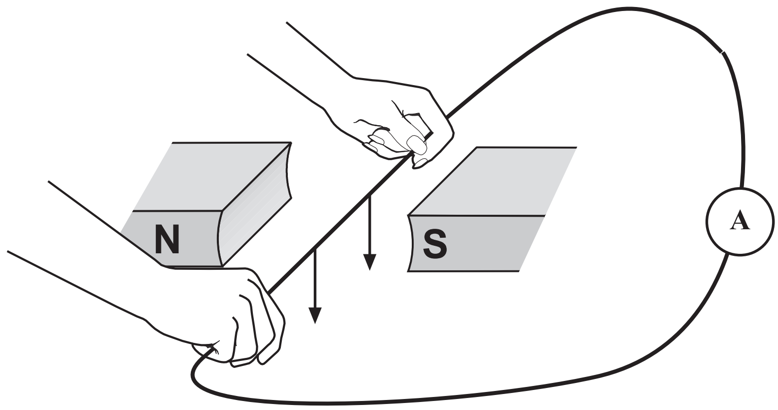
Q is negatively charged

Q is positively charged

QUESTION SEVEN

A wire is moving downwards between the poles of a magnet.

The ammeter gives a positive reading.



Which **two** of the following statements are correct?

if the wire moves upwards, the ammeter will give a negative reading

if the wire moves upwards, the ammeter will give a positive reading

if the wire moves upwards, the ammeter will read zero

if the wire stops, the ammeter will give a negative reading

if the wire stops, the ammeter will read zero

TURN OVER FOR THE NEXT QUESTION

SECTION C

Questions **EIGHT** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION EIGHT

When an aircraft lands it is often electrically charged.

8.1 How has the aircraft become electrically charged?

A By exposure to strong sunlight above the clouds

B By friction with the air

C By leakage of charge from the aircraft’s instruments

D By the radio waves used to contact Air Traffic Control

8.2 The charge on the aircraft can be large.

Why is this dangerous?

A A spark from the charged aircraft could cause an explosion while refuelling

B Dust from the runway could be attracted to the aircraft

C Radio contact with the ground staff could become difficult

D The passengers could get an electric shock

8.3 When the aircraft has landed it has to be electrically discharged.

What is the safest way to do this?

A Invite passengers to leave the aircraft by means of a metal slide

B Keep the aircraft stationary on the runway for 10 minutes

C Open the aircraft doors

D Use a cable to attach the aircraft to a copper rod buried in the ground

8.4 Static electric charges can be useful as well as causing problems.

Which of these devices makes use of electrostatic charges?

A A circuit breaker

B An electric motor

C A filament lamp

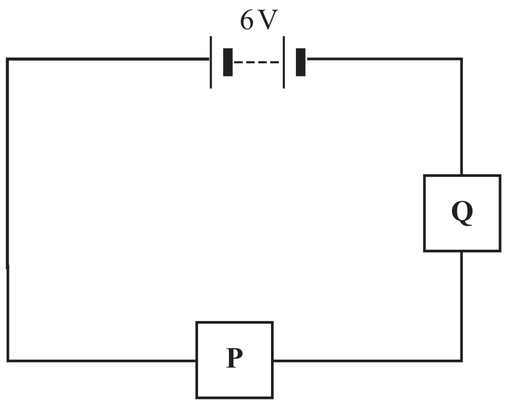
D A smoke precipitator

TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

The diagram shows a device, **P**, in series with a lamp, **Q**.

The potential difference (voltage) across the battery is 6 V. The current flowing through **Q** is 3 A. The potential difference across **Q** is 2 V.



