

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2004



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

Tuesday 29 June 2004 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:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

- 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
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

- 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
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

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

We use symbols for components used in circuits.


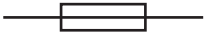

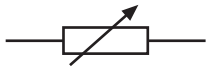
Match words from the list with the numbers **1–4** in the table.

fuse

lamp

thermistor

variable resistor

Component	Symbol
1	
2	
3	
4	

QUESTION TWO

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

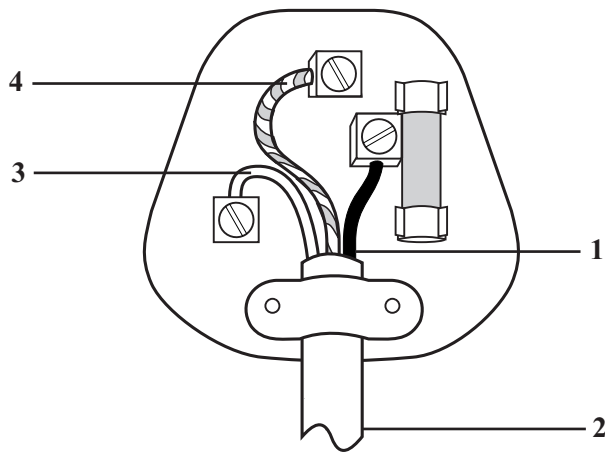
Match words from the list with the labels 1–4 on the diagram.

blue

brown

green and yellow

white



TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION THREE

This question is about the jobs done by different electrical components.

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

changes the voltage of an a.c. supply

melts when the current gets too large

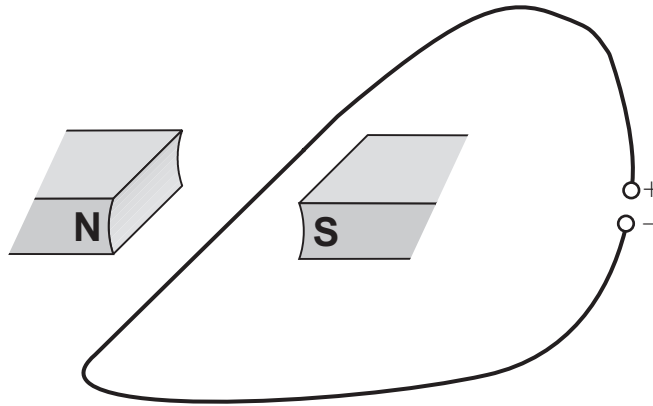
provides a potential difference (voltage)

safety device which uses an electromagnet

Job done by component	Component
1	cell
2	circuit breaker
3	fuse
4	transformer

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 spaces **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**

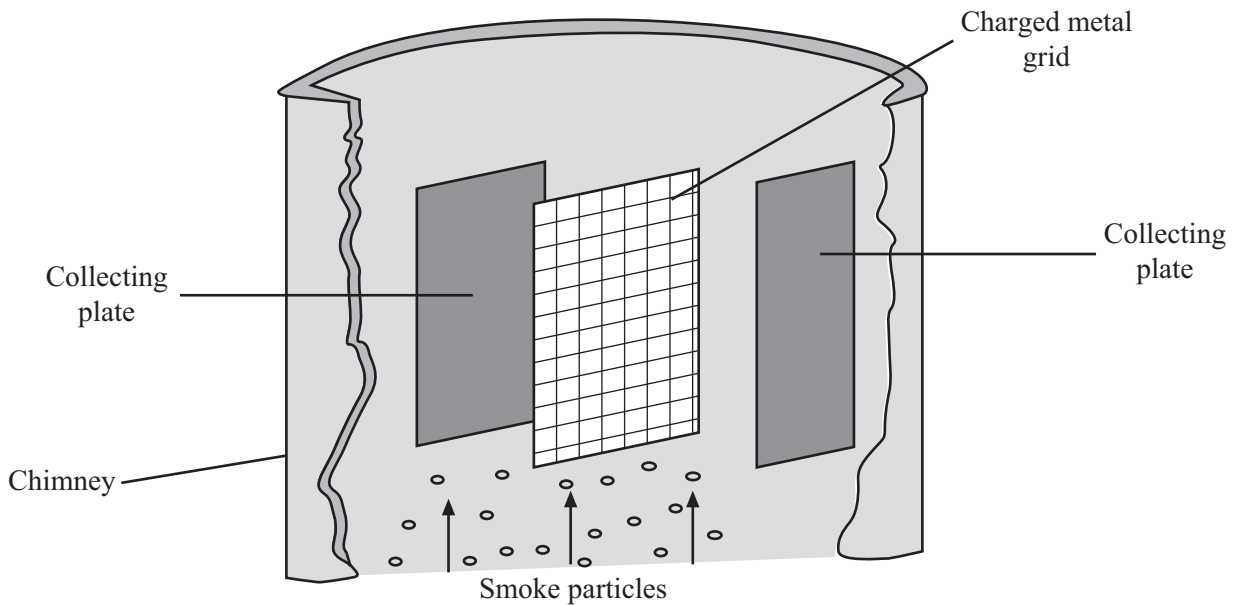
The direction of the force changes if the current is **3**

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 ►

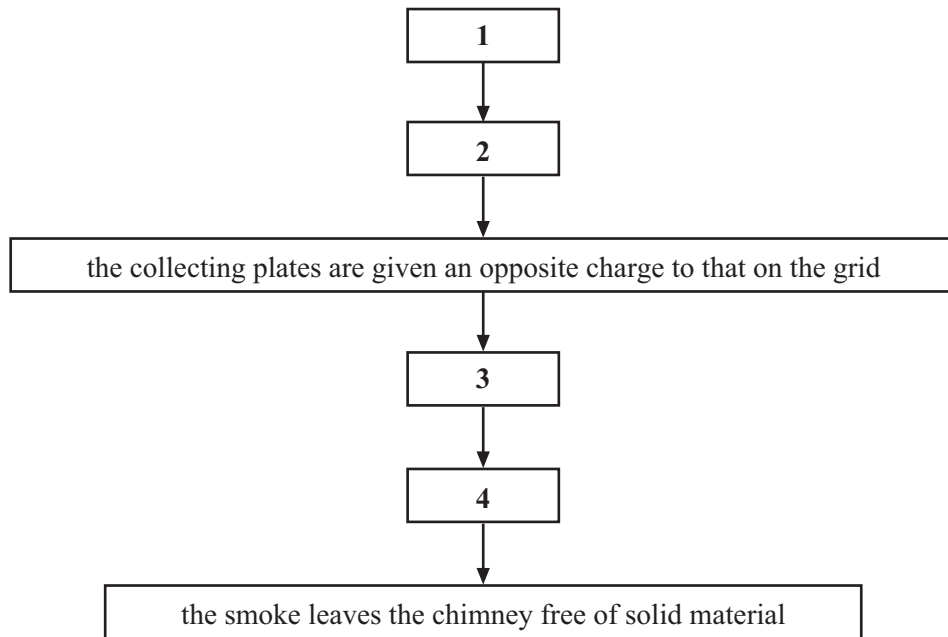
QUESTION FIVE

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.



Explain how the device works by choosing statements **J**, **K**, **L** and **M** from the list to match the boxes **1–4** in the flow diagram.

- 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

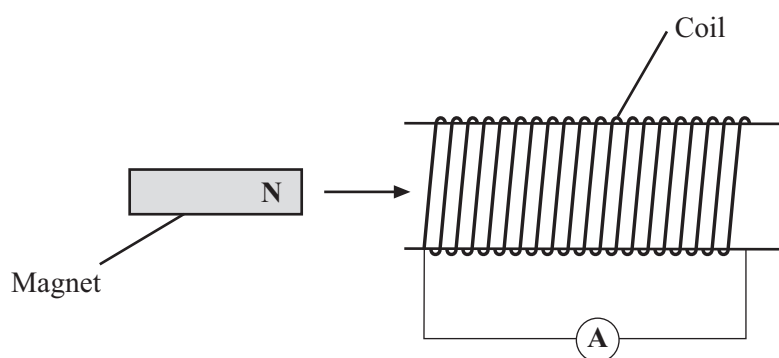
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SECTION BQuestions **SIX** and **SEVEN**.In these questions choose the best **two** answers.Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

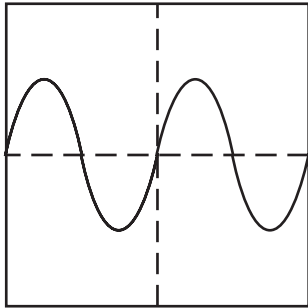
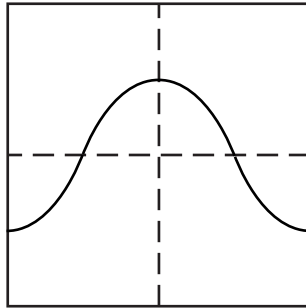
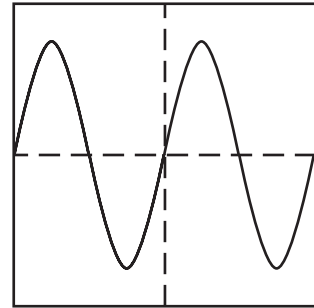
The diagram shows a magnet moving into a coil of wire.
The ammeter gives a positive reading.

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

- P** if the magnet stops, the ammeter will give a negative reading
- Q** if the magnet stops, the ammeter will read zero
- R** if the magnet is moved out of the coil, the ammeter will give a negative reading
- S** if the magnet is moved out of the coil, the ammeter will give a positive reading
- T** if the magnet is reversed and moved out of the coil, the ammeter will give a negative reading

QUESTION SEVEN

The diagrams show the traces produced when three different a.c. supplies, **A**, **B** and **C**, were tested with an oscilloscope. The settings of the oscilloscope were kept the same throughout.

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

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

A has the same frequency as B

A has the same frequency as C

B has a higher frequency than C

B has the same peak voltage as A

C has the same peak voltage as A

TURN OVER FOR THE NEXT QUESTION

Turn over ►

SECTION CQuestions **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 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

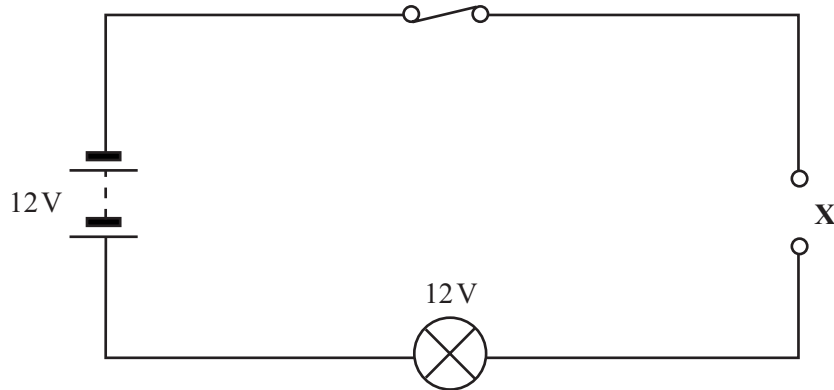
- A** negative charges move from earth to her.
- B** negative charges move from her to earth.
- C** positive charges move from earth to her.
- D** positive charges move from her to earth.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

The diagram shows part of a circuit. The circuit can be completed by putting different components in the gap marked **X**.



- 9.1** With a diode in the gap **X**, the lamp
- A** does not light at all.
 - B** flickers slowly.
 - C** flickers very quickly.
 - D** lights only if the diode is the right way round.
- 9.2** With an LDR in the gap **X**, the lamp
- A** does not light at all.
 - B** lights more brightly when the lights in the room are off.
 - C** lights more brightly when the lights in the room are on.
 - D** lights only if the LDR is the right way round.
- 9.3** With a thermistor in the gap **X**, the lamp
- A** does not light at all.
 - B** lights more brightly if you cool the thermistor.
 - C** lights more brightly if you heat the thermistor.
 - D** lights only if the thermistor is the right way round.

9.4 With a large value resistor in the gap **X**, the lamp

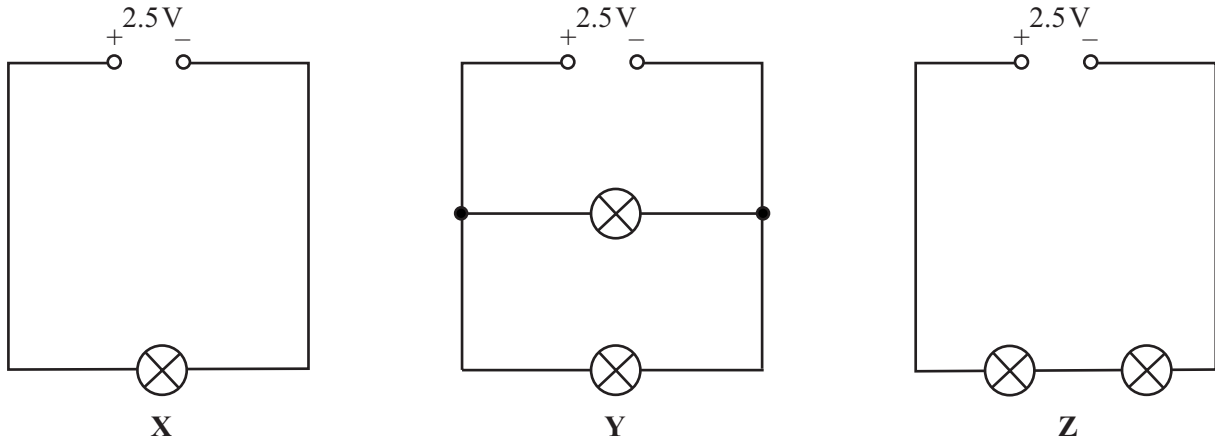
- A** lights only if the resistor is the right way round.
- B** flickers.
- C** lights dimly.
- D** lights brightly.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

Some torch lamps are marked 2.5 V 0.5 A.
They are connected as shown in the circuits **X**, **Y** and **Z**.



10.1 Which of the following statements is correct?

- A** In all three circuits the current taken from the power supply will be the same
- B** The current taken from the power supply in circuit **X** will be the greatest
- C** The current taken from the power supply in circuit **Y** will be the greatest
- D** The current taken from the power supply in circuit **Z** will be the greatest

10.2 The total rate of energy transfer (power) of the lamps is

- A** greatest in circuit **X**.
- B** greatest in circuit **Y**.
- C** greatest in circuit **Z**.
- D** the same in each circuit.

10.3 The power of the lamp in circuit **X** is

- A** 0.20 W
- B** 1.25 W
- C** 2.55 W
- D** 5.00 W

10.4 A voltmeter is connected across each of the lamps shown.

The greatest reading is

- A** in circuit **X** only.
- B** in both circuits **X** and **Y**.
- C** in both circuits **Y** and **Z**.
- D** in circuit **Z** only.

END OF TEST

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

The Foundation Tier starts 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**.

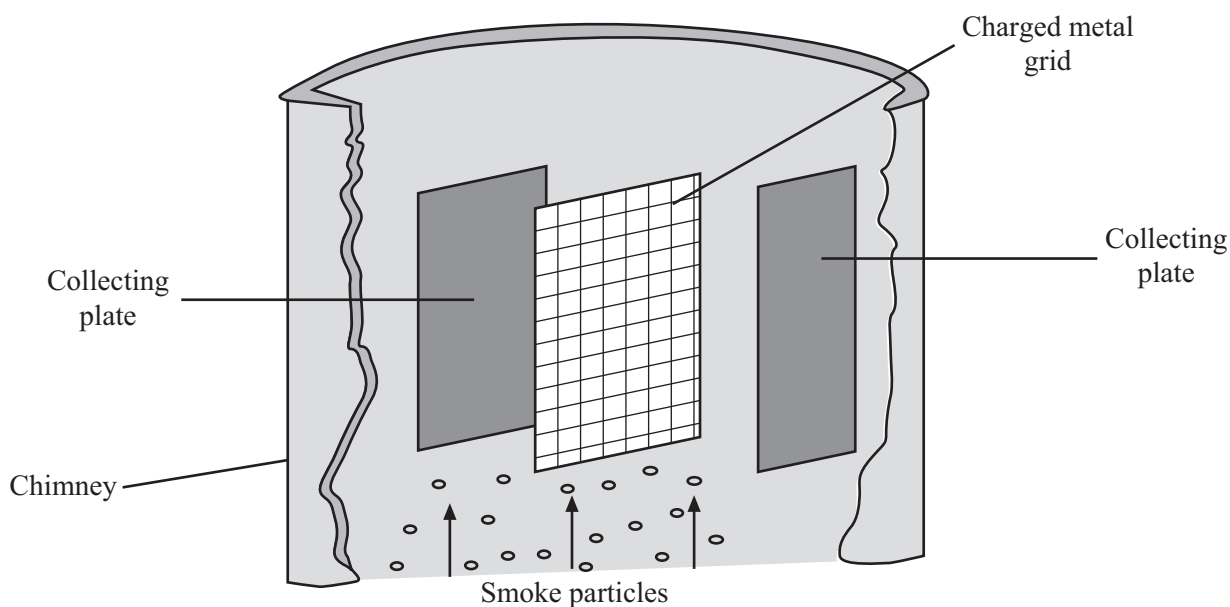
Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows the inside of a chimney at a power station.

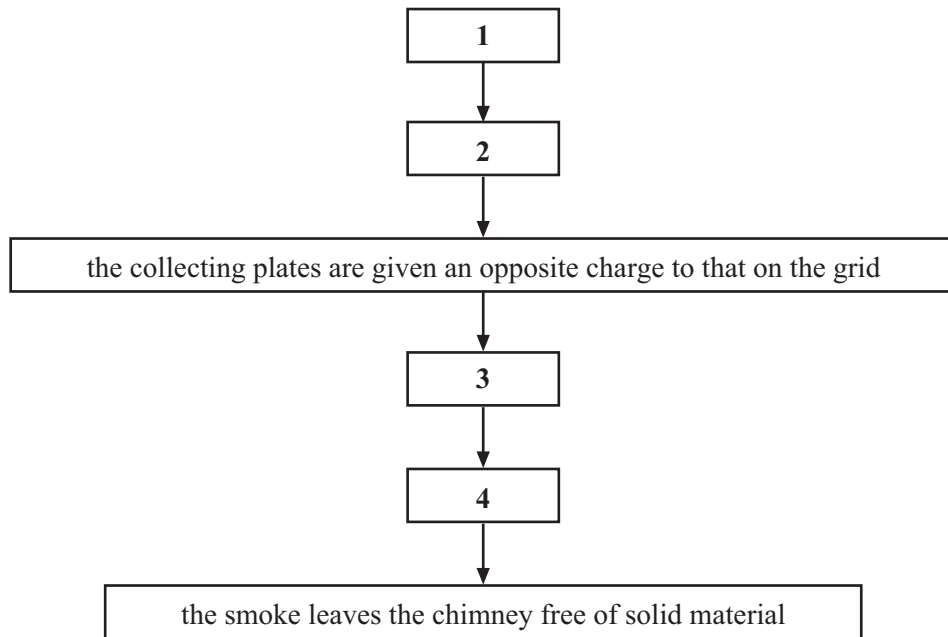
The chimney contains a device for removing tiny particles of solid material from smoke.

