ST EDWARD'S

OXFORD

16+ ENTRANCE EXAMINATION

For entry in September 2016

Physics

(Use of a calculator is permitted)

Time: 1 hour

Candidate First Name: ……

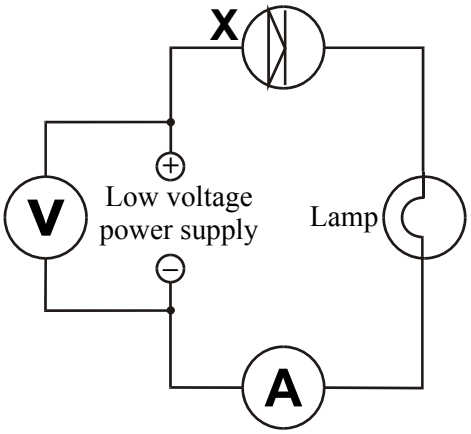
Candidate Surname: ……

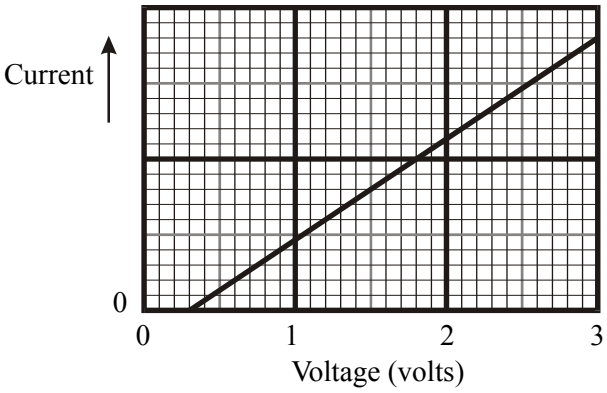
For Internal Use by St Edward's School:

Question Number:	Marks Allocated:
1	/7
2	/8
3	/6
4	/5
5	/6
6	/5
7	/5
8	/9
9	/4
10	/5
TOTAL:	/60
GRADE:	

1. Some students want to find out how the current through component X changes with the voltage they use.

The diagram shows the students' circuit. The graph shows the students' results.





(a) Describe, as fully as you can, what happens to the current through component X as the students both vary and reverse the voltage.

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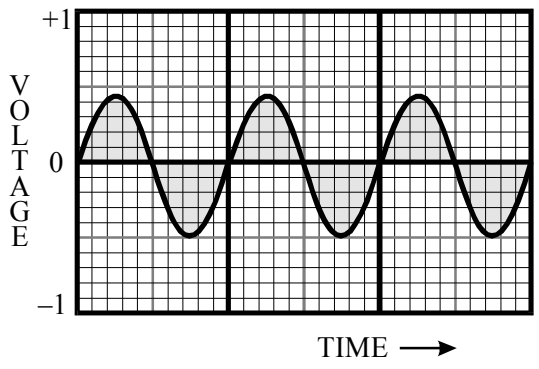
(5)

(b) The low voltage supply is changed to a.c.

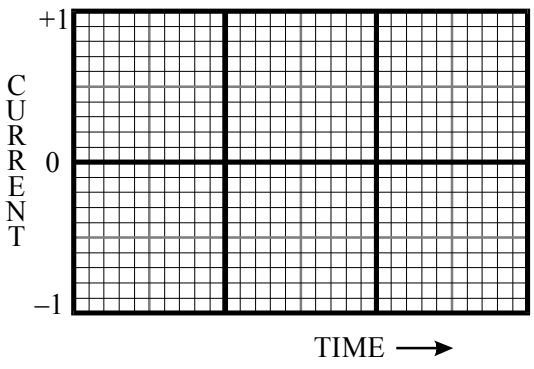
The voltage between terminals P and Q of the supply then constantly changes as shown on Graph A.

Complete Graph B to show what would then happen to the current through component X.

GRAPH A



GRAPH B



The time scale is the same on both graphs

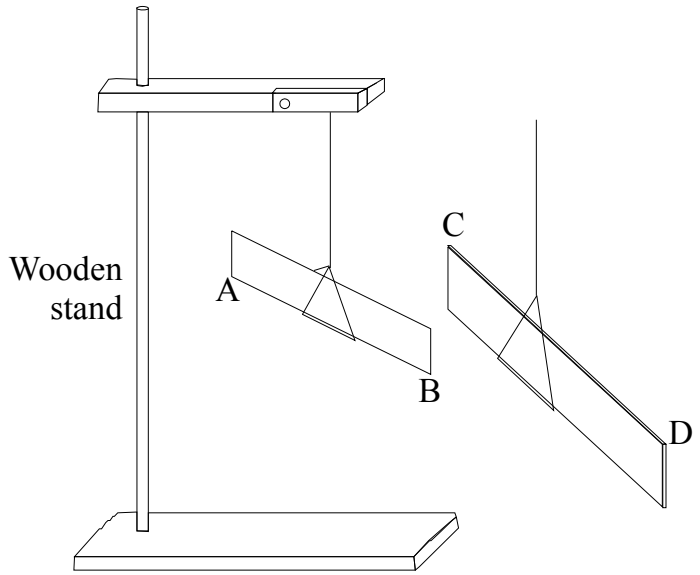
(2)

(Total 7 marks)

2. A pupil did an experiment following the instructions below.

1. Take a polythene rod (AB), hold it at its centre and rub both ends with a cloth.
2. Suspend the rod, without touching the ends, from a stand using a stirrup and nylon thread.
3. Take a perspex rod (CD) and rub it with another cloth.
4. Without touching the ends of the perspex rod bring each end of the perspex rod up to, but without touching, each end of the polythene rod.
5. Make notes on what is observed.

The diagram below shows how the apparatus is to be set up.



(a) When end C was brought near to end B they attracted each other.

(i) Explain why they attracted each other.

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.....

(ii) What would happen if end C were brought near end A?

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(3)

(b) The experiment was repeated with two polythene rods.

(i) Describe what you would expect the pupil to observe as the end of one rod was brought near to the end of the other.

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(ii) Explain your answer.

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(2)

(c) Explain, in terms of electron movement, what happened as the rods were rubbed with the cloths?

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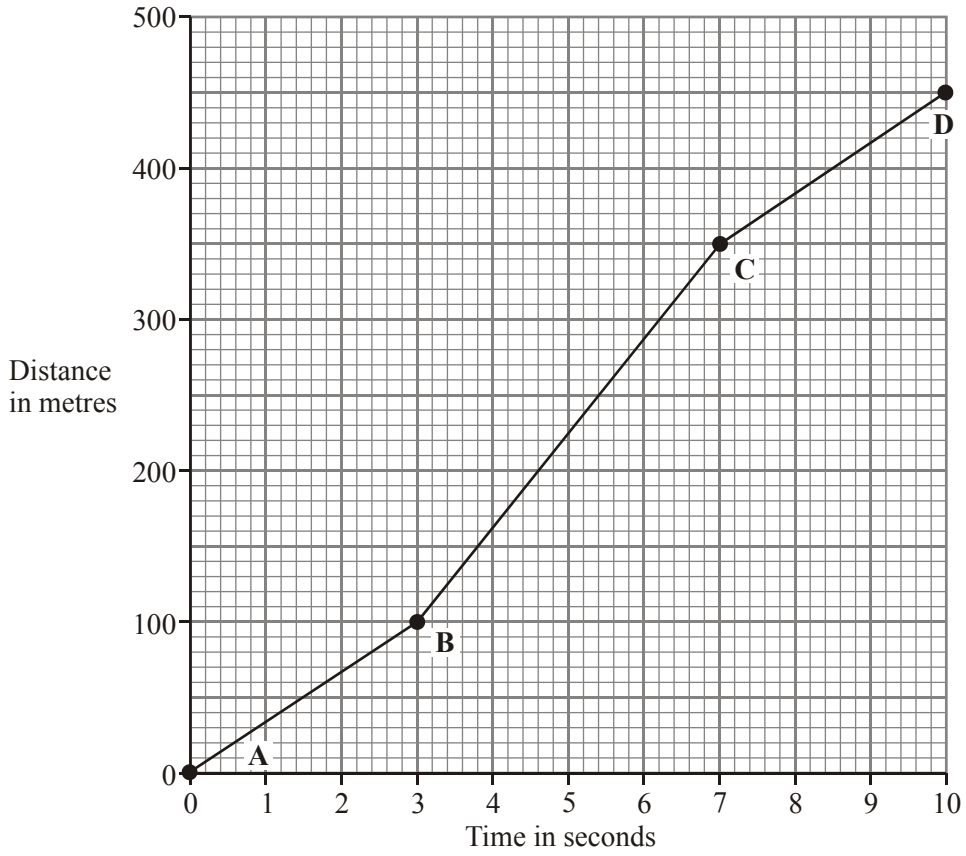
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(3)
(Total 8 marks)

3. The distance-time graph represents the motion of a car during a race.



(a) Describe the motion of the car between point **A** and point **D**. You should not carry out any calculations.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(3)

(b) Calculate the gradient of the graph between point **B** and point **C**. Show clearly how you get your answer.

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Gradient = ...

(3)

(Total 6 marks)

4. A car which is moving has kinetic energy.



The faster a car goes, the more kinetic energy it has. The kinetic energy of this car was 472 500 J when travelling at 30 m/s.
Calculate the total mass of the car.
Show clearly how you work out your answer and give the unit.

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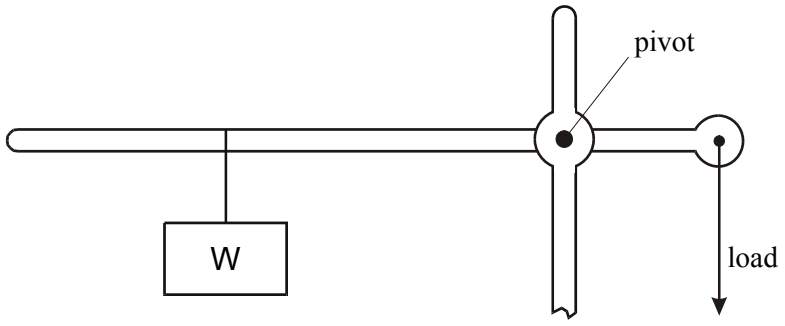
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Mass of the car = ...

(Total 5 marks)

5. The diagram below shows an outline of a balance. The balance is used to weigh lorries. A fraction of the weight of a lorry is used as the load on the right side of the pivot.

A standard weight W is moved along the arm until the weight of the load is balanced.



(a) As the weight W is moved away from the pivot it can support a heavier load.
Why is this?

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(2)

(b) (i) The weight W is 100 N. When it is 0.2 m from the pivot it balances the load.
Calculate the moment of the weight W about the pivot.

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Answer ..... Nm

(2)

(ii) The load is one hundredth of the weight of the lorry and is 0.02 m from the pivot.
Calculate the weight of the lorry.

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Answer ..... N

(2)

(Total 6 marks)

6. (a) Ultraviolet and visible light are both electromagnetic waves.

(i) Name **one** other type of electromagnetic wave.

……

(1)

(ii) Which **one** of the following statements is true for electromagnetic waves travelling through a vacuum?

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

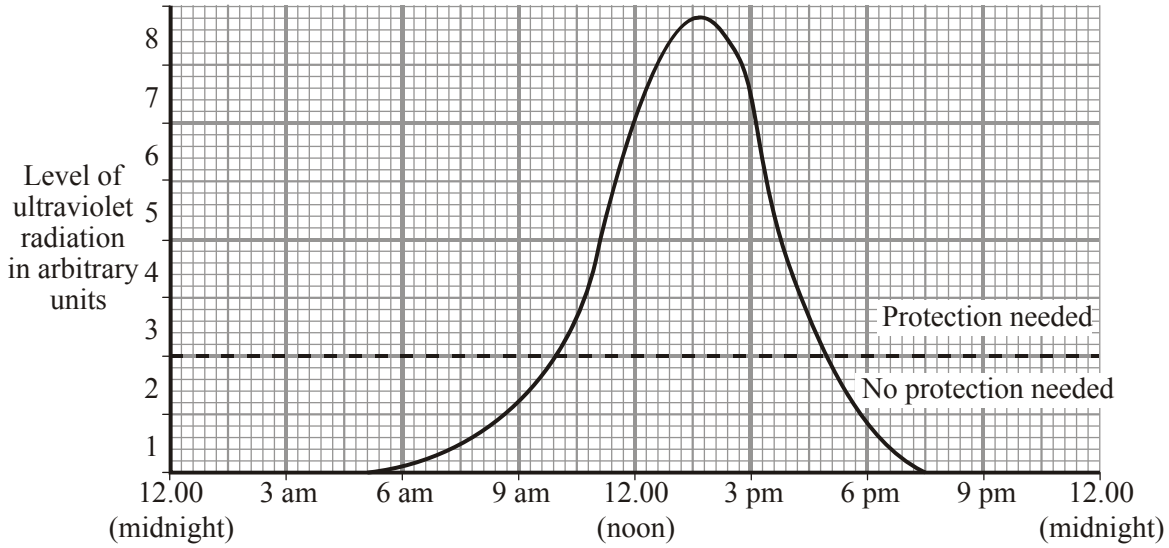
All the waves have the same frequency. ☐

All the waves have the same wavelength. ☐

All the waves travel at the same speed. ☐

(1)

(b) The graph shows how the level of ultraviolet radiation changed during a summer day in England.



(i) What serious health problem can be caused by exposure to the ultraviolet radiation from the Sun?

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(1)

(ii) Explain why it would be sensible to stay out of the Sun between 10 am and 4 pm in the summer.

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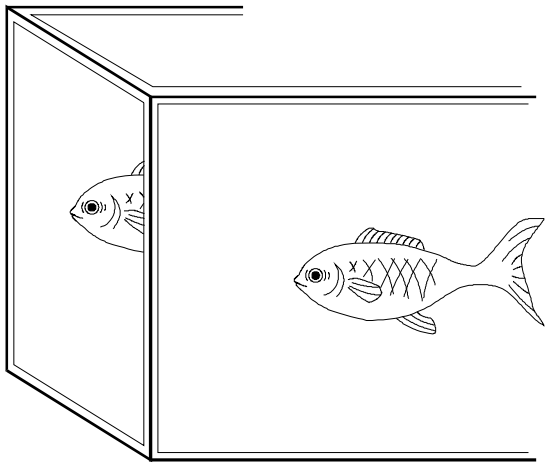
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(2)

(Total 5 marks)

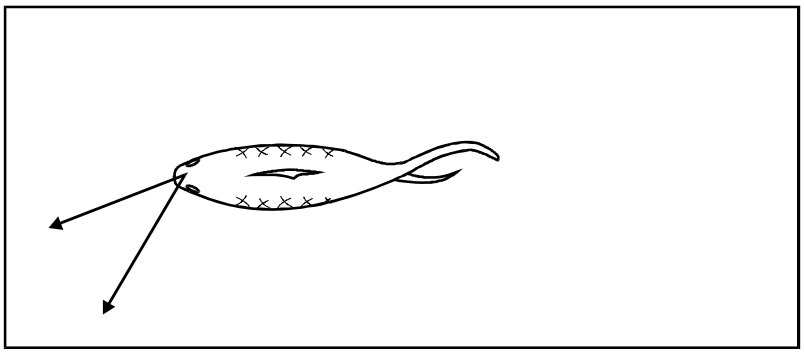
7. An aquarium contains only one fish. But if you look at the comer of the aquarium, there seem to be two fish.



The diagram below shows the top of the aquarium.

Two light waves have been drawn from the fish.

(a) Complete the diagram to show how the light waves reach the eye.





(2)

(b) Complete each sentence by using the correct words from the box.

colour	diffraction	longitudinal	reflection
refraction	speed	transverse	

When the light waves pass from glass into the air they change .....

This causes a change in direction called .....

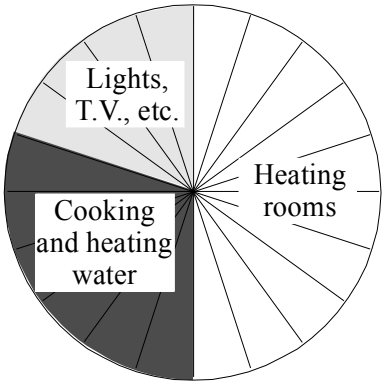
Light waves are ..... waves.

(3)

(Total 5 marks)

8. (a) The pie-chart shows how energy is used in a home.

Complete the table using the information on the pie-chart.

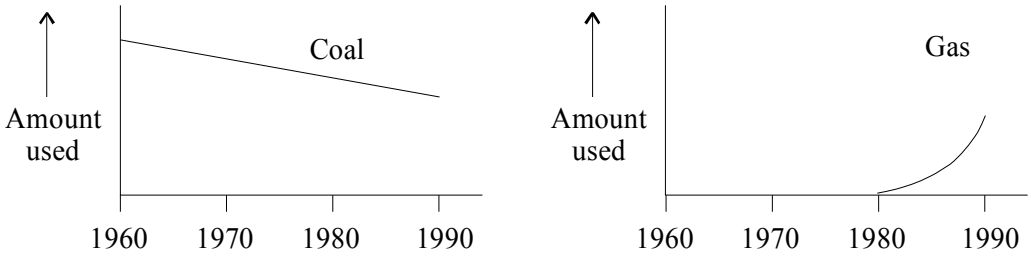


USE OF ENERGY	%
lights, T.V., etc.	20
cooking and heating water	
heating rooms	

(2)

(b) We get some of the energy we need in our homes from electricity.

The graphs show how the amounts of coal and gas used to generate electricity changed between 1960 and 1990.



Describe these changes.

Coal .....

.....

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Gas .....

.....

.....

(4)

(c) Read the information below.

- More carbon dioxide in the air may change the weather. Farmers may then not be able to produce the food we need.
- Burning coal produces sulphur dioxide. Burning gas does not do this.
- It is cheaper to generate electricity from gas than from coal.
- Sulphur dioxide causes acid rain which can kill fish and damage buildings.
- Two power stations generate the same amount of electricity. The one which burns gas produces less carbon dioxide than the other which burns coal.

Many people say that the change from coal to gas is better for the environment.

Why do you think they say this?

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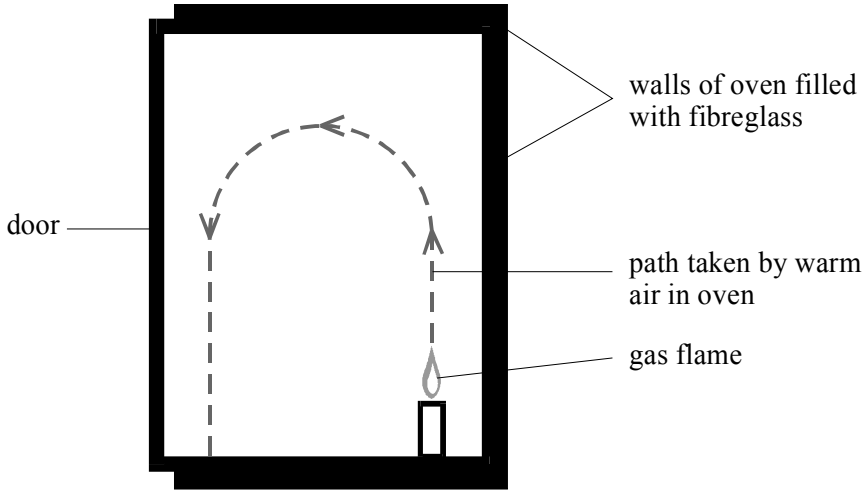
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(3)

(Total 9 marks)

9. The diagram shows a section through a gas oven.



Use words from the list to complete the sentences.

conduction **convection** **insulation** **radiation** **resistance**

The outside of the door gets hot because energy is transferred through

the door by .....

Energy is transferred from the gas flame to the rest of the oven by the movement of air.

This type of energy transfer is called .....

The walls of the oven are packed with fibreglass to reduce energy transfer. Energy transfer

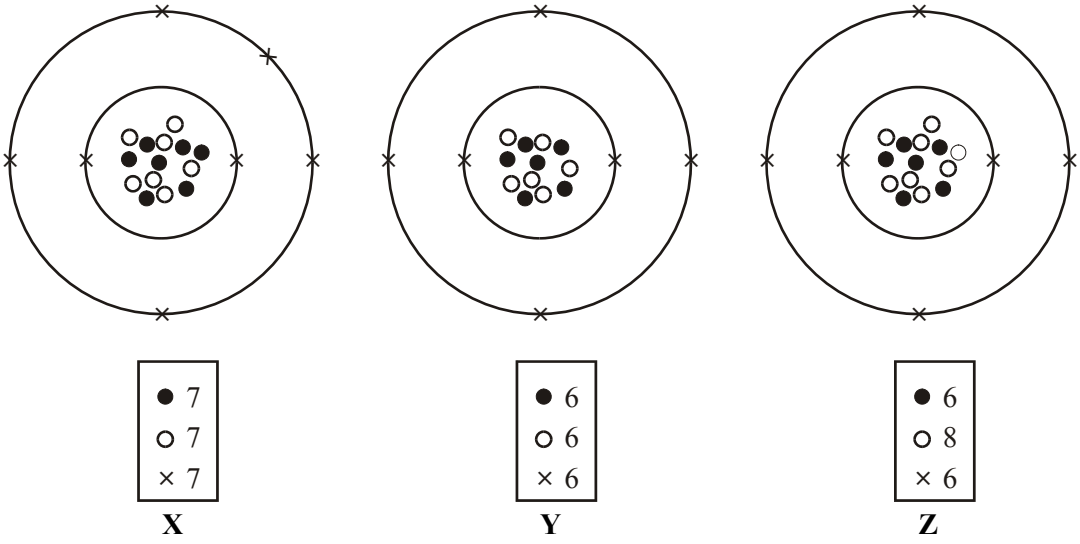
is reduced because fibreglass provides good .....

The outside of the cooker is white and shiny.

This reduces energy transfer by .....

(Total 4 marks)

10. (a) The diagrams represent three atoms **X**, **Y** and **Z**.



Which **two** of the atoms are from the same element?

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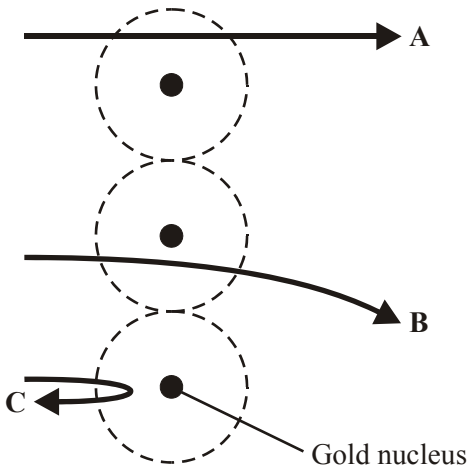
Give a reason for your answer.

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(2)

(b) In the early part of the 20th century some scientists investigated the paths taken by positively charged alpha particles into and out of a very thin piece of gold foil. The diagram shows the paths of three alpha particles.



Explain the different paths **A**, **B** and **C** of the alpha particles.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(3)

(Total 5 marks)