9.1 The current flowing through **P** is . . . . .

A 1.5 A

B 2.0 A

C 3.0 A

D 6.0 A

9.2 The potential difference across **P** is . . . . .

A 2 V

B 3 V

C 4 V

D 6 V

9.3 The power of **Q** is . . . . .

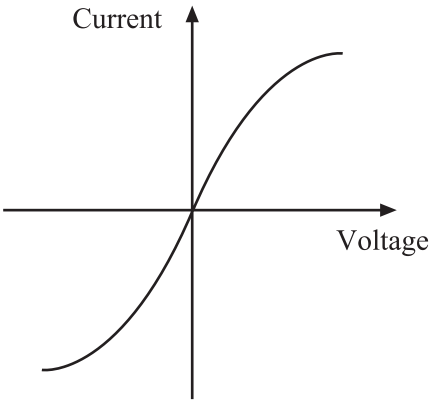
A 2.0 W

B 3.0 W

C 4.5 W

D 6.0 W

9.4 The graph shows how the current through **P** changes when the voltage across it is changed.



The device **P** is a . . . . .

A diode.

B filament lamp.

C resistor at constant temperature.

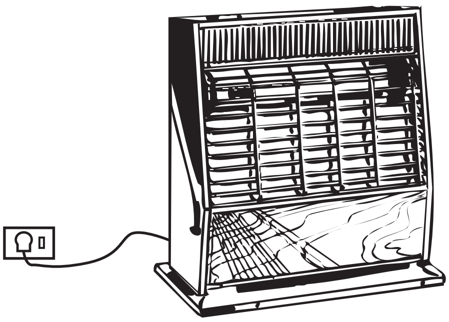
D variable resistor at constant temperature.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

The diagram shows an electric fire which is used on the mains supply.

A current of 4 A flows through the fire when it is connected.



10.1 The mains supply is . . . . .

A 50 V a.c. with a frequency of 230 Hz.

B 50 V d.c. with a frequency of 230 Hz.

C 230 V a.c. with a frequency of 50 Hz.

D 230 V d.c. with a frequency of 50 Hz.

10.2 Which is the best fuse for the fire?

A 1 A

B 3 A

C 5 A

D 13 A

10.3 A fuse works by melting when the . . . . .

A current becomes too high.

B earth wire touches the metal case.

C live wire becomes too hot.

D neutral wire becomes too hot.

10.4 The fire has a metal case. It needs to be earthed because . . . . .

- **A** if there is a fault, the fuse may not work.
- **B** if there is a fault, the live wire may touch the case.
- **C** the metal case may act as an insulator.
- **D** the metal case may become too hot.

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**.

In these questions match the words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about how the resistance of different electrical components can change.

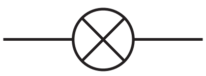
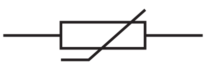
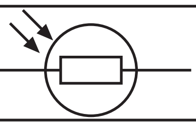
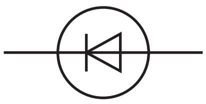
Match phrases **D**, **E**, **F** or **G** from the list with the numbers **1–4** in the table.

D **resistance decreases as the light intensity increases**

E **resistance decreases as the temperature increases**

F **resistance depends on the direction of the current**

G **resistance increases as the temperature increases**

Symbol of the component	How the resistance changes
	**1**
	**2**
	**3**
	**4**

QUESTION TWO

Match words from the list with the numbers **1–4** in the sentences.

earth

live

negative

neutral

In the mains electricity supply, the . . . . . **1** . . . . . terminal stays at zero volts with respect to . . . . . **2** . . . . . .

The . . . . . **3** . . . . . terminal alternates between positive and . . . . . **4** . . . . . voltage with respect to the neutral terminal.

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

SECTION B

Questions **THREE** and **FOUR**.

In these questions choose the best **two** answers.