The smoke passes a charged metal grid as it moves up the chimney.



Explain how the device works by choosing statements **J**, **K**, **L** and **M** from the list to match the boxes **1–4** in the flow diagram.

- 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

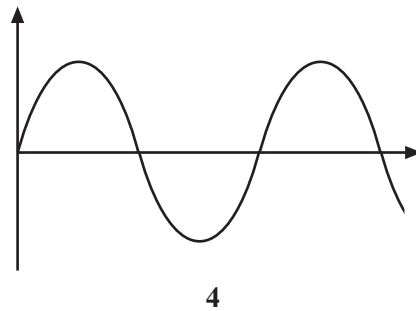
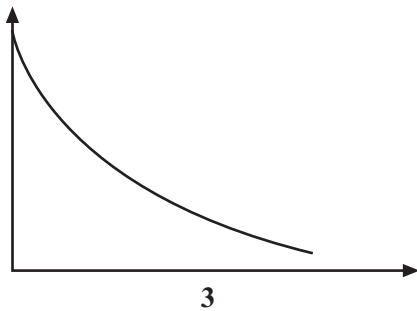
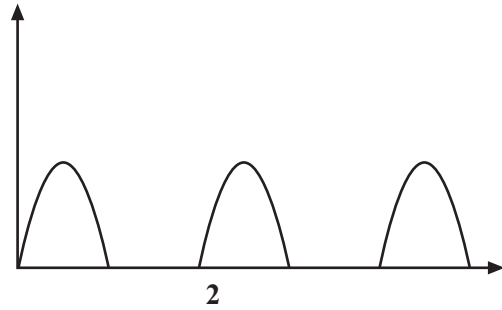


TURN OVER FOR THE NEXT QUESTION

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QUESTION TWO

Four graphs are shown below. The horizontal axis represents time or temperature.



Match statements from the list, **P**, **Q**, **R** and **S**, with the graphs **1–4**, to describe what the graph shows.

- P** how the current through a diode connected to an a.c. supply changes with time
- Q** how the potential difference across an a.c. generator changes with time
- R** how the potential difference (voltage) across a battery changes with time
- S** how the resistance of a thermistor changes with temperature

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

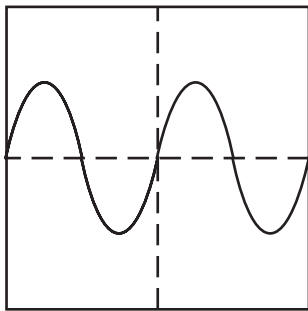
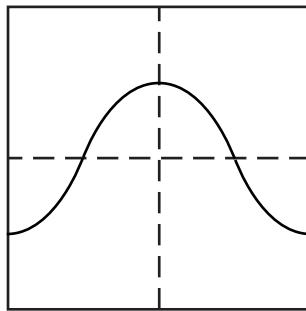
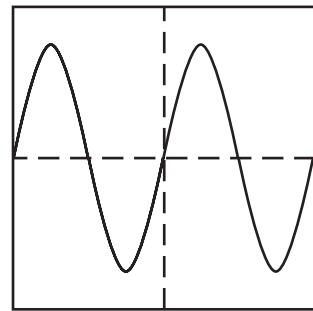
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SECTION BQuestions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

The diagrams show the traces produced when three different a.c. supplies, **A**, **B** and **C**, were tested with an oscilloscope. The settings of the oscilloscope were kept the same throughout.

