Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
March 2007

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

ASSESSMENT and QUALIFICATIONS ALLIANCE

Wednesday 7 March 2007 Morning Session

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

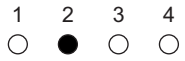
You may use a calculator.

Time allowed: 30 minutes

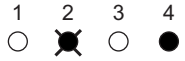
Instructions
- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Electricity' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **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

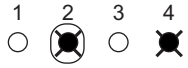
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 words from the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

Circuit diagrams use symbols to represent components.

Match words from the list with the symbols **1–4**.

battery

cell

resistor

variable resistor

1 **2** **3** **4**

QUESTION TWO

Each part of a plug has a job to do.

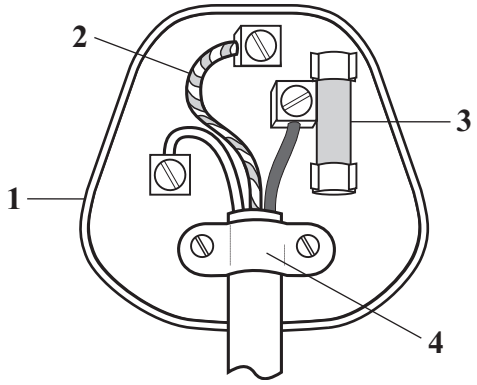
Match words from the list with the labels **1–4** on the diagram.

connects metal case of appliance to earth

holds the cable firmly

insulates the plug

wire inside melts if current is too high



Turn over for the next question

QUESTION THREE

An electric kettle is filled with water and plugged into the mains supply.

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

current

potential difference

power

resistance

The mains supply has a . . . **1** . . . of 230 volts.

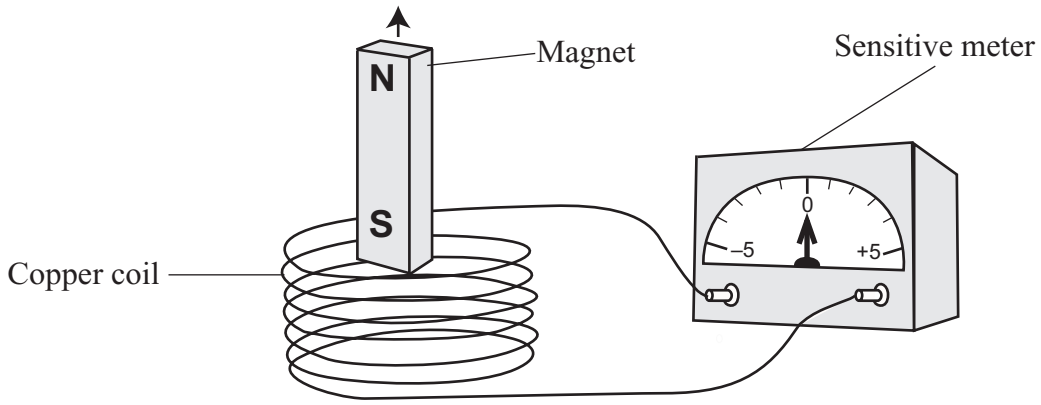
When it is hot, the heating element has a . . . **2** . . . of about 25 ohms.

The . . . **3** . . . through the heating element is 9 amps.

The kettle transfers about 2000 watts of . . . **4** . . . .

QUESTION FOUR

You can produce an electric current with the apparatus shown in the diagram.



When the magnet is moved upwards, the pointer on the meter moves from zero to the right.

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

moves further

moves to the left

moves to the right

points to 0

When the magnet is moved downwards, the pointer on the meter . . . **1** . . . .

If the magnet does not move, the pointer on the meter . . . **2** . . . .

If the magnet is moved more quickly, the pointer on the meter . . . **3** . . . .

The magnet is turned upside down. The magnet is now moved downwards.

The pointer on the meter . . . **4** . . . .

Turn over for the next question

QUESTION FIVE

In a circuit, the resistance of a component can change.