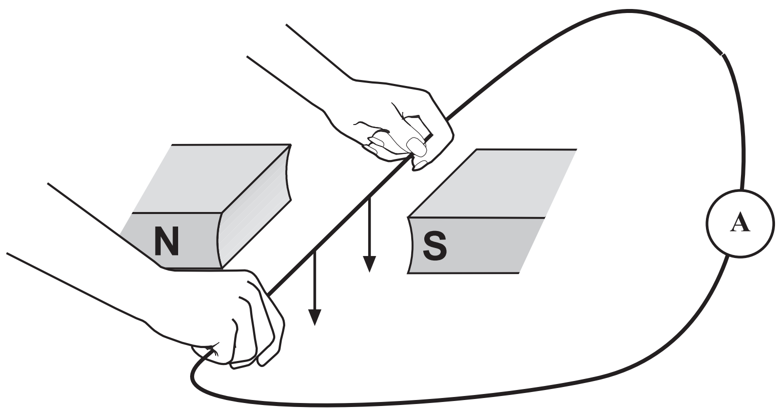
Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

A wire is moving downwards between the poles of a magnet.

The ammeter gives a positive reading.



Which **two** of the following statements are correct?

if the wire moves upwards, the ammeter will give a negative reading

if the wire moves upwards, the ammeter will give a positive reading

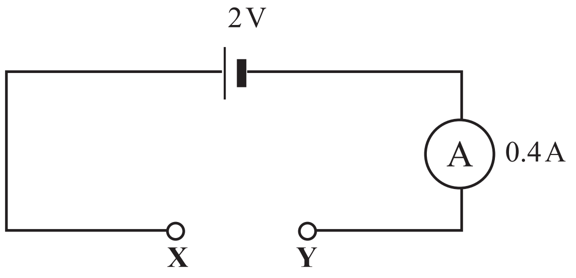
if the wire moves upwards, the ammeter will read zero

if the wire stops, the ammeter will give a negative reading

if the wire stops, the ammeter will read zero

QUESTION FOUR

The diagram shows a circuit with a gap in it between **X** and **Y**.

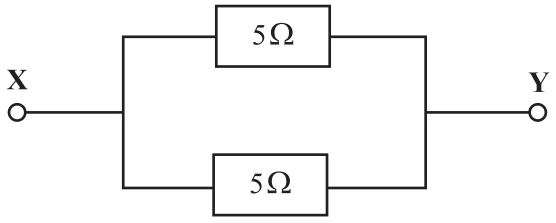


Which **two** of the arrangements, **P**, **Q**, **R**, **S** and **T**, connected between **X** and **Y**, will allow a current of 0.4 A to flow through the ammeter?

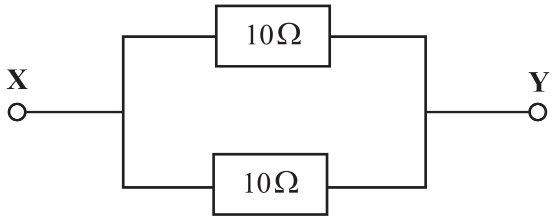
P

Q

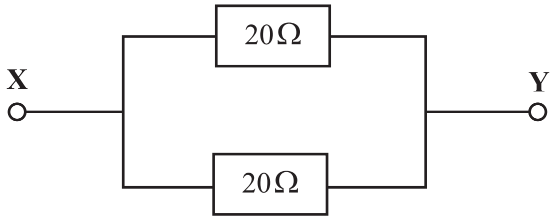
R



S



T



Turn over ▶

SECTION C

Questions **FIVE** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION FIVE

When an aircraft lands it is often electrically charged.

5.1 How has the aircraft become electrically charged?

A By exposure to strong sunlight above the clouds

B By friction with the air

C By leakage of charge from the aircraft's instruments

D By the radio waves used to contact Air Traffic Control

5.2 The charge on the aircraft can be large.

Why is this dangerous?

A A spark from the charged aircraft could cause an explosion while refuelling

B Dust from the runway could be attracted to the aircraft

C Radio contact with the ground staff could become difficult

D The passengers could get an electric shock

5.3 When the aircraft has landed it has to be electrically discharged.

What is the safest way to do this?

A Invite passengers to leave the aircraft by means of a metal slide

B Keep the aircraft stationary on the runway for 10 minutes

C Open the aircraft doors

D Use a cable to attach the aircraft to a copper rod buried in the ground

5.4 Static electric charges can be useful as well as causing problems.

Which of these devices makes use of electrostatic charges?

