Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

AQA Level 1/2 Certificate in Science: Double Award
Specimen Paper

Double Award

Physics Paper 1F

For this paper you must have:
- a pencil, ruler and protractor
- a calculator
- the Physics Equations Sheet (enclosed).

Time allowed
- 60 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

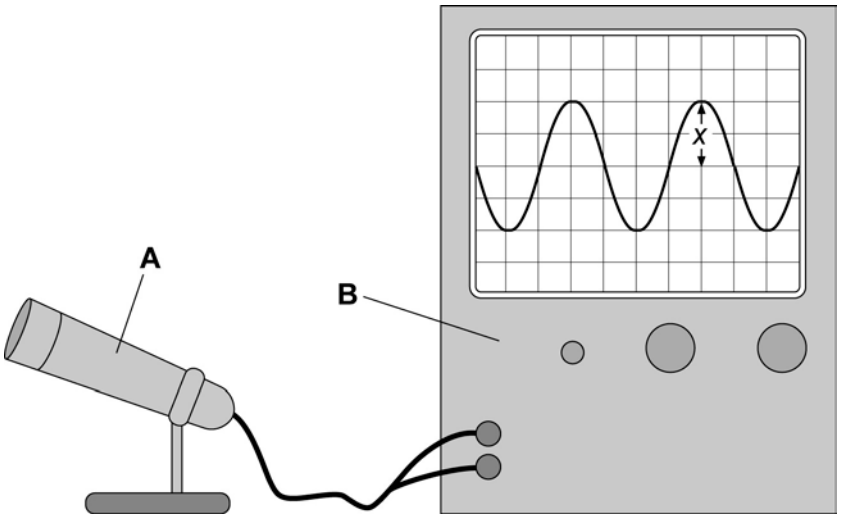
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

Do not write outside the box

Answer **all** questions in the spaces provided.

1 (a) A student uses two pieces of equipment, **A** and **B**, to display a sound wave.



1 (a) (i) Use words from the box to complete the sentence.

a loudspeaker	**a microphone**	**an oscilloscope**	**a screen**

A is …….. and **B** is …….. .

(2 marks)

1 (a) (ii) Use words from the box to complete the sentence.

the amplitude	**half the amplitude**	**the frequency**	**half the frequency**

The distance ***X*** marked on the diagram represents .....

of the sound wave.

(1 mark)

Do not write outside the box

1 (a) (iii) Complete the sentence.

The distance ***X*** becomes smaller. This is because the sound has

become ..... .

(1 mark)

1 (b) Astronauts in space cannot hear sounds from outside their spacesuits.

Explain why.

.....

.....

.....

.....

(2 marks)

Question 1 continues on the next page

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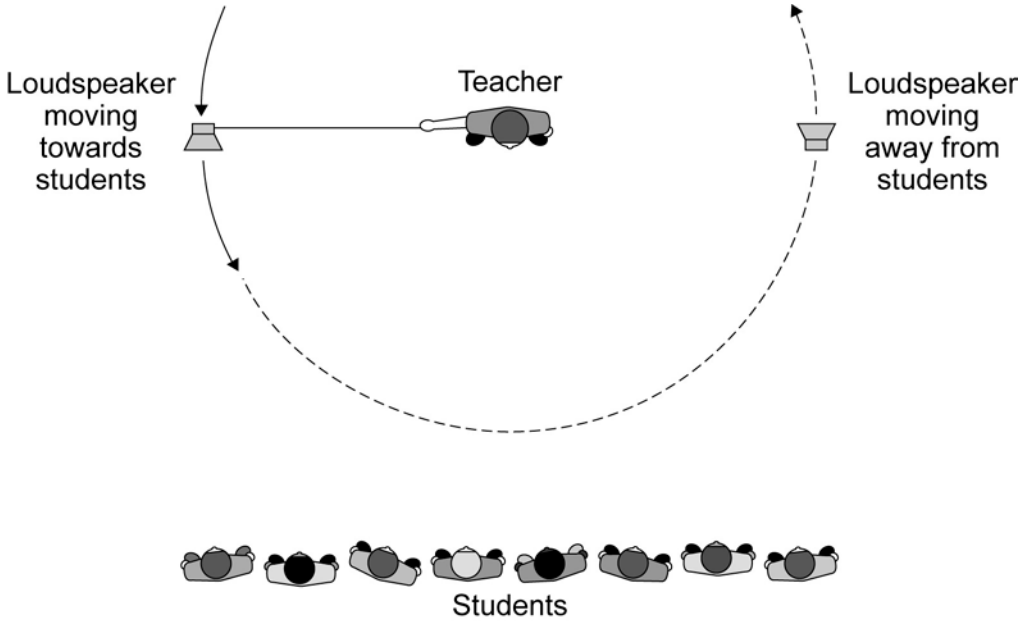
1 (c) The diagram shows a teacher using a loudspeaker to demonstrate an important effect. The loudspeaker, which produces a sound of constant frequency, is swung around in a circle.



