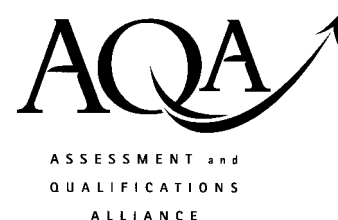


Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2006

SCIENCE: SINGLE AWARD A (MODULAR)
Energy and Electricity (Module 17)

346017



Tuesday 27 June 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

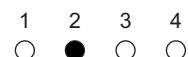
Instructions

- 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 'Energy and Electricity' printed on it.
- Attempt **one Tier only**, either the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

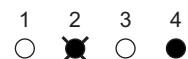
- Use a **black ball-point pen**.

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

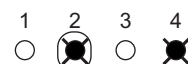


- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

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.

QUESTION ONE

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

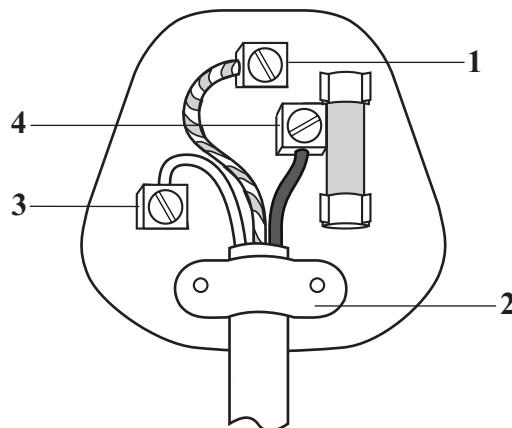
Match words from the list with the labels **1–4** on the diagram.

cable grip

earth connection

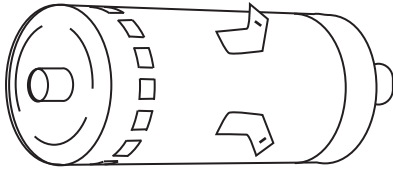
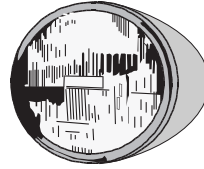
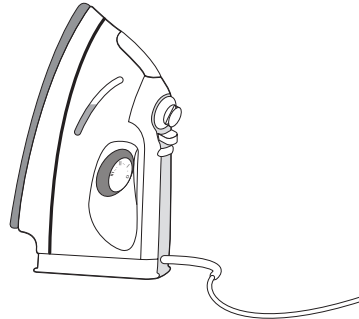
live connection

neutral connection



QUESTION TWO

The drawings show devices which are designed to transfer energy.

Car generator**Car headlamp****Food mixer****Iron**

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

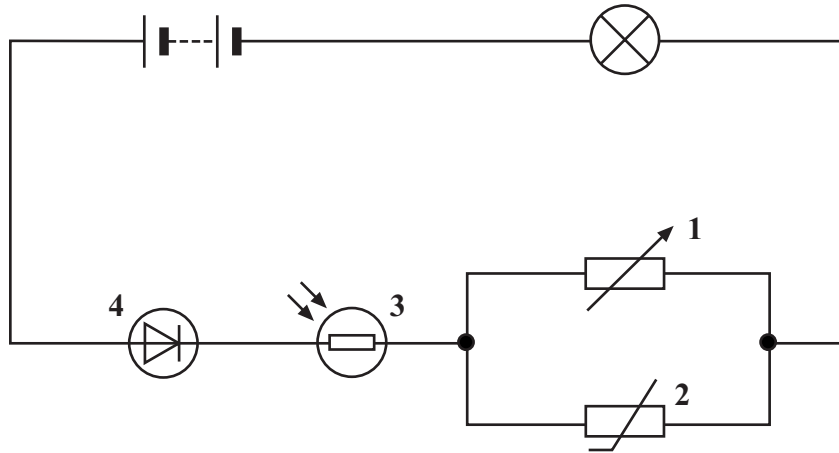
electrical**heat****light****movement**

Device	Output energy wanted
car generator	1
car headlamp	2
food mixer	3
iron	4

Turn over ►

QUESTION THREE

The circuit diagram has four components labelled **1–4**.



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

diode

LDR (light-dependent resistor)

thermistor

variable resistor

QUESTION FOUR

Different types of material are used to make plugs and cables.

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

the case of a plug

the core of a cable

the covering on a cable

the pins on a plug

Description of material used	Part of plug or cable
flexible conductor	1
rigid conductor	2
flexible non-conductor	3
rigid non-conductor	4

QUESTION FIVE

The table shows the useful energy transfers produced by four devices.

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

cordless drill

loudspeaker

microphone

torch

Useful energy transfer	Device
chemical energy → electrical energy → light	1
chemical energy → electrical energy → kinetic energy	2
electrical energy → kinetic energy → sound	3
sound → kinetic energy → electrical energy	4

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.

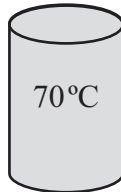
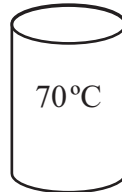
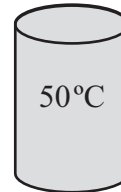
QUESTION SIX

The three blocks in the diagram are the same size and are made of the same material. They have different surfaces. Their temperatures are marked on the diagram.

Dull matt surface

Shiny surface

Dull matt surface

**X****Y****Z**

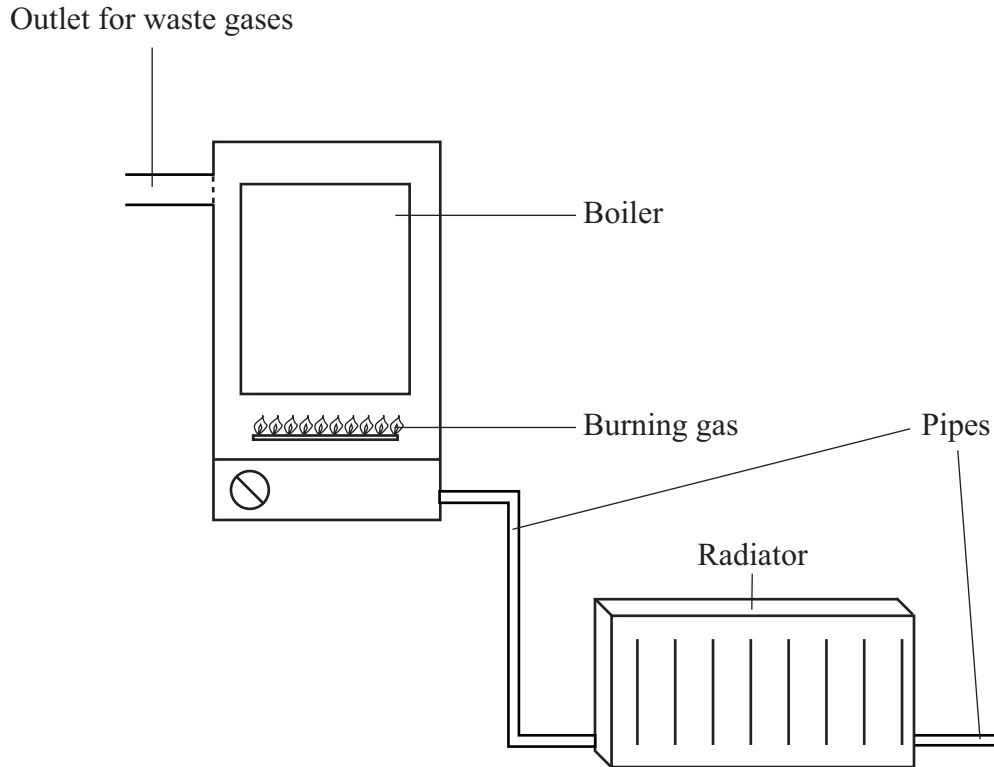
The statements are about the amounts of infra red radiation given off per second.

Which **two** statements must be correct?

Y gives off less than X**Y gives off more than X****Y gives off more than Z****Z gives off less than X****Z gives off more than X**

QUESTION SEVEN

The diagram shows part of a gas central heating system. The water is heated in the boiler and pumped to a radiator in a room where the heat is needed.



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

- J** a light-coloured shiny radiator gives out more heat than a dark-coloured dull radiator
- K** all the heat from the burning gas is absorbed by the water
- L** heat is wasted through the outlet for waste gases
- M** insulating the pipes reduces heat loss
- N** the system can be made 100 % efficient

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.




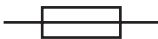
QUESTION EIGHT

This question is about fuses.

The lighting circuit in a house has a 5 A fuse.

The current through a 100 W lamp is 0.43 A.

8.1 What is the symbol for a fuse?

- A 
- B 
- C 
- D 

8.2 The filament in a fuse is made from a solid . . .

- A conductor with a high melting point.
- B conductor with a low melting point.
- C insulator with a high melting point.
- D insulator with a low melting point.
-
- 8.3** What is the largest number of 100 W lamps which can be used on this lighting circuit?
- A 5
- B 11
- C 43
- D 100

8.4 If too many lamps are used, they will . . .

- A** cause the fuse wire to melt.
- B** explode.
- C** work, but not be safe.
- D** work, but not shine so brightly.

Turn over for the next question

Turn over ►

QUESTION NINE

The manufacturer gives the following information about four different appliances. All the appliances are designed to work from the 230 V mains.

Appliance	Fuse required
Hairdryer	13 A
Television	5 A
Table lamp	3 A
Washing machine	13 A

- 9.1** What is the most likely value for the resistance of the washing machine?
- A** 20 Ω
 - B** 10 Ω
 - C** 5 Ω
 - D** 3 Ω
- 9.2** What can you deduce, from the information in the table, about the power of the table lamp and television?
- A** Nothing
 - B** It is greater for the table lamp.
 - C** It is greater for the television.
 - D** It is the same in each.
- 9.3** The washing machine needs to be earthed because it . . .
- A** has a metal case.
 - B** has a 13 A fuse.
 - C** is the most powerful appliance.
 - D** is wet inside.

9.4 If a 13 A fuse is put into the plug of the table lamp, . . .

- A** no earth wire will be needed.
- B** the table lamp will not work.
- C** the table lamp will shine more brightly.
- D** there will be a risk of a fire.

Turn over for the next question

Turn over ►

QUESTION TEN

This question is about power stations.

10.1 The source of energy for geothermal power stations is . . .

- A combustion.
- B decay of radioactive elements.
- C movement of air.
- D movement of water.

10.2 The gas mainly responsible for causing acid rain is . . .

- A natural gas.
- B nitrogen.
- C oxygen.
- D sulphur dioxide.

10.3 What is an advantage of a tidal barrage over a wind farm?

- A More power is produced at times of high demand.
- B More power is produced in winter than in summer.
- C The times and sizes of outputs for each day are more reliable.
- D There are no environmental impacts.

10.4 When 100 tonnes of coal are burned in 1 hour, 700 000 kilowatts of power are produced.

How quickly must the coal be burned to produce 7 000 000 kilowatts?

- A 100 tonnes in 5 minutes
- B 100 tonnes in 6 minutes
- C 100 tonnes in 7 minutes
- D 100 tonnes in 8 minutes

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 words in the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

The table shows the useful energy transfers produced by four devices.

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

cordless drill

loudspeaker

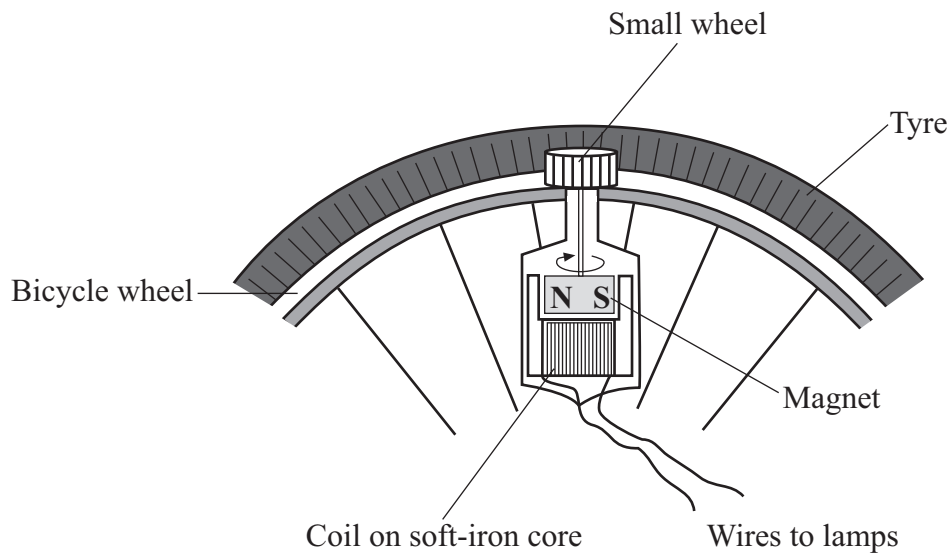
microphone

torch

Useful energy transfer	Device
chemical energy → electrical energy → light	1
chemical energy → electrical energy → kinetic energy	2
electrical energy → kinetic energy → sound	3
sound → kinetic energy → electrical energy	4

QUESTION TWO

The diagram shows a bicycle dynamo.



The flow chart is about how the dynamo works.

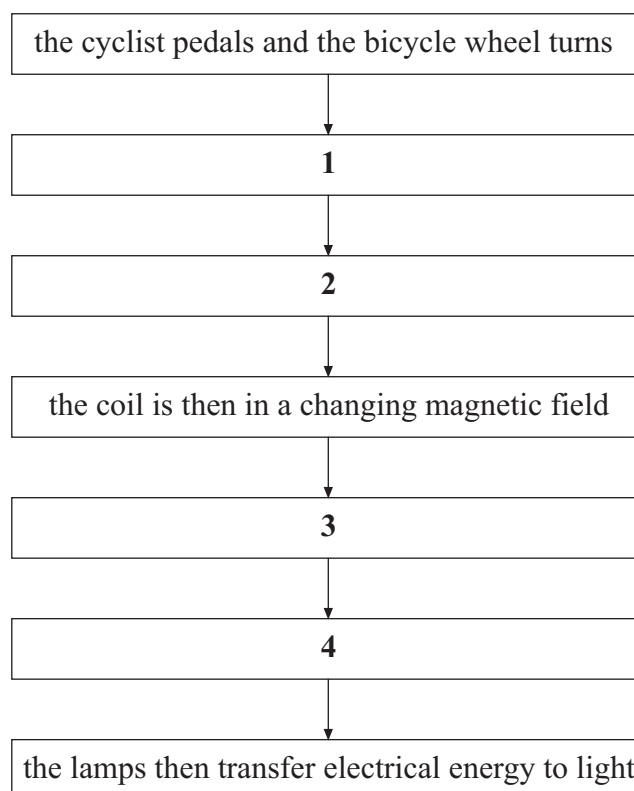
Match sentences from the list with the boxes **1–4** in the flow chart.

a voltage is induced across the coil

the dynamo's small wheel turns

this causes a current to flow

this spins the magnet near the coil



Turn over ►

SECTION B

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

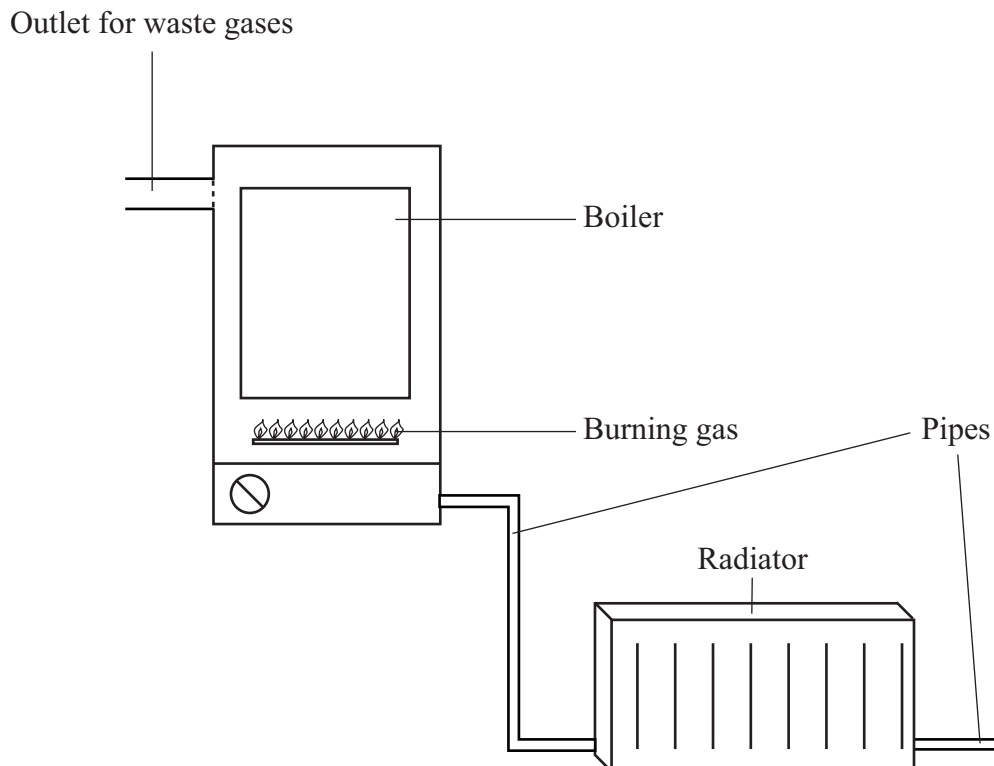
In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION THREE

The diagram shows part of a gas central heating system. The water is heated in the boiler and pumped to a radiator in a room where the heat is needed.



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

- J** a light-coloured shiny radiator gives out more heat than a dark-coloured dull radiator
- K** all the heat from the burning gas is absorbed by the water
- L** heat is wasted through the outlet for waste gases
- M** insulating the pipes reduces heat loss
- N** the system can be made 100 % efficient

QUESTION FOUR

Heat energy can be transferred by conduction.

Which **two** endings could correctly complete the sentence?

Heat is conducted through metals because of . . .

changes in density.

collisions between particles.

expansion.

infra red waves.

the movement of free electrons.

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.




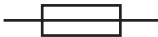
QUESTION FIVE

This question is about fuses.

The lighting circuit in a house has a 5 A fuse.

The current through a 100 W lamp is 0.43 A.

5.1 What is the symbol for a fuse?

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

5.2 The filament in a fuse is made from a solid . . .

- A** conductor with a high melting point.
- B** conductor with a low melting point.
- C** insulator with a high melting point.
- D** insulator with a low melting point.
- 5.3** What is the largest number of 100 W lamps which can be used on this lighting circuit?
- A** 5
- B** 11
- C** 43
- D** 100

5.4 If too many lamps are used, they will . . .

- A** cause the fuse wire to melt.
- B** explode.
- C** work, but not be safe.
- D** work, but not shine so brightly.

Turn over for the next question

Turn over ►

QUESTION SIX

The manufacturer gives the following information about four different appliances. All the appliances are designed to work from the 230 V mains.

Appliance	Fuse required
Hairdryer	13 A
Television	5 A
Table lamp	3 A
Washing machine	13 A

6.1 What is the most likely value for the resistance of the washing machine?

- A** 20 Ω
- B** 10 Ω
- C** 5 Ω
- D** 3 Ω

6.2 What can you deduce, from the information in the table, about the power of the table lamp and television?

- A** Nothing
- B** It is greater for the table lamp.
- C** It is greater for the television.
- D** It is the same in each.

6.3 The washing machine needs to be earthed because it . . .

- A** has a metal case.
- B** has a 13 A fuse.
- C** is the most powerful appliance.
- D** is wet inside.

6.4 If a 13 A fuse is put into the plug of the table lamp, . . .

- A** no earth wire will be needed.
- B** the table lamp will not work.
- C** the table lamp will shine more brightly.
- D** there will be a risk of a fire.

Turn over for the next question

Turn over ►

QUESTION SEVEN

This question is about power stations.

- 7.1** The source of energy for geothermal power stations is . . .
- A** combustion.
 - B** decay of radioactive elements.
 - C** movement of air.
 - D** movement of water.
- 7.2** The gas mainly responsible for causing acid rain is . . .
- A** natural gas.
 - B** nitrogen.
 - C** oxygen.
 - D** sulphur dioxide.
- 7.3** What is an advantage of a tidal barrage over a wind farm?
- A** More power is produced at times of high demand.
 - B** More power is produced in winter than in summer.
 - C** The times and sizes of outputs for each day are more reliable.
 - D** There are no environmental impacts.
- 7.4** When 100 tonnes of coal are burned in 1 hour, 700 000 kilowatts of power are produced.
- How quickly must the coal be burned to produce 7 000 000 kilowatts?
- A** 100 tonnes in 5 minutes
 - B** 100 tonnes in 6 minutes
 - C** 100 tonnes in 7 minutes
 - D** 100 tonnes in 8 minutes

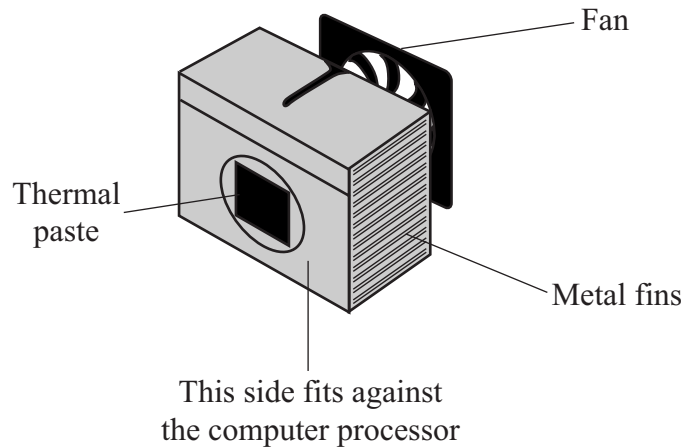
Turn over for the next question

Turn over ►

QUESTION EIGHT

The drawing shows a fan-assisted cooler designed to be fitted inside a computer.

The thermal paste ensures that heat can transfer easily from the computer's processor.



- 8.1** The metal fins are painted black to . . .
- A increase heat transfer by conduction.
 - B increase heat transfer by radiation.
 - C reduce heat transfer by conduction.
 - D reduce heat transfer by radiation.
- 8.2** The thermal paste is there to . . .
- A decrease the transfer of heat by conduction.
 - B decrease the transfer of heat by radiation.
 - C increase the transfer of heat by conduction.
 - D increase the transfer of heat by radiation.

8.3 Which process or processes is/are aided by the fan?

- A** Conduction only
- B** Convection and conduction
- C** Radiation and conduction
- D** Radiation only

8.4 What causes the heat transfer through the metal fins?

- A** Electrons which collide with both ions and other electrons
- B** Electrons which do not collide with either ions or other electrons
- C** Ions which collide with both electrons and other ions
- D** Ions which do not collide with either electrons or other ions

Turn over for the next question

Turn over ►

QUESTION NINE

The table gives some information about the insulation of a house.

Part of house	Area (in m ²)	Type of insulation	Heat (in joules) escaping through 1 m ² in 1 second for every 1 °C that it is warmer inside than it is outside	
			Without insulation	With insulation
Floors	120	Carpet with underlay	1	0.4
Roof	120	Fibreglass in loft	2	0.3
Walls	210	Foam in cavities	1	0.5
Windows	40	Double glazing	5	2.5

9.1 How do insulators help to conserve energy?

- A By reducing heat escaping by conduction
- B By reducing heat escaping by convection
- C By reducing heat escaping by conduction and convection
- D By reducing heat escaping by conduction and convection and radiation

9.2 Which insulator reduces the energy escaping through it by the biggest percentage?

- A Carpet with underlay
- B Fibreglass in loft
- C Foam in cavities
- D Double glazing

9.3 It is 10°C warmer inside than outside.

The loft has not been insulated.

How much heat escapes through the roof each second?

- A 120 J
- B 240 J
- C 1200 J
- D 2400 J

9.4 With all four types of insulation in place, where will the most heat escape?

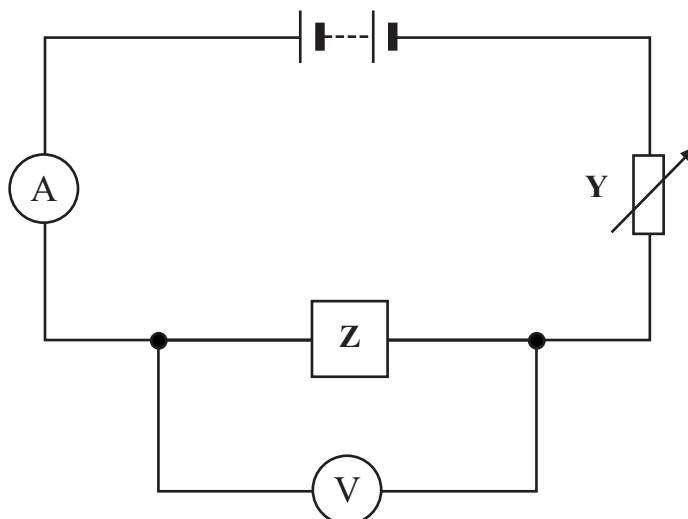
- A Through the floors
- B Through the roof
- C Through the walls
- D Through the windows

Turn over for the next question

Turn over ►

QUESTION TEN

Some students set up the circuit shown in the diagram. They wanted to find out how the current through component **Z** varied when they changed the potential difference (p.d.) across it.



10.1 The resistance of component **Y** is adjusted so that it is different from the resistance of component **Z**.

Which of the following is true about the current through component **Y** and the potential difference across component **Y**?

	Current through Y	Potential difference across Y
A	different from that through Z	different from that across Z
B	different from that through Z	the same as that across Z
C	almost the same as that through Z	different from that across Z
D	almost the same as that through Z	the same as that across Z

10.2 Component **Y** is used to . . .

- A** reverse the p.d. and current.
- B** vary both the current through **Z** and the p.d. across **Z**.
- C** vary the current through **Z** while keeping the p.d. across **Z** constant.
- D** vary the p.d. across **Z** while keeping the current through **Z** constant.

The table shows the results of the students' experiment.

Potential difference (V)	1	2	3	4
Current (mA)	100	150	175	182

10.3 What happens to the resistance of component **Z** as the potential difference across it increases?

- A It decreases at a slower and slower rate.
- B It increases at a slower and slower rate.
- C It increases at a faster and faster rate.
- D It stays the same.

10.4 Component **Z** could be a . . .

- A diode.
- B filament lamp.
- C thermistor.
- D variable resistor at constant temperature.

END OF TEST

There are no questions printed on this page

There are no questions printed on this page

There are no questions printed on this page