A A circuit breaker

B An electric motor

C A filament lamp

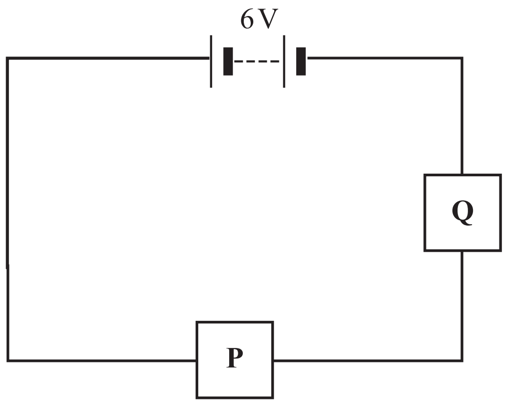
D A smoke precipitator

TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

The diagram shows a device, **P**, in series with a lamp, **Q**.

The potential difference (voltage) across the battery is 6 V. The current flowing through **Q** is 3 A. The potential difference across **Q** is 2 V.



6.1 The current flowing through **P** is . . . . .

A 1.5 A

B 2.0 A

C 3.0 A

D 6.0 A

6.2 The potential difference across **P** is . . . . .

A 2 V

B 3 V

C 4 V

D 6 V

6.3 The power of **Q** is . . . . .

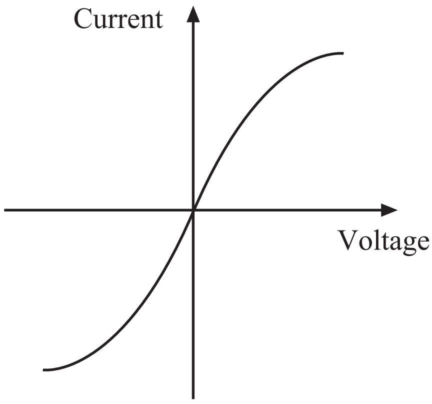
A 2.0 W

B 3.0 W

C 4.5 W

D 6.0 W

6.4 The graph shows how the current through **P** changes when the voltage across it is changed.



The device **P** is a . . . . .

A diode.

B filament lamp.

C resistor at constant temperature.

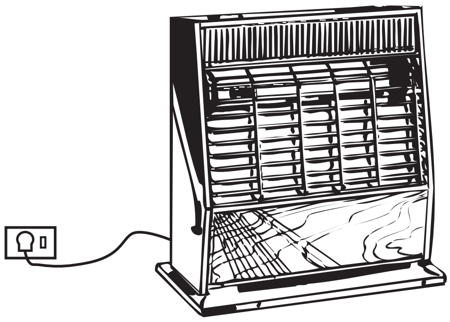
D variable resistor at constant temperature.

TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

The diagram shows an electric fire which is used on the mains supply.

A current of 4 A flows through the fire when it is connected.



7.1 The mains supply is . . . . .

A 50 V a.c. with a frequency of 230 Hz.

B 50 V d.c. with a frequency of 230 Hz.

C 230 V a.c. with a frequency of 50 Hz.

D 230 V d.c. with a frequency of 50 Hz.

7.2 Which is the best fuse for the fire?

A 1 A

B 3 A

C 5 A

D 13 A

7.3 A fuse works by melting when the . . . . .

A current becomes too high.

B earth wire touches the metal case.

C live wire becomes too hot.

D neutral wire becomes too hot.

7.4 The fire has a metal case. It needs to be earthed because . . . . .

A if there is a fault, the fuse may not work.

B if there is a fault, the live wire may touch the case.

C the metal case may act as an insulator.

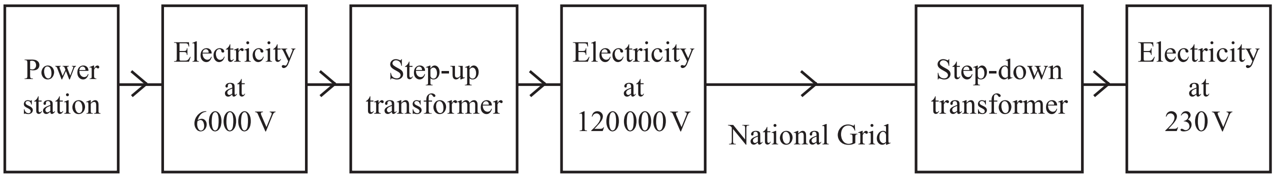
D the metal case may become too hot.

TURN OVER FOR THE NEXT QUESTION

Turn over

QUESTION EIGHT

The diagram shows the system for transmitting electricity from power stations to our homes.



8.1 Which statement about the way a transformer works is correct?

A A current flows from one coil to the other through the iron core

B An a.c. voltage across one coil induces an a.c. voltage across the other

C The most efficient transformers use a core made from copper

D Transformers work more efficiently with d.c. voltage than with a.c. voltage

8.2 The primary coil of the step-up transformer has 10 000 turns.

How many turns does the secondary coil have?

A 500

B 7 200

C 200 000

D 313 040

8.3 The power station transmits power of 600 000 W.

Which row of the table gives the correct current values?

	Current if transmitted at 6000 V	**Current if transmitted at 120 000 V**
A	0.01 A	1.67 A
B	1.67 A	0.01 A
C	5.00 A	100.00 A
D	100.00 A	5.00 A

8.4 Why is a high voltage transmission system used?

A It is safe because the power lines are above the ground

B Less energy is wasted in heating up the power lines

C No energy is lost in the two transformers

D Transformers have no moving parts

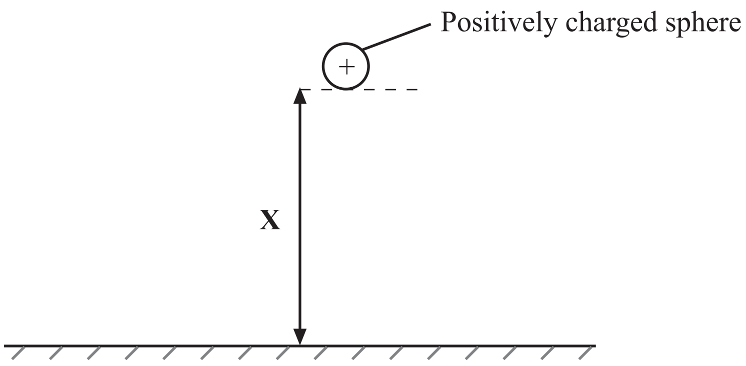
TURN OVER FOR THE NEXT QUESTION

Turn over ▶

QUESTION NINE

The diagram shows an isolated sphere positioned above the ground.

The sphere is given a positive charge.



9.1 The potential difference (voltage) between the sphere and the earth increases when . . . . .

A the charge on the sphere is changed to a negative charge.

B the charge on the sphere is decreased.

C the charge on the sphere is increased.

D the distance **X** is increased.

9.2 If the potential difference between the sphere and earth is large enough . . . . .

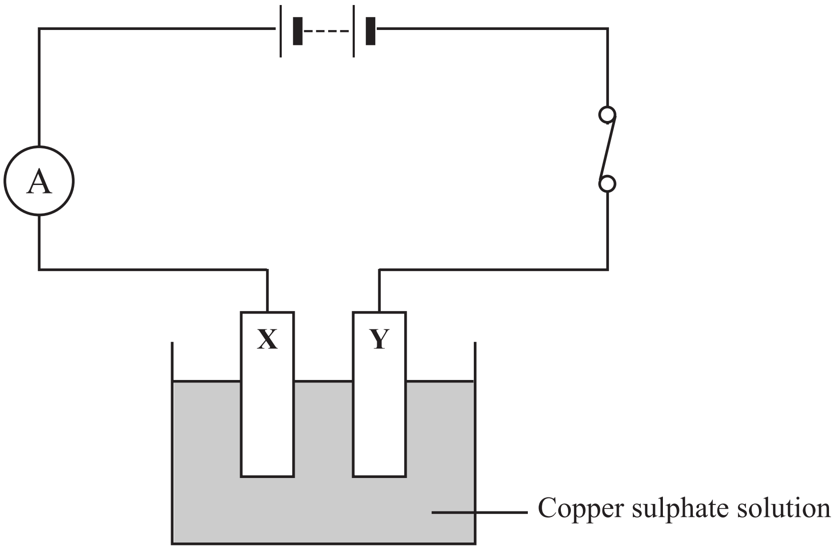
A electrons flow slowly from earth to the sphere.

