

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
Winter 2005



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

Thursday 24 November 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:

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

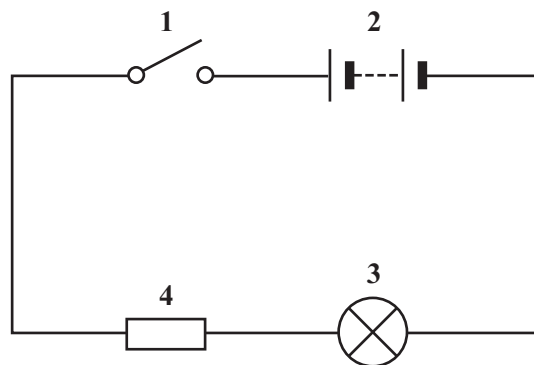
Match words from the list with the labels **1–4** on the circuit diagram.

battery

lamp

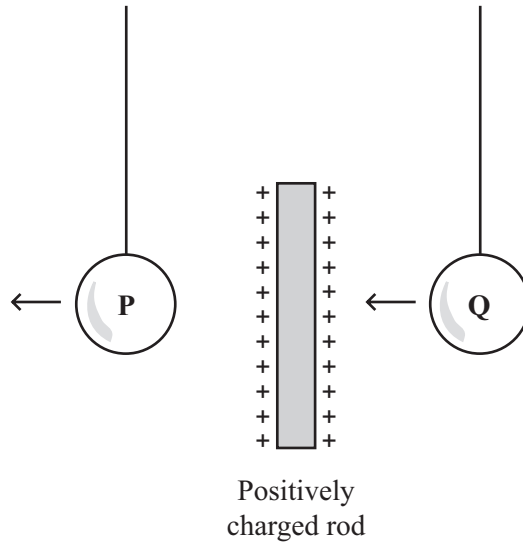
resistor

switch



QUESTION TWO

A positively charged rod is held between two charged balls **P** and **Q**.
This makes **P** and **Q** move as shown.



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

attracted

negatively charged

positively charged

repelled

Ball **P** is **1** by the rod because it is **2**

Ball **Q** is **3** by the rod because it is **4**

Turn over ►

QUESTION THREE

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

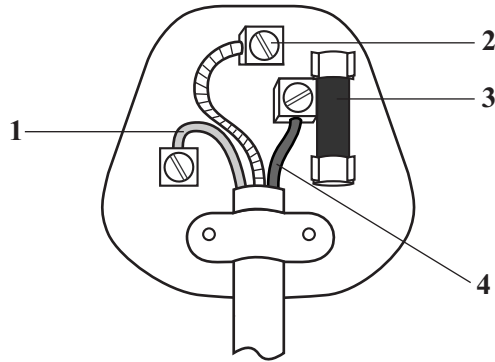
Match words from the list with the labels 1–4 on the diagram.

brass

fuse

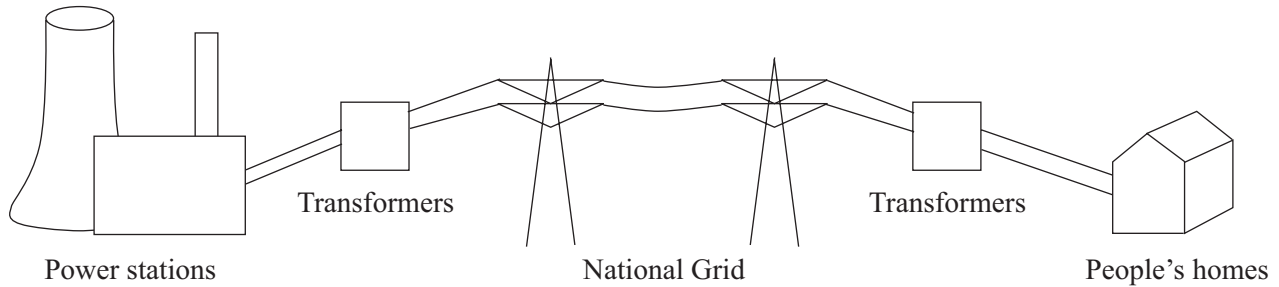
live

neutral



QUESTION FOUR

Transformers are used to change the voltage of an a.c. supply.



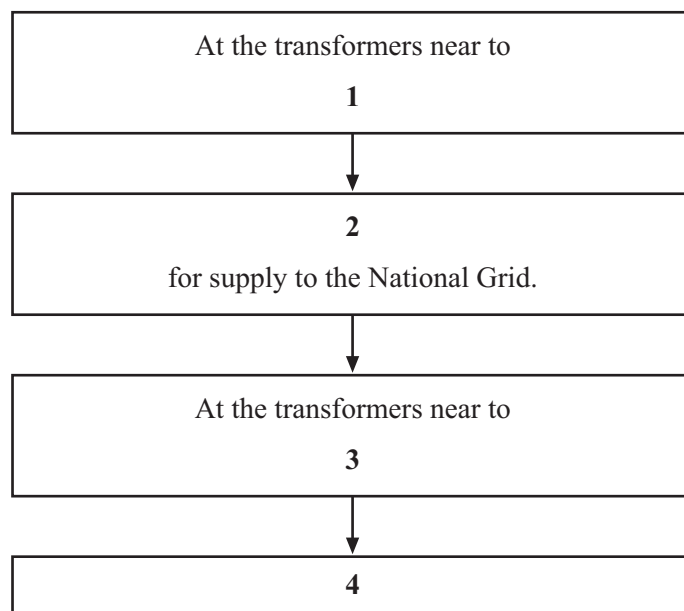
Match words from the list with the numbers **1–4** in the boxes.

people's homes

power stations

the voltage is decreased

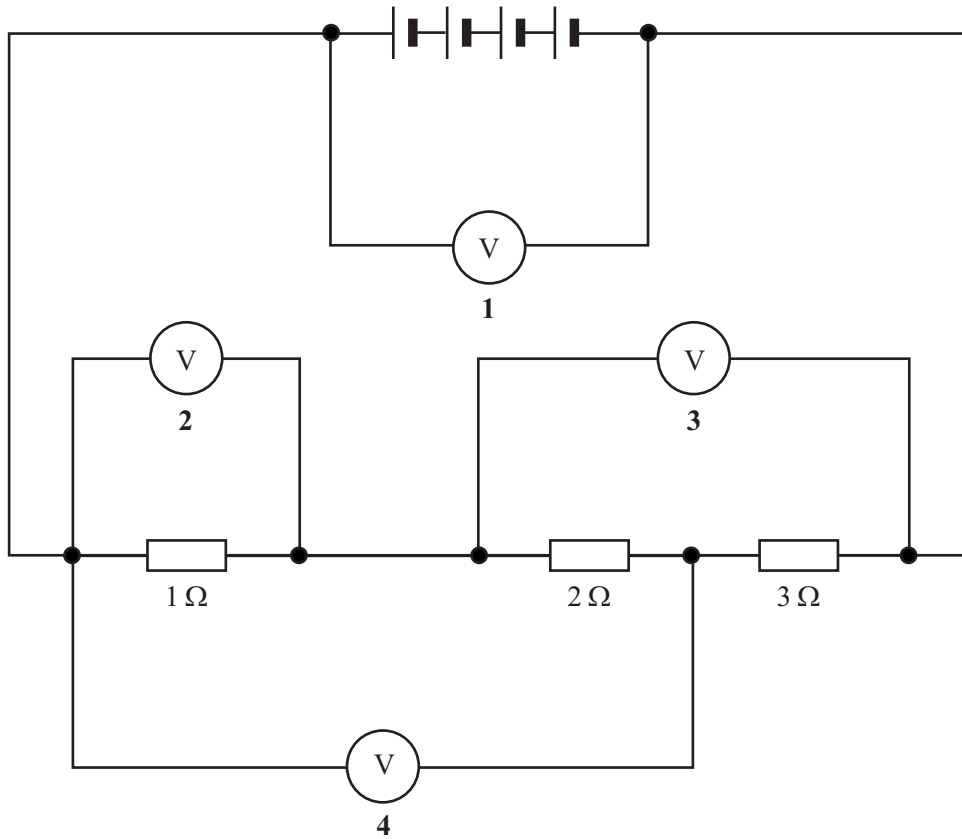
the voltage is increased



Turn over ►

QUESTION FIVE

The diagram shows three resistors joined in series to four cells. Each of the cells is 1.5 volts.



Match the readings in the list with the correct voltmeters 1–4 in the diagram.

1.0 volts

3.0 volts

5.0 volts

6.0 volts

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

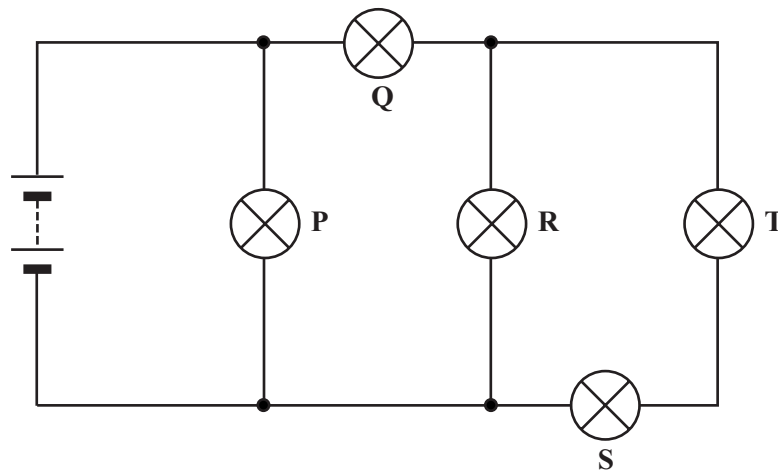
Turn over ►

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 circuit diagram contains a battery and five lamps.



When two of the lamps were unscrewed, the other three lamps went out.

Which **two** lamps were unscrewed?

lamp P

lamp Q

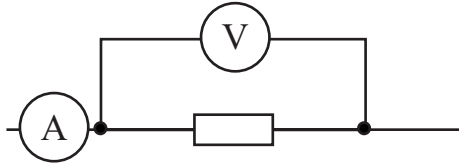
lamp R

lamp S

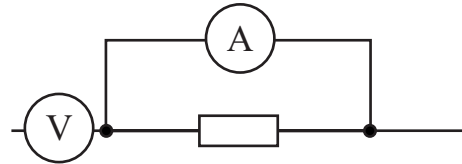
lamp T

QUESTION SEVEN

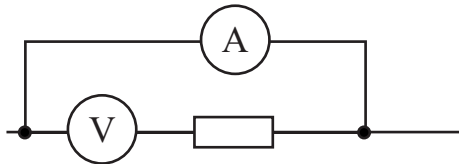
Which **two** arrangements of meters could be used to measure the resistance of the resistor?



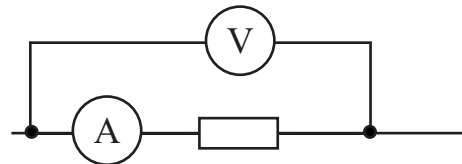
Arrangement J



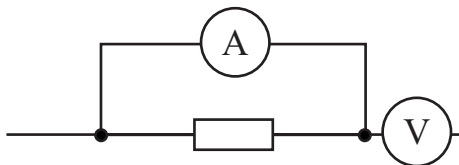
Arrangement K



Arrangement L



Arrangement M



Arrangement N

TURN OVER FOR THE NEXT QUESTION

Turn over ►

SECTION CQuestions **EIGHT** to **TEN**.

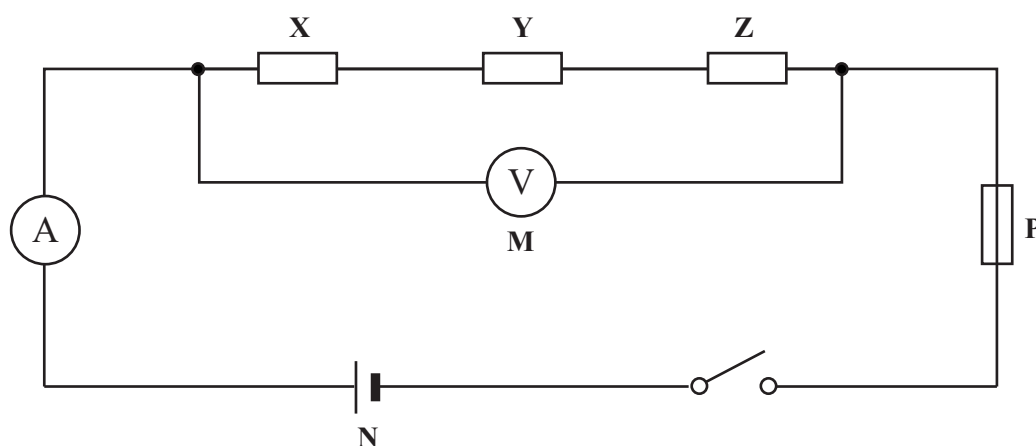
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION EIGHT

The following circuit was set up.

**8.1** Which row of the table, **A**, **B**, **C** or **D**, gives the names of components **N**, **P** and **X**?

	N	P	X
A	cell	fuse	resistor
B	cell	resistor	thermistor
C	switch	thermistor	resistor
D	thermistor	resistor	switch

8.2 Which one of the following is correct?

- A** X, Y and Z are connected in parallel with each other and in parallel with M
- B** X, Y and Z are connected in parallel with each other and in series with M
- C** X, Y and Z are connected in series with each other and in parallel with M
- D** X, Y and Z are connected in series with each other and in series with M

8.3 Which equation relates potential difference, current and resistance?

- A** potential difference = current + resistance
- B** potential difference = current – resistance
- C** potential difference = current × resistance
- D** potential difference = current ÷ resistance

8.4 A 3 ohm resistor is connected in series with a 4 ohm resistor.

Their total resistance is

- A** 1.0 Ω
- B** 1.3 Ω
- C** 7.0 Ω
- D** 12.0 Ω

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

The drawing shows a table lamp. It is connected to the 230 V mains.



9.1 A 100 W filament lamp gives no light when it is switched on.

This could be because

- A the earth wire connection in the plug is loose.
- B the fuse value is too high.
- C the live wire connection in the plug is loose.
- D 100 W is too much power for a home circuit to cope with.

9.2 The fault is put right and the lamp lights.

The bulb is taking

- A a direct current.
- B an alternating current.
- C an electrolytic current.
- D an induced current.

9.3 The filament lamp is replaced by a 20 W energy saving lamp.

Compared with the 100 W lamp, the 20 W lamp takes

- A 0.2 times the current.
- B 2.3 times the current.
- C 5.0 times the current.
- D 11.5 times the current.

9.4 When a filament lamp bulb fails, it is often just after it has been switched on.

This is because the resistance of a filament

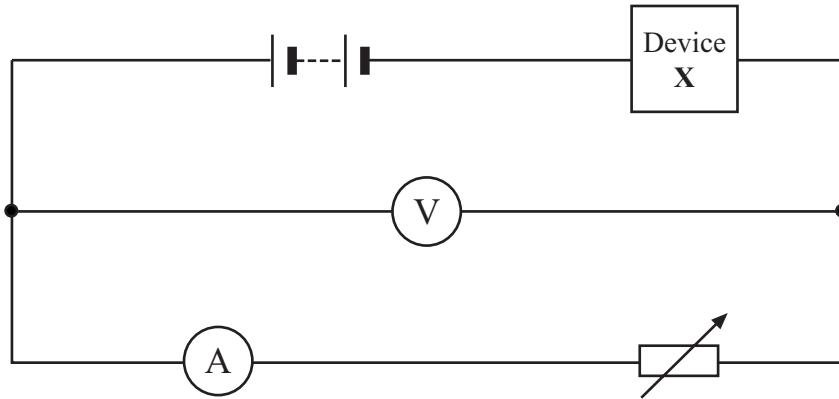
- A decreases as the temperature of the filament increases.
- B decreases as the amount of light given off decreases.
- C increases as the potential difference increases.
- D increases as the temperature of the filament increases.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

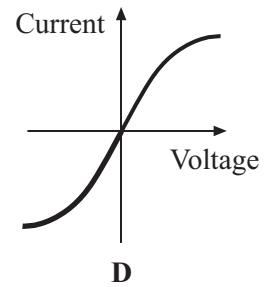
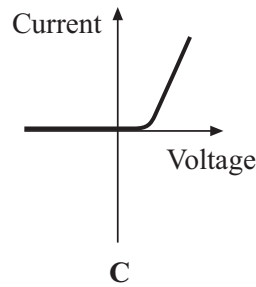
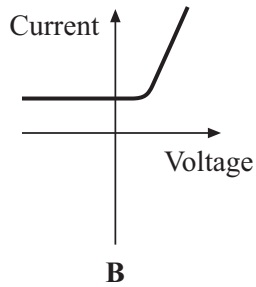
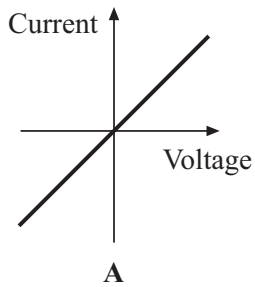
QUESTION TEN

A student investigates device **X** by using the circuit shown in the diagram.

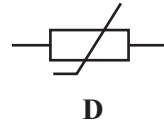
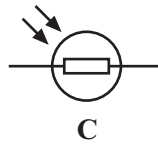


The student tells the teacher, “When I increased the voltage, nothing happened at first, but then the current shot up. When I turned **X** round there was no current, however much I increased the voltage”.

10.1 Which graph represents these results?



10.2 Which symbol should replace **X** in the diagram?



10.3 After the voltage has increased, the resistance of **X**

- A** becomes zero.
- B** increases steadily.
- C** remains constant.
- D** suddenly starts decreasing.

10.4 **X** could be used in a circuit to

- A** allow current to flow in one direction only.
- B** increase the current.
- C** increase the voltage.
- D** prevent overheating.

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**.

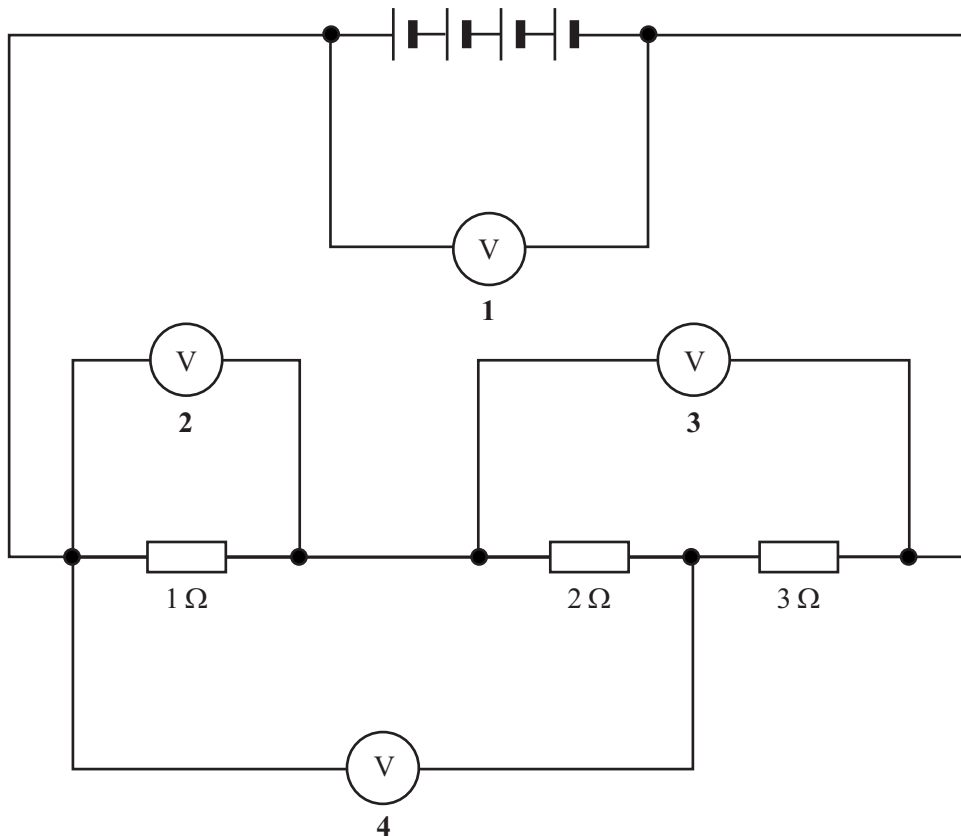
In these questions match the words in the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows three resistors joined in series to four cells. Each of the cells is 1.5 volts.



Match the readings in the list with the correct voltmeters **1–4** in the diagram.

1.0 volts

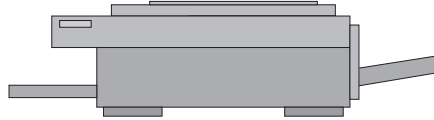
3.0 volts

5.0 volts

6.0 volts

QUESTION TWO

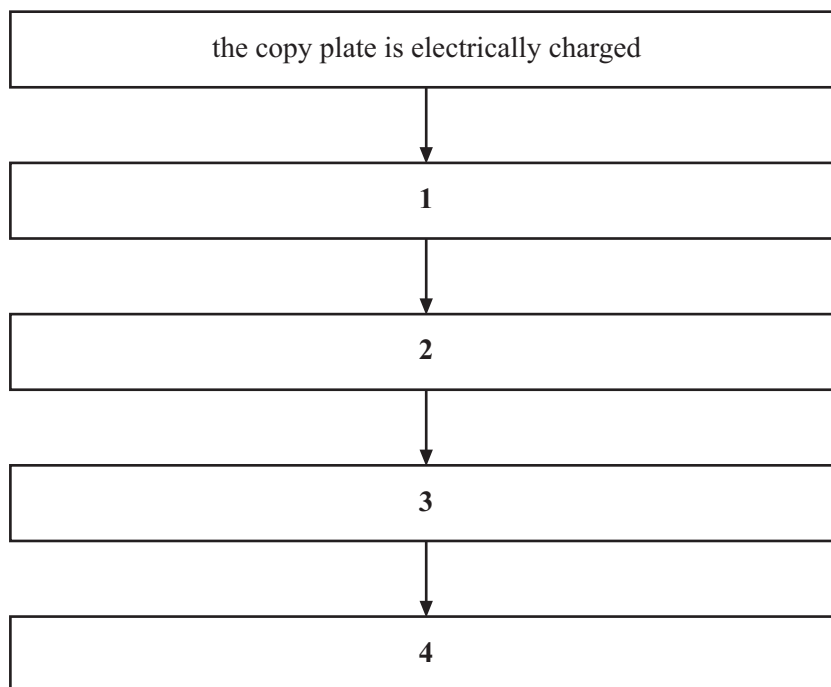
The drawing shows a small photocopier suitable for home use.



The boxes below explain step by step how the photocopier works.

Match statements **P**, **Q**, **R** and **S** from the list with the boxes **1–4** in the flow chart.

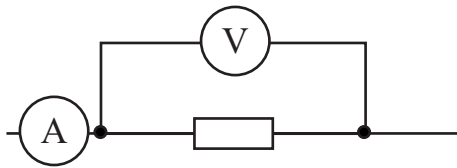
- P** an image of the original is projected on to the plate
- Q** black powder is transferred from the plate to the paper
- R** the plate parts which are still charged attract black powder
- S** where light falls on the plate, some electric charges leak away



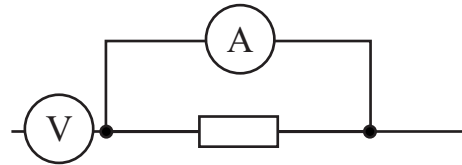
Turn over ►

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

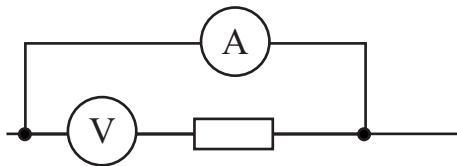
Mark your choices on the answer sheet.

QUESTION THREEWhich **two** arrangements of meters could be used to measure the resistance of the resistor?

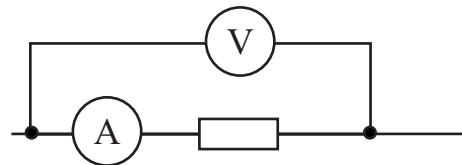
Arrangement J



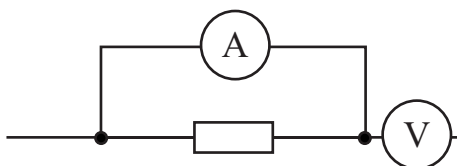
Arrangement K



Arrangement L



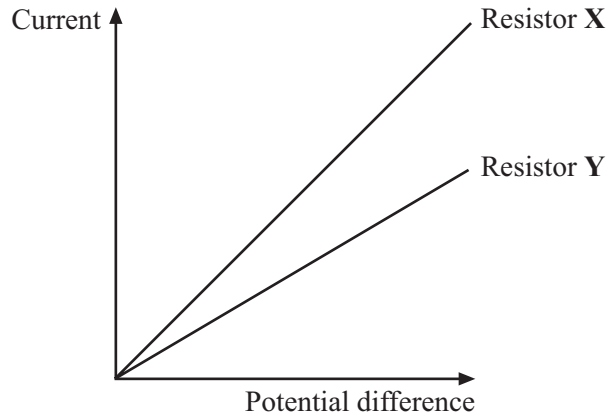
Arrangement M



Arrangement N

QUESTION FOUR

The current through two different resistors, **X** and **Y**, was measured as the potential difference across them was changed. The results are shown on the graph.



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

- J** for a given potential difference, a larger current flows through resistor Y than through resistor X
- K** resistor Y has a greater resistance than resistor X
- L** the resistance of both resistors decreases with potential difference
- M** the resistance of both resistors increases with potential difference
- N** the temperature of both resistors remains constant

TURN OVER FOR THE NEXT QUESTION

Turn over ►

SECTION C

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

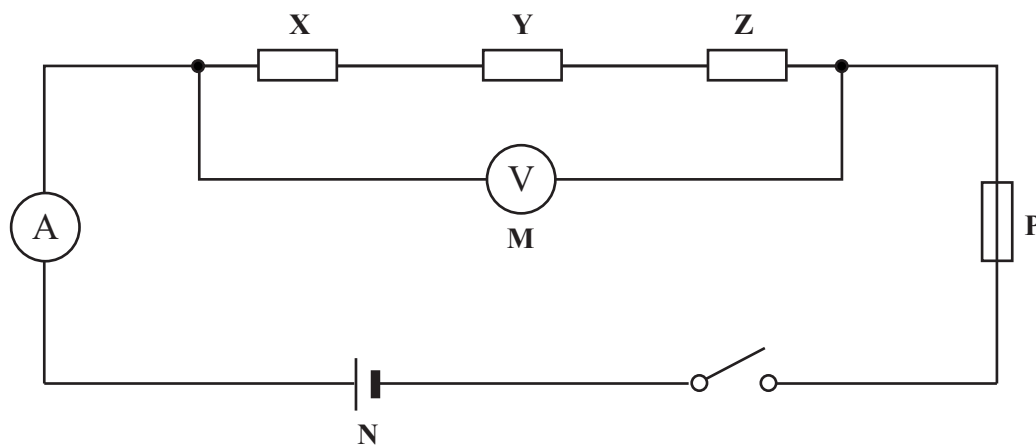
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION FIVE

The following circuit was set up.



5.1 Which row of the table, **A**, **B**, **C** or **D**, gives the names of components **N**, **P** and **X**?

	N	P	X
A	cell	fuse	resistor
B	cell	resistor	thermistor
C	switch	thermistor	resistor
D	thermistor	resistor	switch

5.2 Which one of the following is correct?

- A** X, Y and Z are connected in parallel with each other and in parallel with M
- B** X, Y and Z are connected in parallel with each other and in series with M
- C** X, Y and Z are connected in series with each other and in parallel with M
- D** X, Y and Z are connected in series with each other and in series with M

5.3 Which equation relates potential difference, current and resistance?

- A** potential difference = current + resistance
- B** potential difference = current – resistance
- C** potential difference = current × resistance
- D** potential difference = current ÷ resistance

5.4 A 3 ohm resistor is connected in series with a 4 ohm resistor.

Their total resistance is

- A** 1.0 Ω
- B** 1.3 Ω
- C** 7.0 Ω
- D** 12.0 Ω

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SIX

The drawing shows a table lamp. It is connected to the 230 V mains.



6.1 A 100 W filament lamp gives no light when it is switched on.

This could be because

- A the earth wire connection in the plug is loose.
- B the fuse value is too high.
- C the live wire connection in the plug is loose.
- D 100 W is too much power for a home circuit to cope with.

6.2 The fault is put right and the lamp lights.

The bulb is taking

- A a direct current.
- B an alternating current.
- C an electrolytic current.
- D an induced current.

6.3 The filament lamp is replaced by a 20 W energy saving lamp.

Compared with the 100 W lamp, the 20 W lamp takes

- A 0.2 times the current.
- B 2.3 times the current.
- C 5.0 times the current.
- D 11.5 times the current.

6.4 When a filament lamp bulb fails, it is often just after it has been switched on.

This is because the resistance of a filament

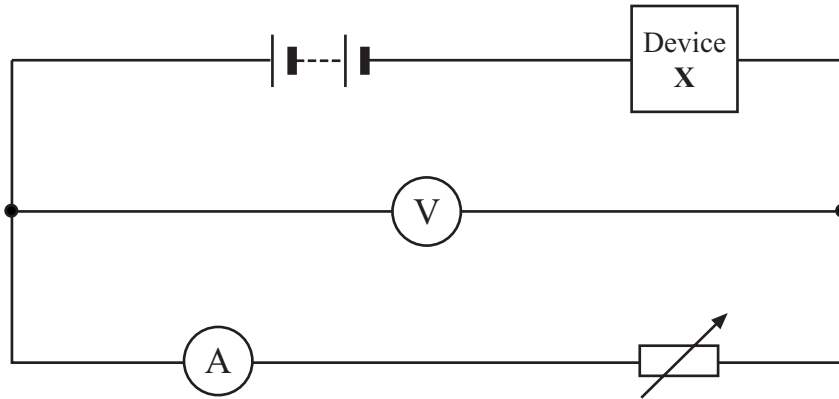
- A decreases as the temperature of the filament increases.
- B decreases as the amount of light given off decreases.
- C increases as the potential difference increases.
- D increases as the temperature of the filament increases.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

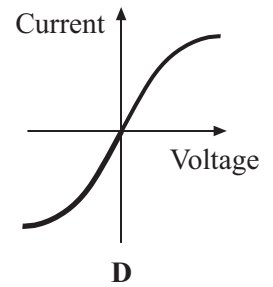
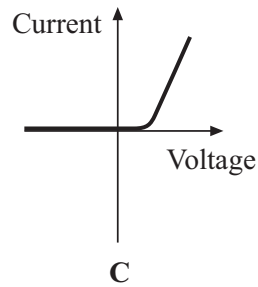
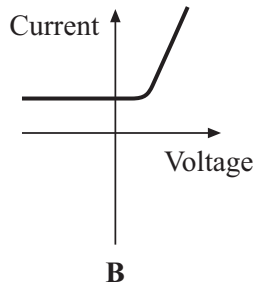
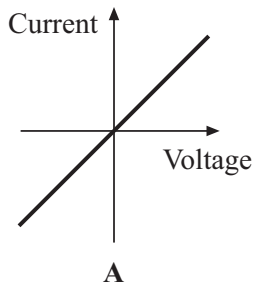
QUESTION SEVEN

A student investigates device **X** by using the circuit shown in the diagram.

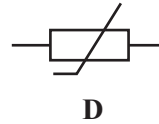
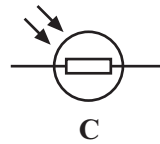


The student tells the teacher, “When I increased the voltage, nothing happened at first, but then the current shot up. When I turned **X** round there was no current, however much I increased the voltage”.

7.1 Which graph represents these results?



7.2 Which symbol should replace **X** in the diagram?



7.3 After the voltage has increased, the resistance of **X**

- A** becomes zero.
- B** increases steadily.
- C** remains constant.
- D** suddenly starts decreasing.

7.4 **X** could be used in a circuit to

- A** allow current to flow in one direction only.
- B** increase the current.
- C** increase the voltage.
- D** prevent overheating.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION EIGHT

The wiring in an old house has not been checked for over 30 years. It uses the mains supply of 230 volts and still has a fuse box.

In this house, a socket is used incorrectly. It has the following appliances connected to it.

Appliance	Power rating
CD player	50 W
Electric heater	2000 W
Electric iron	1000 W
Electric kettle	2500 W

8.1 All four appliances are switched on.

What is the total current going through the socket?

- A 21.7 A
- B 23.1 A
- C 23.9 A
- D 24.1 A

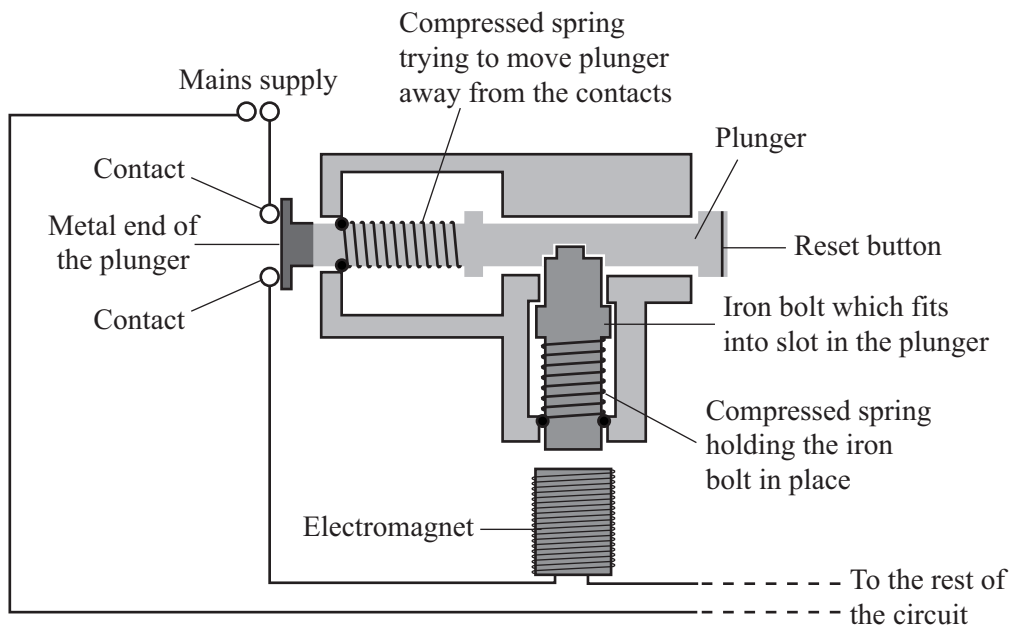
8.2 After a few seconds, all the appliances stop working. This happens because the 20 A fuse in the fuse box, protecting the wiring in the power circuit, has melted.

The person repairing the fault does so incorrectly. He replaces the 20 A fuse with a 40 A fuse.

Why is this incorrect?

- A Only half the correct current goes to each appliance
- B The fuse melts more often, as fewer appliances can be used together
- C The power circuit wiring overheats, as more appliances can be used together
- D Twice the correct current goes to each appliance

- 8.3** In modern wiring systems, the fuses have been replaced with circuit breakers. The diagram shows one type of circuit breaker.



This type of circuit breaker makes use of

- A** induced current from a changing magnetic field.
- B** the electrostatic force between charges.
- C** the magnetic effect of an electric current.
- D** the transformer principle.
- 8.4** Which row of the table, **A**, **B**, **C** or **D**, describes the condition of the circuit breaker after it has broken the circuit?

