

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education  
March 2006

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

**346010**



Wednesday 8 March 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

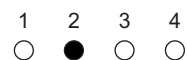
**Instructions**

- 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**

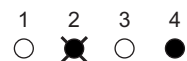
- Use a **black ball-point pen**.

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

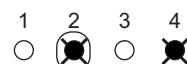


- Do **not** extend beyond the circles.

- 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 14 of this booklet.

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## 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.

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#### QUESTION ONE

A family bought a second-hand DVD player. The current taken by the DVD player is 1 A.  
When they checked the plug, they found the faults labelled **1–4** on the diagram.

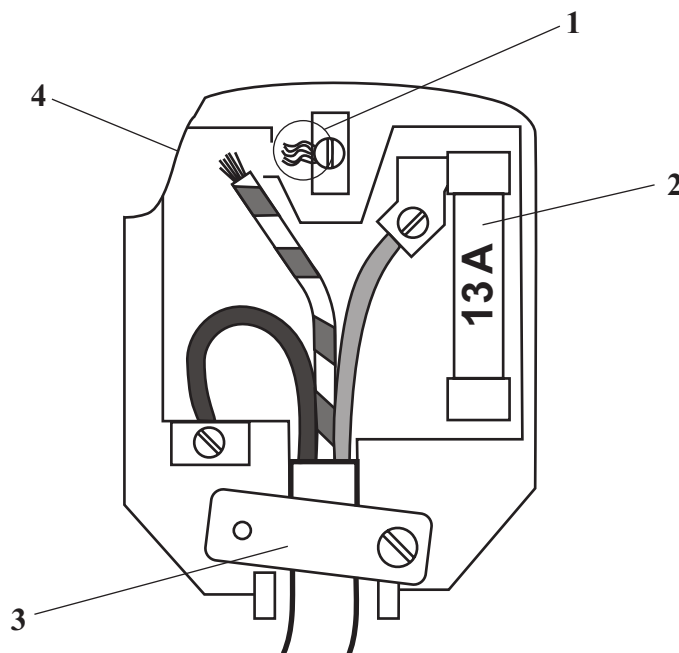
Match words from the list with the labels **1–4** on the diagram.

**cable grip is loose**

**case is broken**

**DVD player is not earthed**

**wrong fuse is used**



**QUESTION TWO**

Symbols are used for the components in circuit diagrams.

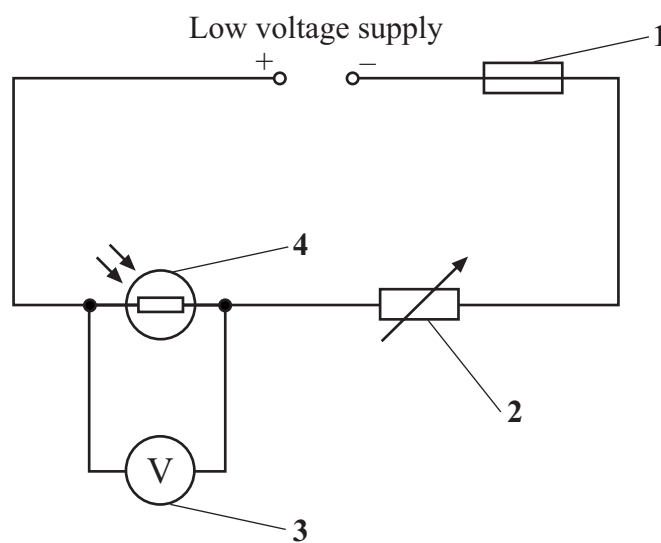
Match components from the list with the symbols **1–4** in the circuit diagram.

**fuse**

**LDR (light dependent resistor)**

**variable resistor**

**voltmeter**

**QUESTION THREE**

Components in circuits do different jobs.

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

**fuse**

**LDR (light dependent resistor)**

**variable resistor**

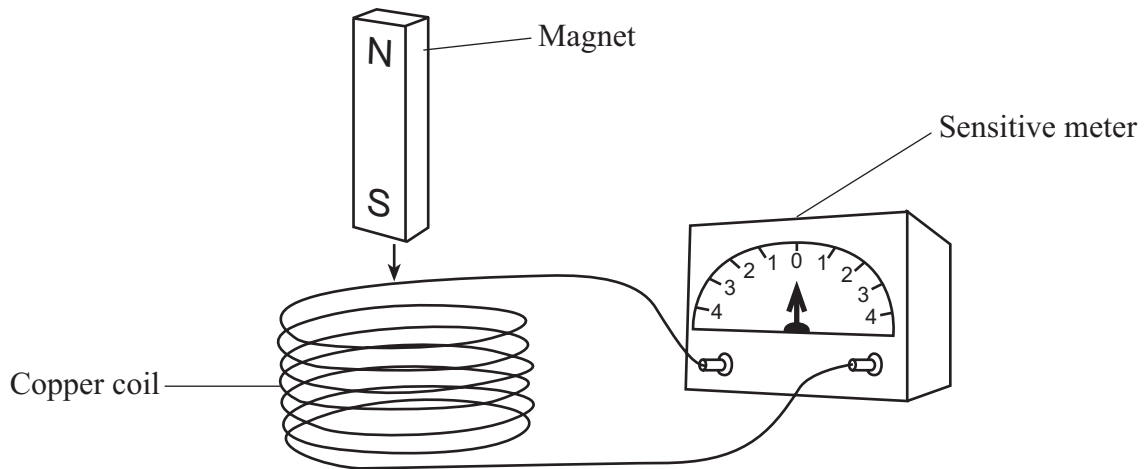
**voltmeter**

What it does	Component
its resistance can be adjusted	<b>1</b>
its resistance decreases when the light gets brighter	<b>2</b>
measures the potential difference across a component	<b>3</b>
prevents too high a current from flowing	<b>4</b>

**Turn over ►**

## QUESTION FOUR

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



When the magnet is moved downwards, the pointer on the meter moves from zero to the left.

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 upwards, out of the coil, the pointer on the meter . . . **1** . . . .

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

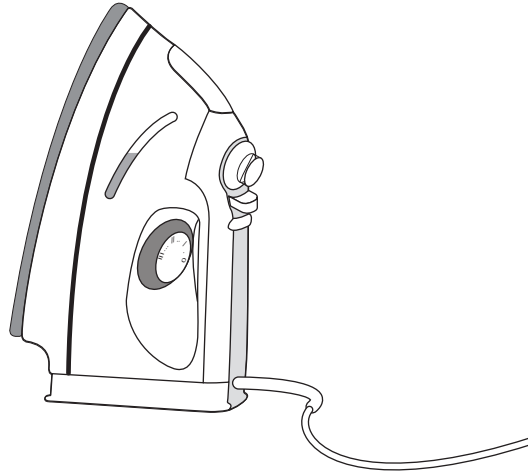
If the magnet is moved more quickly, the pointer on the meter . . . **3** . . . .

The poles of the magnet are reversed.

When the magnet is now moved upwards, out of the coil, the pointer on the meter . . . **4** . . . .

**QUESTION FIVE**

This question is about an electric iron.



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

**50 hertz**

**58 ohms**

**230 volts**

**920 watts**

The electric iron uses the mains supply of ... **1** ... .

The mains supply has a frequency of ... **2** ... .

The power rating of the iron is ... **3** ... .

The resistance of the iron is ... **4** ... .

**Turn over ►**

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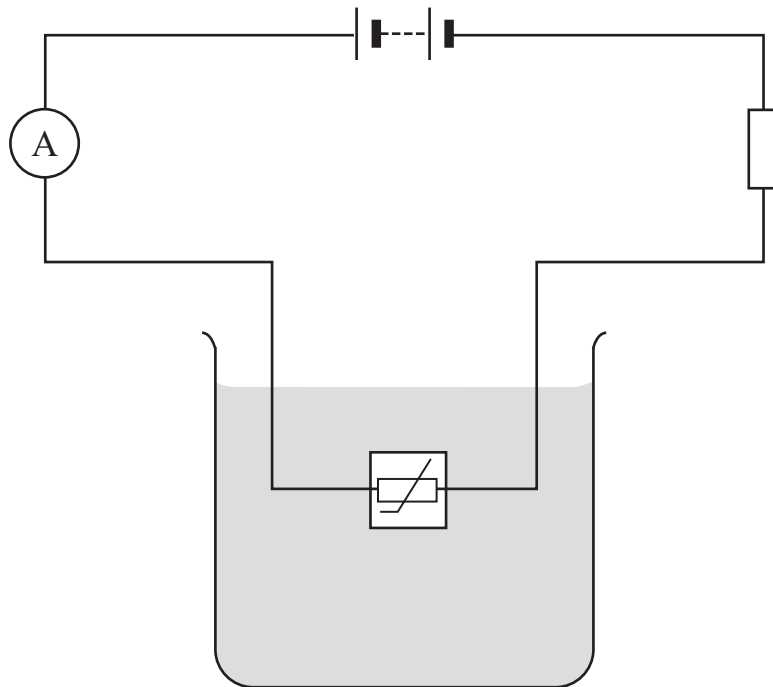
**SECTION B**Questions **SIX** and **SEVEN**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

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**QUESTION SIX**

The circuit shows a thermistor connected in series with an ammeter and a resistor.

The thermistor is in a beaker of cold water.



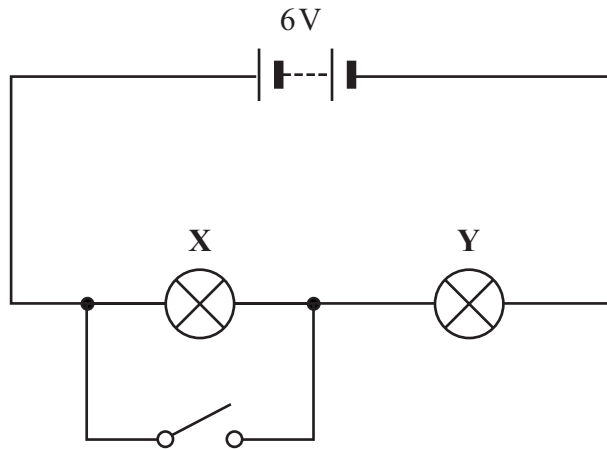
The water in the beaker is heated.

Which **two** changes now occur?

- the reading on the ammeter decreases**
- the reading on the ammeter increases**
- the resistance of the thermistor decreases**
- the resistance of the thermistor increases**
- the resistance of the thermistor is unchanged**

**QUESTION SEVEN**

The diagram shows two 6 volt lamps connected to a 6 volt battery.



The switch is now closed.

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

- P** both lamps glow less brightly
- Q** both lamps go out
- R** lamp Y glows more brightly and lamp X goes out
- S** the potential difference (p.d.) across each lamp is now 3 V
- T** the p.d. across lamp X is now 0 V and the p.d. across lamp Y is now 6 V

**Turn over for the next question**

**Turn over ►**

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

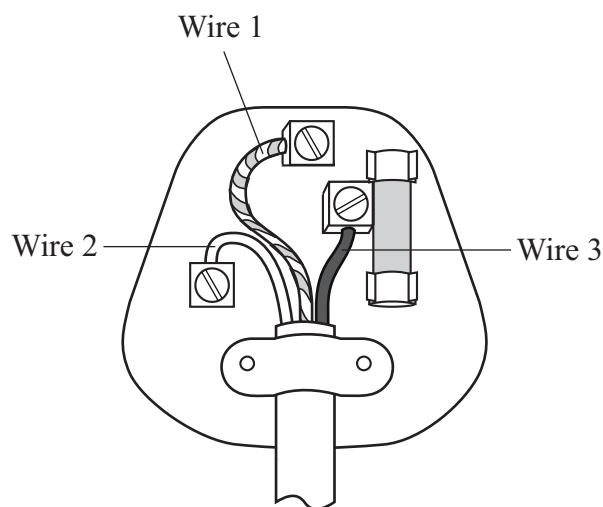
Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

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**QUESTION EIGHT**

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

**8.1** The colour of the insulation on the live wire is . . .

- A blue.
- B black.
- C brown.
- D green.

**8.2** Which row of the table, **A**, **B**, **C** or **D**, is correct?

	Wire 1	Wire 2	Wire 3
A	earth	live	neutral
B	earth	neutral	live
C	neutral	earth	live
D	neutral	live	earth



**8.3** The pins to which the wires are connected are made of . . .

- A** aluminium.
- B** brass.
- C** copper.
- D** iron.

**8.4** The current through a vacuum cleaner is 3 A.

What value of fuse would be best to use with this vacuum cleaner?

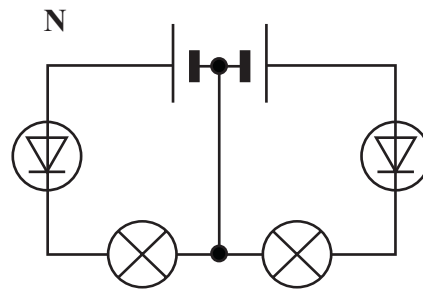
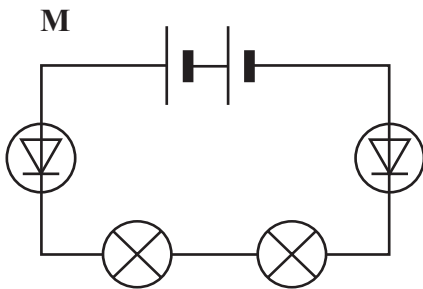
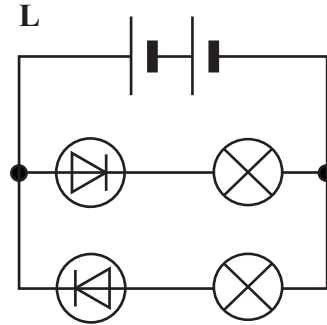
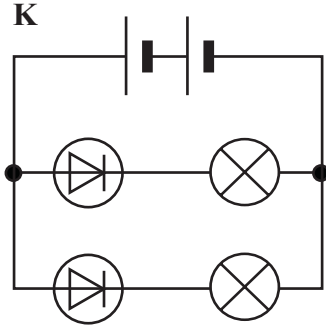
- A** 3 A
- B** 5 A
- C** 10 A
- D** 13 A

**Turn over for the next question**

**Turn over ►**

**QUESTION NINE**

All the cells, lamps and diodes in these circuits are identical. Decide which lamps light in the different arrangements before you answer the questions.



**9.1** Both lamps are off in . . .

- A** circuit **K** only.
- B** circuits **K**, **L** and **M**.
- C** circuits **M** and **N**.
- D** circuit **M** only.

**9.2** Only one lamp lights in . . .

- A** circuit **K** only.
- B** circuits **K** and **M**.
- C** circuits **L** and **N**.
- D** circuit **L** only.

**9.3** Both lamps light in . . .

- A** circuit **K** only.
- B** circuits **K** and **N**.
- C** circuits **L** and **M**.
- D** circuit **M** only.

**9.4** In which circuit do the cells run down most quickly?

- A** Circuit **K**
- B** Circuit **L**
- C** Circuit **M**
- D** Circuit **N**

**Turn over for the next question**

**Turn over ►**

**QUESTION TEN**

The diagram shows a helicopter that is being used to rescue someone. When the helicopter flies through the air, a charge of static electricity builds up on it. The build-up of static charge can give the person who is being rescued an electric shock.



**10.1** Why does a charge of static electricity build up on the helicopter?

- A The helicopter flies through a thunderstorm.
- B The helicopter is moving through the Earth's magnetic field.
- C There is a powerful battery on the helicopter.
- D There is friction between the air and the helicopter.