B electrons flow slowly from the sphere to earth.

C a spark could jump from the sphere to the lowest cloud.

D a spark could jump across the gap between the sphere and earth.

9.3 The diagram shows two copper electrodes, **X** and **Y**, in copper sulphate solution. During electrolysis, electrode **Y** becomes copper plated.



The mass of copper deposited can be doubled by . . . . .

A doubling **either** the current **or** the time and keeping the other the same.

B halving **either** the current **or** the time and keeping the other the same.

C halving the current and keeping the time the same.

D halving the time and keeping the current the same.

9.4 Copper is a good conductor of electricity because its atoms have . . . . .

A all their electrons tightly held.

B loose electrons which can move freely.

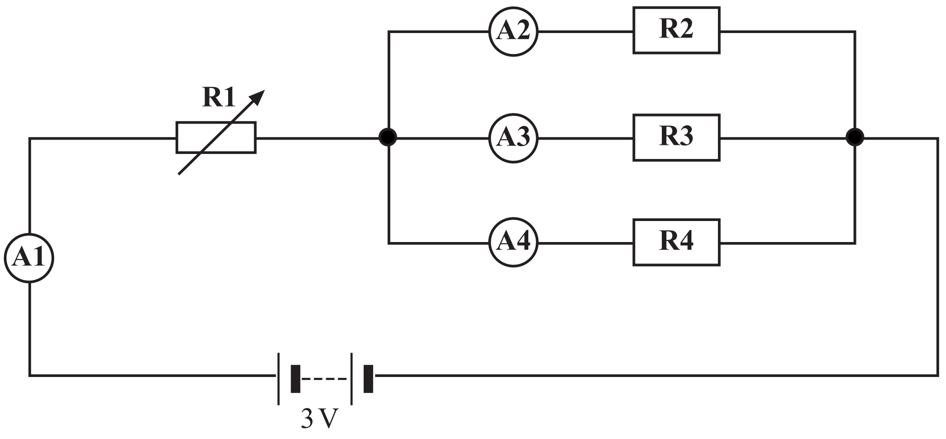
C loose electrons **and** loose protons which can move freely.

D loose protons which can move freely.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

The diagram shows a circuit including four resistors labelled **R1** to **R4** with four ammeters labelled **A1** to **A4**.



10.1 The current flowing through **A1** is 3.2 A, and through **A2** is 0.8 A.

What may ammeters **A3** and **A4** read?

	A3	**A4**
A	0.8 A	0.8 A
B	0.8 A	1.6 A
C	1.6 A	1.6 A
D	1.6 A	3.2 A

10.2 The potential differences (voltages) across which two resistors are the same?

A **R1** and **R2**

B **R1** and **R3**

C **R1** and **R4**

D **R2** and **R4**

10.3 The variable resistor is altered, and the reading on **A1** changes to 1.6 A.

Ammeter **A2** now reads . . . . .

A 0.4 A

B 0.8 A

C 1.2 A

D 1.6 A

10.4 Which of the following statements correctly describes the changes in the potential differences when the variable resistor is altered in this way?

A The potential difference across **R1** is less and the potential difference across the other resistors is unchanged

B The potential difference across **R1** is unchanged but the potential difference across the other resistors is less

C The potential difference across **R1** is greater and the potential difference across the other resistors is less

D The potential differences across all the resistors are unchanged

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE