

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education  
Spring 2005



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

Wednesday 2 March 2005 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

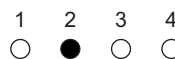
**Instructions**

- 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**

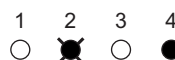
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

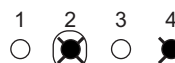


- Do **not** extend beyond the circles.

- 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.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Higher Tier starts on page 18 of this booklet.

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**FOUNDATION TIER**

**SECTION A**

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

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

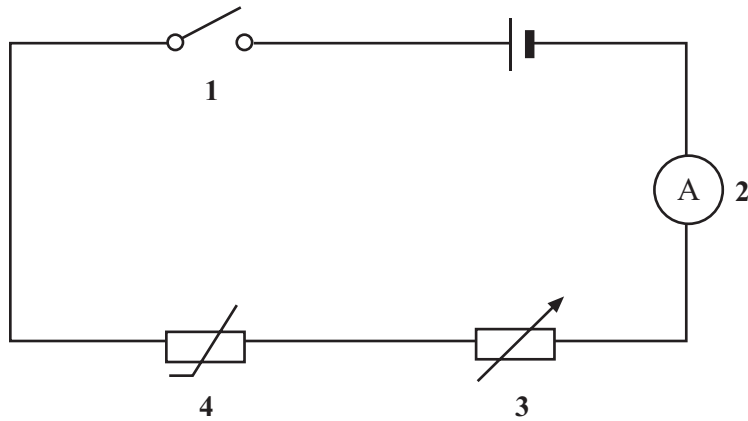
Use **each** answer only **once**.

Mark your choices on the answer sheet.

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**QUESTION ONE**

The circuit shown contains different components.



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

**ammeter**

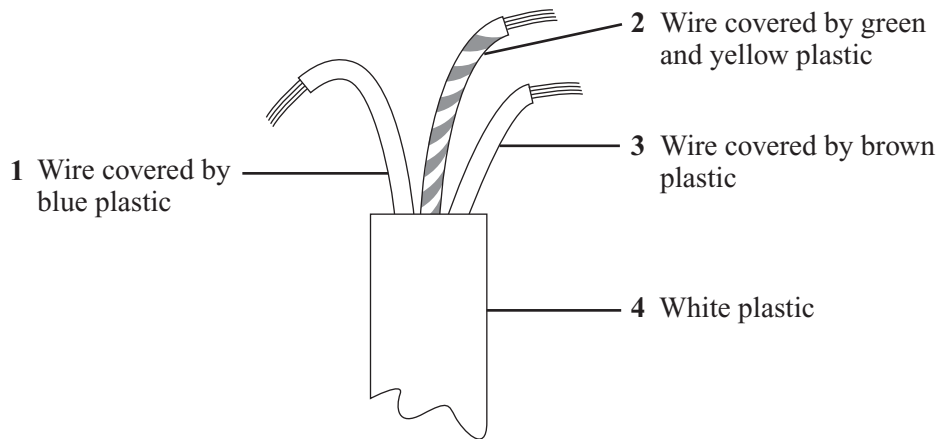
**switch**

**thermistor**

**variable resistor**

**QUESTION TWO**

The diagram shows a cable that is attached to an electric fire.  
The cable will be connected to a plug when the fire is used.



Match phrases **E**, **F**, **G** and **H** from the list with the labels **1–4** on the diagram.

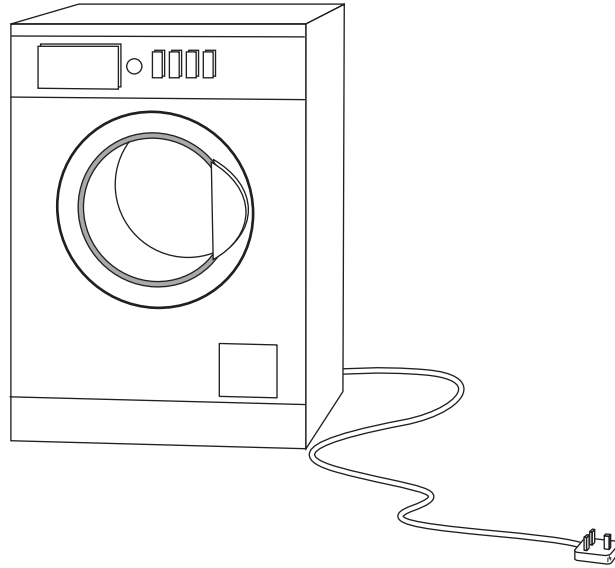
- E** the cable grip is tightened on this
- F** connects the earth pin to the metal case of the fire
- G** is connected to the fuse
- H** is connected to the neutral terminal

**TURN OVER FOR THE NEXT QUESTION**

Turn over ►

**QUESTION THREE**

The washing machine has a power of 2 kW.



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

**50**

**100**

**2000**

**120 000**

Electric current from the mains supply changes direction . . . . . **1** . . . . . times in one second.

The frequency of the mains supply is . . . . . **2** . . . . . hertz.

The power of the washing machine is . . . . . **3** . . . . . watts.

The energy transferred to the washing machine in one minute is . . . . . **4** . . . . . joules.

**QUESTION FOUR**

Electrical devices do different jobs.

Match the devices in the list with the numbers 1–4 in the table.

**generator**

**oscilloscope**

**transformer**

**variable resistor**

<b>Electrical device</b>	<b>Job done by device</b>
<b>1</b>	changes the current flowing in a circuit
<b>2</b>	changes the voltage of an a.c. supply
<b>3</b>	produces electricity by rotating a magnet near a coil
<b>4</b>	used to compare peak voltages of a.c. supplies

**TURN OVER FOR THE NEXT QUESTION**

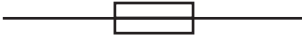

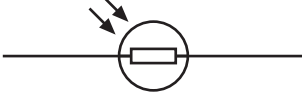
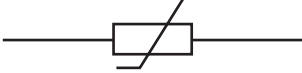
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**QUESTION FIVE**

The table shows symbols for some electrical components. Each component has a different function.

Match functions **P**, **Q**, **R** and **S** from the list with the numbers **1–4** in the table.