As the loudspeaker moves towards the students, the frequency of the sound heard by the students increases.

What happens to the sound heard by the students as the loudspeaker moves away from them?

.....

.....

(1 mark)

Do not write outside the box

1 (d) The teacher is using the demonstration to model the red-shift in light that is observed from most distant galaxies.

1 (d) (i) Which **one** of the following statements gives the main reason why models are used in science?

Put a tick (✓) in the box next to your answer.

Models can help to explain an effect or theory. ☐

Models can prove that a theory is correct. ☐

Models can help to generate new ideas. ☐

(1 mark)

1 (d) (ii) Explain how the teacher's demonstration can be used as a model for red-shift.

.....

.....

.....

.....

(2 marks)

1 (e) Red-shift provides evidence to support the theory that the Universe began from a very small initial point.

What name is given to this theory?

.....

(1 mark)

11

Turn over for the next question

Do not write outside the box

2 Use words from the box to complete the following sentences.

conduction	**convection**	**radiation**

2 (a) (i) The transfer of energy by the movement of hot liquids is called

..... .

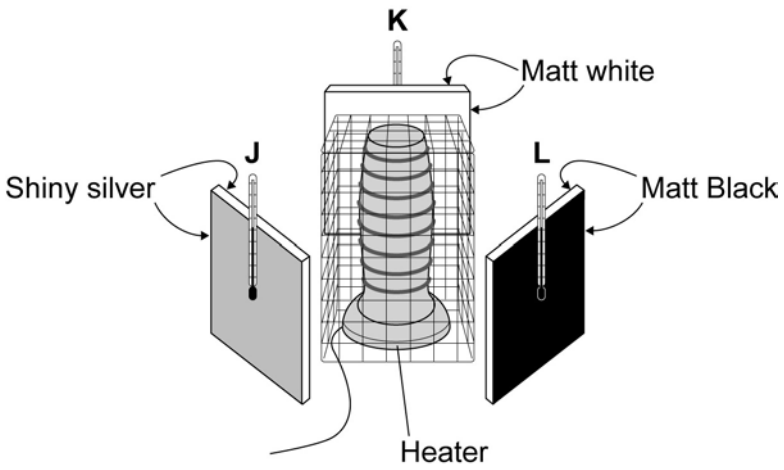
(1 mark)

2 (a) (ii) The transfer of energy from one particle to another is called

..... .

(1 mark)

2 (b) The apparatus below shows three metal plates that are the same distance from a heater.



A safety guard was placed around the heater and the heater was switched on for 10 minutes.

The thermometers, **J**, **K** and **L**, were read before the heater was switched on and just after the heater was switched off.

The readings are shown in the table.

Reading	Temperature before switching on in °C	Temperature just after switching off in °C
1	19	21
2	19	29
3	19	23

Do not write outside the box

2 (b) (i) Which set of readings**, 1**, **2** or **3**, is most likely to have been taken from the thermometer labelled **L**?

☐

Give a reason for your answer.

.....

.....

(2 marks)

2 (b) (ii) Which **one** of the following was **not** a control variable in this experiment?

Put a tick (✓) in the box next to your answer.

The distance between the heater and the metal plates ☐

The power of the heater ☐

The temperature before the heater was switched on ☐

The colour of the metal plates ☐

(1 mark)

2 (b) (iii) Name a piece of apparatus that could be used, instead of the thermometers, to measure the temperatures.

.....

Suggest **one** advantage of the piece of apparatus you have named.

.....

.....

.....

(2 marks)

Question 2 continues on the next page

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2 (c) The picture shows a firefighter putting out a forest fire.

The firefighter's clothing has thick thermal padding inside and a light-coloured, fireproof, layer outside.

2 (c) (i) What is the main way that energy is transferred through the air from the fire to the firefighter?

.....

(1 mark)

2 (c) (ii) Why is the outside layer of the clothing shiny?

