Rewarding Learning

71	

Candidate Number

General Certificate of Secondary Education
2010

Science: Physics

Paper 1
Foundation Tier

[G7602]

G7602

FRIDAY 28 MAY, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all five** questions.

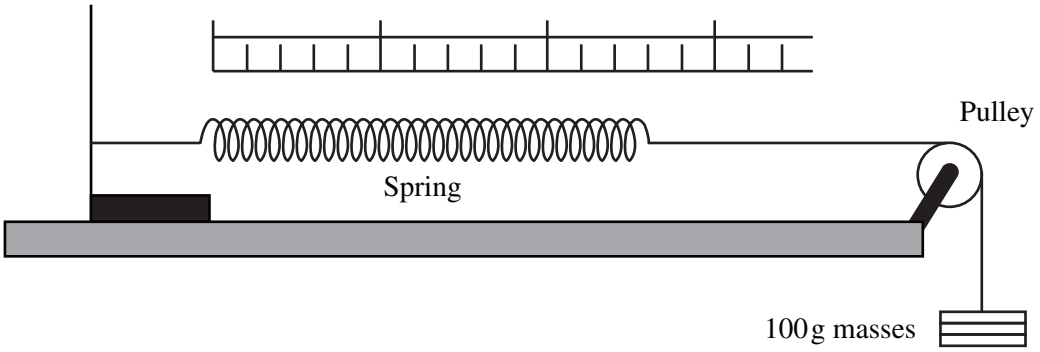
INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Quality of written communication will be assessed in question **1(c)(iv)**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Details of calculations should be shown.
Units must be stated with numerical answers where appropriate.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
Total Marks	

Examiner Only	
Marks	Remark

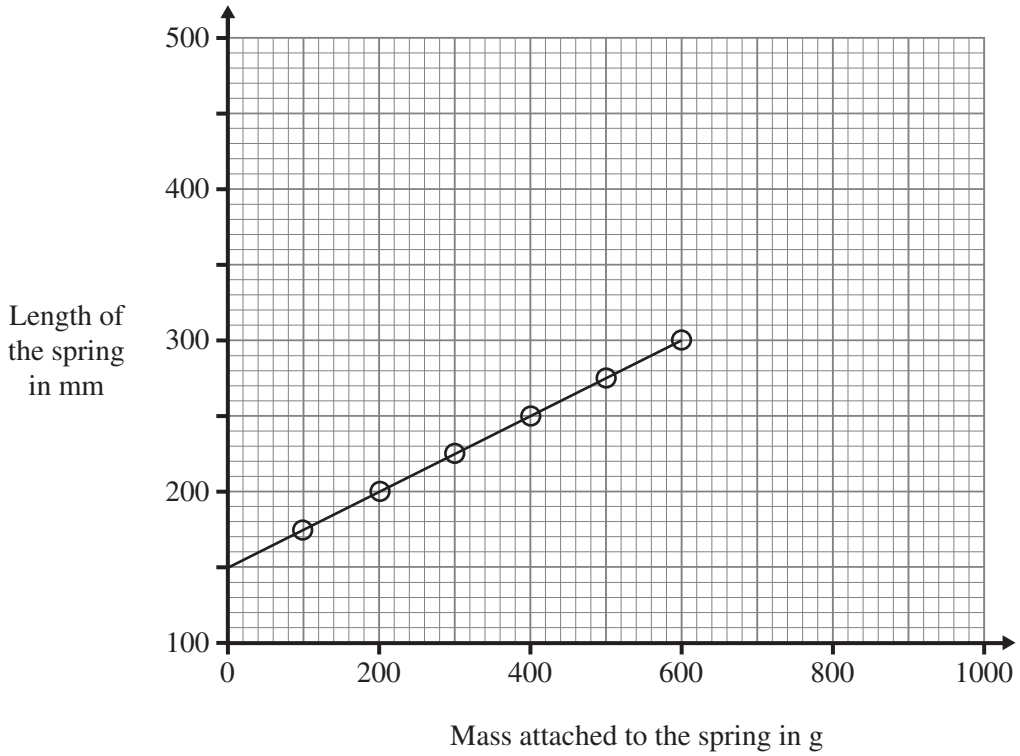
1 **(a)** John sets up the apparatus shown below. He uses it to discover how the length of the spring changes as he increases the force stretching it. He changes this force by adding 100 g masses to a length of string attached to the spring.