- P** allows current to flow in one direction only
- Q** changes resistance when the light intensity changes
- R** changes resistance when the temperature changes
- S** melts when the current is too large

Symbol	Function
	1
	2
	3
	4

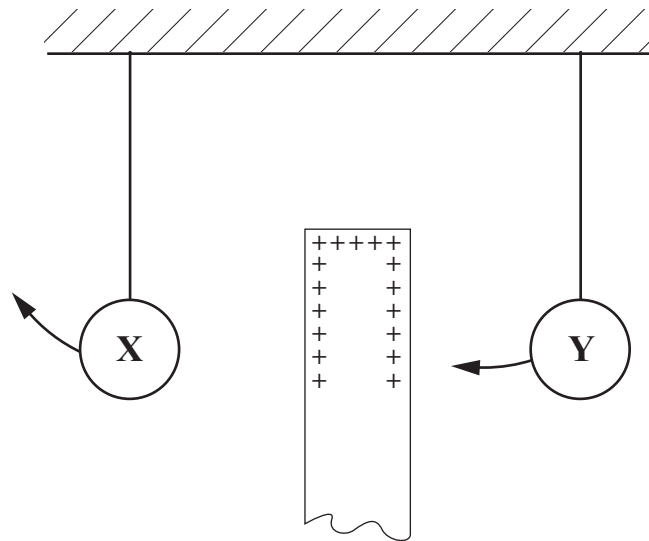
**NO QUESTIONS APPEAR ON THIS PAGE**

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**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.

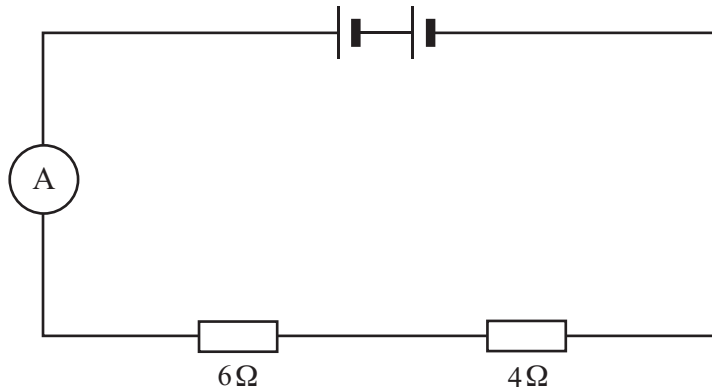
**QUESTION SIX****X** and **Y** are hollow metal balls hanging from nylon threads.When a positively charged plastic rod is placed between them, **X** is repelled from the rod and **Y** is attracted to the rod.Which **two** rows of the table **J**, **K**, **L**, **M** and **N** show how **X** and **Y** might be charged?

	<b>X</b>	<b>Y</b>
<b>J</b>	positive	negative
<b>K</b>	positive	positive
<b>L</b>	positive	uncharged
<b>M</b>	uncharged	positive
<b>N</b>	uncharged	uncharged



**QUESTION SEVEN**

A student builds this circuit using two 2 V cells.



Which **two** statements are correct?

**the potential difference (voltage) across the 4 Ω resistor is 0.8 V**

**the potential difference (voltage) across the 6 Ω resistor is 2.4 V**

**the potential difference (voltage) across the battery is 2 V**

**the total current in the circuit is 0.2 A**

**the total resistance is 10 Ω**

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**SECTION C**Questions **EIGHT** to **TEN**.

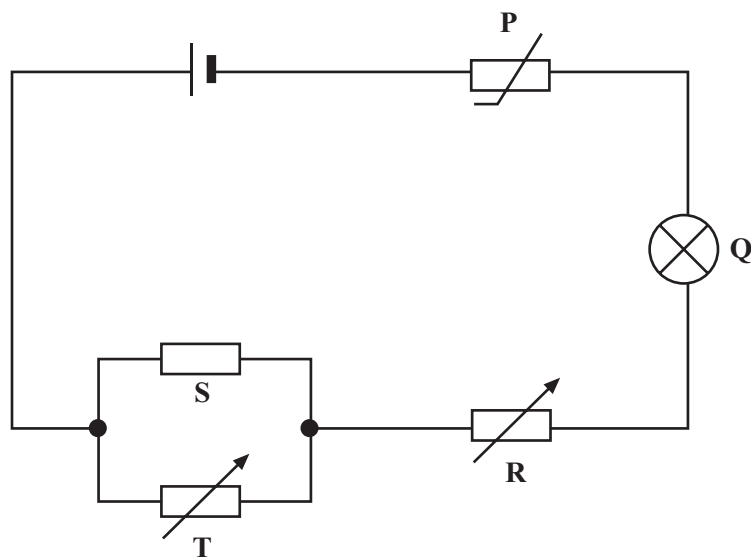
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

**QUESTION EIGHT**

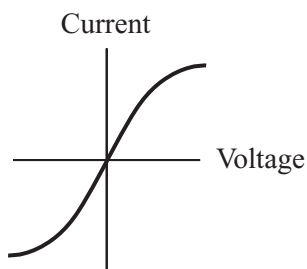
The diagram shows a circuit with several different components.

**8.1** The potential difference (voltage) across each component was measured.

Which components have the same potential difference across them?

- A P, Q and R only
- B P, Q, R, S and T
- C R and T only
- D S and T only

8.2 The graph shows how current changes with voltage across one of the components.



Which component would give this graph?

- A P
- B Q
- C R
- D S

8.3 Through which two components does the same size current flow?

- A P and Q
- B P and S
- C P and T
- D R and T

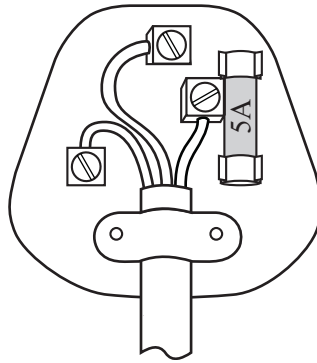
8.4 Which component has a resistance which increases when temperature increases?

- A P
- B Q
- C R
- D S

Turn over ►

**QUESTION NINE**

An iron is connected to the 230 volt mains supply by a 3-pin fused plug.  
The maximum current flowing through the iron is 4 A.  
The diagram shows how the plug is wired.



**9.1** An earth wire has been connected to make the iron safe.

This is because the iron . . . . .

- A** has a metal base.
- B** has water inside it.
- C** is sometimes used on damp clothes.
- D** might overheat.

**9.2** The value of the fuse fitted is 5 A.

This value . . . . .

- A** is correct.
- B** is too high.
- C** is too low.
- D** should always be 13 A in a 3-pin plug.

**9.3** Which of these statements about the fuse is **not** true?

- A** It breaks the circuit when there is a fault
- B** It is a safety device
- C** It melts if the current becomes too high
- D** It should be connected to the earth wire

**9.4** What is the maximum power of the iron?

- A** 920 W
- B** 960 W
- C** 1150 W
- D** 1200 W

**TURN OVER FOR THE NEXT QUESTION**

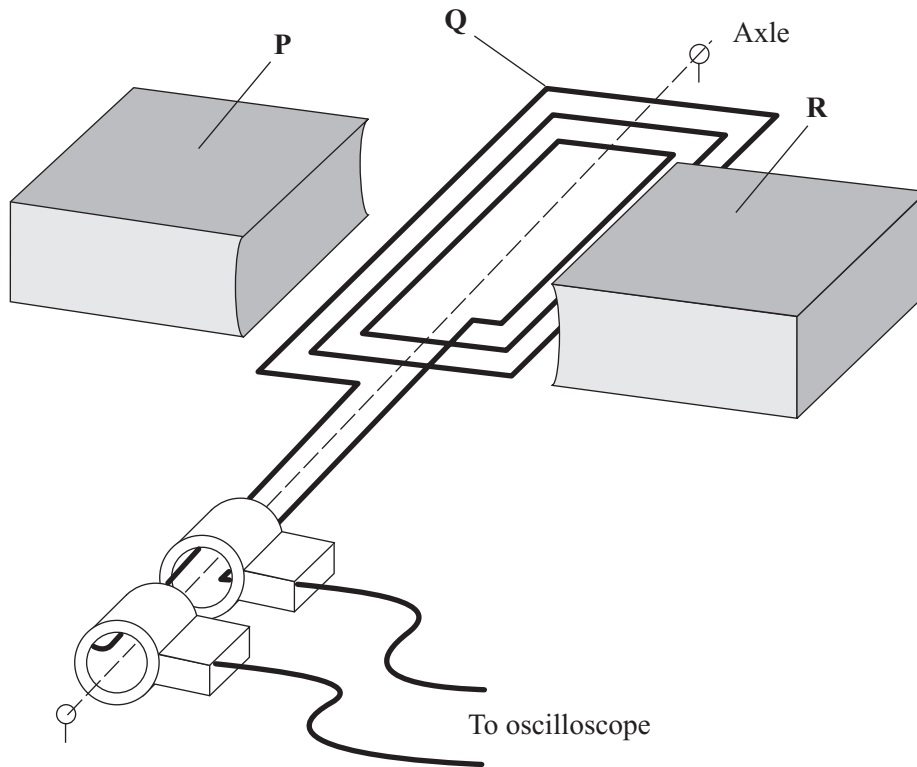
**Turn over ►**

**QUESTION TEN**

A generator is used to produce electricity.

The diagram shows a simple generator.

An oscilloscope is used to investigate the potential difference (voltage) produced.



**10.1** Which row of the table gives the correct labels on the diagram?

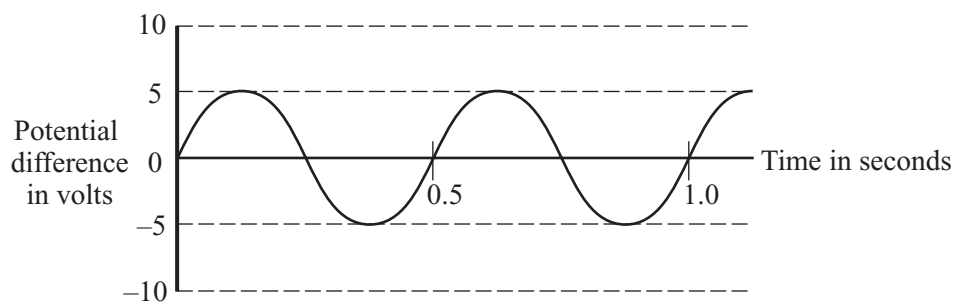
	<b>P</b>	<b>Q</b>	<b>R</b>
<b>A</b>	coil	N-pole	N-pole
<b>B</b>	N-pole	coil	S-pole
<b>C</b>	N-pole	coil	N-pole
<b>D</b>	S-pole	coil	S-pole

**10.2** The induced voltage depends on the area of the coil and the number of turns on it.

Which combination would give the biggest voltage?

	Area of coil	Number of turns
<b>A</b>	large	large
<b>B</b>	small	large
<b>C</b>	large	small
<b>D</b>	small	small

**10.3** The graph shows the oscilloscope display.



The a.c. voltage shown on this graph is . . . . .

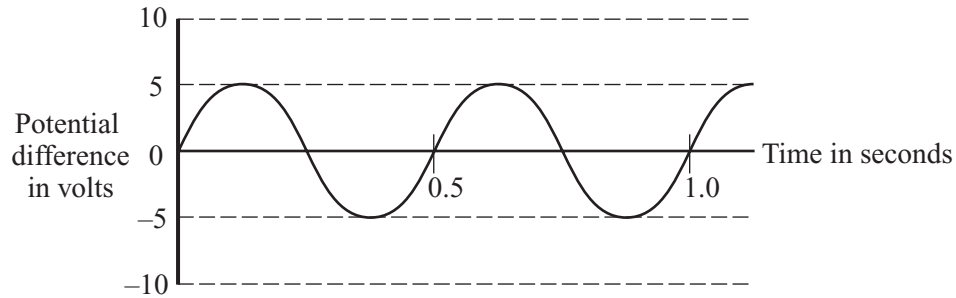
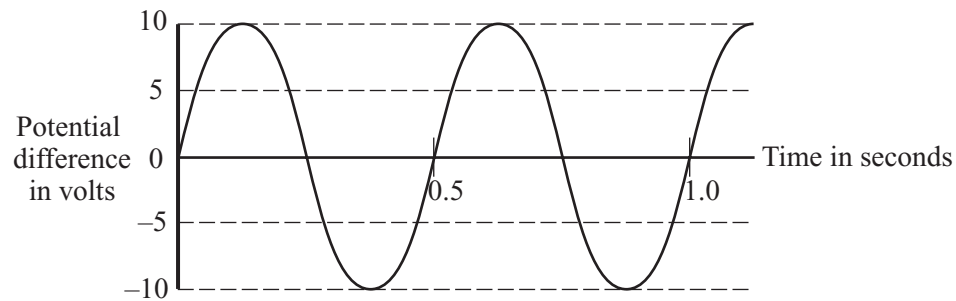
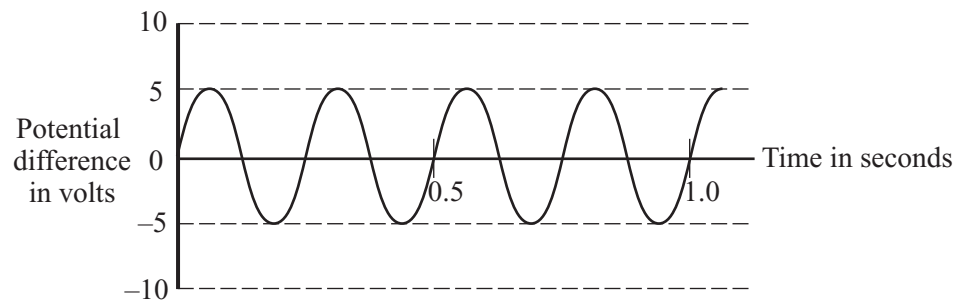
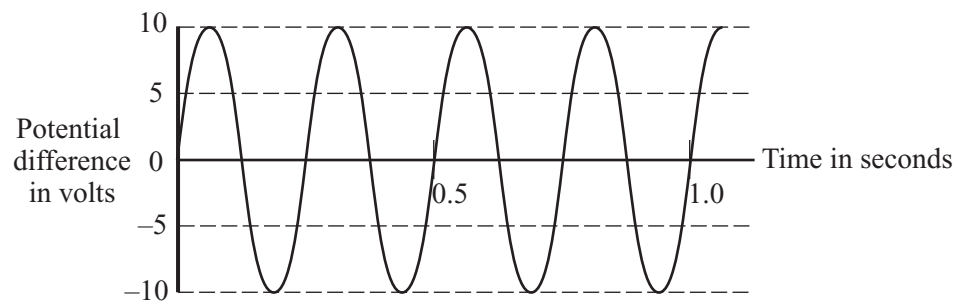
- A** 5 V and 0.5 Hz.
- B** 5 V and 2.0 Hz.
- C** 10 V and 0.5 Hz.
- D** 10 V and 2.0 Hz.

**QUESTION TEN CONTINUES ON THE NEXT PAGE**

**Turn over ►**

**10.4** The coil is now rotated at twice the original speed. The oscilloscope settings are not changed.

What will the oscilloscope display look like now?

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

**END OF TEST**



**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**

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**.

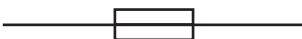

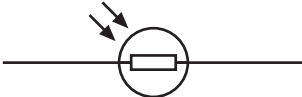

Mark your choices on the answer sheet.

#### QUESTION ONE

The table shows symbols for some electrical components. Each component has a different function.

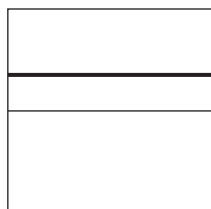
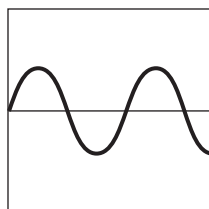
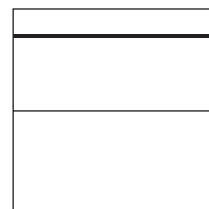
Match functions **P**, **Q**, **R** and **S** from the list with the numbers **1–4** in the table.

- P** allows current to flow in one direction only
- Q** changes resistance when the light intensity changes
- R** changes resistance when the temperature changes
- S** melts when the current is too large

Symbol	Function
	1
	2
	3
	4

**QUESTION TWO**

The diagrams show four different oscilloscope traces.  
They are all drawn to the same scale.

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

Match words from the list **J**, **K**, **L** and **M** with the oscilloscope traces **1–4**.

**J** earth voltage

**K** voltage across a 2 V cell

**L** voltage across a 4 V battery

**M** voltage between live and neutral terminals of an a.c. supply

**TURN OVER FOR THE NEXT QUESTION**

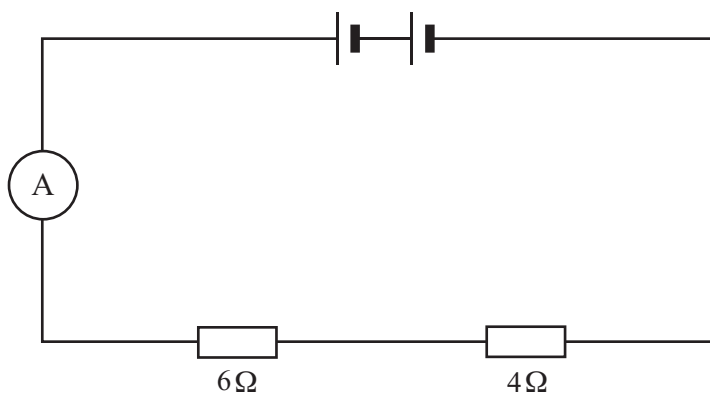
Turn over ►

**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.

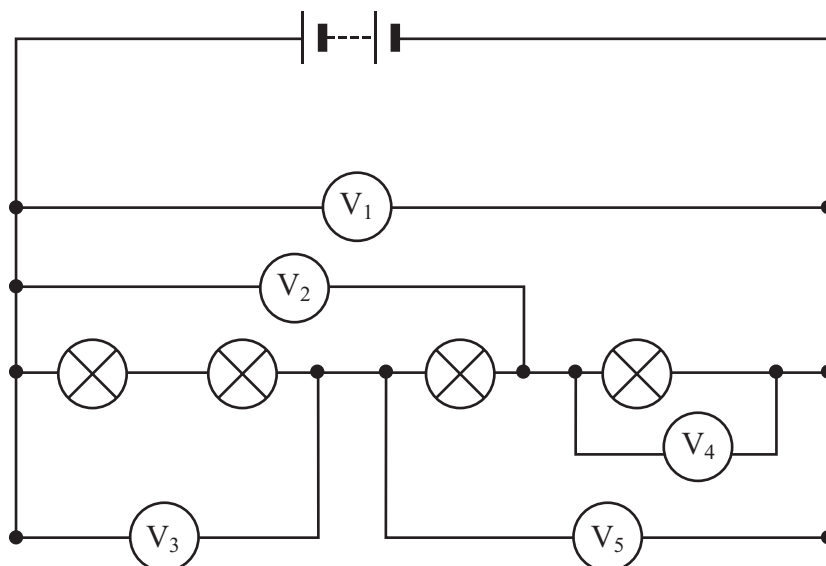
**QUESTION THREE**

A student builds this circuit using two 2 V cells.

Which **two** statements are correct?**the potential difference (voltage) across the 4 Ω resistor is 0.8 V****the potential difference (voltage) across the 6 Ω resistor is 2.4 V****the potential difference (voltage) across the battery is 2 V****the total current in the circuit is 0.2 A****the total resistance is 10 Ω**

**QUESTION FOUR**

The diagram shows a circuit containing four identical lamps.  
The potential difference (voltage) across the battery is 8 V.



Which **two** of the voltmeter readings are correct?

**$V_1$  has a reading of 1 V**

**$V_2$  has a reading of 6 V**

**$V_3$  has a reading of 4 V**

**$V_4$  has a reading of 6 V**

**$V_5$  has a reading of 3 V**

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

**SECTION C**Questions **FIVE** to **TEN**.

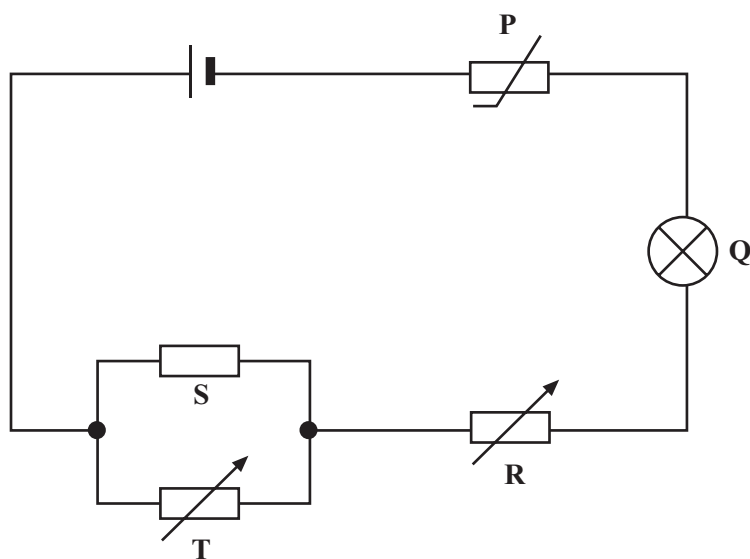
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

**QUESTION FIVE**

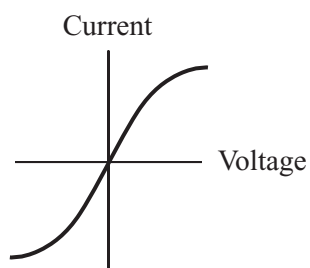
The diagram shows a circuit with several different components.

**5.1** The potential difference (voltage) across each component was measured.

Which components have the same potential difference across them?

- A** P, Q and R only
- B** P, Q, R, S and T
- C** R and T only
- D** S and T only

5.2 The graph shows how current changes with voltage across one of the components.



Which component would give this graph?

- A P
- B Q
- C R
- D S

5.3 Through which two components does the same size current flow?

- A P and Q
- B P and S
- C P and T
- D R and T

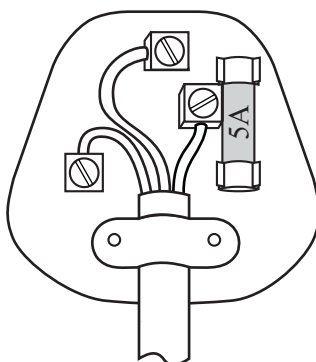
5.4 Which component has a resistance which increases when temperature increases?

- A P
- B Q
- C R
- D S

Turn over ►

**QUESTION SIX**

An iron is connected to the 230 volt mains supply by a 3-pin fused plug. The maximum current flowing through the iron is 4 A. The diagram shows how the plug is wired.



**6.1** An earth wire has been connected to make the iron safe.

This is because the iron . . . . .

- A** has a metal base.
- B** has water inside it.
- C** is sometimes used on damp clothes.
- D** might overheat.

**6.2** The value of the fuse fitted is 5 A.

This value . . . . .

- A** is correct.
- B** is too high.
- C** is too low.
- D** should always be 13 A in a 3-pin plug.



**6.3** Which of these statements about the fuse is **not** true?

- A It breaks the circuit when there is a fault
- B It is a safety device
- C It melts if the current becomes too high
- D It should be connected to the earth wire

**6.4** What is the maximum power of the iron?

- A 920 W
- B 960 W
- C 1150 W
- D 1200 W

**TURN OVER FOR THE NEXT QUESTION**

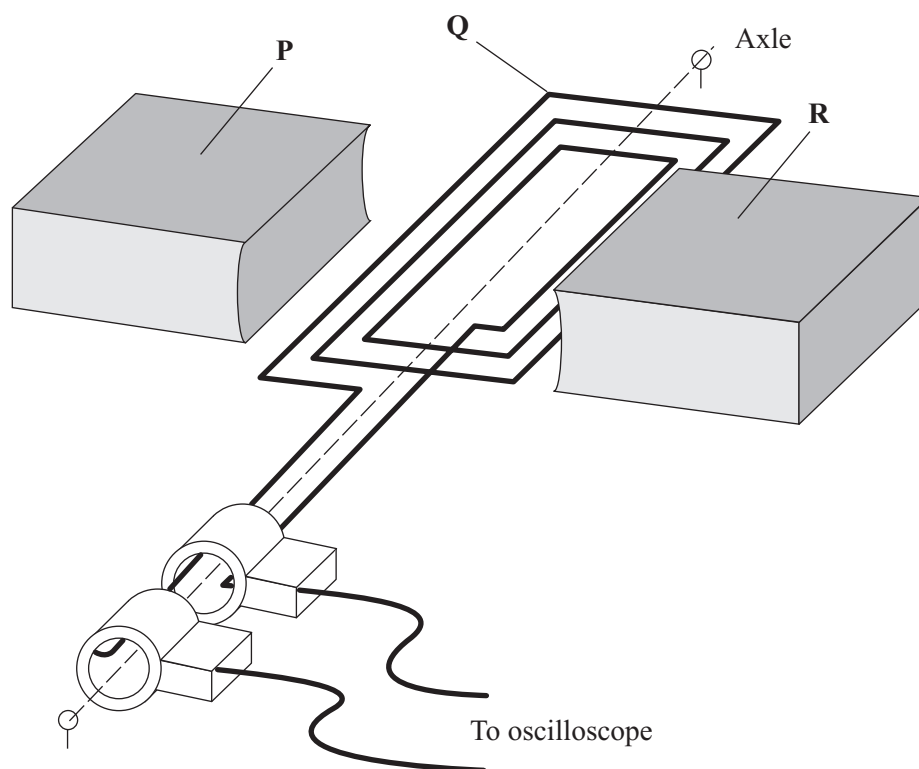
**Turn over ►**

### QUESTION SEVEN

A generator is used to produce electricity.

The diagram shows a simple generator.

An oscilloscope is used to investigate the potential difference (voltage) produced.



7.1 Which row of the table gives the correct labels on the diagram?

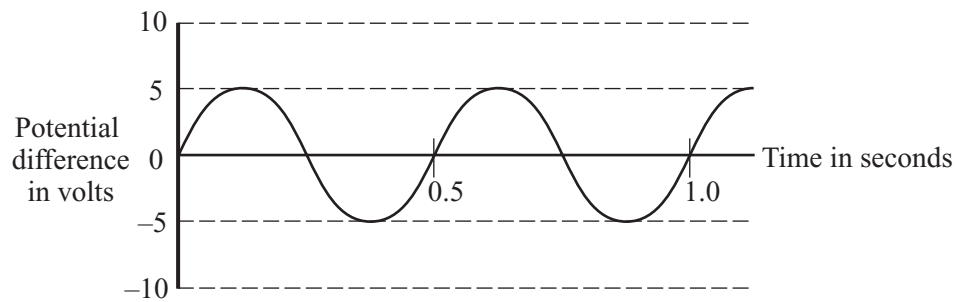
	<b>P</b>	<b>Q</b>	<b>R</b>
<b>A</b>	coil	N-pole	N-pole
<b>B</b>	N-pole	coil	S-pole
<b>C</b>	N-pole	coil	N-pole
<b>D</b>	S-pole	coil	S-pole

7.2 The induced voltage depends on the area of the coil and the number of turns on it.

Which combination would give the biggest voltage?

	Area of coil	Number of turns
<b>A</b>	large	large
<b>B</b>	small	large
<b>C</b>	large	small
<b>D</b>	small	small

7.3 The graph shows the oscilloscope display.



The a.c. voltage shown on this graph is . . . . .

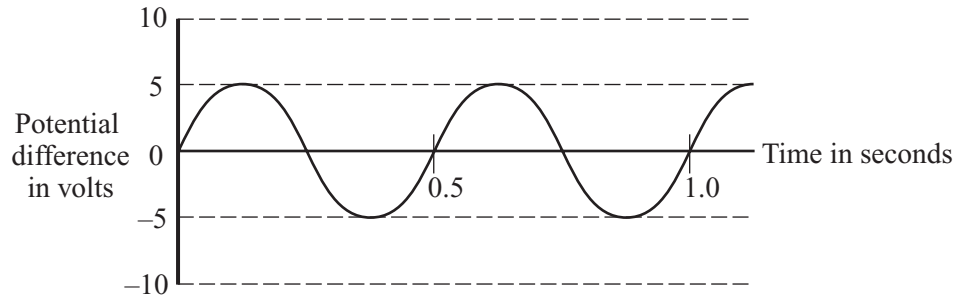
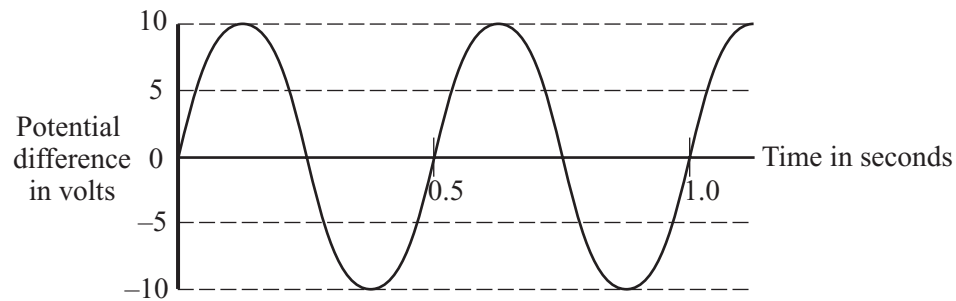
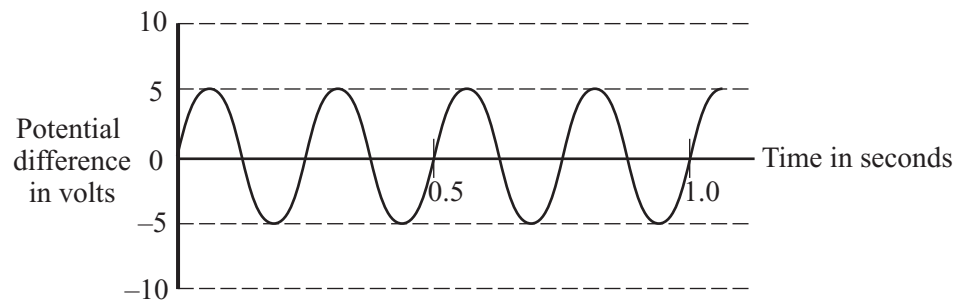
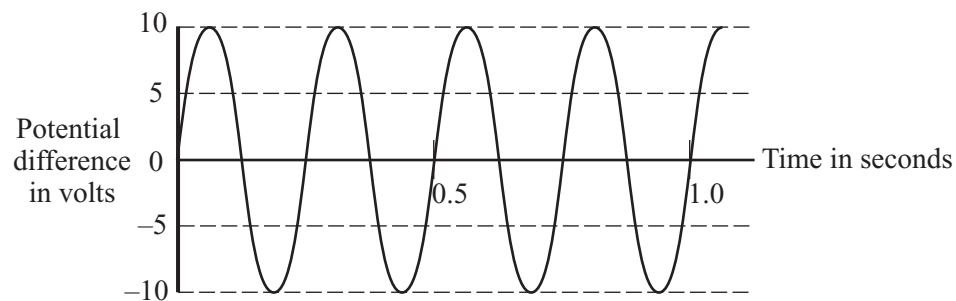
- A 5 V and 0.5 Hz.
- B 5 V and 2.0 Hz.
- C 10 V and 0.5 Hz.
- D 10 V and 2.0 Hz.

**QUESTION SEVEN CONTINUES ON THE NEXT PAGE**

**Turn over ►**

7.4 The coil is now rotated at twice the original speed. The oscilloscope settings are not changed.

What will the oscilloscope display look like now?

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

**NO QUESTIONS APPEAR ON THIS PAGE**

**TURN OVER FOR THE NEXT QUESTION**

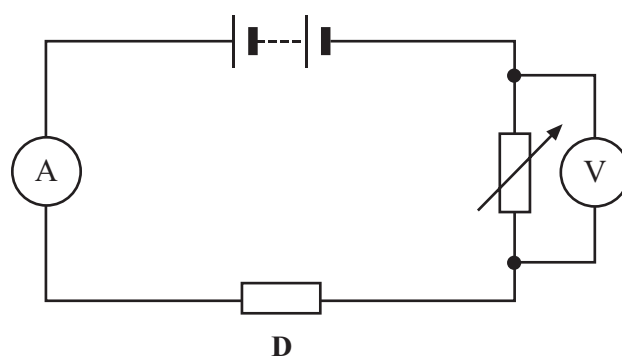
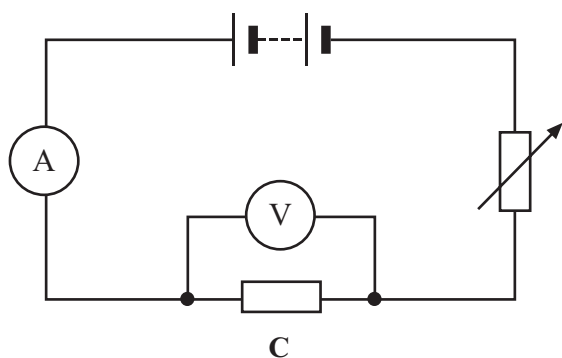
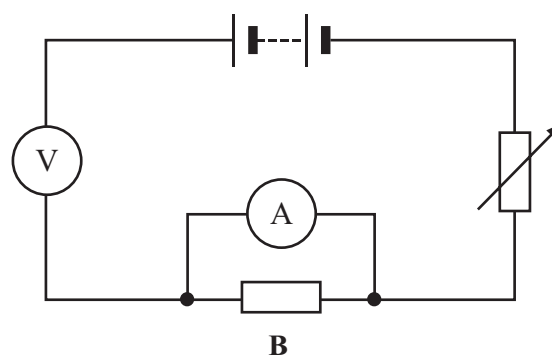
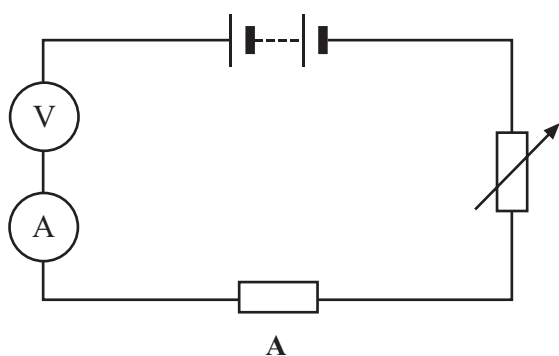
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**QUESTION EIGHT**

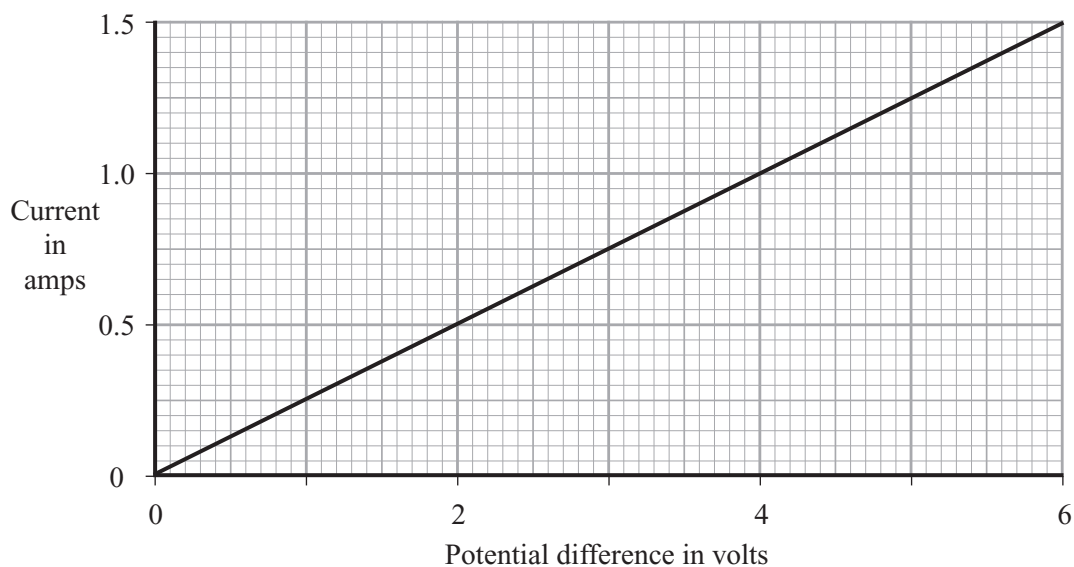
A student is asked to set up a circuit to find the resistance of a fixed resistor.

The student is given a battery, an ammeter, a voltmeter, a variable resistor and the fixed resistor.

**8.1** Which circuit **A**, **B**, **C** or **D** is connected correctly?



8.2 The student plotted the graph shown below.



Which conclusion is correct?

- A The current is proportional to the potential difference
- B The current is inversely proportional to the potential difference
- C The resistance is proportional to the current
- D The resistance is inversely proportional to the current

8.3 What is the resistance of the fixed resistor in ohms?

- A 0.25
- B 2.50
- C 4.00
- D 9.00

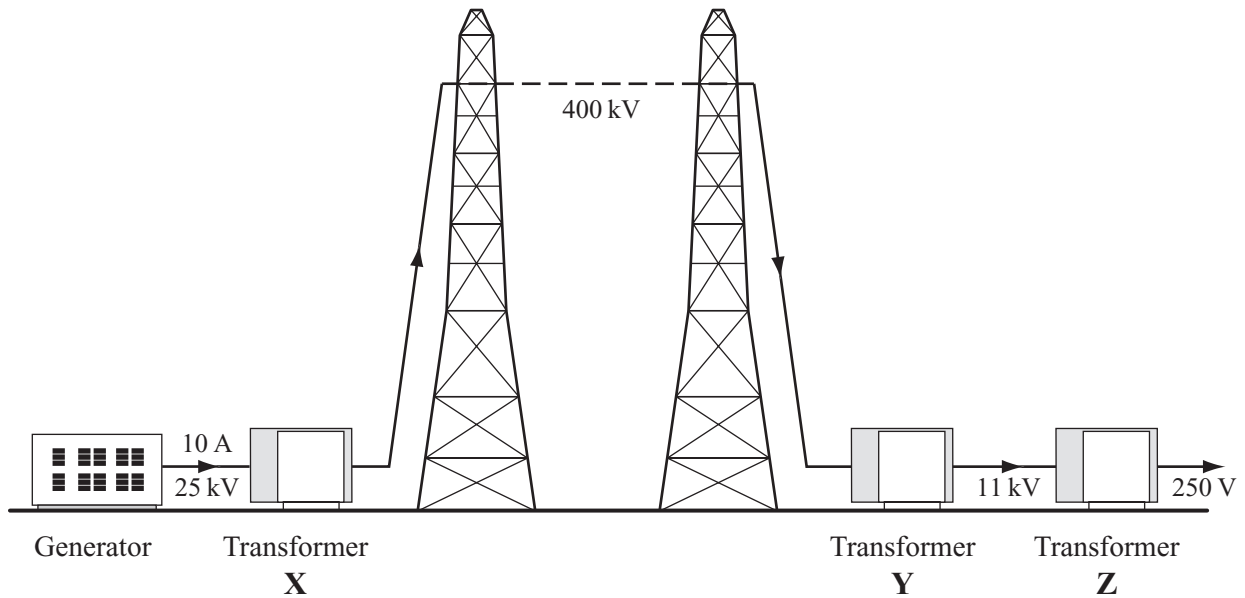
8.4 In this experiment, the current is kept as low as possible because . . . . .

- A large currents would cause the resistor to warm up which would alter its resistance.
- B only small currents can be measured accurately by ammeters.
- C only small currents can be provided by batteries.
- D only small potential differences can be measured accurately by voltmeters.

Turn over ►

**QUESTION NINE**

The diagram shows how electricity is distributed.



- 9.1** If transformer **X** has 1000 turns on its primary coil, how many turns does it have on its secondary coil?
- A** 62.5
  - B** 600
  - C** 16 000
  - D** 40 000
- 9.2** Electricity is distributed at high voltage because . . . . .
- A** energy losses in the cables are lower at high voltages.
  - B** high voltages are needed by some factories.
  - C** higher currents are transmitted by the cables.
  - D** the resistance of the cables is higher at high voltages.



**9.3** The current flowing from the generator is 10 A.

What is the current flowing from transformer **X**?  
(Assume that there is no power loss in transformer **X**.)

- A** 0.400 A
- B** 0.625 A
- C** 160 A
- D** 250 A

**9.4** If we assume that no power is lost throughout the system, the current leaving transformer **Z** would be 1000 A.

In fact, the current will be . . . . .

- A** less than 1000 A because energy is wasted heating up the power lines.
- B** equal to 1000 A because energy is conserved.
- C** more than 1000 A because the transformers step up the current.
- D** impossible to estimate from the information given.

**TURN OVER FOR THE NEXT QUESTION**

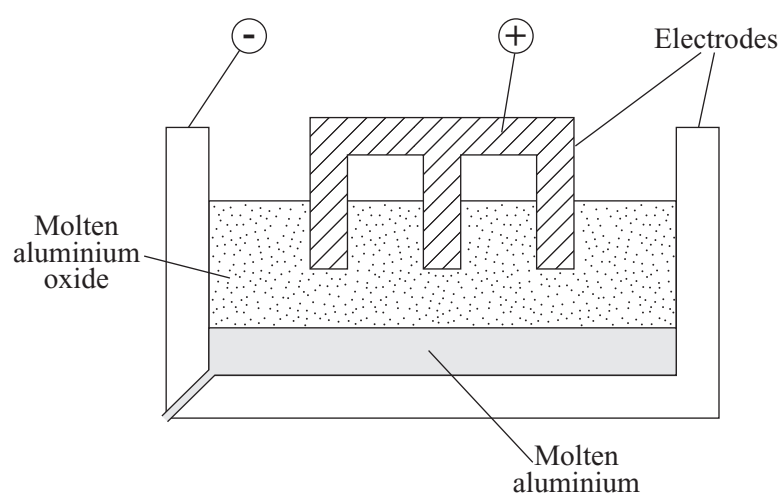
**Turn over ►**

**QUESTION TEN**

Aluminium is produced by passing a current through molten aluminium oxide.

Aluminium oxide consists of aluminium ions and oxide ions.

The diagram shows how a current can be passed through aluminium oxide.



**10.1** This process is called . . . . .

- A electrodes.
- B electrolysis.
- C electromagnetism.
- D electrostatics.

**10.2** A current of 1.5 A passes through the aluminium oxide for 5 minutes.

The amount of charge which flows is . . . . .

- A 0.3 C
- B 7.5 C
- C 200 C
- D 450 C

**10.3** Aluminium is produced at the negative electrode.  
Oxygen is given off at the positive electrode.

What does this tell you about the aluminium ions and the oxide ions?

- A Aluminium ions are negatively charged and oxide ions are positively charged
- B Aluminium ions are positively charged and oxide ions are negatively charged
- C Aluminium ions and oxide ions are both negatively charged
- D Aluminium ions and oxide ions are both positively charged

**10.4** The current through the wires that connect the electrodes to the electricity supply is due to . . . . .

- A electrons moving through the wire.
- B negatively charged ions moving through the wire.
- C positively charged ions moving through the wire.
- D both negatively and positively charged ions moving through the wire.

**END OF TEST**

**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**