**10.2** The charge on the helicopter is negative.

The helicopter has . . .

- A gained electrons.
- B gained protons.
- C lost electrons.
- D lost protons.

**10.3** Before she rescues the person, the rescuer must discharge the helicopter.

How can she discharge the helicopter?

- A Connect the helicopter to Earth with a long strip of plastic
- B Connect the helicopter to Earth with a metal wire
- C Connect the helicopter to the negative side of a high voltage supply
- D Connect the helicopter to the positive side of a high voltage supply

**10.4** The helicopter is negatively charged.

What happens as the helicopter is being discharged?

- A Negative charges move off the helicopter.
- B Negative charges move on to the helicopter.
- C Positive charges move off the helicopter.
- D Positive charges move on to the helicopter.

**END OF TEST**

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

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## HIGHER TIER

### SECTION A

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

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

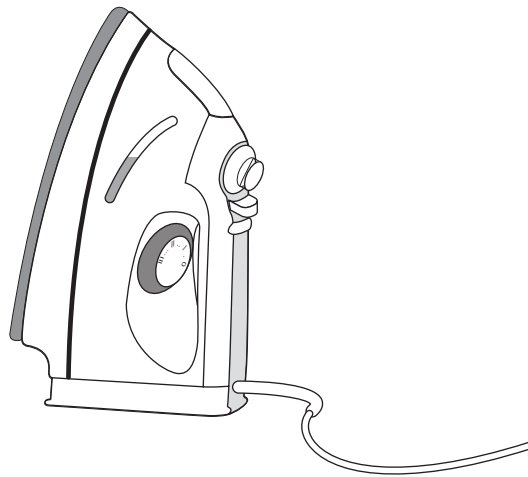
Use **each** answer only **once**.

Mark your choices on the answer sheet.

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### QUESTION ONE

This question is about an electric iron.



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

**50 hertz**

**58 ohms**

**230 volts**

**920 watts**

The electric iron uses the mains supply of . . . **1** . . . .

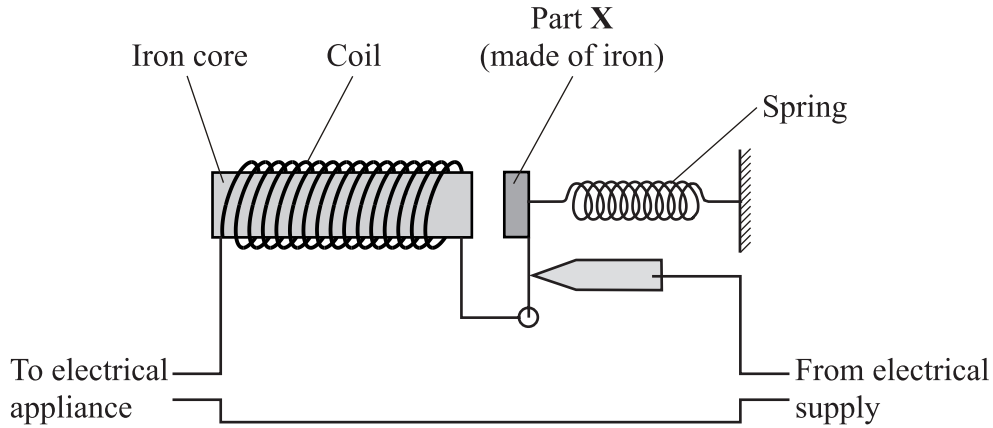
The mains supply has a frequency of . . . **2** . . . .

The power rating of the iron is . . . **3** . . . .

The resistance of the iron is . . . **4** . . . .

## QUESTION TWO

The diagram shows a circuit breaker connected between an electrical supply and an electrical appliance.



The electrical appliance is switched on. The electrical appliance works normally.

The flow chart describes what happens in the circuit breaker.

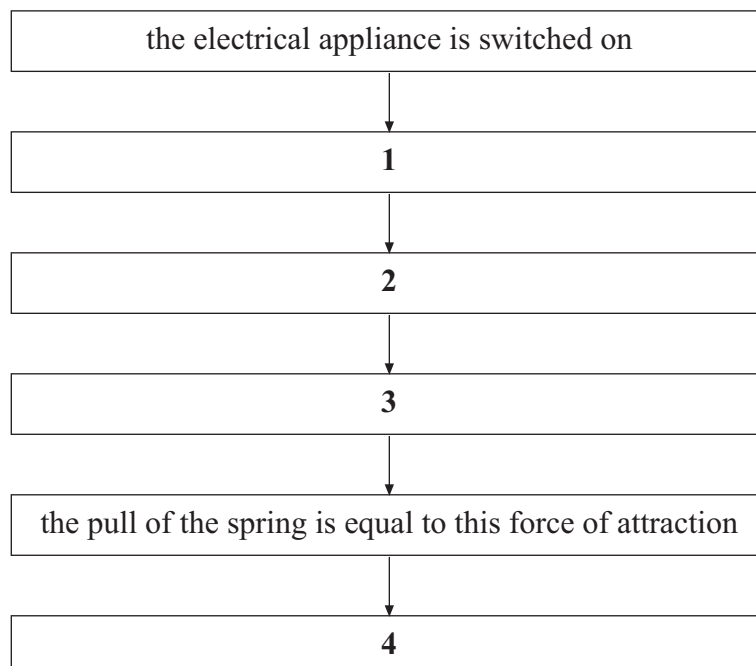
Match sentences from the list with the boxes **1–4** in the flow chart.

**current flows through the coil**

**part X does not move**

**part X is attracted to the iron core**

**the iron core becomes an electromagnet**



**Turn over ►**

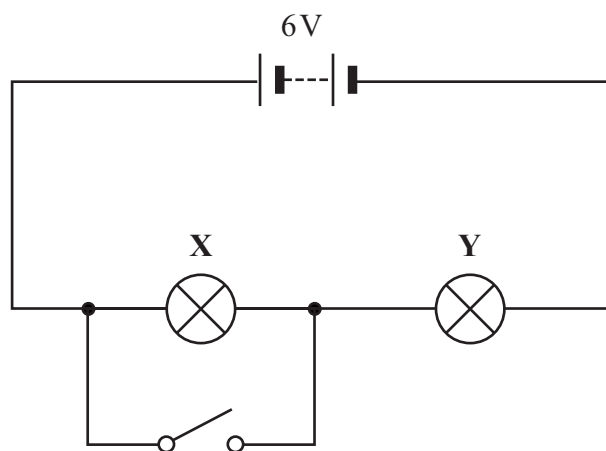
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**SECTION B**Questions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

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**QUESTION THREE**

The diagram shows two 6 volt lamps connected to a 6 volt battery.



The switch is now closed.

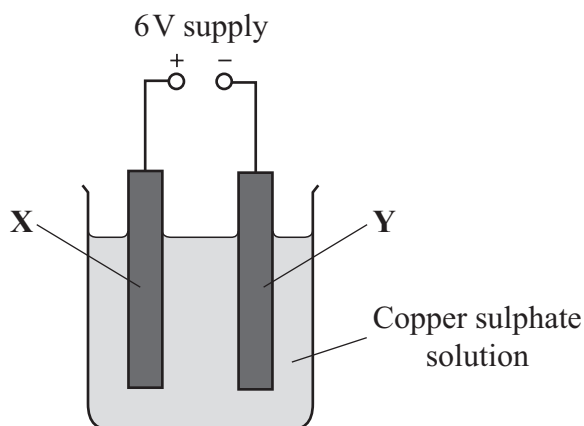
Which **two** statements **P**, **Q**, **R**, **S** and **T** are correct?

- P** both lamps glow less brightly
- Q** both lamps go out
- R** lamp Y glows more brightly and lamp X goes out
- S** the potential difference (p.d.) across each lamp is now 3 V
- T** the p.d. across lamp X is now 0 V and the p.d. across lamp Y is now 6 V



**QUESTION FOUR**

The diagram shows the electrolysis of copper sulphate solution using copper electrodes and copper wires.



Which **two** statements **J**, **K**, **L**, **M** and **N** are correct?

- J** both copper ions and electrons flow through the wires
- K** only copper ions flow through the wires from X to Y
- L** only copper ions flow through the wires from Y to X
- M** only electrons flow through the wires
- N** only ions flow through the solution

**Turn over for the next question**

**Turn over ►**

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**SECTION C**

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

Each of these questions has four parts.

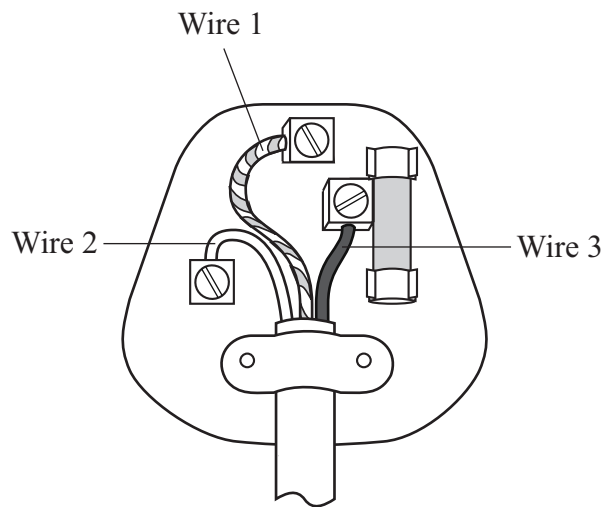
In each part choose only **one** answer.

Mark your choices on the answer sheet.

---

**QUESTION FIVE**

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



**5.1** The colour of the insulation on the live wire is . . .

- A** blue.
- B** black.
- C** brown.
- D** green.

**5.2** Which row of the table, **A**, **B**, **C** or **D**, is correct?

	<b>Wire 1</b>	<b>Wire 2</b>	<b>Wire 3</b>
<b>A</b>	earth	live	neutral
<b>B</b>	earth	neutral	live
<b>C</b>	neutral	earth	live
<b>D</b>	neutral	live	earth

**5.3** The pins to which the wires are connected are made of . . .

- A** aluminium.
- B** brass.
- C** copper.
- D** iron.

**5.4** The current through a vacuum cleaner is 3 A.

What value of fuse would be best to use with this vacuum cleaner?

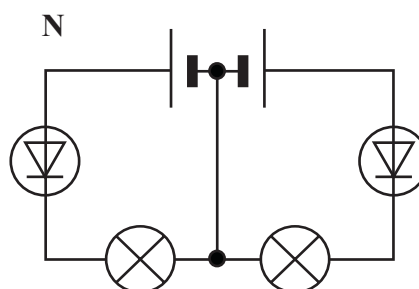
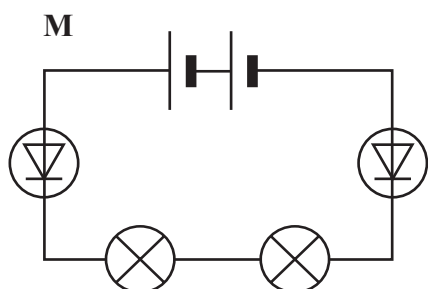
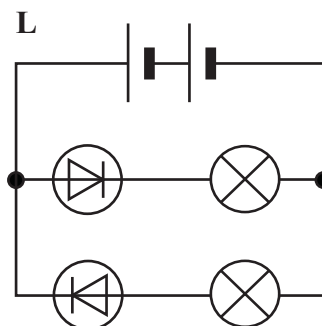
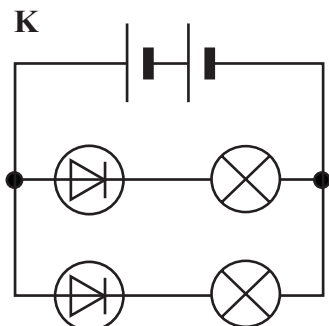
- A** 3 A
- B** 5 A
- C** 10 A
- D** 13 A

**Turn over for the next question**

**Turn over ►**

**QUESTION SIX**

All the cells, lamps and diodes in these circuits are identical. Decide which lamps light in the different arrangements before you answer the questions.



**6.1** Both lamps are off in . . .

- A** circuit **K** only.
- B** circuits **K**, **L** and **M**.
- C** circuits **M** and **N**.
- D** circuit **M** only.

**6.2** Only one lamp lights in . . .

- A** circuit **K** only.
- B** circuits **K** and **M**.
- C** circuits **L** and **N**.
- D** circuit **L** only.

**6.3** Both lamps light in . . .

- A circuit **K** only.
- B circuits **K** and **N**.
- C circuits **L** and **M**.
- D circuit **M** only.

**6.4** In which circuit do the cells run down most quickly?

- A Circuit **K**
- B Circuit **L**
- C Circuit **M**
- D Circuit **N**

**Turn over for the next question**

**Turn over ►**

**QUESTION SEVEN**

The diagram shows a helicopter that is being used to rescue someone. When the helicopter flies through the air, a charge of static electricity builds up on it. The build-up of static charge can give the person who is being rescued an electric shock.



**7.1** Why does a charge of static electricity build up on the helicopter?

- A** The helicopter flies through a thunderstorm.
- B** The helicopter is moving through the Earth's magnetic field.
- C** There is a powerful battery on the helicopter.
- D** There is friction between the air and the helicopter.

**7.2** The charge on the helicopter is negative.

The helicopter has . . .

- A** gained electrons.
- B** gained protons.
- C** lost electrons.
- D** lost protons.

**7.3** Before she rescues the person, the rescuer must discharge the helicopter.

How can she discharge the helicopter?

- A** Connect the helicopter to Earth with a long strip of plastic
- B** Connect the helicopter to Earth with a metal wire
- C** Connect the helicopter to the negative side of a high voltage supply
- D** Connect the helicopter to the positive side of a high voltage supply

**7.4** The helicopter is negatively charged.

What happens as the helicopter is being discharged?

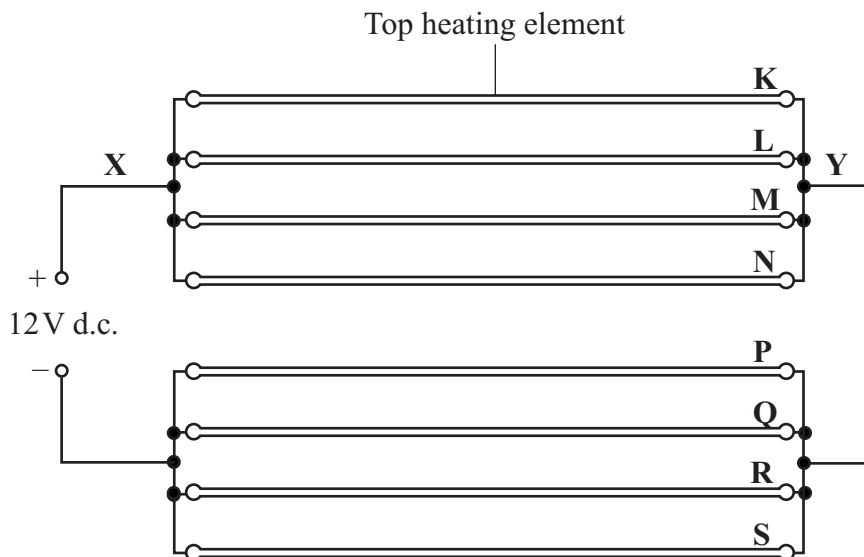
- A** Negative charges move off the helicopter.
- B** Negative charges move on to the helicopter.
- C** Positive charges move off the helicopter.
- D** Positive charges move on to the helicopter.

**Turn over for the next question**

**Turn over ►**

## QUESTION EIGHT

The diagram shows the way in which the eight elements of a car rear-window heater are connected. All the elements are exactly the same.



8.1 How are the elements connected?

- A K, L, M and N are in series, and P, Q, R and S are in series.
- B K, L, M and N are in series with each other but in parallel with P, Q, R and S.
- C K, L, M and N are in parallel with each other but in series with P, Q, R and S, which are in parallel with each other.
- D All eight elements are in parallel with each other.

8.2 Each heating element has a resistance of  $8.0 \Omega$ .  
The potential difference between X and Y is 6.0 V.

The current in K is . . .

- A 0.19 A
- B 0.75 A
- C 1.33 A
- D 5.33 A



**8.3** The top heating element, **K**, becomes damaged and stops conducting.

Which statement is true?

- A** Each of the elements **L**, **M** and **N** carries the same current as before.
- B** Each of the elements **L**, **M** and **N** carries less current than each of **P**, **Q**, **R** and **S**.
- C** Each of the elements **L**, **M** and **N** carries the same current as each of **P**, **Q**, **R** and **S**.
- D** Each of the elements **L**, **M** and **N** carries more current than each of **P**, **Q**, **R** and **S**.

**8.4** The total current drawn from the supply when the heater is working normally is 3.0 A.  
It takes four minutes to demist the window.

How much charge flows through the heater in this time?

- A** 80 coulombs
- B** 720 coulombs
- C** 2 400 coulombs
- D** 43 200 coulombs

**Turn over for the next question**

**Turn over ►**

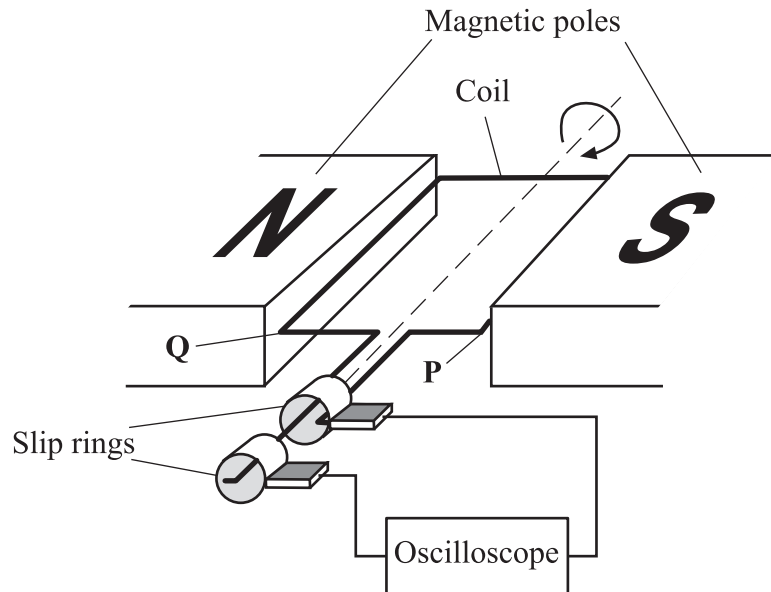
**QUESTION NINE**

The diagram shows a rectangular coil of wire between the poles of a magnet.

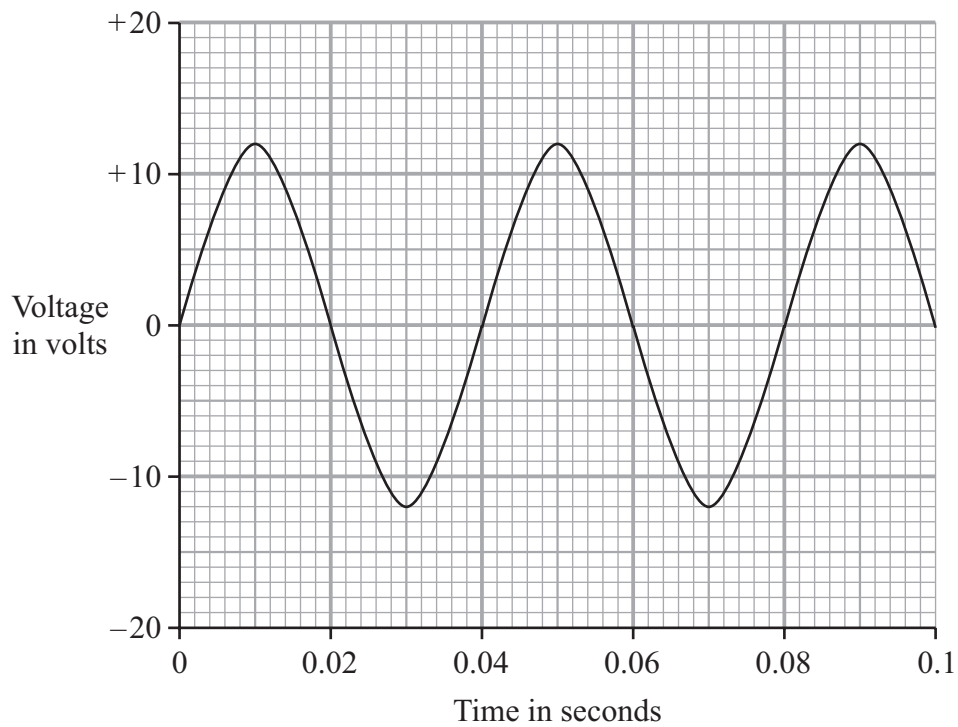
The two ends of the coil are connected to slip rings.

The slip rings make contact with brushes which are connected to an oscilloscope.

The coil is rotated at a steady speed.



**Voltage trace on the oscilloscope**



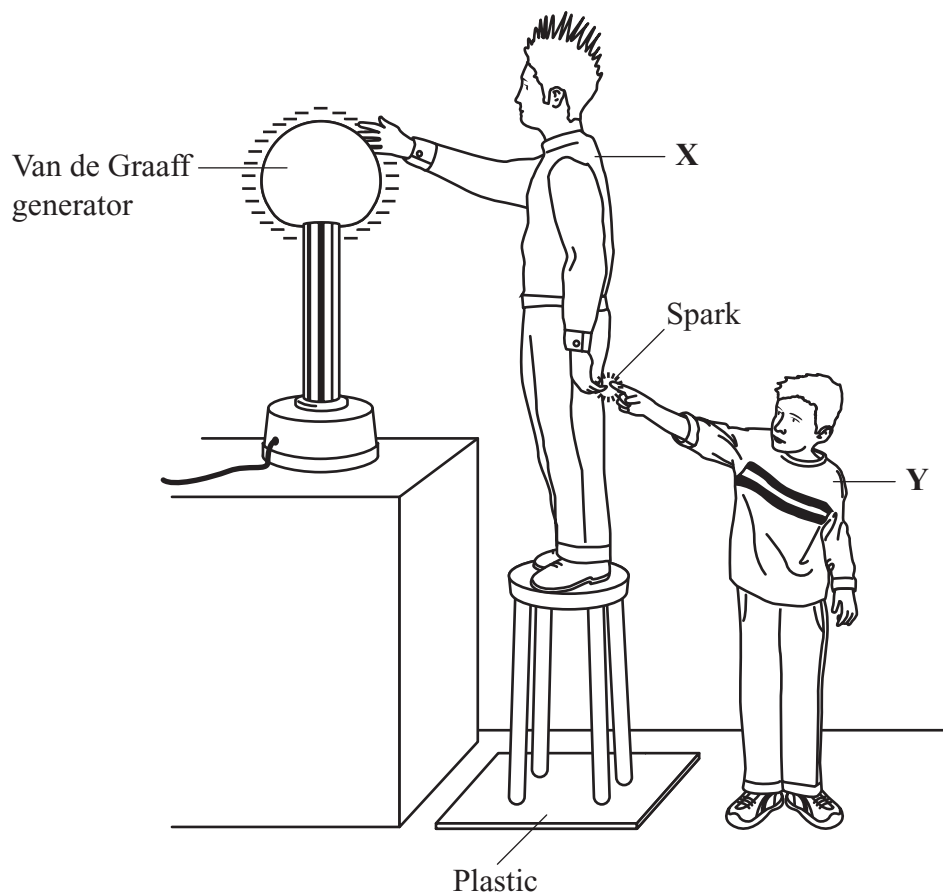
- 
- 9.1** When does the voltage trace on the oscilloscope cross the 0 volt line?
- A** When the coil is horizontal and only when **P** is to the left of **Q**
  - B** When the coil is horizontal and **P** is either to the left or to the right of **Q**
  - C** When the coil is vertical and only when **P** is above **Q**
  - D** When the coil is vertical and **P** is either above or below **Q**
- 9.2** What makes the height of the voltage trace **smaller**?
- A** Decreasing the time for one complete turn of the coil
  - B** Increasing the number of turns of wire on the coil
  - C** Rotating the coil more slowly
  - D** Using stronger magnets
- 9.3** What is the peak voltage shown by the trace on the oscilloscope?
- A** 0 V
  - B** 6 V
  - C** 12 V
  - D** 24 V
- 9.4** What is the frequency of rotation of the coil?
- A** 8 Hz
  - B** 25 Hz
  - C** 40 Hz
  - D** 50 Hz

Turn over ►

**QUESTION TEN**

The diagram shows a Van de Graaff generator. This produces negative charge which collects on the metal sphere.

The generator is being used to demonstrate what happens when a person is charged with static electricity.



**10.1** Person **X** is standing on a stool placed on a thick sheet of plastic.

Why is the stool on a sheet of plastic?

- A** So that electrons can flow from the floor to the stool
- B** So that electrons can flow from the stool to the floor
- C** So that negative charge can build up on **X**
- D** So that positive charge can build up on **X**

**10.2** Person **Y** is standing on the floor. When he brings a finger near to **X**, it makes a spark.

What causes this?

- A** Damp air conducts electricity.
- B** Electrons from earth flow through **Y** and jump to **X**.
- C** Electrons jump from **X** to **Y**.
- D** Positive ions in the air are attracted to **X**.

The spark lasts for 0.02 seconds and a charge of 0.001 coulombs is passed. The voltage on the sphere is 200 000 volts.

**10.3** What current flows through person **Y**?

- A** 0.000 002 A
- B** 0.05 A
- C** 20 A
- D** 200 A

**10.4** How much energy is transferred by the spark?

- A** 0.40 J
- B** 200 J
- C** 1000 J
- D** 4000 J

**END OF TEST**

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