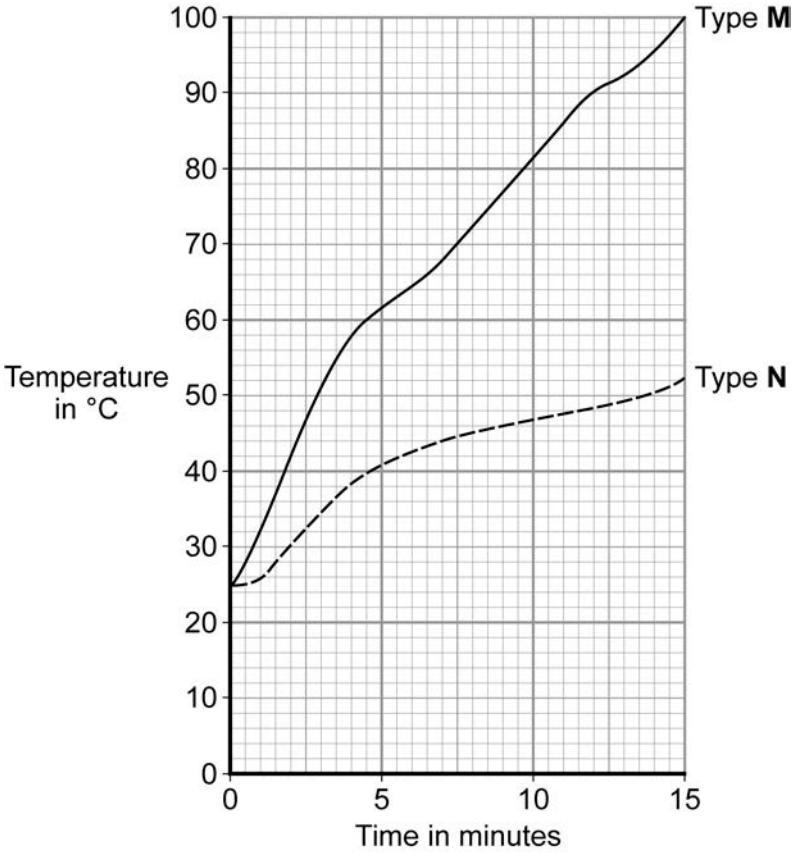
.....

.....

(1 mark)

Do not write outside the box

2 (d) The graph shows the result of a laboratory test on two types of thermal padding, **M** and **N**. Each type of padding was put onto a very hot metal surface and the temperature inside the padding was taken every minute.



Which type of padding, **M** or **N**, would it be best to use inside the fire fighter's clothing?

Give a reason for your answer.

.....

.....

.....

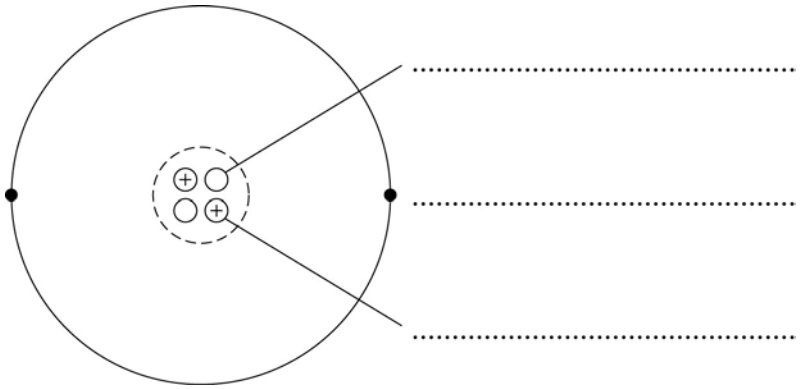
(1 mark)

10

Turn over for the next question

Do not write outside the box

3 (a) The diagram shows a helium atom.



3 (a) (i) Use the words in the box to label the diagram.

electron	**neutron**	**proton**

(2 marks)

3 (a) (ii) An alpha particle is the same as the nucleus of a helium atom.

How is an alpha particle **different** from a helium atom?

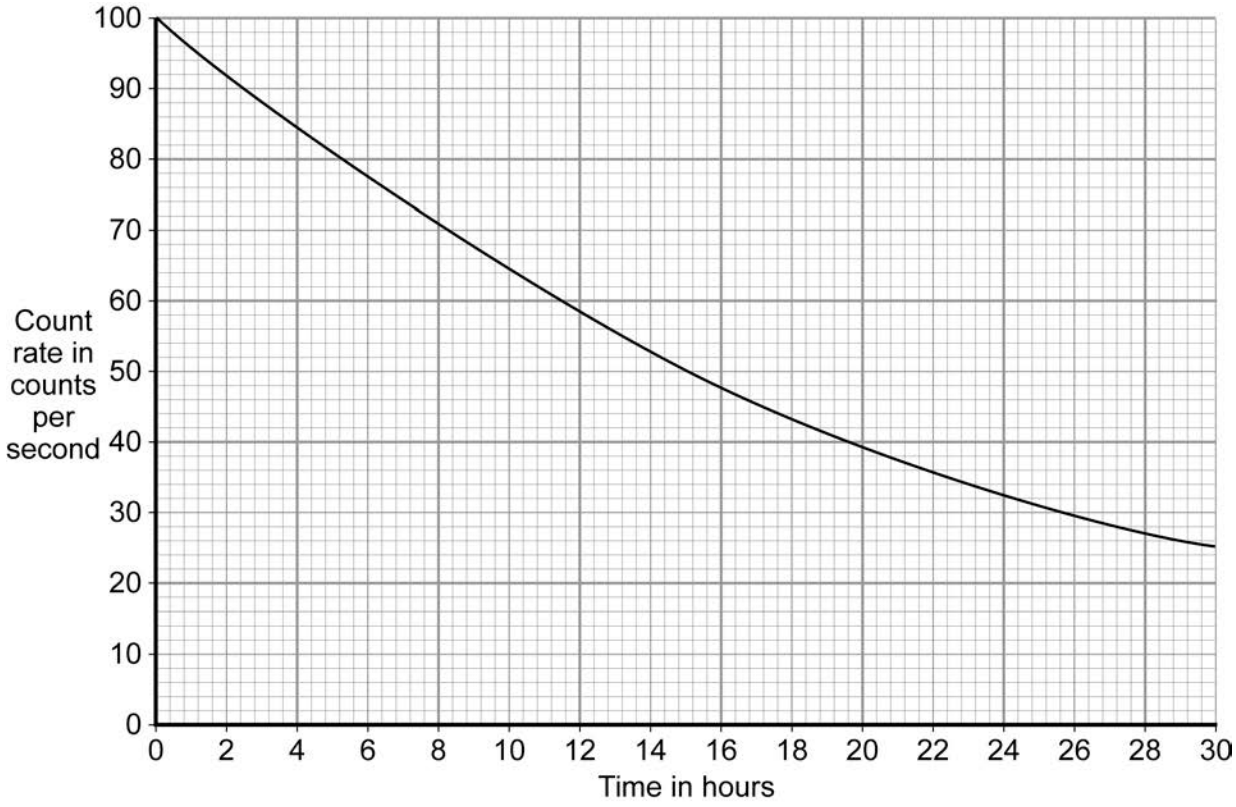
.....

.....

(1 mark)

Do not write outside the box

3 (b) The graph shows how the count rate from a sample of radioactive sodium-24 changes with time.



3 (b) (i) How many hours does it take for the count rate to fall from 100 counts per second to 50 counts per second?

Time = ... hours

(1 mark)

3 (b) (ii) What is the half-life of sodium-24?

Half-life = ... hours

(1 mark)

Question 3 continues on the next page

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3 (c) A smoke detector contains a small amount of americium-241.

Americium-241 is a radioactive substance which emits alpha particles. It has a half-life of 432 years.

3 (c) (i) Which **one** of the following statements gives a reason why the americium-241 inside the smoke detector will **not** need replacing?

Put a tick (✓) in the box next to your answer.

The alpha particles have a low energy. ☐

People replace smoke detectors every few years. ☐

Americium-241 has a long half-life. ☐

(1 mark)

3 (c) (ii) Draw a straight line from each type of radiation in **List A** to its correct property in **List B**.

Draw only **two** lines.

List A **Type of nuclear radiation**	**List B** **Property of radiation**
	Has the same mass as an electron
Beta	
	Deflected by a magnetic field but not deflected by an electric field
Gamma	
	Passes through 10 cm of aluminium

(2 marks)

8

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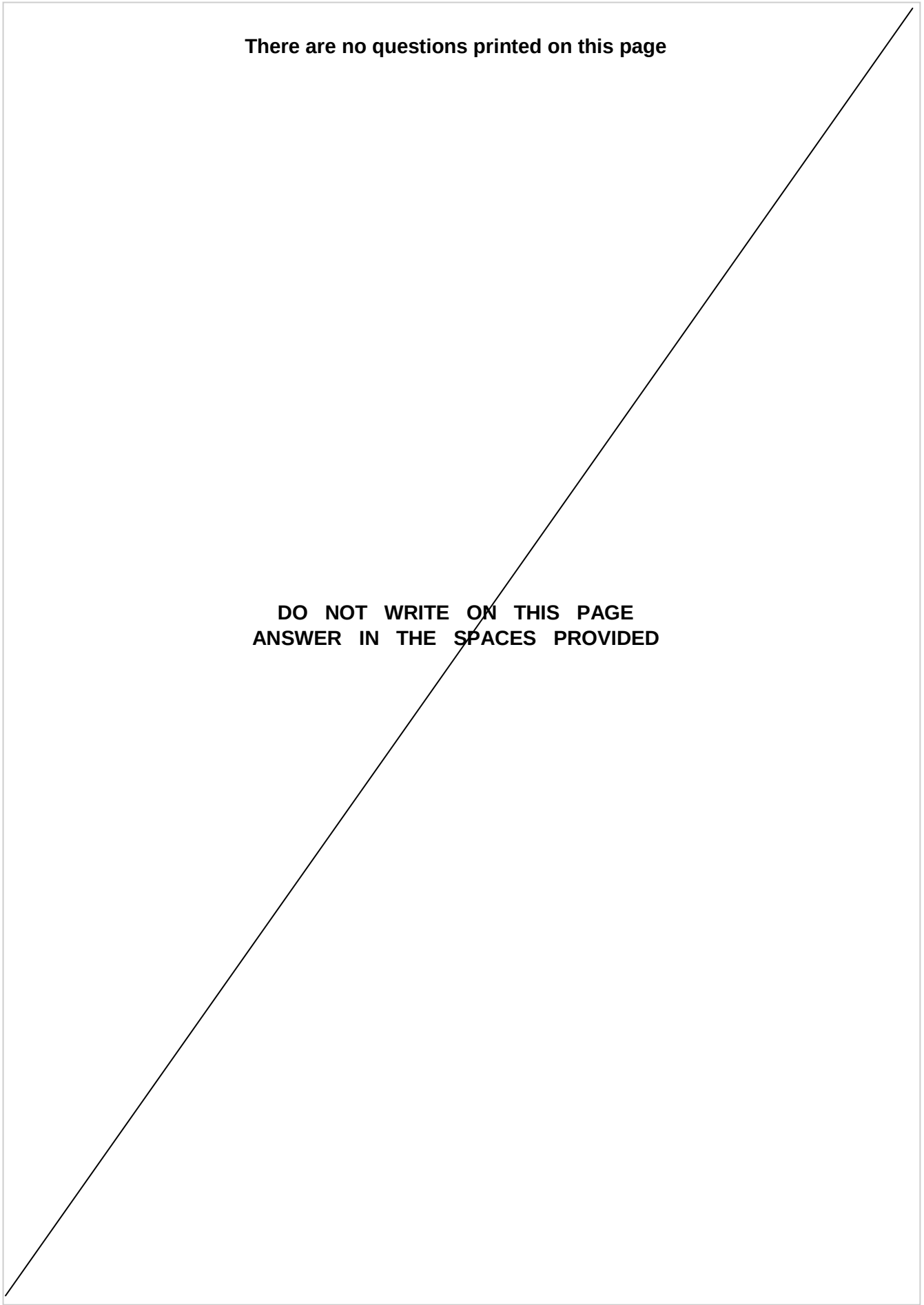
ANSWER IN THE SPACES PROVIDED



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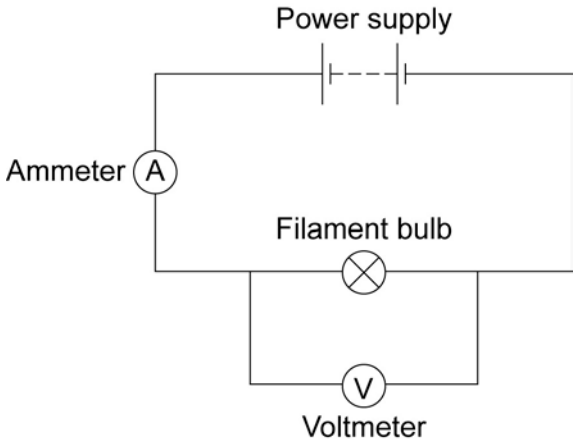
4 (a) The diagram shows a circuit used by a student to measure a current through a filament bulb and the potential difference across it.



After adding another component to the circuit, the student obtained a range of current and potential difference readings. The student's results are shown in the table below.

Current in amps	Potential difference in volts
0.10	1.0
0.15	2.0
0.20	4.0
0.25	7.0
0.30	11.0

4 (a) (i) Which **one** of the following components did the student add to the circuit?

Draw a ring around your answer.

fuse **switch** **variable resistor**

(1 mark)

4 (a) (ii) In the space below, draw the appropriate symbol for the component you have chosen.

(1 mark)

Do not write outside the box

4 (a) (iii) Use the data in the table to calculate the **maximum** power, in watts, of the filament bulb.

.....

.....

.....

Power = ...W

(3 marks)

4 (b) Draw a ring around the correct answer to complete the sentence.

As the temperature of the filament bulb increases, its resistance

increases.

remains constant.

decreases.

(1 mark)

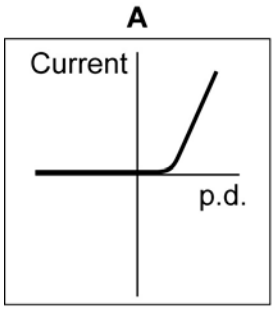
Question 4 continues on the next page

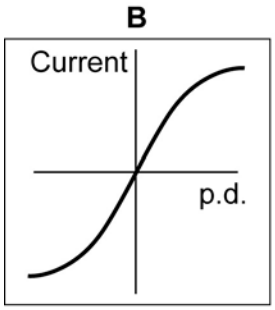
Do not write outside the box

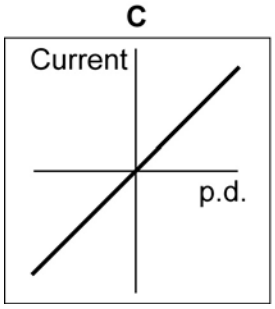
4 (c) The graphs, **A**, **B** and **C**, show how the current through a component varies with the potential difference (p.d.) across the component.

Draw a line to link each graph to the correct component.

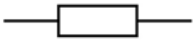
Draw only **three** lines.



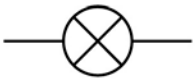




A resistor at constant temperature



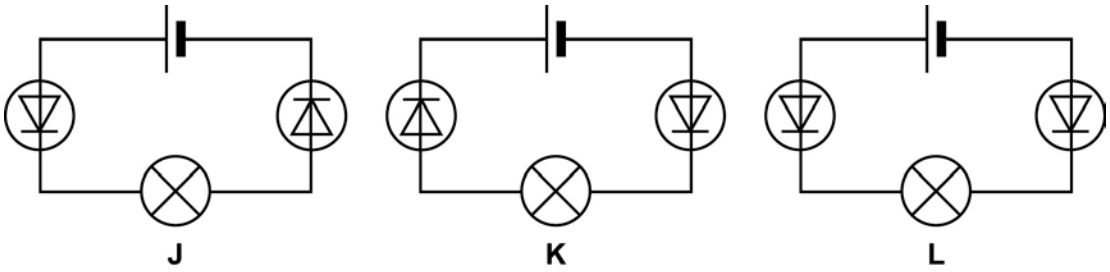
A filament bulb



A diode

(2 marks)

4 (d) Each of the circuits, **J**, **K** and **L**, include two diodes.



In which circuit, **J, K** or **L,** would the bulb be on?

(1 mark)

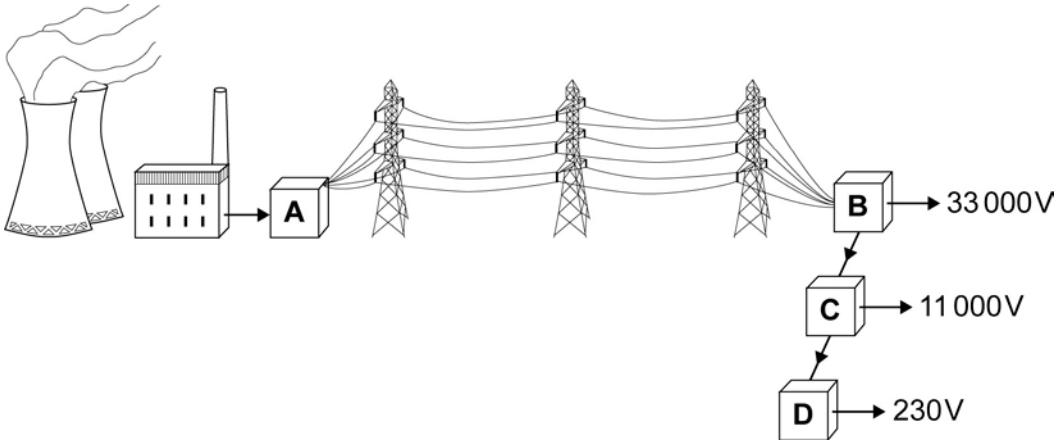
Do not write outside the box

4 (e) Electricity is generated in power stations. It is then sent to all parts of the country through a network of cables.

The network is called the National ..... .

(1 mark)

4 (f) In the diagram, **A**, **B**, **C** and **D** are transformers.



4 (f) (i) Which transformer, **A**, **B**, **C** or **D**, is a step-up transformer?

Transformer.....

(1 mark)

4 (f) (ii) Which transformer**, A, B, C** or **D,** will supply homes, offices and shops?

Transformer.....