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

diode

filament lamp

LDR

thermistor

Description of resistance	Component
its resistance decreases when its temperature increases	**1**
its resistance decreases when the light intensity increases	**2**
its resistance increases when its temperature increases	**3**
its resistance is very high in the reverse direction	**4**

Turn over for the next question

SECTION B

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

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

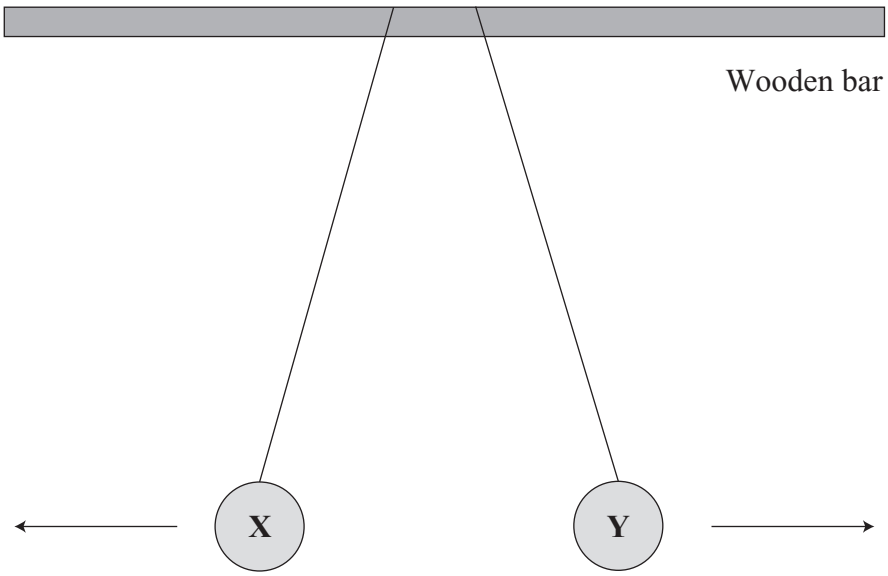
Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

Electrically charged objects exert a force on other objects.

The diagram shows two plastic spheres, labelled **X** and **Y**. They are repelling each other.

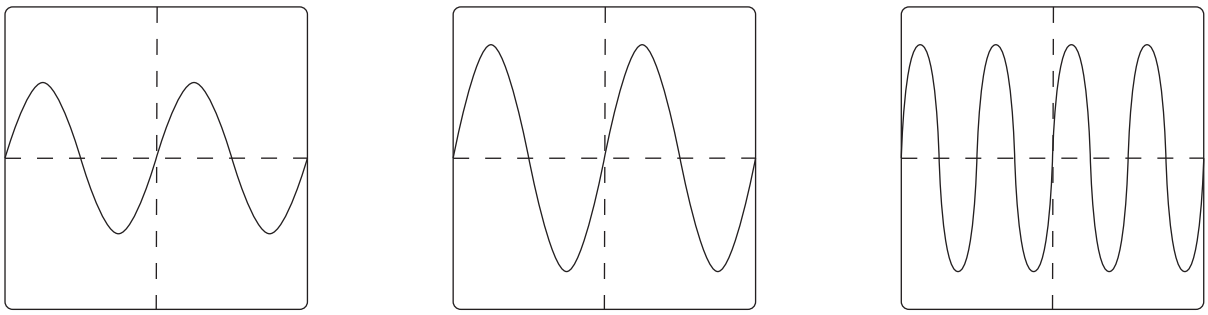


Which **two** rows in the table describe how **X** and **Y** might be charged?

	Charge on X	**Charge on Y**
P	negative	negative
Q	negative	positive
R	negative	uncharged
S	positive	positive
T	uncharged	uncharged

QUESTION SEVEN

The diagrams show the traces produced when three different a.c. supplies, **G**, **H**, and **J**, were connected to an oscilloscope. The settings of the oscilloscope were not changed. Time is on the horizontal axis.



G **H** **J**

Which **two** statements are correct?

G has the same frequency as H

G has the same peak voltage as H

G has the same peak voltage as J

H has the same frequency as J

H has the same peak voltage as J

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

A student walks on a nylon carpet. She then touches an earthed metal object and gets an electric shock.

This happens because an electric charge has built up on her.

8.1 An electric charge builds up on the student because . . .

A charged particles have been transferred between her and the carpet.

B she is a good electrical conductor.

C she is moving in the Earth's magnetic field.

D the earthed metal object charges her up.

8.2 The charge on the student is a negative charge.

This is because she has . . .

A gained electrons.

B gained ions.

C lost electrons.

D lost ions.

8.3 When the student has an electric charge on her, she can feel the hairs on her arm standing on end.

Why does this happen?

A All the hairs have the same charge, and the same charge as her body.

B All the hairs have the same charge, which is different from the charge on her body.

C The hairs have different charges, which are different from the charge on her body.

D The hairs have no charge, but her body is charged.

8.4 When the student touches the earthed object, she loses the charge which is on her.

This happens because . . .

A negative charges move from earth to her.

B negative charges move from her to earth.

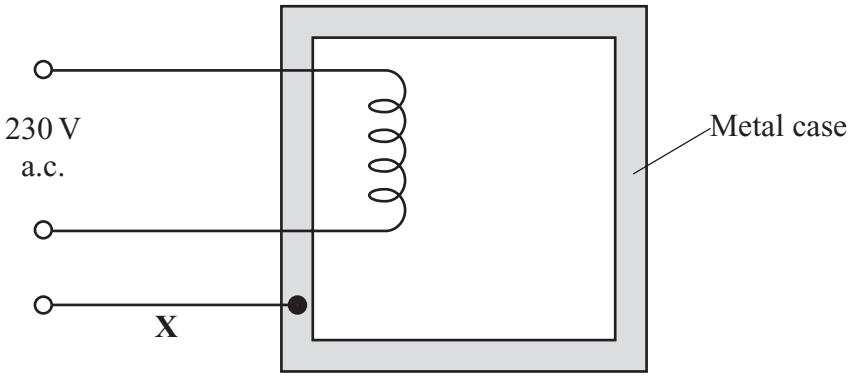
C positive charges move from earth to her.

D positive charges move from her to earth.

Turn over for the next question

QUESTION NINE

The diagram shows an appliance with a metal case.
The three wires form the cable to the mains plug.



9.1 What is the colour of wire **X**?

A Blue

B Brown

C Green/yellow

D Red

9.2 Why is a fuse included in the mains plug?

A To break the circuit when there is a power cut

B To prevent too large a current flow

C To protect anyone touching the plug

D To provide a path to earth

9.3 A fuse should have a value . . .

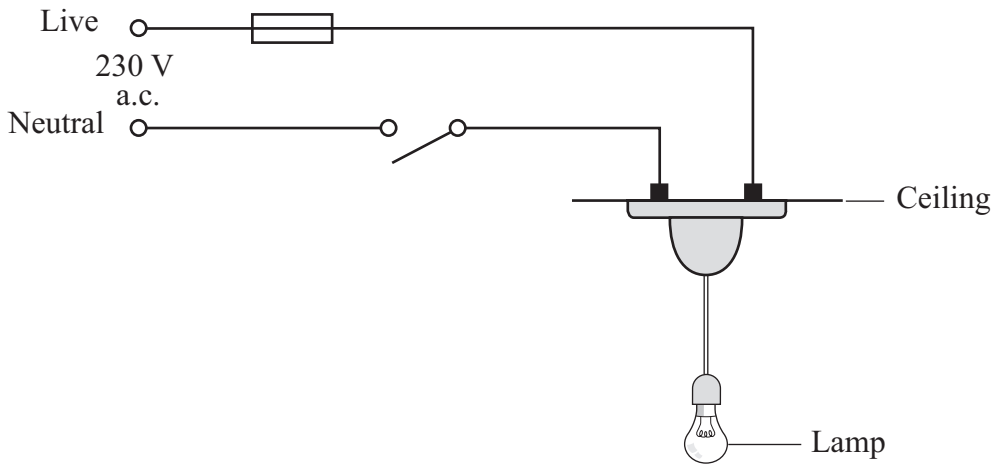
A a lot less than the normal current taken by the appliance.

B equal to the normal current taken by the appliance.

C just greater than the normal current taken by the appliance.

D much greater than the normal current taken by the appliance.

9.4 The lighting circuit shown in the diagram below is wired **incorrectly**.



What is wrong with the lighting circuit?

A Both the switch and the fuse should be in the live wire.

B Both the switch and the fuse should be in the neutral wire.

C The fuse should be in a separate earth wire for safety.

D The switch should be in the live wire and the fuse should be in the neutral wire.

Turn over for the next question

QUESTION TEN

Generators are used to produce electricity.

10.1 The box shows part of a student's notebook.

Electricity can be generated by:

- *rotating a coil of wire in a magnetic field*
- *rotating a magnet inside a coil of wire*
- *rotating two coils of wire next to each other*
- *rotating two magnets next to each other*

How many of these points are correct?

A None of them

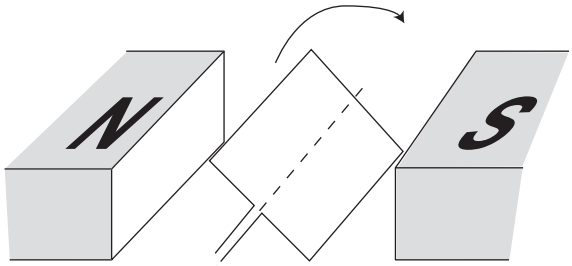
B Only the first two

C Only the last two

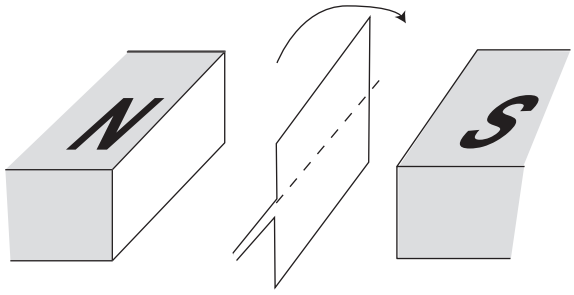
D All of them

10.2 A coil of wire rotates between the poles of a magnet. The diagram shows four positions of the coil.

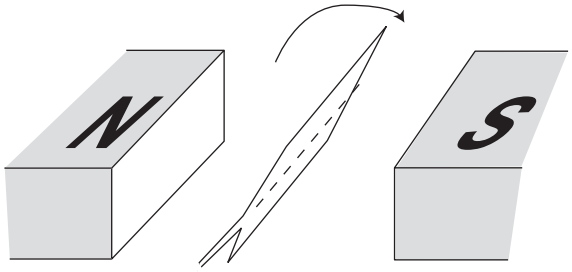
In which position, **A**, **B**, **C** or **D**, will the potential difference induced across the coil be greatest?



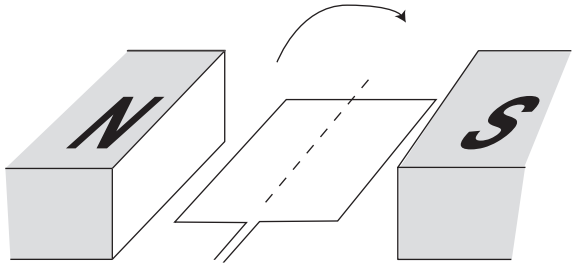
Position **A**



Position **B**



Position **C**



Position **D**

10.3 Which action will **not** increase the potential difference produced by a generator?

A Increasing the area of the coil

B Increasing the distance between the coil and the magnet

C Increasing the speed of rotation

D Increasing the strength of the magnetic field

10.4 A potential difference is induced across the ends of a coil.

This causes a current in the coil if the coil . . .

A is made of an insulating material.

B is made of a magnetic material.

C is part of a complete circuit.

D is stationary.

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 from the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

In a circuit, the resistance of a component can change.

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

diode

filament lamp

LDR

thermistor

Description of resistance	Component
its resistance decreases when its temperature increases	**1**
its resistance decreases when the light intensity increases	**2**
its resistance increases when its temperature increases	**3**
its resistance is very high in the reverse direction	**4**

QUESTION TWO

An ammeter is used to measure the current in four different circuits. The same battery is used in each circuit and all the resistors have the same value.

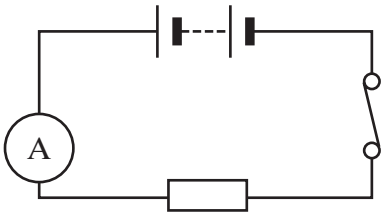
Match the ammeter readings from the list with the circuits **1–4**.

0.13 amps

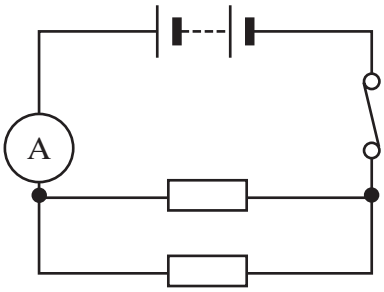
0.20 amps

0.40 amps

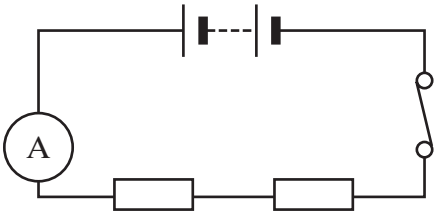
0.80 amps



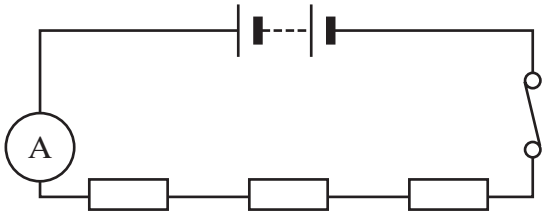
Circuit **1**



Circuit **2**



Circuit **3**



Circuit **4**

Turn over for the next question

SECTION B

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

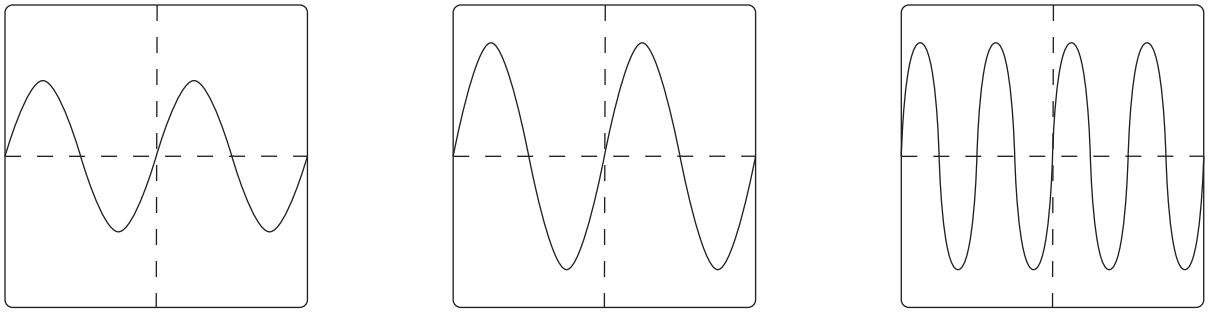
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

The diagrams show the traces produced when three different a.c. supplies, **G**, **H**, and **J**, were connected to an oscilloscope. The settings of the oscilloscope were not changed. Time is on the horizontal axis.



G **H** **J**

Which **two** statements are correct?

G has the same frequency as H

G has the same peak voltage as H

G has the same peak voltage as J

H has the same frequency as J

H has the same peak voltage as J

QUESTION FOUR

Resistors are used in electrical circuits.

When the temperature of a resistor remains constant, which **two** statements are correct?

the current can only flow in one direction

the current is directly proportional to potential difference

the current is directly proportional to resistance

the current is directly proportional to temperature

the resistance remains constant

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

A student walks on a nylon carpet. She then touches an earthed metal object and gets an electric shock.

This happens because an electric charge has built up on her.

5.1 An electric charge builds up on the student because . . .

A charged particles have been transferred between her and the carpet.

B she is a good electrical conductor.

C she is moving in the Earth's magnetic field.

D the earthed metal object charges her up.

5.2 The charge on the student is a negative charge.

This is because she has . . .

A gained electrons.

B gained ions.

C lost electrons.

D lost ions.

5.3 When the student has an electric charge on her, she can feel the hairs on her arm standing on end.

Why does this happen?

A All the hairs have the same charge, and the same charge as her body.

B All the hairs have the same charge, which is different from the charge on her body.

C The hairs have different charges, which are different from the charge on her body.

D The hairs have no charge, but her body is charged.

5.4 When the student touches the earthed object, she loses the charge which is on her.

This happens because . . .

A negative charges move from earth to her.

B negative charges move from her to earth.

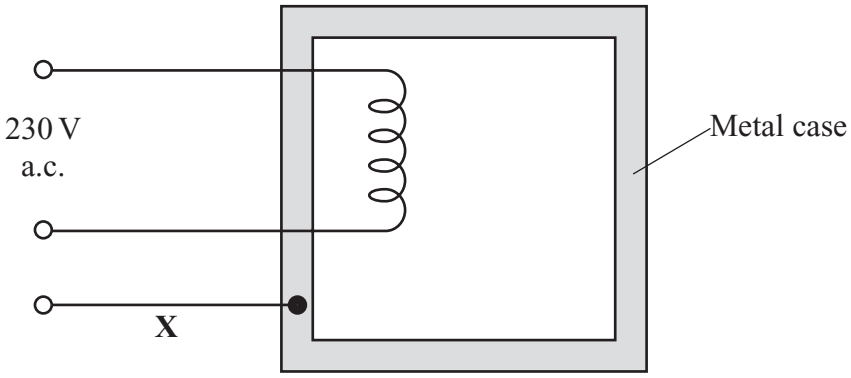
C positive charges move from earth to her.

D positive charges move from her to earth.

Turn over for the next question

QUESTION SIX

The diagram shows an appliance with a metal case.
The three wires form the cable to the mains plug.



6.1 What is the colour of wire **X**?

A Blue

B Brown

C Green/yellow

D Red

6.2 Why is a fuse included in the mains plug?

A To break the circuit when there is a power cut

B To prevent too large a current flow

C To protect anyone touching the plug

D To provide a path to earth

6.3 A fuse should have a value . . .

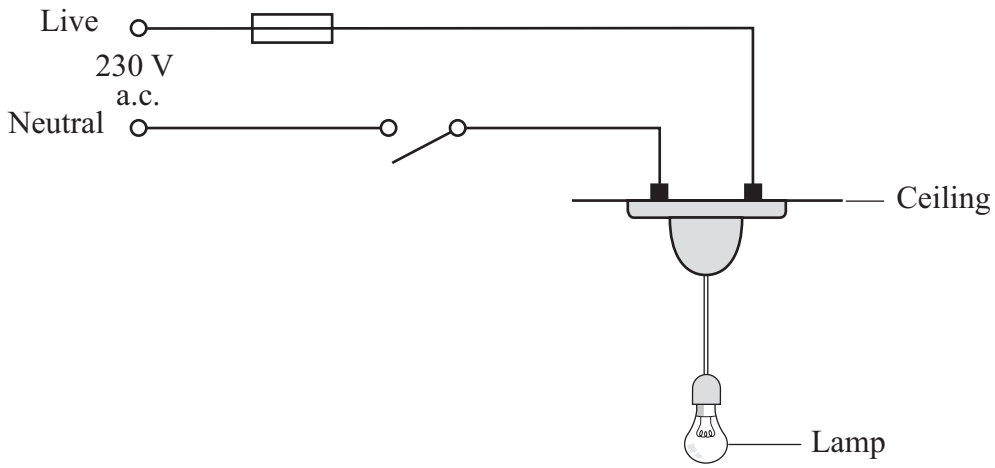
A a lot less than the normal current taken by the appliance.

B equal to the normal current taken by the appliance.

C just greater than the normal current taken by the appliance.

D much greater than the normal current taken by the appliance.

6.4 The lighting circuit shown in the diagram below is wired **incorrectly**.



What is wrong with the lighting circuit?

A Both the switch and the fuse should be in the live wire.

B Both the switch and the fuse should be in the neutral wire.

C The fuse should be in a separate earth wire for safety.

D The switch should be in the live wire and the fuse should be in the neutral wire.

Turn over for the next question

QUESTION SEVEN

Generators are used to produce electricity.

7.1 The box shows part of a student's notebook.

> *Electricity can be generated by:*
>
> - *rotating a coil of wire in a magnetic field*
> - *rotating a magnet inside a coil of wire*
> - *rotating two coils of wire next to each other*
> - *rotating two magnets next to each other*

How many of these points are correct?

A None of them

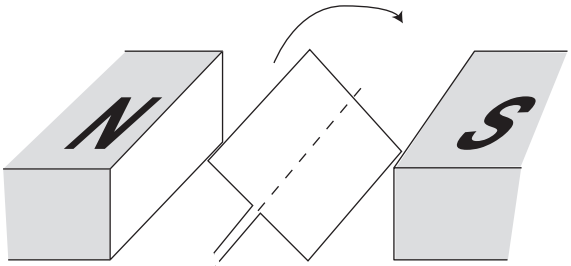
B Only the first two

C Only the last two

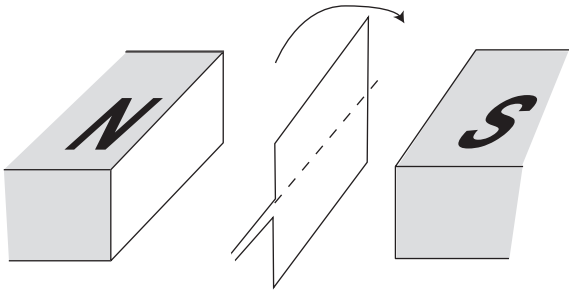
D All of them

7.2 A coil of wire rotates between the poles of a magnet. The diagram shows four positions of the coil.

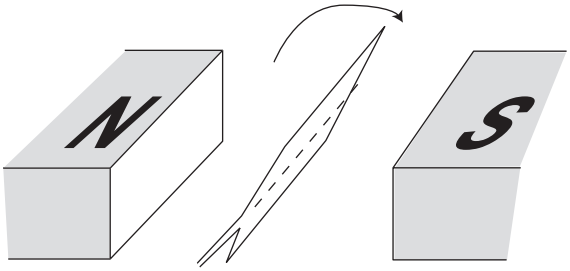
In which position, **A**, **B**, **C** or **D**, will the potential difference induced across the coil be greatest?



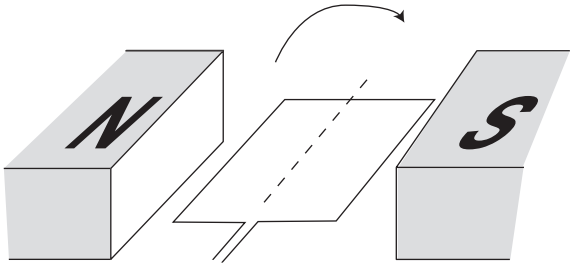
Position **A**



Position **B**



Position **C**



Position **D**

7.3 Which action will **not** increase the potential difference produced by a generator?

A Increasing the area of the coil

B Increasing the distance between the coil and the magnet

C Increasing the speed of rotation

D Increasing the strength of the magnetic field

7.4 A potential difference is induced across the ends of a coil.

This causes a current in the coil if the coil . . .

A is made of an insulating material.

B is made of a magnetic material.

C is part of a complete circuit.

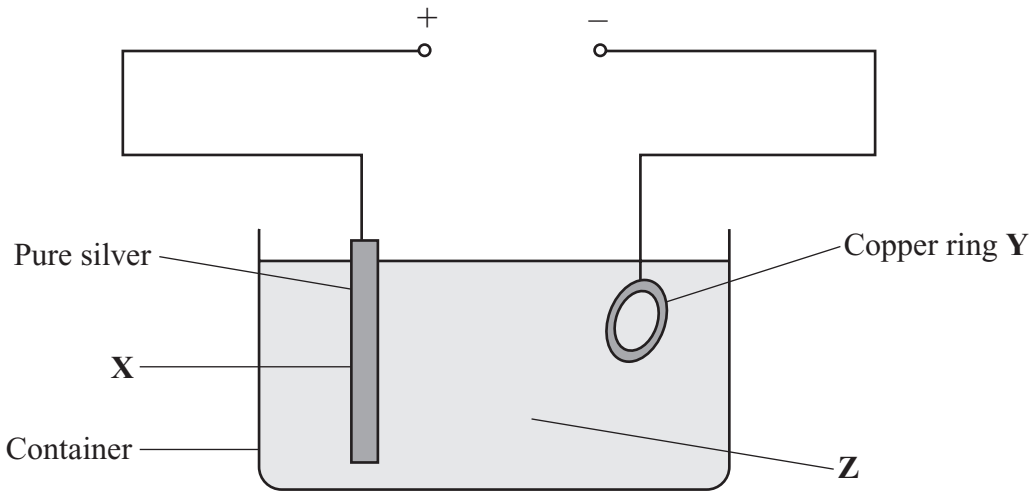
D is stationary.

Turn over for the next question

QUESTION EIGHT

Some types of jewellery can be made by plating copper with a layer of silver, by electrolysis.

The circuit is shown in the diagram.



Silver is deposited on the copper ring **Y**.

8.1 Which row in the table correctly matches the labels, **X**, **Y** and **Z**, on the diagram?

	X	Y	Z
A	negative electrode	positive electrode	copper nitrate solution
B	negative electrode	positive electrode	silver nitrate solution
C	positive electrode	negative electrode	copper nitrate solution
D	positive electrode	negative electrode	silver nitrate solution

8.2 Which statement correctly describes what happens in the container?

A Negative silver ions travel towards **Y**.

B Positive silver ions travel towards **Y**.

C Silver atoms travel towards **X**.

D Silver atoms travel towards **Y**.

8.3 A charge of 900 C will deposit 1 g of silver.

How long will it take a current of 2.5 A to deposit 1 g of silver?

A 6 minutes

B 40 minutes

C 360 minutes

D 2250 minutes

8.4 If a current of 5 A flows for three times as long as the current in **8.3**, what mass of silver will be deposited?

A 2 g

B 4 g

C 6 g

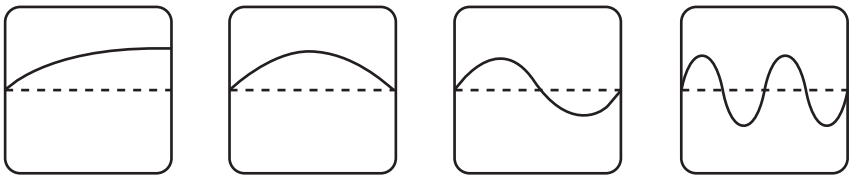
D 8 g

Turn over for the next question

QUESTION NINE

The mains electricity is usually an a.c. supply of about 230 V, frequency 50 Hz.

9.1 Each of these oscilloscope traces corresponds to 0.01 seconds.



Which trace, **A**, **B**, **C** or **D**, shows the 50 Hz mains supply?

9.2 The live and neutral mains wires carry the current.

Which statement is correct?

A The live and neutral voltages both alternate relative to earth.

B The live wire always has a positive voltage relative to earth.

C The neutral wire has a voltage close to zero relative to earth.

D The neutral wire has a voltage which is negative relative to earth.

9.3 Why are mains supplies a.c.?

A A fuse will operate with a.c., but not with d.c.

B The voltage can be changed easily, using transformers.

C They are generally much safer than d.c. mains supplies.

D They produce more energy than d.c. for the same voltage.

9.4 Why are a.c. supplies transmitted from power stations to local substations at very high voltages?

A High voltage transmission is safer than low voltage transmission.

B Local transformers can reduce the voltage to that needed by consumers.

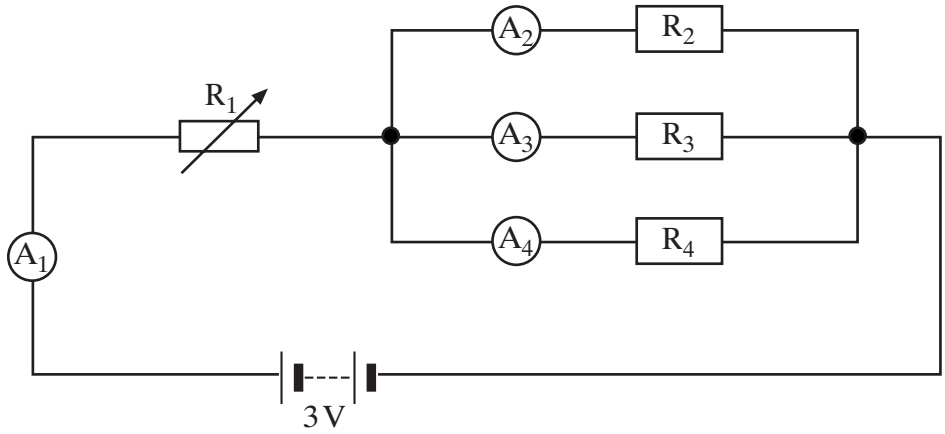
C Power stations produce electricity at very high voltages.

D The higher the voltage, the less energy is wasted in transmission.

Turn over for the next question

QUESTION TEN

The diagram shows a circuit including four resistors labelled R_1 to R_4 and four ammeters labelled A_1 to A_4.



The current flowing through A_1 is 3.2 A and through A_2 is 0.8 A.

10.1 What may ammeters A_3 and A_4 read?

	A_3	**A_4**
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 Across which two resistors is the potential difference certain to be the same?

A R_1 and R_2

B R_1 and R_3

C R_1 and R_4

D R_2 and R_4

The variable resistor is adjusted, and the reading on A_1 changes from 3.2 A to 1.6 A.

10.3 Ammeter A_2 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 R_1 is less and the potential difference across the other resistors is unchanged.

B The potential difference across R_1 is unchanged but the potential difference across the other resistors is less.

C The potential difference across R_1 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