(i) What is the force provided by attaching a 100 g mass to the string?

Force = _____ N [2]

The graph below shows some of John's results.



(ii) Use the graph to find the unstretched length of the spring.

_____ mm [1]

(iii) Use the graph to find the extension of the spring for each 100 g mass added.

Extension for each 100 g mass = _____ mm [1]

(iv) The 100 g masses are removed and replaced by an object. The length of spring is then measured as 250 mm. Use the graph to read off the mass of this object.

Mass = _____ g [2]

(v) State Hooke's law.

_____

_____

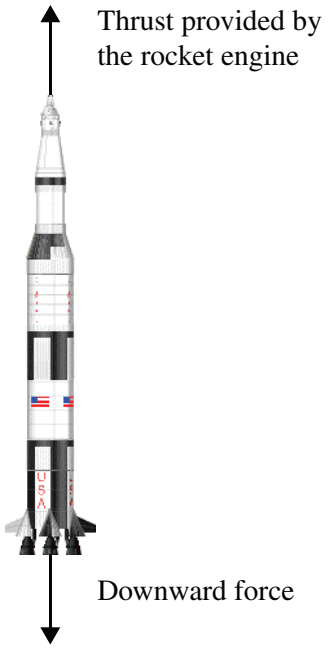
_____ [2]

(vi) John discovers that the spring obeys Hooke's law for masses up to a maximum of 800 g.
On the grid, continue the graph to show its shape up to 800 g and from 800 g to 1000 g. [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(b) The diagram below shows a space rocket and two of the forces acting on it a short time after its launch.



(i) What provides the downward force on the rocket?

_____ [1]

(ii) The upward thrust force is **greater** than the downward force. Tick (✓) the statement below which best describes the upward motion of the rocket.

The rocket is slowing down. ☐

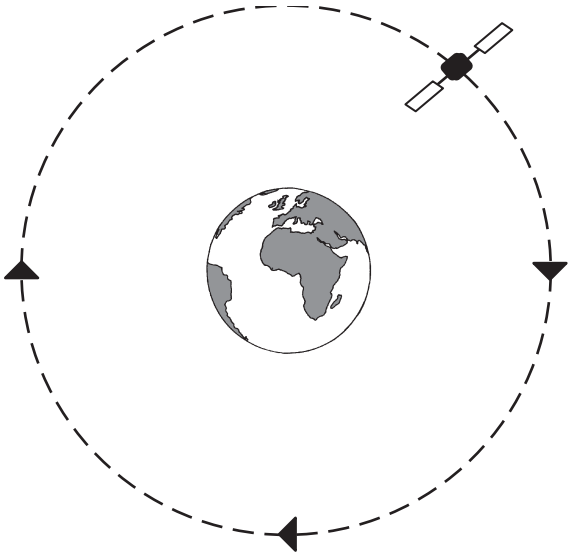
The rocket is moving with constant speed. ☐

The rocket is speeding up. ☐ [1]

(c) Rockets of this type are used to place satellites in orbit around the Earth.

Examiner Only	
Marks	Remark

(i) On the diagram below, draw an arrow to show the direction of the centripetal force acting on the satellite that is orbiting the Earth. **Make sure you label this arrow F**. [1]



(ii) What provides this centripetal force?

_____ [1]

(iii) On the diagram above, draw an arrow to show the direction of the satellite's velocity. **Make sure you label this arrow V**. [1]

(iv) Explain why a satellite's velocity is different from its speed.

_____

_____ [1]

Quality of written communication [1]

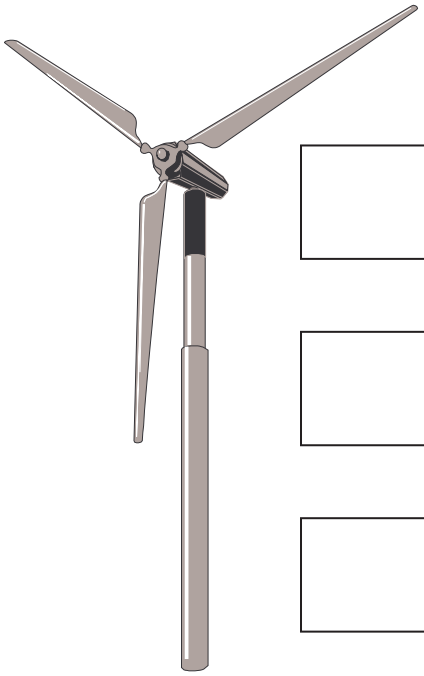
(v) This satellite takes 1.5 hours to complete one orbit.
The distance it travels in one orbit is 40 000 km. Calculate its average speed in kilometres per hour.

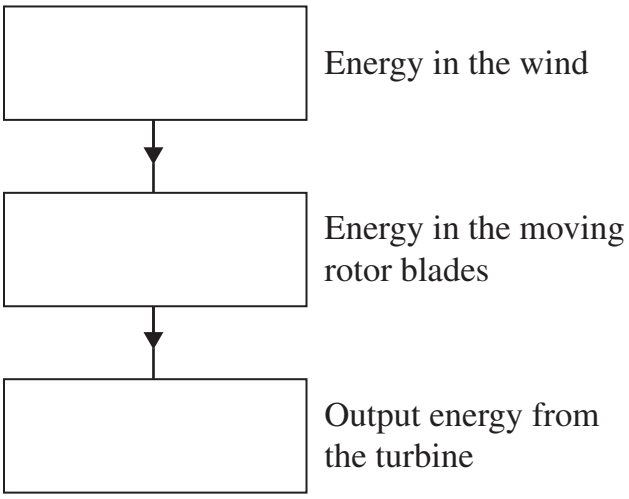
Speed = _____ km/h [3]

Examiner Only	
Marks	Remark

2 **(a)** The use of wind turbines is on the increase.

(i) Complete the boxes below naming the main energy changes taking place in a wind turbine.





[3]

(ii) Name two unwanted forms of energy that result from the use of wind turbines.

1. _____ 2. _____ [2]

(iii) Apart from environmental concerns, what is the main disadvantage of wind turbines compared with the use of fossil fuels?

_____

_____[1]

(iv) The efficiency of a wind turbine is 0.3 (30%). Explain carefully what this means.

_____

_____

_____[2]

(b) Global warming is seen by many as a major threat to many countries and peoples.

Examiner Only	
Marks	Remark

(i) What human activity is seen as a major contributor to global warming?

_____

Describe briefly how it contributes to global warming.

_____

_____[2]

(ii) Nuclear power is seen by some as a solution to the problem of global warming. Explain briefly why this is.

_____

_____

_____[1]

(iii) Why is the waste resulting from the use of nuclear power considered to be dangerous?

_____[1]

(iv) What element is used as the fuel in nuclear power stations?

_____[1]

(v) Nuclear power is a **non-renewable** source of energy.
Explain why it is described in this way.

_____

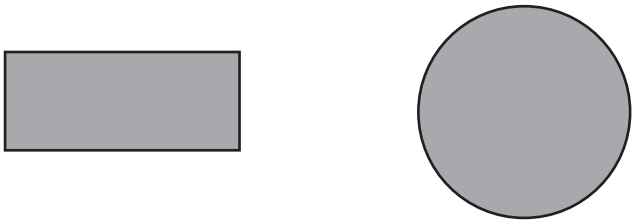
_____

_____[1]

Examiner Only	
Marks	Remark

(c) The diagrams show a cardboard rectangle and circle.

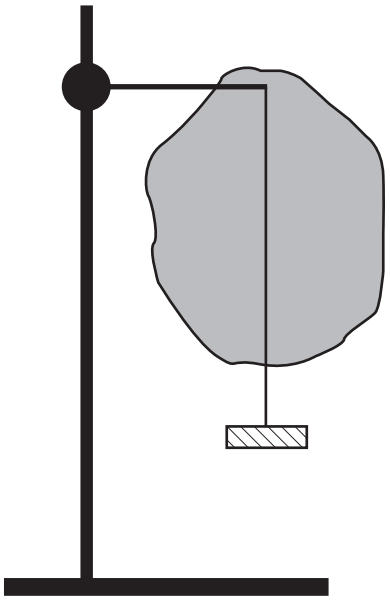
(i) Label the centre of mass (centre of gravity) of each with an X.



[2]

Clare is given a piece of cardboard with an irregular shape as shown below.
She suspends the cardboard from a retort stand using a pin so that it can swing freely.
When it comes to rest she hangs a plumbline (a length of string with a weight attached) from the pin as shown in the diagram.

(ii) Mark on the diagram where you think the centre of mass of the cardboard might be. Use an X.



[1]

(iii) Describe what Clare needs to do to find accurately the position of the centre of mass of the cardboard.

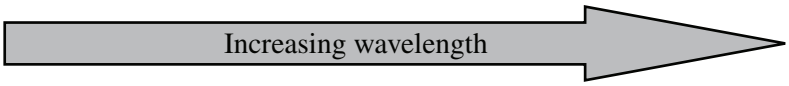
_____

_____

_____ [3]

3 **(a)** The electromagnetic spectrum is a set of transverse waves.
Three members of the electromagnetic spectrum are shown below.

(i) Write the names of the other four members of the electromagnetic spectrum in the appropriate boxes.



Gamma rays			Visible light		Microwaves	

[4]

(ii) State a property unique to electromagnetic waves.

_____[1]

(b) Which member of the electromagnetic spectrum is used:

(i) to sterilize medical instruments _____

(ii) to heat food quickly _____

(iii) in sunbeds to give a tan? _____[3]

(c) **(i)** Explain what a luminous object is.

_____[1]

(ii) Give an example of a luminous object.

_____[1]

(iii) Explain what a non-luminous object is.

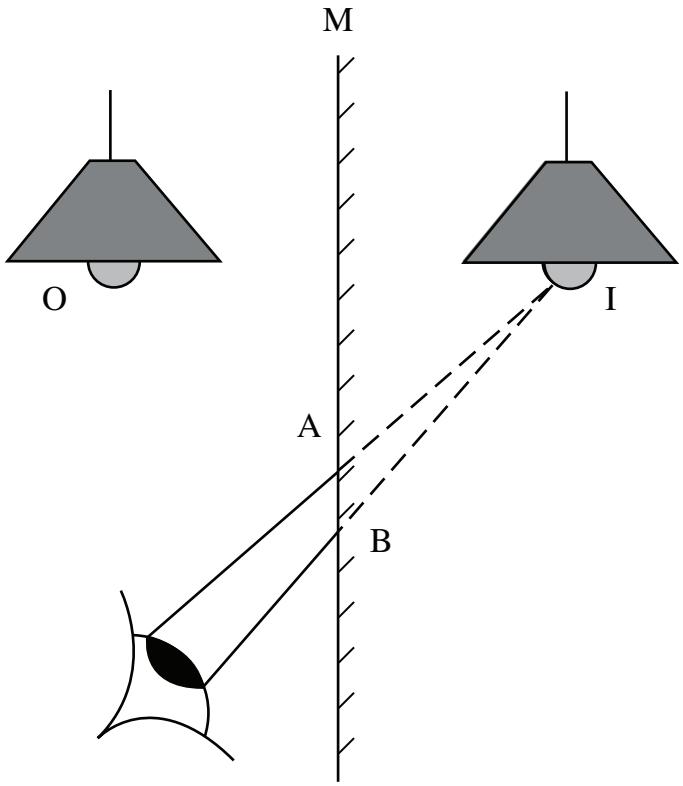
_____[1]

(iv) Give an example of a non-luminous object.

_____[1]

Examiner Only	
Marks	Remark

(d) The incomplete ray diagram below shows the image I of a lamp O, in a plane mirror M.



Draw on the diagram;

(i) the normals at points A and B. [1]

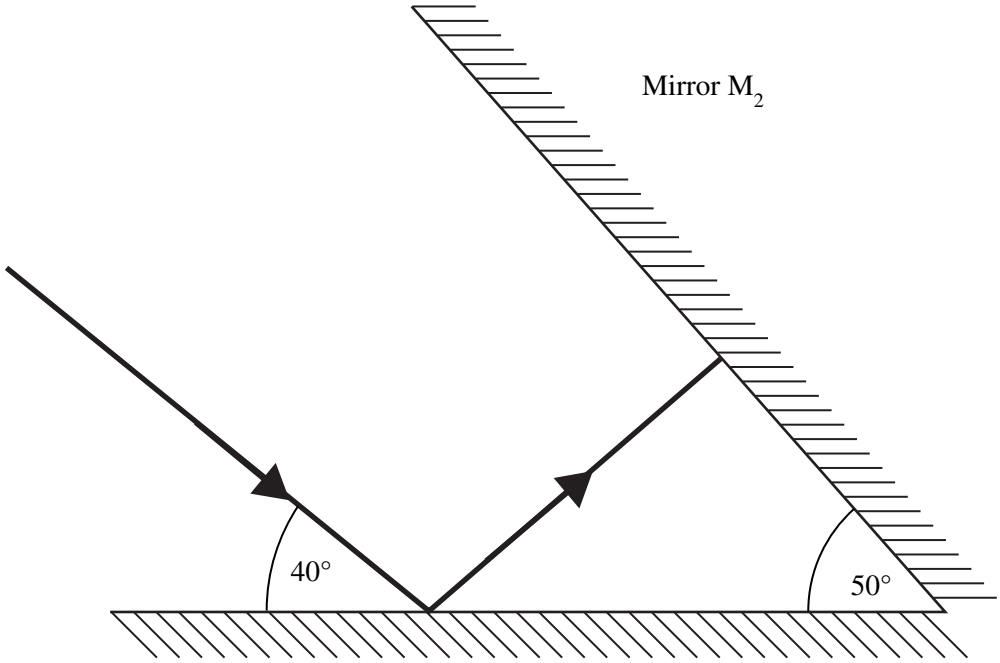
(ii) the corresponding incident rays. [1]

(iii) arrows to show the direction of the incident rays. [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(e) Two plane mirrors, M_1 and M_2 are inclined at 50° to each other as shown in the diagram below. A ray of light strikes M_1, so that the angle between the mirror and the ray is 40°.



(i) Calculate the angle of incidence at M_1.

Angle of incidence at M_1 = _____ [1]

(ii) State the angle of reflection at M_1.

Angle of reflection at M_1 = _____ [1]

(iii) Calculate the angle of incidence at M_2.

Angle of incidence at M_2 = _____ [2]

(iv) Draw on the diagram an arrow to show the path of the reflected ray from M_2. [1]

Examiner Only	
Marks	Remark

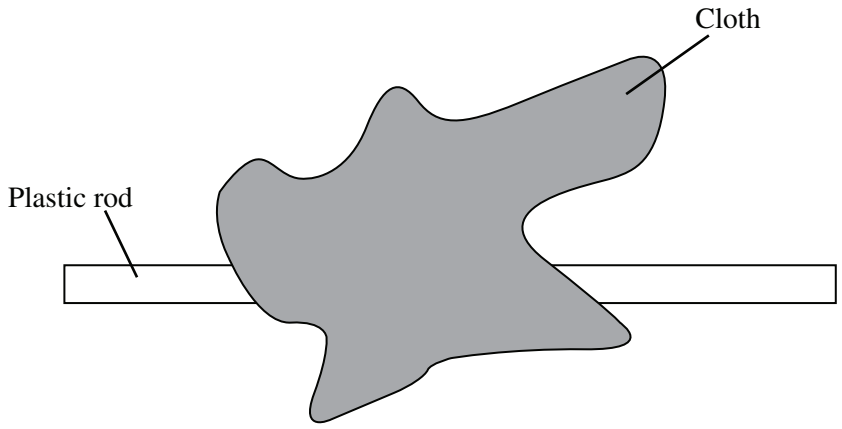
4 **(a)** Atoms contain electric charges.

(i) Explain how an atom can be neutral.

_____

_____ [1]

A cloth is rubbed on a plastic rod. This makes electrons move from the cloth to the rod.



(ii) What kind of electric charge does an electron have?

_____ [1]

(iii) What effect does the movement of the electrons have on the charge of the cloth and the charge of the plastic rod?

_____

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

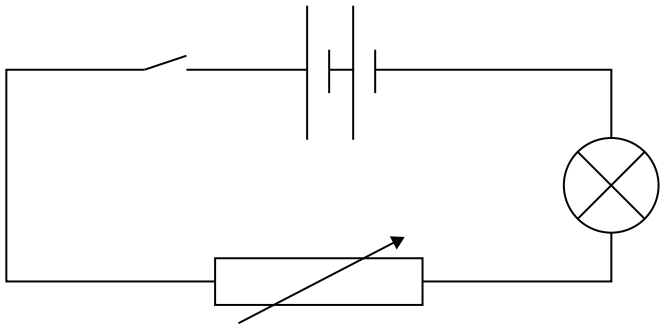
(b) **(i)** Name the instrument used to measure the electric current in a circuit.

_____ [1]

(ii) What is the unit of electric current?

_____ [1]

The current can be changed in the circuit shown below.



(iii) How will it be possible to know whether the current is being increased or decreased or staying the same in this circuit?

_____

_____

_____ [2]

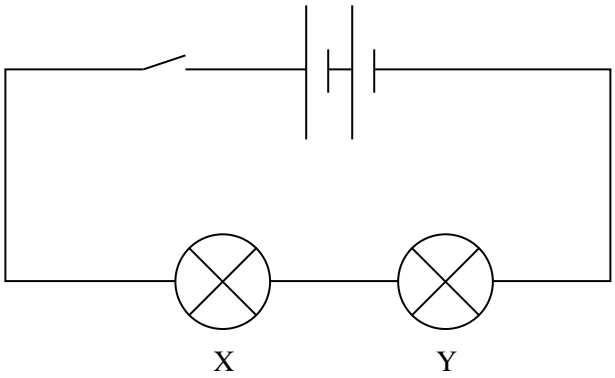
On the diagram **above** mark the following.

(iv) The positive terminal of the battery, using a + sign. [1]

(v) The direction of electron flow in this circuit, using an arrow. [1]

Examiner Only	
Marks	Remark

(c) Two lamps are connected as shown below.



(i) What name is given to the way the lamps are connected in this circuit?

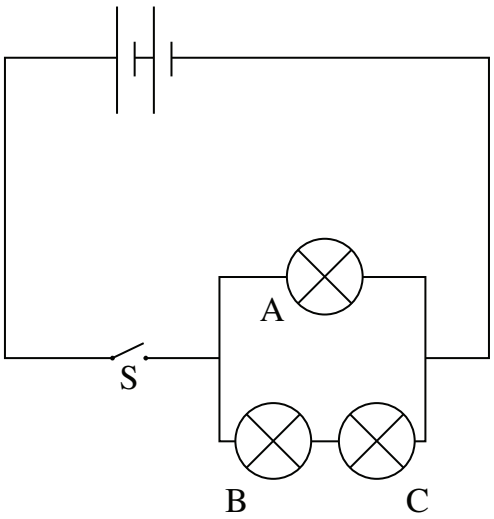
_____[1]

When the switch is closed, the current flowing in bulb Y is 0.25 A.

(ii) Is the current flowing through the switch smaller than, equal to or greater than 0.25 A?

_____[1]

(d) The circuit shown in the diagram below is set up.



(i) On the circuit diagram, using the correct symbol, show how a voltmeter should be connected to measure the voltage across lamp A. [1]

When the switch is closed, it is found that the current flowing in lamp A is 0.2 A and the current flowing in lamp B is 0.15 A.

(ii) What is the current flowing through the switch S?
You are advised to show clearly how you get your answer.

Current = _____ A [1]

Lamps B and C are **identical**. The voltage across lamp B is 1.4 V.

(iii) What is the voltage across lamp C?

Voltage = _____ V [1]

(iv) What is the voltage across lamp A?
You are advised to show clearly how you get your answer.

Voltage = _____ V [2]

(v) What is the resistance of lamp A?
You are advised to show clearly how you get your answer.

Resistance = _____ Ω [3]

Examiner Only	
Marks	Remark

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5 **(a)** **(i)** Name the three particles that make up an **atom**.

_____

_____

_____ [3]

(ii) Name the particles that are together in the **nucleus** of an atom.

_____

_____ [1]

A nucleus has an atomic number 3 and mass number 7.

(iii) What does this tell you about the particles that make up the nucleus?

_____

_____ [2]

(b) **(i)** What is a beta particle?

_____ [1]

(ii) What part of the atom emits a beta particle?

_____ [1]

(iii) Name the two other radiations that can be emitted by a radioactive substance.

_____ [2]

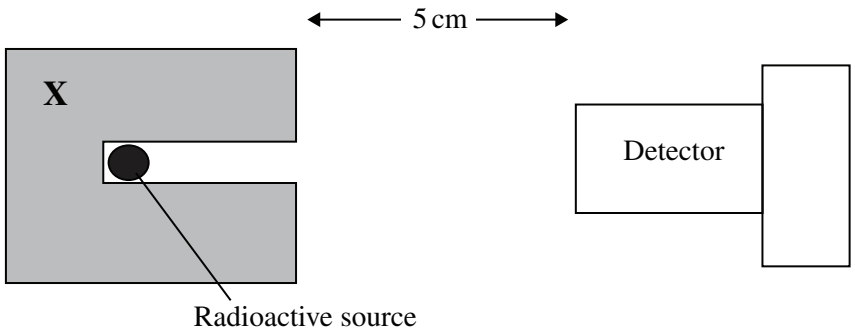
(iv) A sheet of paper can stop **one** of these three radiations. Which one?

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(c) A beta-emitting radioactive source is placed 5 cm from a detector, as shown in the diagram below. The radioactive source is surrounded by a substance **X** on all sides, except for a narrow opening on the right.



(i) Name the substance **X** surrounding the source.

_____[1]

(ii) Give two reasons why the substance **X** is used in this way.

1. _____

_____

2. _____

_____[2]

(iii) Give one reason why even a weak radioactive source should be handled using tongs.

_____

_____[1]

You are provided with a number of aluminium squares, each 1 mm thick.

(iv) Describe, briefly, how you would use the equipment shown opposite and the aluminium squares, to measure the range of the beta particles in aluminium.

_____

_____

_____

_____

_____

_____

_____

_____ [5]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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