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

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

A has the same frequency as B

A has the same frequency as C

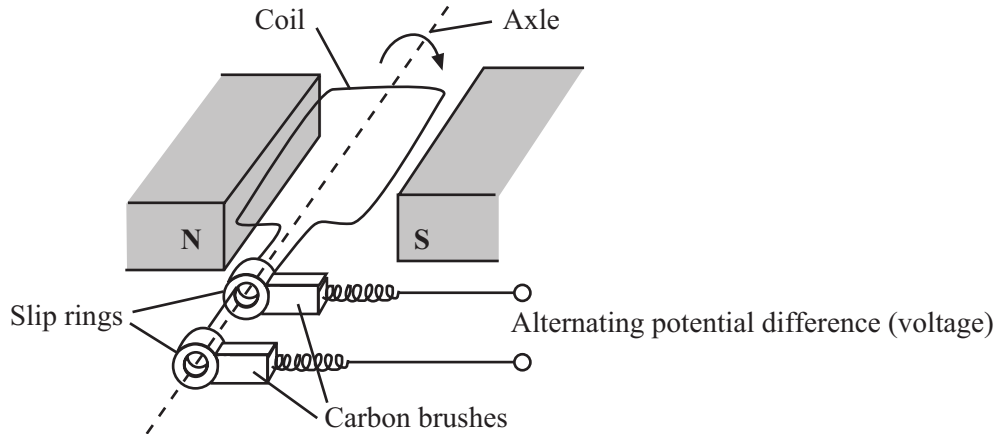
B has a higher frequency than C

B has the same peak voltage as A

C has the same peak voltage as A

QUESTION FOUR

The diagram shows a simple generator.



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

the brushes change a.c. to d.c.

the slip rings prevent the wires from getting tangled up

the stronger the magnetic field the greater the voltage produced

when the coil spins faster the frequency of the a.c. generated decreases

the voltage produced increases if the number of turns on the coil is increased

TURN OVER FOR THE NEXT QUESTION

Turn over ►

SECTION CQuestions **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 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

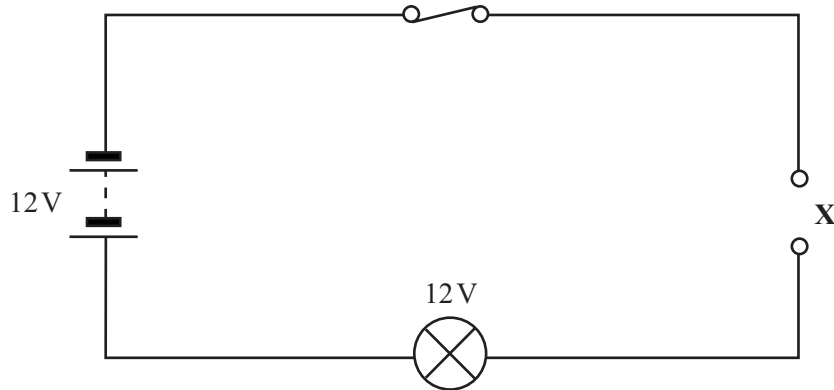
- A** negative charges move from earth to her.
- B** negative charges move from her to earth.
- C** positive charges move from earth to her.
- D** positive charges move from her to earth.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SIX

The diagram shows part of a circuit. The circuit can be completed by putting different components in the gap marked **X**.



- 6.1** With a diode in the gap **X**, the lamp
- A** does not light at all.
 - B** flickers slowly.
 - C** flickers very quickly.
 - D** lights only if the diode is the right way round.
- 6.2** With an LDR in the gap **X**, the lamp
- A** does not light at all.
 - B** lights more brightly when the lights in the room are off.
 - C** lights more brightly when the lights in the room are on.
 - D** lights only if the LDR is the right way round.
- 6.3** With a thermistor in the gap **X**, the lamp
- A** does not light at all.
 - B** lights more brightly if you cool the thermistor.
 - C** lights more brightly if you heat the thermistor.
 - D** lights only if the thermistor is the right way round.

- 6.4** With a large value resistor in the gap **X**, the lamp
- A** lights only if the resistor is the right way round.
 - B** flickers.
 - C** lights dimly.
 - D** lights brightly.

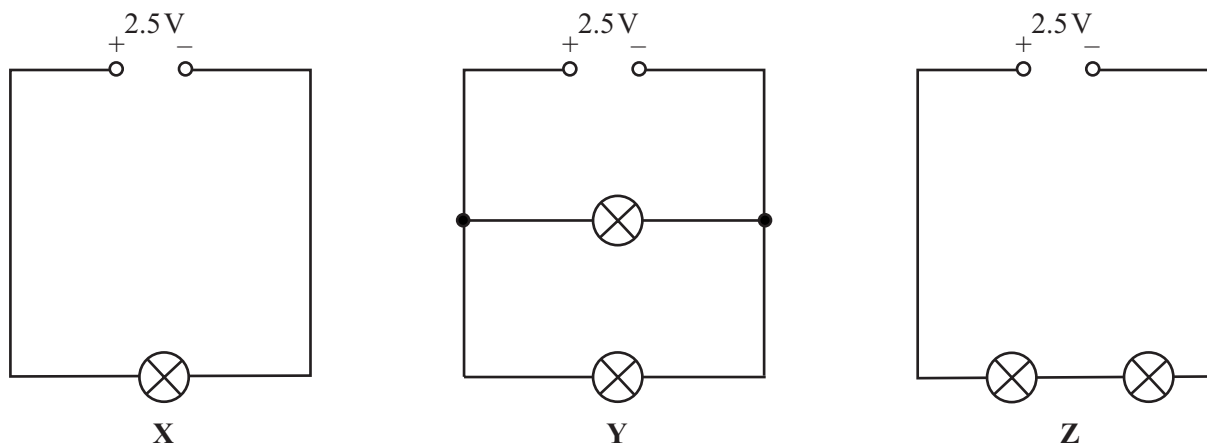
TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SEVEN

Some torch lamps are marked 2.5 V 0.5 A

They are connected as shown in the circuits **X**, **Y** and **Z**.



7.1 Which of the following statements is correct?

- A In all three circuits the current taken from the power supply will be the same
- B The current taken from the power supply in circuit **X** will be the greatest
- C The current taken from the power supply in circuit **Y** will be the greatest
- D The current taken from the power supply in circuit **Z** will be the greatest

7.2 The total rate of energy transfer (power) of the lamps is

- A greatest in circuit **X**.
- B greatest in circuit **Y**.
- C greatest in circuit **Z**.
- D the same in each circuit.

7.3 The power of the lamp in circuit **X** is

- A** 0.20 W
- B** 1.25 W
- C** 2.55 W
- D** 5.00 W

7.4 A voltmeter is connected across each of the lamps shown.

The greatest reading is

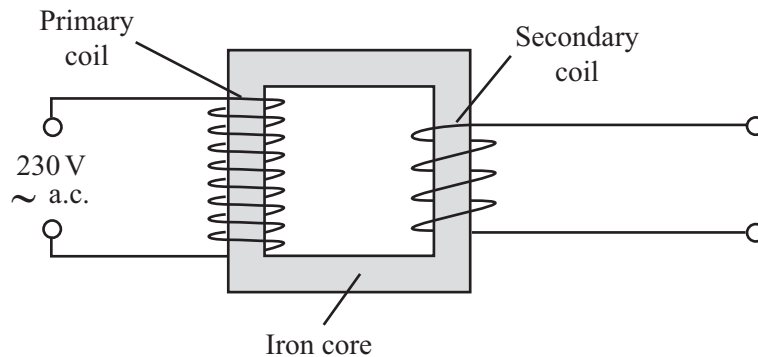
- A** in circuit **X** only.
- B** in both circuits **X** and **Y**.
- C** in both circuits **Y** and **Z**.
- D** in circuit **Z** only.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION EIGHT

The diagram shows a transformer used to change the voltage of the mains supply.



8.1 Why is a voltage induced across the secondary coil?

- A Because the secondary coil is electrically connected to the primary coil by the iron core
- B Because there are fewer turns on the secondary coil than on the primary coil
- C Because there is a magnetic field inside the secondary coil
- D Because the magnetic field inside the secondary coil is continually changing

8.2 The primary coil has 2000 turns. The secondary coil has 100 turns.

The voltage induced across the secondary coil is

- A 2.30 V
- B 5.75 V
- C 11.5 V
- D 4600 V

8.3 The power in the primary coil is 115 W.

What is the current in the primary coil?

- A 0.50 A
- B 1.15 A
- C 2.00 A
- D 8.70 A

- 8.4** Another transformer steps the voltage up by 40 times.
The current in the primary coil is 4 A.

What is the current in the secondary coil if no power is lost?

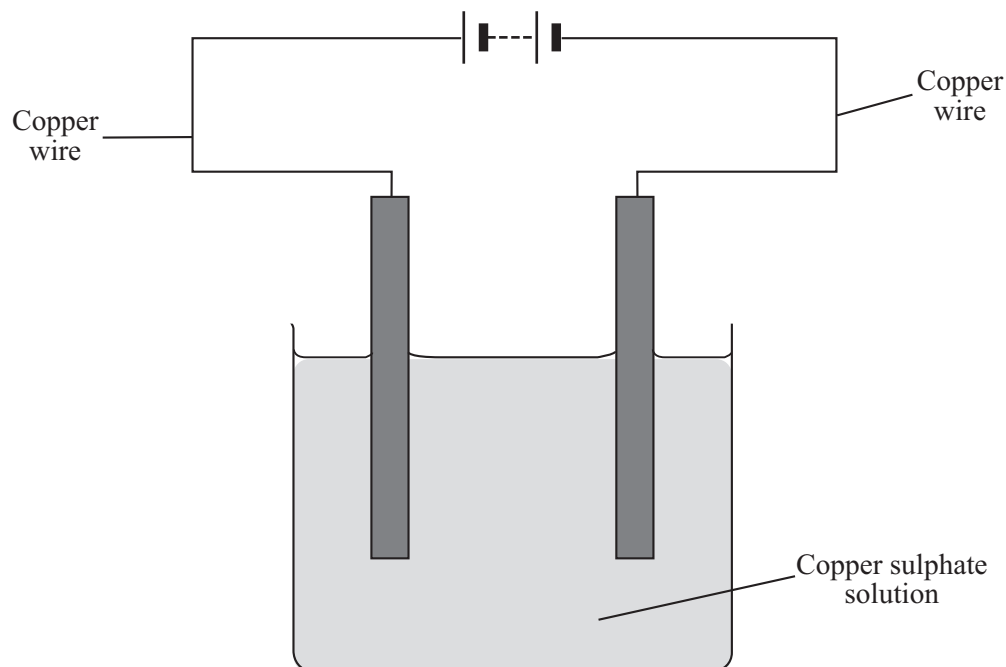
- A 0.1 A
- B 4.0 A
- C 10.0 A
- D 160.0 A

TURN OVER FOR THE NEXT QUESTION

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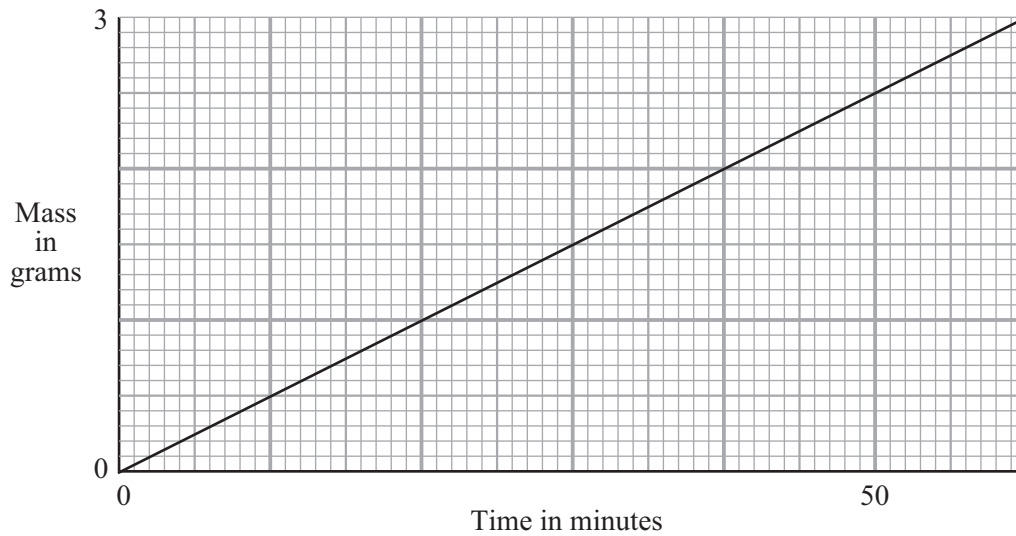
QUESTION NINE

The diagram shows apparatus used for copper plating.



- 9.1** The current is taken through the copper 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 copper sulphate 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 copper deposited varies with time.



9.3 What mass of copper is deposited in 30 minutes?

- A 1.0 g
- B 1.5 g
- C 2.0 g
- D 2.5 g

9.4 How would the mass deposited change if both the current and the time are doubled?

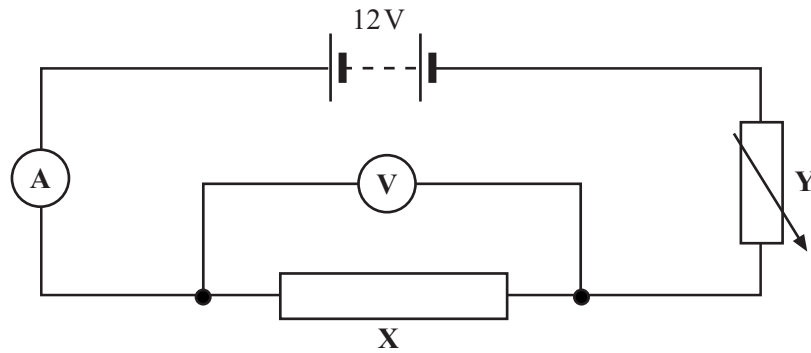
- A It would halve
- B It would be the same
- C It would double
- D It would be four times bigger

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

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



When the potential difference (voltage) across **X** was 4 V, the current flowing through it was 0.2 A.

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

- A 0.05
- B 0.80
- C 3.00
- D 20.00

10.2 The current through **X** remained at 0.2 A. What was the resistance of component **Y** in ohms?

- A Half the resistance of **X**
- B The same as the resistance of **X**
- C Twice the resistance of **X**
- D It is not possible to calculate the resistance of **Y**

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

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

	Current 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 resistor **X** for 10 minutes.

How much charge has flowed?

- A** 7.5 C
- B** 13.3 C
- C** 450 C
- D** 800 C

END OF TEST

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