Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
November 2006

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

Thursday 23 November 2006 Morning Session

For this paper you must have:
- a black ball-point pen
- an objective test 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.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 1 ○ 2 ● 3 ○ 4 ○
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 1 ○ 2 ✕ 3 ○ 4 ●
- 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: 1 ○ 2 ⊗ 3 ○ 4 ✕

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 words in the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

We use symbols for the components in circuit diagrams.

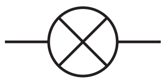
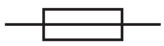
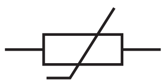
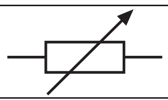
Match words from the list with the numbers **1–4** in the table.

fuse

lamp

thermistor

variable resistor

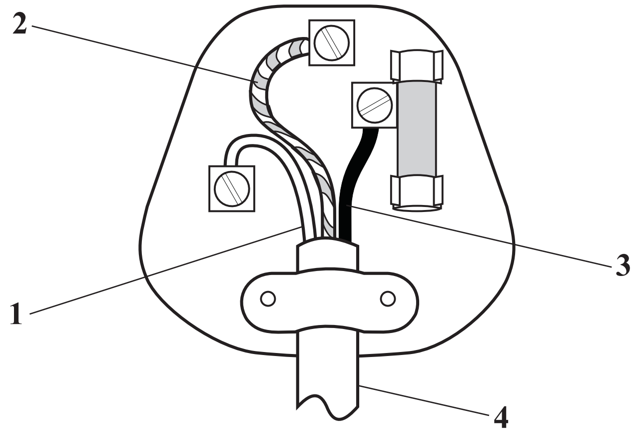
Symbol	Component
	**1**
	**2**
	**3**
	**4**

QUESTION TWO

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

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

- **blue plastic**
- **brown plastic**
- **green and yellow plastic**
- **white plastic**



Turn over for the next question

QUESTION THREE

The table is about the resistance of different components.

Match components from the list with the numbers **1–4** in the table.

diode

filament lamp

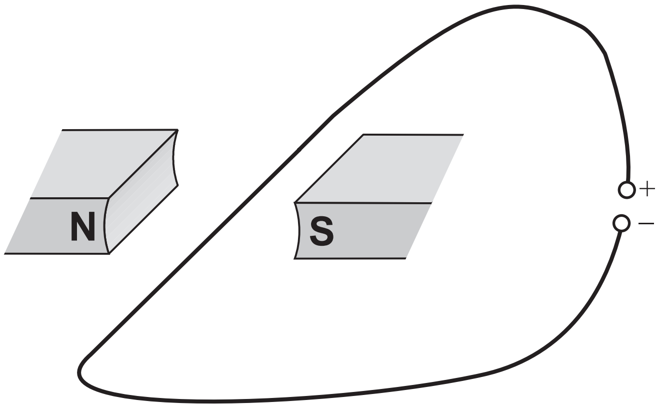
LDR

thermistor

Resistance	Component
its resistance decreases as light intensity increases	**1**
its resistance decreases as temperature increases	**2**
its resistance depends on the direction of the current flowing through it	**3**
its resistance increases as temperature increases	**4**

QUESTION FOUR

The diagram shows a wire carrying an electric current in a magnetic field. A force causes the wire to move.



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

decreased

increased

reversed

the same

The size of the force increases if the strength of the magnetic field is . . . **1** . . . . .

The size of the force decreases if the current is . . . **2** . . . . .

The direction of the force changes if the current is . . . **3** . . . . .

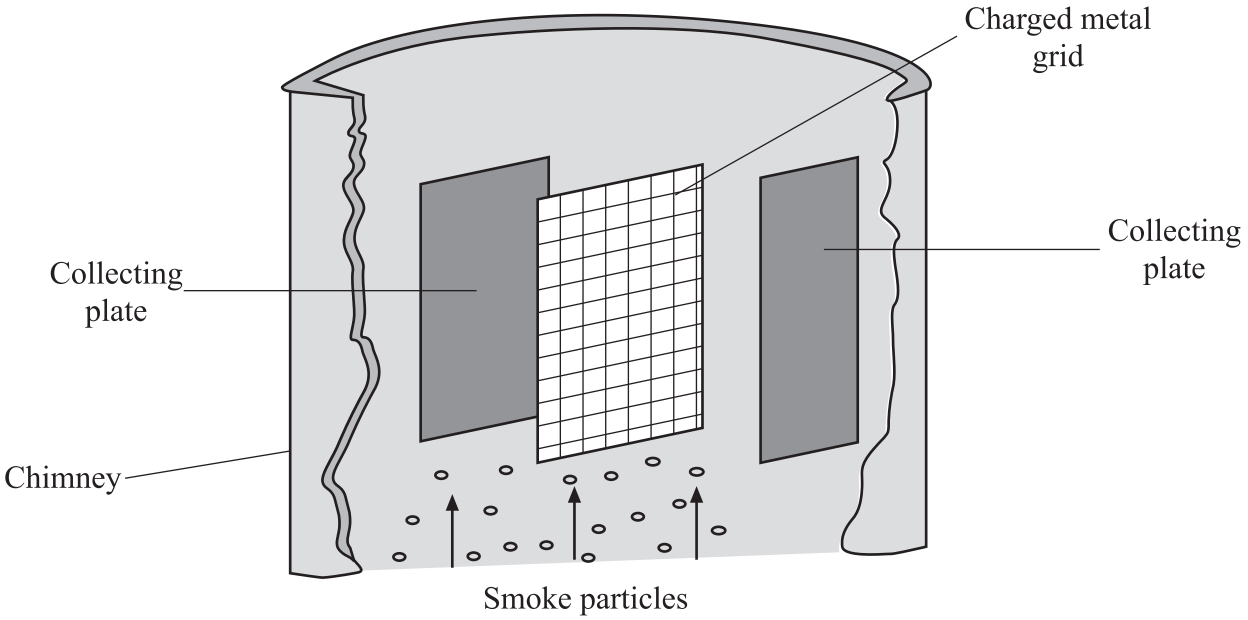
If the direction of the current and the direction of the magnetic field are both reversed, the direction

of the force is . . . **4** . . . . .

Turn over for the next question

QUESTION FIVE

The diagram shows the inside of a chimney at a power station. The chimney contains a device for removing tiny particles of solid material from smoke. The smoke passes a charged metal grid as it moves up the chimney.



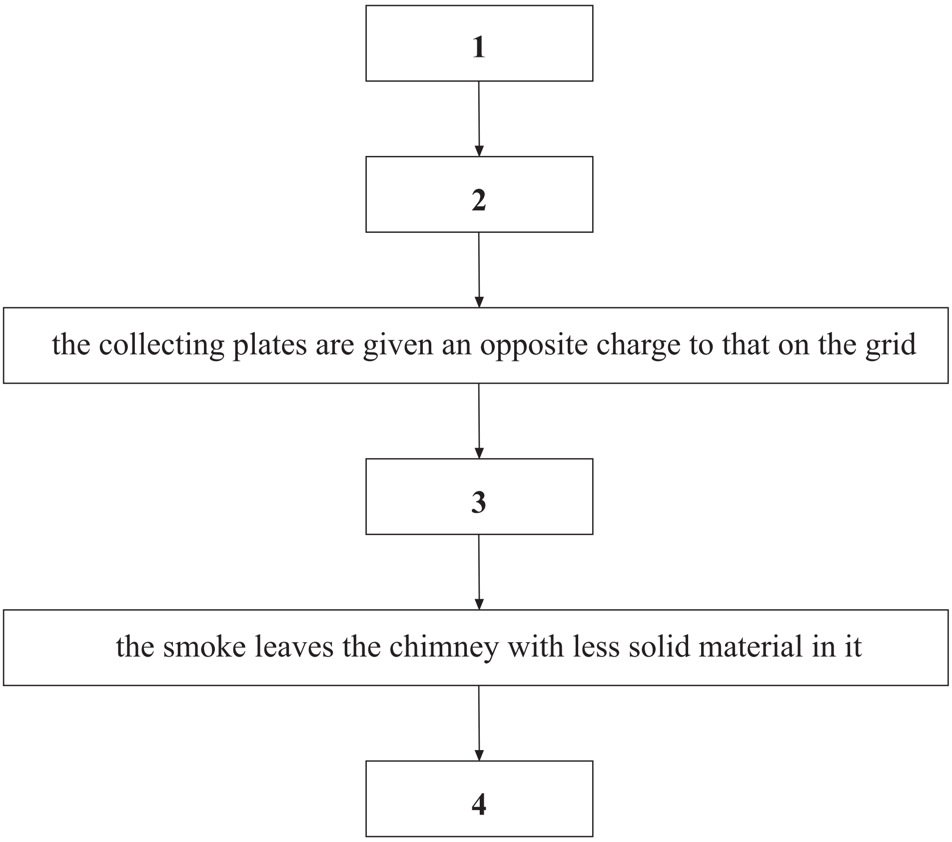
Match statements, **J**, **K**, **L** and **M**, from the list with the boxes **1–4** in the flow chart to explain how the device works.

J **the collecting plates are knocked so that the particles fall down**

K **the smoke particles are attracted to the collecting plates and stick to them**

L **the smoke particles are repelled by the similar charge on the grid**

M **the smoke particles become charged as they pass the grid**



Turn over for the next question

SECTION B

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

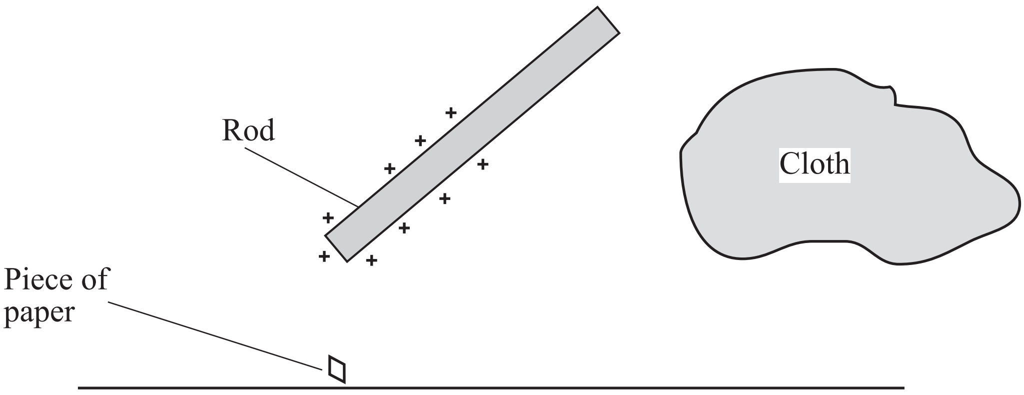
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

A rod is rubbed with a cloth. The rod becomes positively charged. It now attracts a small piece of paper.



Which **two** statements are true?

Electrons were rubbed from the cloth on to the rod

Electrons were rubbed from the rod on to the cloth

The cloth gained a negative charge

The cloth gained a positive charge

The piece of paper has a positive charge

QUESTION SEVEN

Fuses are often used with electrical appliances.

Which **two** of the statements, **P**, **Q**, **R**, **S** and **T**, are correct?

P **if a fault causes too large a current to flow, the fuse causes a break in the circuit**

Q **the fuse is connected to the neutral terminal in a plug**

R **the fuse should have a lower value than the current which flows through the appliance when it is working normally**

S **the wire in the fuse melts when it gets too hot**

T **when the wire in the fuse melts, the circuit is completed**

Turn over for the next question

SECTION C

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

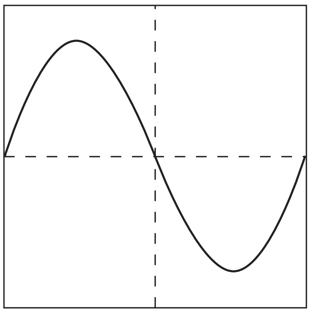
Each of these questions has four parts.

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

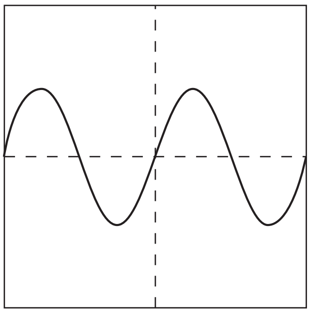
Mark your choices on the answer sheet.

QUESTION EIGHT

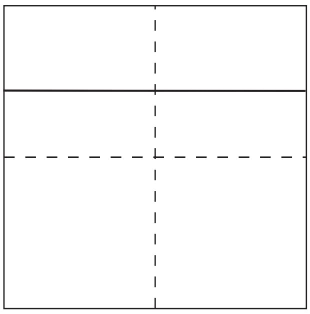
Four different power supplies are connected in turn to an oscilloscope. The oscilloscope settings are not changed. The traces, **P**, **Q**, **R** and **S**, are shown below.



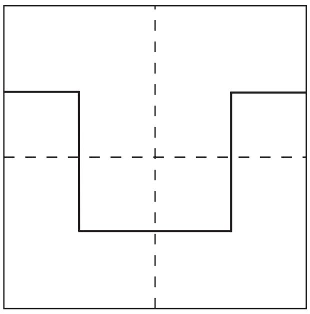
P



Q



R



S

8.1 Which of the traces shows the greatest peak voltage?

A **P**

B **Q**

C **R**

D **S**

8.2 Which trace shows a d.c. supply?

A **P**

B **Q**

C **R**

D **S**

8.3 Trace **P** represents a supply of frequency 60 Hz.

What is the frequency of supply **Q** ?

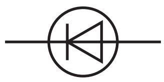
A 30 Hz

B 60 Hz

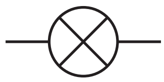
C 90 Hz

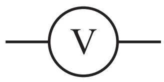
D 120 Hz

8.4 Which component could produce, by itself, one of the traces shown?

A 

B 

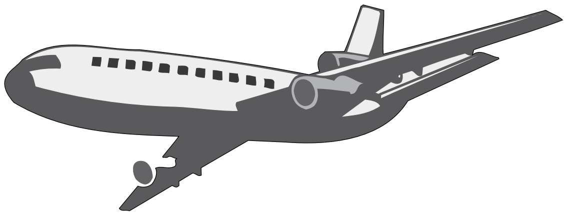
C 

D 

Turn over for the next question

QUESTION NINE

When an aircraft lands, it is often electrically charged.



9.1 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

9.2 The charge on the aircraft can be large.

Why is this dangerous?

A A spark from the charged aircraft could cause an explosion during refuelling.

B Dust from the runway could be attracted to the aircraft.

C Radio contact with ground staff could become difficult.

D The passengers could get an electric shock.

9.3 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 stairway

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

9.4 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 photocopier

Turn over for the next question

QUESTION TEN

Magnetic fields can be used to produce electric currents.

10.1 A coil of wire is part of a complete circuit.

Which object will induce a current in the coil when it is moved **into** the coil?

A A bar magnet

B A brass bar

C A copper bar

D An iron bar

10.2 A coil of wire is part of a complete circuit.

Which object will induce a current in the coil when it is moved **out of** the coil?

A A bar magnet

B A brass bar

C A copper bar

D An iron bar

10.3 The generator at a power station . . .

A has either a rotating coil or a rotating magnet.

B has neither a rotating coil nor a rotating magnet.

C must have a coil rotating in a magnetic field.

D must have a magnet rotating inside a coil.

10.4 Read this part of a student's notebook.

> *If a coil of wire cuts through a magnetic field then a potential difference is induced between the ends of the coil.*
>
> *The size of this potential difference is greater when*
>
> - *the area of the coil is greater*
> - *the number of turns on the coil is greater*
> - *the speed of the coil is greater*
> - *the strength of the magnetic field is greater*

How many of the bullet points are correct?

A None of them

B Only two of them

C Only three of them

D All of them

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**.

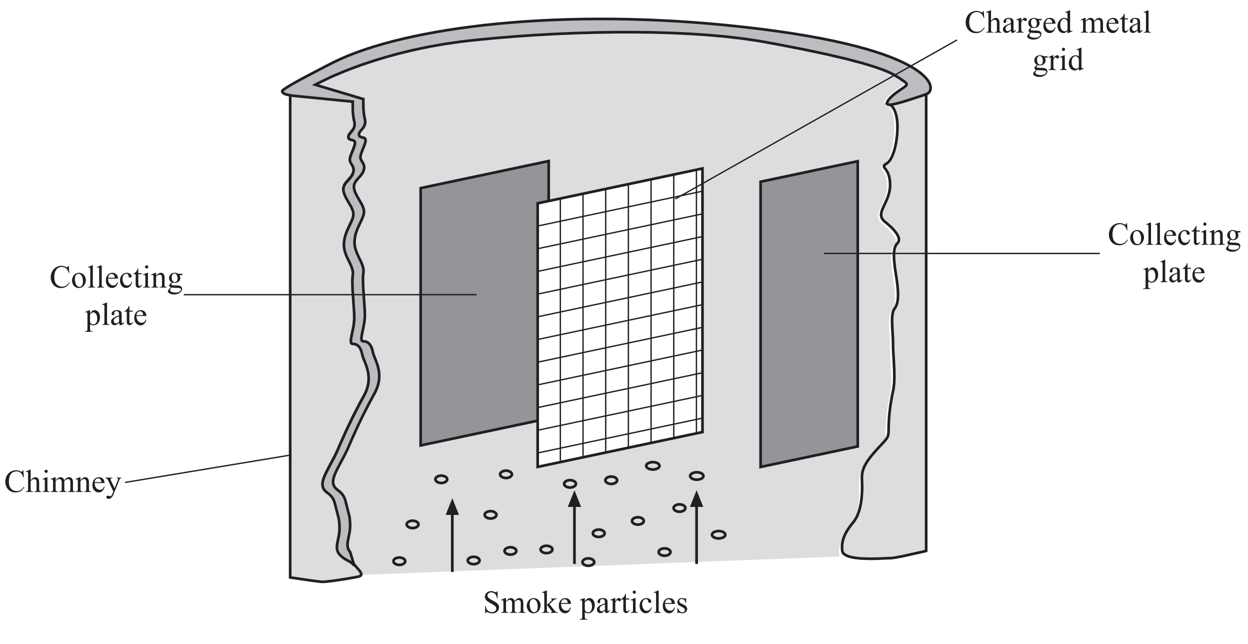
In these questions match words in the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows the inside of a chimney at a power station. The chimney contains a device for removing tiny particles of solid material from smoke. The smoke passes a charged metal grid as it moves up the chimney.



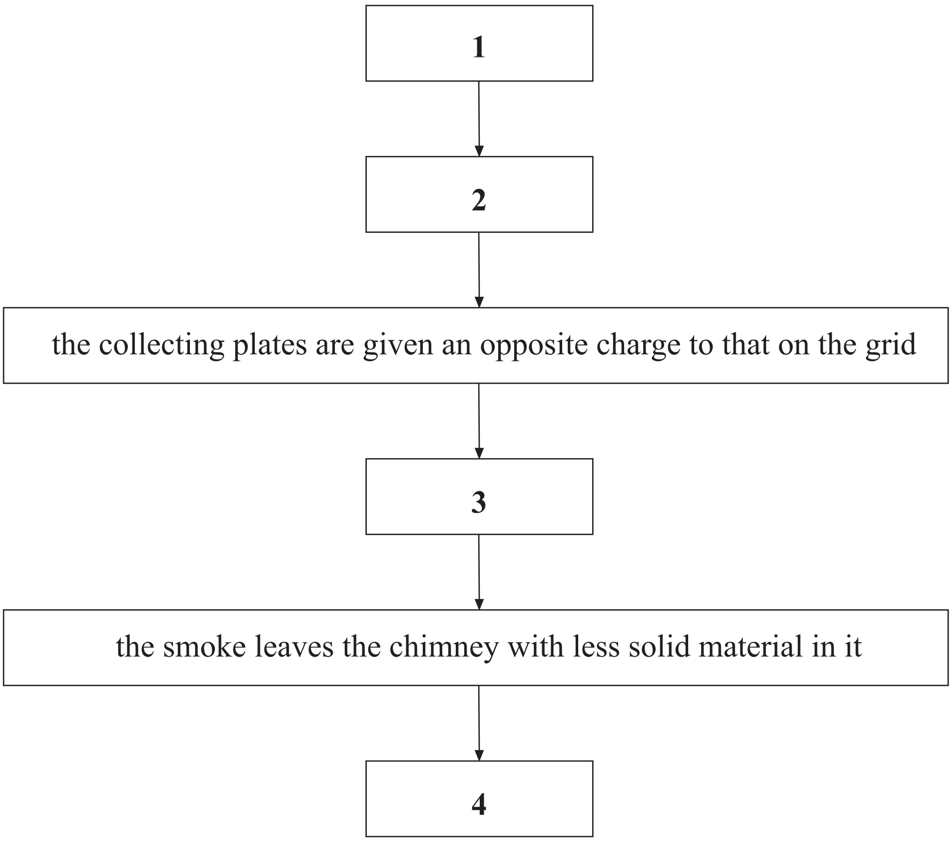
Match statements, **J**, **K**, **L** and **M**, from the list with the boxes **1–4** in the flow chart to explain how the device works.

J **the collecting plates are knocked so that the particles fall down**

K **the smoke particles are attracted to the collecting plates and stick to them**

L **the smoke particles are repelled by the similar charge on the grid**

M **the smoke particles become charged as they pass the grid**



Turn over for the next question

QUESTION TWO

This question is about mains electricity.

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

earth

live

neutral

positive

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

The . . . **3** . . . terminal alternates between . . . **4** . . . and negative potential difference 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

Fuses are often used with electrical appliances.

Which **two** of the statements, **P**, **Q**, **R**, **S** and **T**, are correct?

P **if a fault causes too large a current to flow, the fuse causes a break in the circuit**

Q **the fuse is connected to the neutral terminal in a plug**

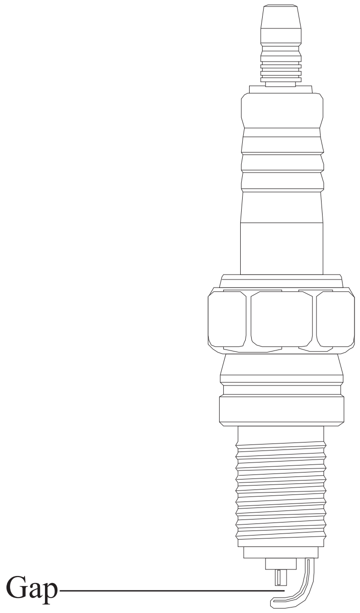
R **the fuse should have a lower value than the current which flows through the appliance when it is working normally**

S **the wire in the fuse melts when it gets too hot**

T **when the wire in the fuse melts, the circuit is completed**

QUESTION FOUR

The diagram shows a spark plug from a car. The plug produces a spark which ignites the fuel.



Which **two** changes will make it easier for a spark to form in the gap?

a bigger gap

a bigger potential difference

a smaller current

a smaller gap

a smaller potential difference

Turn over for the next question

SECTION C

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

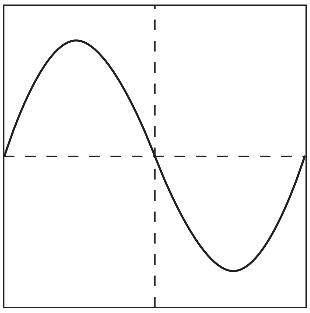
Each of these questions has four parts.

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

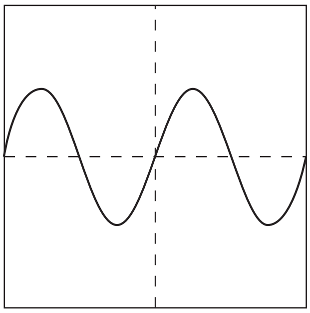
Mark your choices on the answer sheet.

QUESTION FIVE

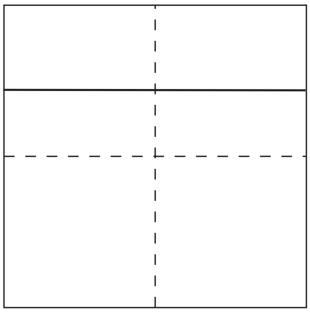
Four different power supplies are connected in turn to an oscilloscope. The oscilloscope settings are not changed. The traces, **P**, **Q**, **R** and **S**, are shown below.



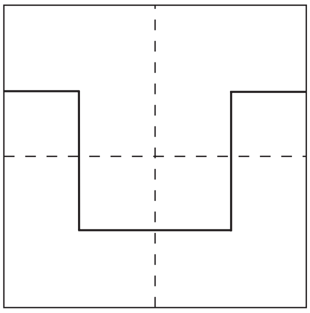
P



Q



R



S

5.1 Which of the traces shows the greatest peak voltage?

A **P**

B **Q**

C **R**

D **S**

5.2 Which trace shows a d.c. supply?

A **P**

B **Q**

C **R**

D **S**

5.3 Trace **P** represents a supply of frequency 60 Hz.

What is the frequency of supply **Q**?

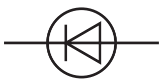
A 30 Hz

B 60 Hz

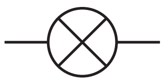
C 90 Hz

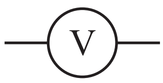
D 120 Hz

5.4 Which component could produce, by itself, one of the traces shown?

A 

B 

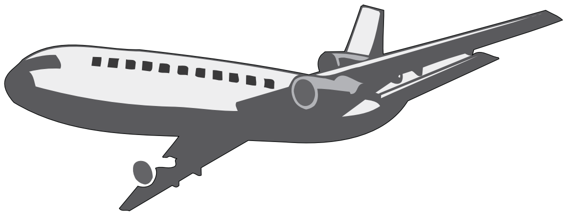
C 

D 

Turn over for the next question

QUESTION SIX

When an aircraft lands, it is often electrically charged.



6.1 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

6.2 The charge on the aircraft can be large.

Why is this dangerous?

A A spark from the charged aircraft could cause an explosion during refuelling.

B Dust from the runway could be attracted to the aircraft.

C Radio contact with ground staff could become difficult.

D The passengers could get an electric shock.

6.3 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 stairway

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

6.4 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 photocopier

Turn over for the next question

QUESTION SEVEN

Magnetic fields can be used to produce electric currents.

7.1 A coil of wire is part of a complete circuit.

Which object will induce a current in the coil when it is moved **into** the coil?

A A bar magnet

B A brass bar

C A copper bar

D An iron bar

7.2 A coil of wire is part of a complete circuit.

Which object will induce a current in the coil when it is moved **out of** the coil?

A A bar magnet

B A brass bar

C A copper bar

D An iron bar

7.3 The generator at a power station . . .

A has either a rotating coil or a rotating magnet.

B has neither a rotating coil nor a rotating magnet.

C must have a coil rotating in a magnetic field.

D must have a magnet rotating inside a coil.

7.4 Read this part of a student's notebook.

If a coil of wire cuts through a magnetic field then a potential difference is induced between the ends of the coil.

The size of this potential difference is greater when

- *the area of the coil is greater*
- *the number of turns on the coil is greater*
- *the speed of the coil is greater*
- *the strength of the magnetic field is greater*

How many of the bullet points are correct?

A None of them

B Only two of them

C Only three of them

D All of them

Turn over for the next question

QUESTION EIGHT

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

Power station → Electricity at 12 000 V → Step-up transformer → Electricity at 240 000 V → Step-down transformer → Electricity at 230 V

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

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

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

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 1000 turns.

How many turns does the secondary coil have?

A 500

B 7 200

C 20 000

D 313 040

8.3 The power station transmits power of 1 200 000 W.

Which row in the table gives the correct current values?

	Current if transmitted at 12 000 V	**Current if transmitted at 240 000 V**
A	0.01A	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.

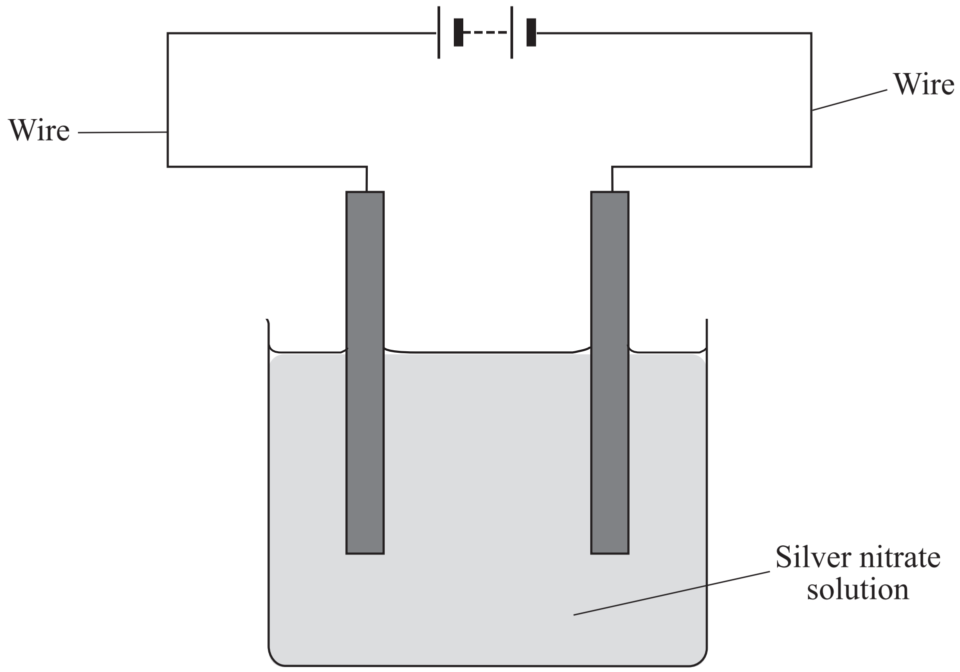
C No energy is lost in the two transformers.

D Transformers have no moving parts.

Turn over for the next question

QUESTION NINE

The diagram shows apparatus used for silver plating.



9.1 The current is taken through the wires by . . .

A electrons.

B negative ions only.

C positive ions only.

D both positive and negative ions.

9.2 The current is taken through the silver nitrate solution by . . .

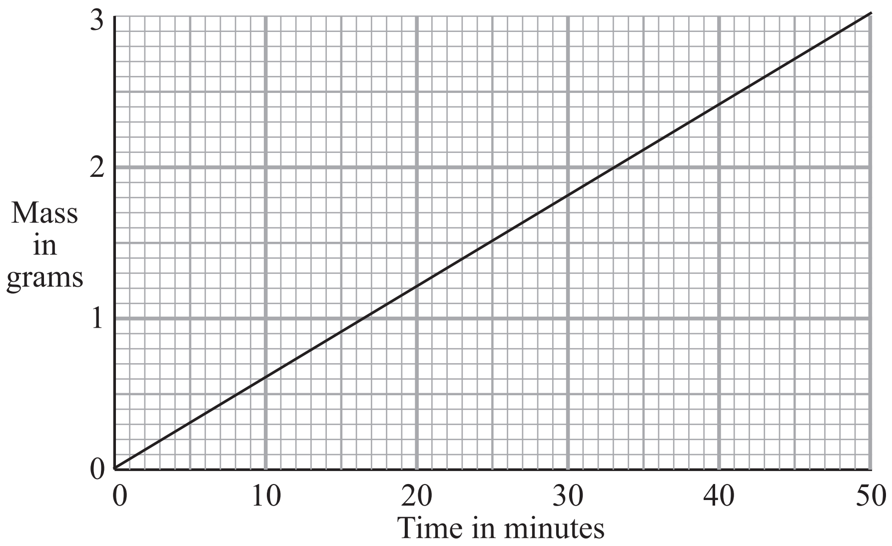
A electrons.

B negative ions only.

C positive ions only.

D both positive and negative ions.

The graph shows how the mass of silver deposited varies with time.



9.3 What mass of silver is deposited in 25 minutes?

A 1.0 g

B 1.5 g

C 2.0 g

D 2.5 g

9.4 How will the mass deposited change, if the current is doubled and the time is halved?

A It will halve.

B It will be the same.

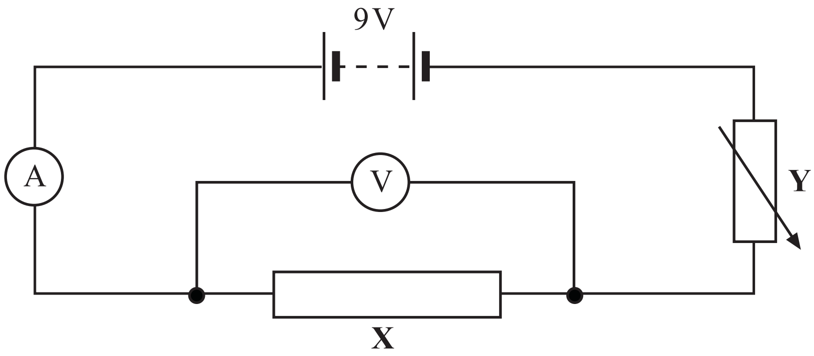
C It will double.

D It will be four times bigger.

Turn over for the next question

QUESTION TEN

Some students used the circuit shown below to determine the resistance of **X**. Component **Y** was adjusted to give a range of values.



When the potential difference across **X** was 6 V, the current flowing through it was 0.2 A.

10.1 What was the resistance of **X**?

A 0.75 Ω

B 3.33 Ω

C 6.00 Ω

D 30.00 Ω

10.2 The current through **X** remained at 0.2 A.

What was the resistance of component **Y**?

A Half the resistance of **X**.

B The same as the resistance of **X**.

C Twice the resistance of **X**.

D Four times the resistance of **X**.

10.3 The resistance of **Y** is increased.

How do the current flowing through **X** and the potential difference across **X** change?

	Current flowing through X	Potential difference across X
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

10.4 A current of 0.75 A flows through **X** in 10 minutes.

How much charge has flowed?

A 7.5 C

B 13.3 C

C 450.0 C

D 800.0 C

END OF TEST

There are no questions printed on this page

There are no questions printed on this page

There are no questions printed on this page