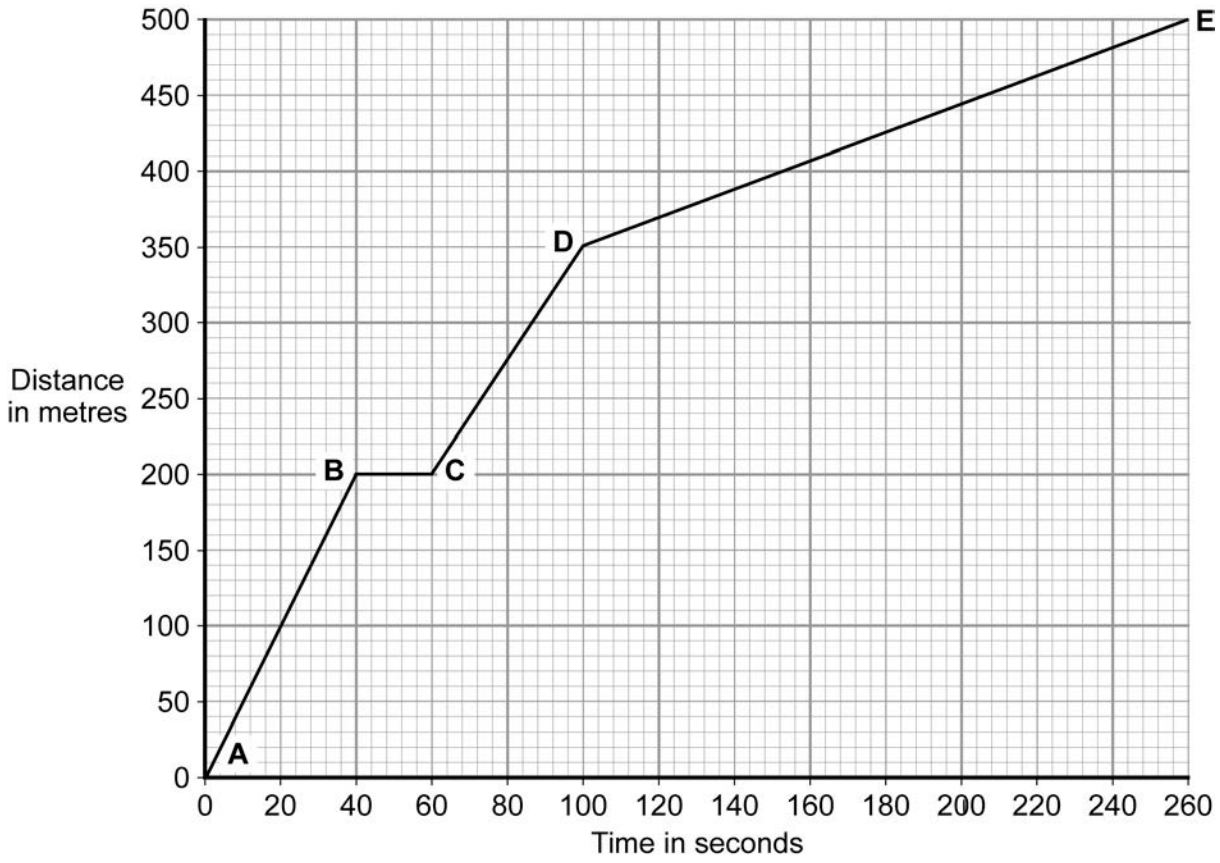
(1 mark)

12

Turn over for the next question

Do not write outside the box

5 The distance – time graph shows how far a bus travelled along a bus route and how long it took.



5 (a) The bus travels the slowest between points **D** and **E**.

How can you tell this from the graph?

.....

.....

(1 mark)

5 (b) Between which points was the bus travelling the **fastest**?

Put a tick (✓) in the box next to your answer.

Points	Tick
A and B	
B and C	
C and D	

(1 mark)

Do not write outside the box

5 (c) There is a bus stop on this part of the bus route.

This is marked as point **B** on the graph.

5 (c) (i) What is the distance between point **A** on the graph and the bus stop?

Distance .....metres
(1 mark)

5 (c) (ii) How long did the bus stop at the bus stop?

Show clearly how you work out your answer.

.....

.....

Time = ... seconds
(2 marks)

5 (d) A cyclist made the same journey along the bus route.
The cyclist started at the same time as the bus and completed the journey in 200 seconds. The cyclist travelled the whole distance at a constant speed.

5 (d) (i) Draw a line on the graph to show the cyclist's journey.
(2 marks)

5 (d) (ii) After how many seconds would the cyclist overtake the bus?

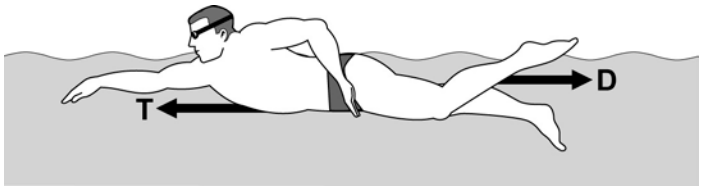
The cyclist overtook the bus after..... seconds
(1 mark)

8

Turn over for the next question

Do not write outside the box

6 The diagram shows the horizontal forces acting on a swimmer.



6 (a) (i) Force is an example of a vector quantity.

State what is meant by a *vector* quantity.

.....

.....

(1 mark)

6 (a) (ii) The swimmer is moving at a constant speed.
Force **T** is 120 N.

What is the size of force **D**?

..... N

(1 mark)

6 (a) (iii) By increasing force **T** to 140 N, the swimmer accelerates to a higher speed.

Calculate the size of the resultant force now acting on the swimmer.

.....

Resultant force = ... N

(1 mark)

Do not write outside the box

6 (a) (iv) Even though the swimmer keeps the force **T** constant at 140 N, the resultant force on the swimmer decreases to zero.

Explain why.

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.....

.....

.....

.....

(3 marks)

Question 6 continues on the next page

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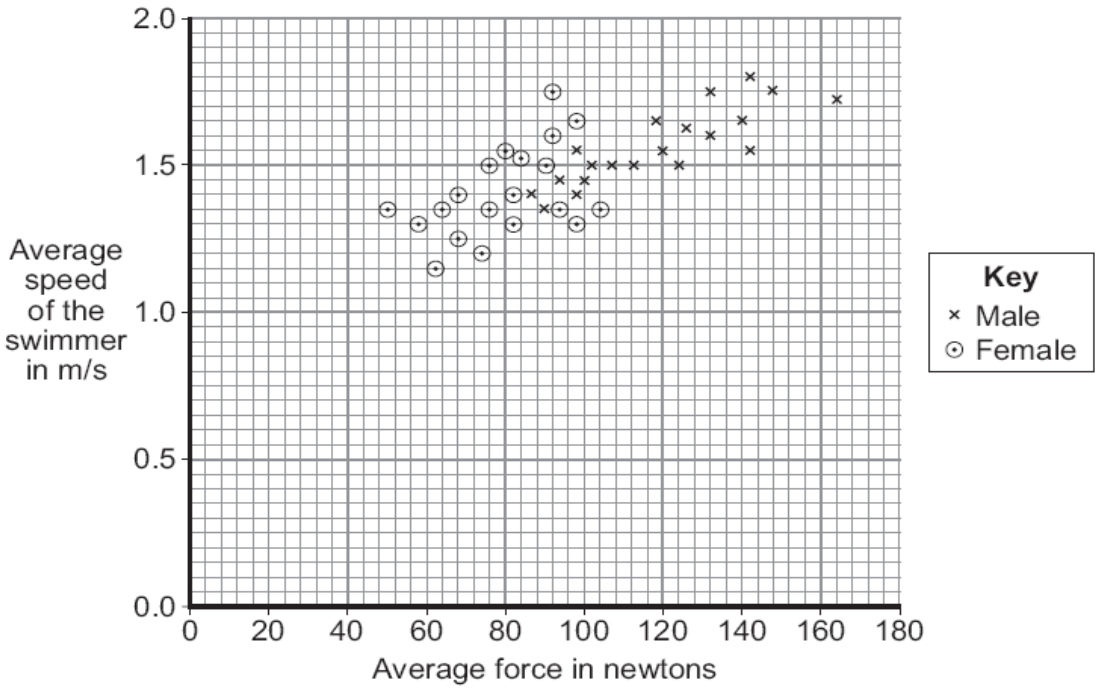
6 (b) A sports scientist investigated how the force exerted by a swimmer's hands against the water affects the swimmer's speed.

The investigation involved 20 males and 20 females swimming a fixed distance. Sensors placed on each swimmer's hands measured the force many times every second over the last 10 metres of the swim.

The measurements were used to calculate an average force.
The average speed of each swimmer over the last 10 metres of the swim was also measured.

The data from the investigation is displayed in the graph.



6 (b) (i) What was the dependent variable in this investigation?

.....

(1 mark)

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6 (b) (ii) Give **one** reason for measuring the force many times every second rather than just once every second.

.....

.....

(1 mark)

6 (b) (iii) Give **two** ways in which the data for the male swimmers is different from the data for the female swimmers.

.....

.....

.....

.....

(2 marks)

6 (b) (iv) Considering **only** the data from this investigation, what advice should a swimming coach give to swimmers who want to increase their average speed?

.....

.....

(1 mark)

11

END OF QUESTIONS

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