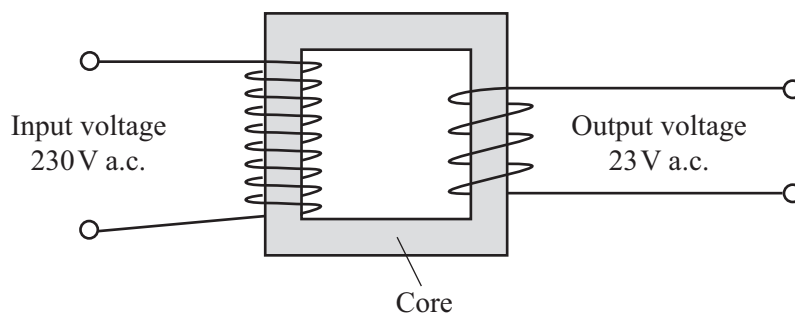
	Iron bolt	Plunger
A	in plunger slot	pushed back opening contacts
B	in plunger slot	pushed forward closing contacts
C	not in plunger slot	pushed back opening contacts
D	not in plunger slot	pushed forward closing contacts

Turn over ►

QUESTION NINE

The diagram shows a transformer being used to change the voltage of an electrical supply.

The input voltage is 230 volts and the output is 23 volts.



9.1 The material of the transformer core is mainly

- A copper.
- B iron.
- C plastic.
- D steel.

9.2 There are 2300 turns on the primary coil.

How many turns are there on the secondary coil?

- A 10
- B 230
- C 529
- D 5290

9.3 Which row of the table, **A**, **B**, **C** or **D**, is correct for this transformer?

	Voltage	Where it is used
A	step-down (decrease)	local electricity substation
B	step-down (decrease)	set of coloured lamps
C	step-up (increase)	battery charger
D	step-up (increase)	power station

9.4 Power losses in the transformer are almost zero. The current in the primary coil is 0.02 A.

What is the current in the secondary coil?

- A 0.20 A
- B 0.46 A
- C 2.30 A
- D 4.60 A

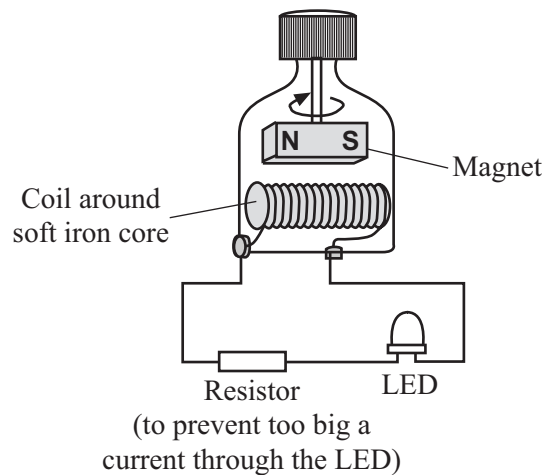
TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION TEN

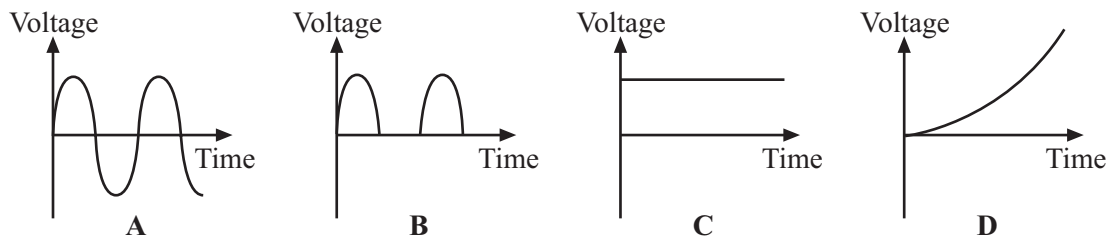
The diagram shows an a.c. generator connected to a light-emitting diode.

A light-emitting diode (LED) is a diode which gives out (emits) light when a current flows through it. The bigger the current through the LED, the brighter the light. The resistance of a light-emitting diode varies in the same way as that of an ordinary diode.

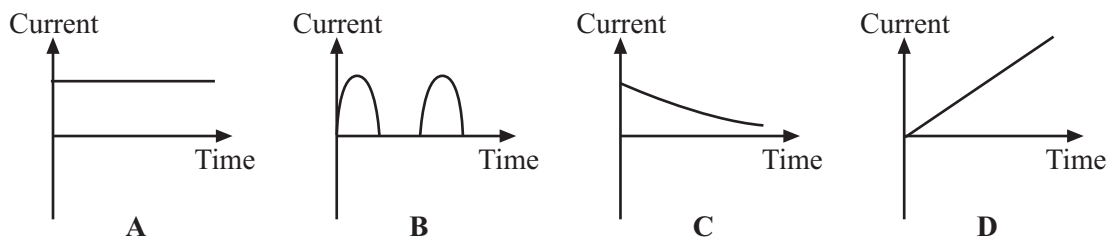


10.1 When the magnet turns, the generator produces a voltage across the ends of the coil.

Which of these graphs shows how the voltage across the ends of the coil varies with time?



10.2 Which of these graphs shows how the current through the resistor and the LED varies with time?



10.3 As the magnet spins, the LED

- A flashes once for every full turn of the magnet.
- B flashes once for every two full turns of the magnet.
- C flashes twice for every full turn of the magnet.
- D gives out a constant bright light.

10.4 The magnet is now turned twice as fast.

The LED now

- A flashes at the same rate as before, with a brighter light.
- B flashes twice as fast as before, with a brighter light.
- C flashes twice as fast as before, with the same brightness.
- D has a constant light which is brighter than before.

END OF TEST

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE