Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015

GCSE Physics

Unit 1

Foundation Tier

GPH11

[GPH11]

FRIDAY 12 JUNE, AFTERNOON

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.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **2(c)**.

1 (a) (i) In Physics, displacement is different from distance.
Explain why this is.

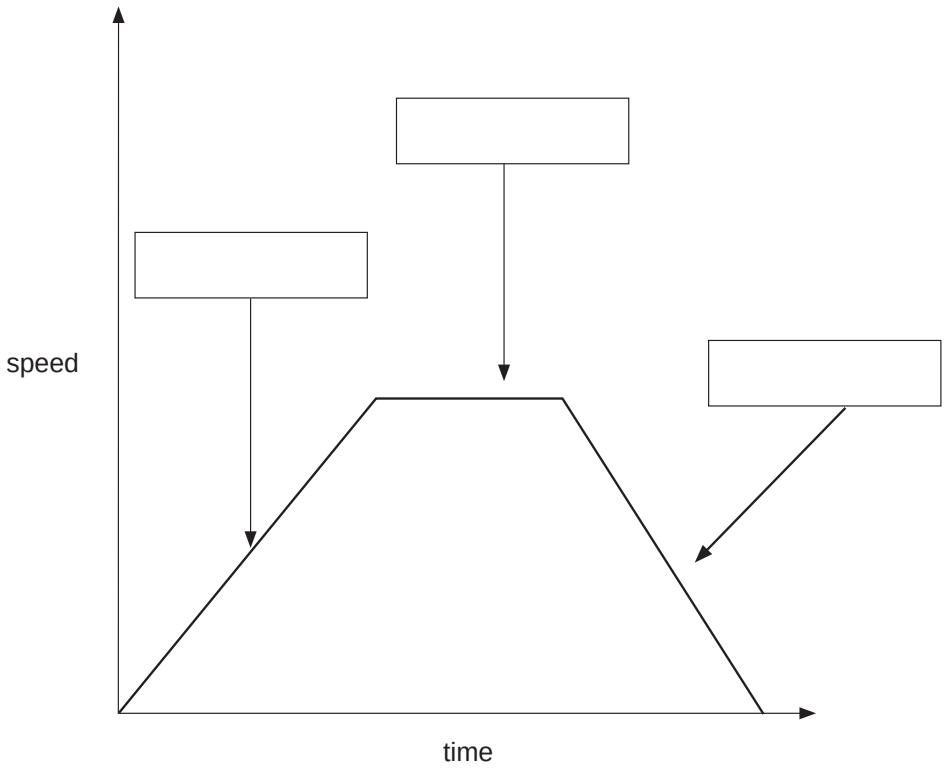
_____

_____

_____ [1]

(ii) Below is a speed–time graph. Label the parts of the graph to which the arrows point. Choose your answers from the words listed below. Write your answers in the boxes provided. [3]

constant speed : stationary : accelerating : decelerating



(b) To investigate the motion of a ball falling from rest a series of photographs were taken at regular intervals. The diagram on the right was copied from the photographs obtained.

(i) Explain how this diagram shows that the ball is accelerating.

_____

_____

_____ [1]

(ii) After 0.5 s the ball has fallen a distance of 1.2 m.
Calculate the average speed of the ball during 0.5 s.

You are advised to show clearly how you get your answer.

Average speed = _____ m/s [3]

(iii) The final speed of the ball at 0.5 s is greater than its average speed. Using the equation below and your answer to part **(ii)** calculate the final speed of the ball at 0.5 s.

Final speed = 2 × Average speed – Initial speed

You are advised to show clearly how you get your answer.

Remember the ball falls from rest.

Final speed = _____ m/s [3]

[Turn over

(iv) Calculate the rate of change of speed (acceleration) of the ball as it falls.

You are advised to show clearly how you get your answer.

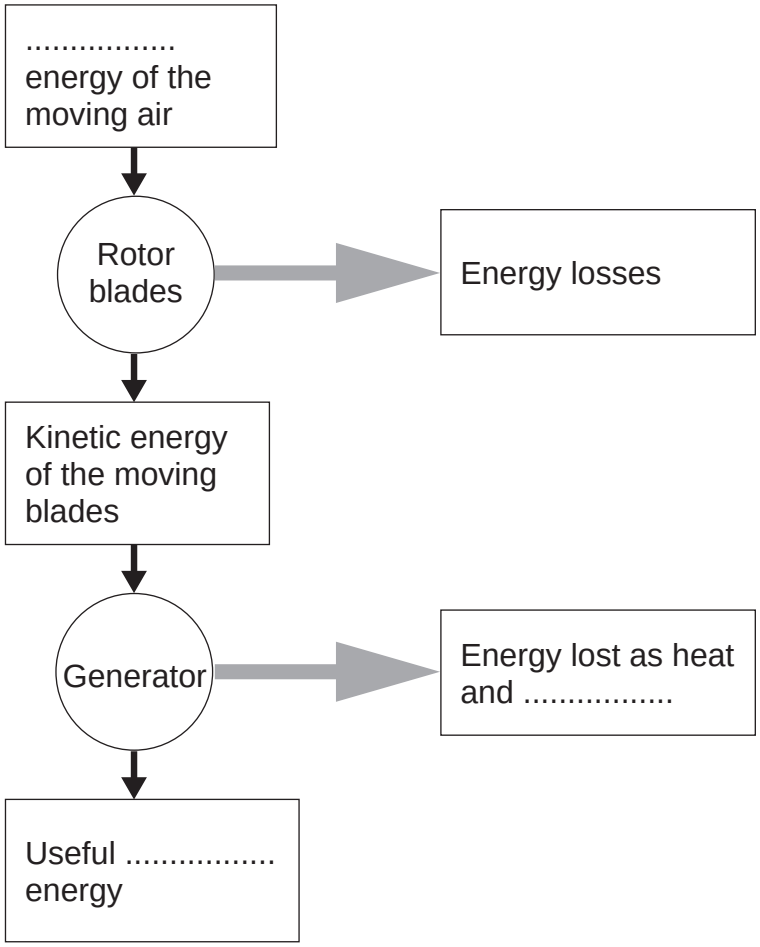
Remember to include the unit for rate of change of speed.

Rate of change of speed (acceleration) = _____ [4]

2 **(a)** Wind turbines provide some of our energy needs.

© Jezperklauzen/ iStock/ Thinkstock

(i) Complete the energy flow diagram below by writing the type of energy in the spaces provided.



[3]

[Turn over

(ii) For every 1000 J of energy from the moving air the wind turbine produces 300 J of useful output energy.

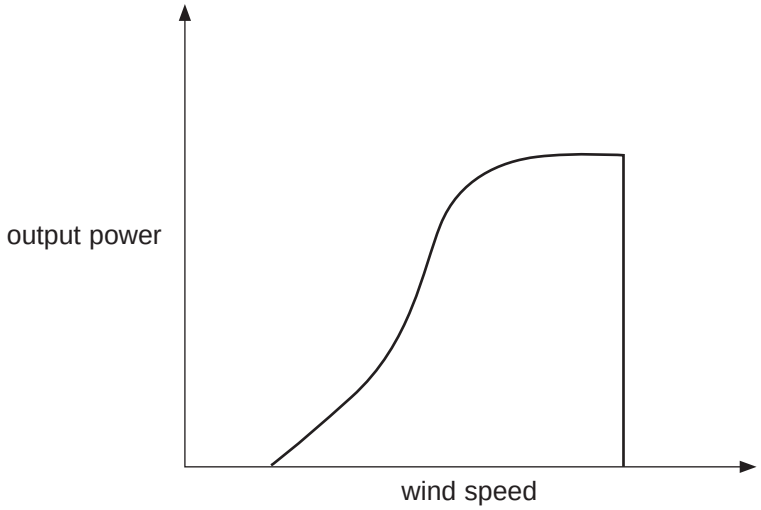
Calculate the efficiency of this wind turbine.

You are advised to show clearly how you get your answer.

Efficiency = _____ [2]

(b) The power output of a wind turbine varies with wind speed as shown in the graph below.

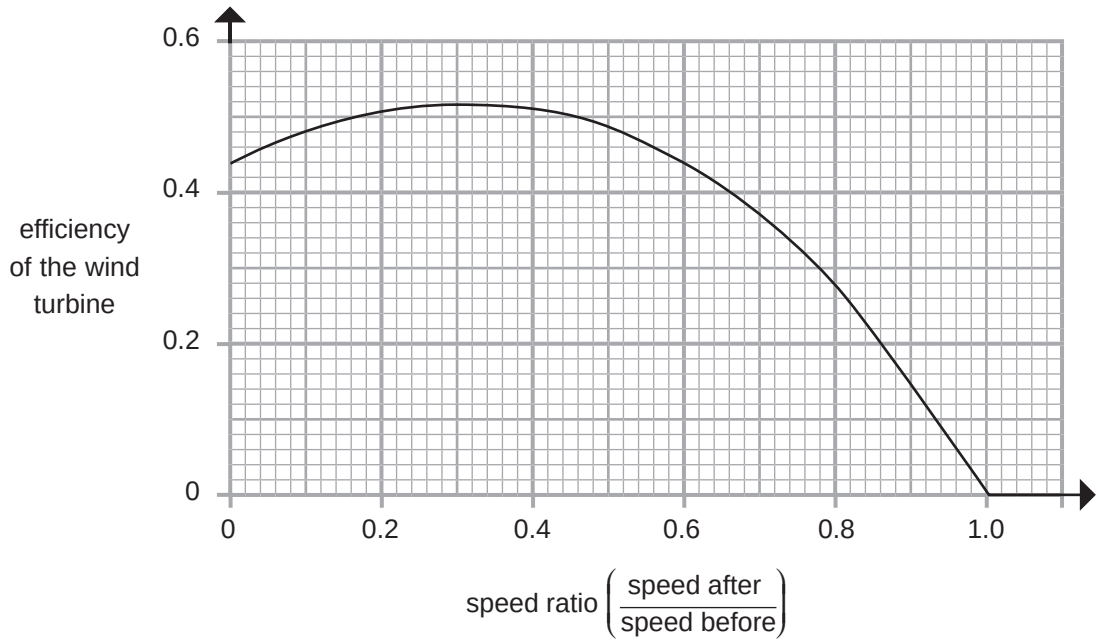
The **Cut-in** speed is the wind speed at which the wind turbine starts to produce electricity. The **Cut-off** speed is the wind speed at which the wind turbine is shut down to prevent it being damaged.



(i) On the graph above mark clearly and label the Cut-in speed and the Cut-off speed. [2]

The efficiency of the wind turbine depends on the ratio of the speed of the air after it has passed through the rotor blades to the speed of the air before it passes through the rotor blades.

The graph below shows how the efficiency of the wind turbine depends on the ratio of these two speeds.



(ii) What is the maximum efficiency of the wind turbine and the ratio of the two speeds at which it happens?

Maximum efficiency = _____

Speed ratio $\left(\frac{\text{speed after}}{\text{speed before}}\right)$ = _____

[2]

[Turn over

(c) The photograph below shows the type of weight lifting machine found in most gyms.

© Алексей Многосмыслов/ iStock/ Thinkstock.

Describe, in detail, how this machine could be used to measure the personal power of the person using it. In your answer you should state the measurements to take and the calculations needed to find the personal power of the person using the machine.

In this question you will be assessed on your communication skills and use of specialist science terms.

[6]

[Turn over

3 **(a)** **(i)** Write down, **in words**, the formula used to calculate the density of a substance.

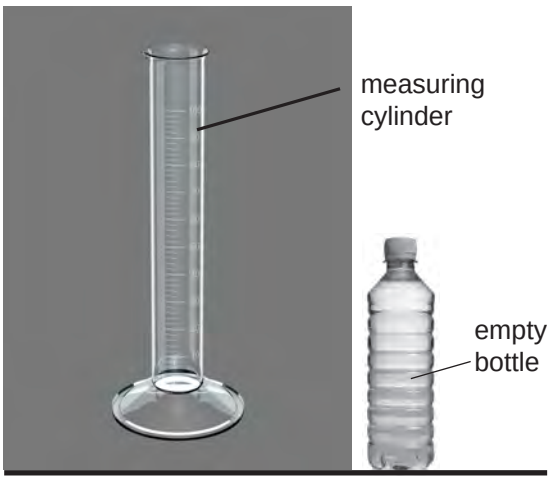
[1]

(ii) A block of wood has a volume of 60 cm^3 and a mass of 30 g. Calculate the density of the wood.

You are advised to show clearly how you get your answer.

Density of wood = _____ g/cm^3 [2]

(b) Maureen is asked to measure the volume of plastic used in a small bottle as shown below. She is given a large measuring cylinder and a supply of water.

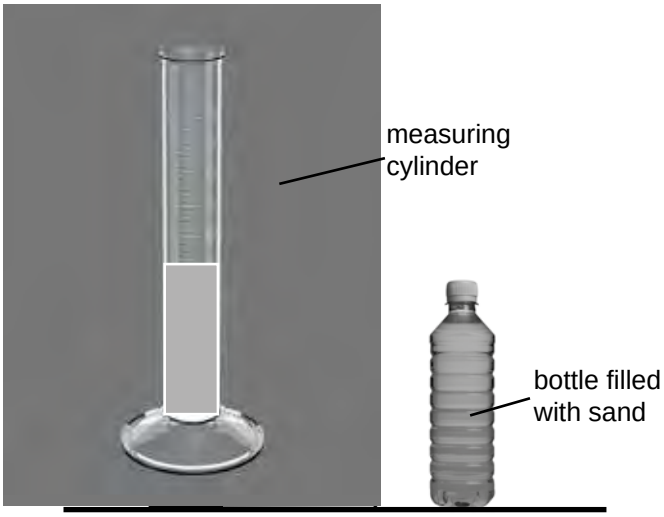


(i) Describe how she could find the volume of the inside of the bottle.

[3]

[Turn over

The bottle is now filled with sand and the top replaced.
The bottle will now sink in water.
The large measuring cylinder is now half-filled with water.



(ii) Describe how she could find the total volume of the bottle.

[3]

(iii) What calculation does she need to make to find the volume of the plastic used to make the bottle?

[1]

[Turn over

4 **(a)** Mary is the front-seat passenger in a car involved in a road traffic accident.

(i) How might wearing a car seat belt reduce the injuries to Mary?

_____

_____

_____

_____

_____

_____ [1]

(ii) State one other safety feature of a modern car which might reduce the injuries to passengers involved in a road traffic accident.

_____

_____

_____

_____ [1]

Mary has a mass of 48 kg and, at the time of the collision, the car was travelling at 15 m/s.

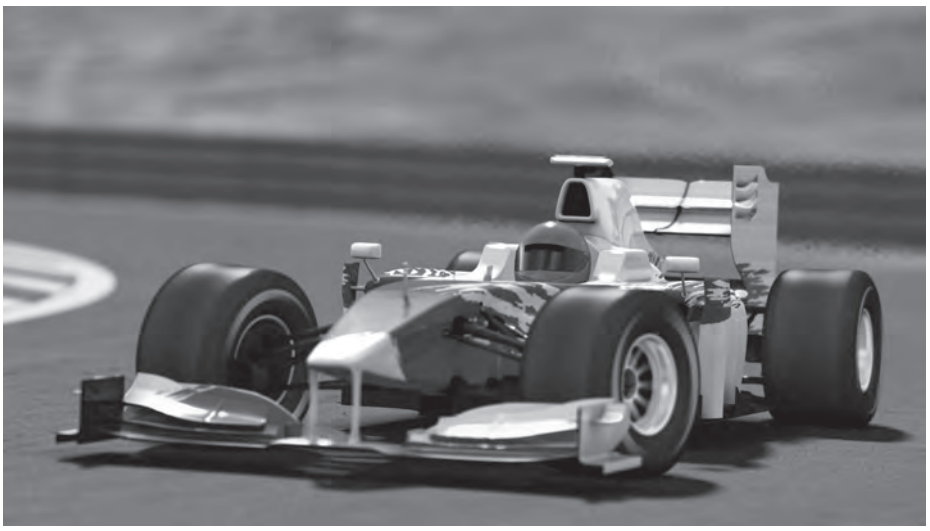
(iii) Calculate Mary's momentum at the time of the collision.

You are advised to show clearly how you get your answer.

Remember to include a unit with your answer.

Momentum = _____ [4]

(b) The photograph below shows a car going round a corner on a racetrack at a steady speed.



©braverabbit/ iStock/ Thinkstock

(i) What provides the centripetal force that enables the car to go around the corner?

_____

_____

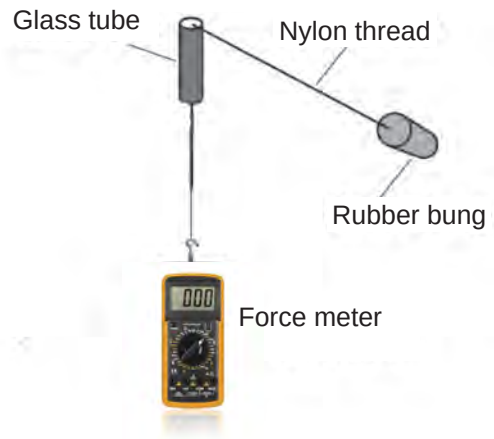
_____ [2]

(ii) In what direction does this centripetal force act?

_____ [1]

[Turn over

(c) Jane carries out an investigation on the factors which control the size of the centripetal force acting on a rubber bung whirled in a circle. She uses the apparatus below.



© gilotyna / iStock / Thinkstock

Jane holds the glass tube in her hand and whirls the rubber bung above her head. When the bung is moving at a constant speed she records the reading on the force meter.

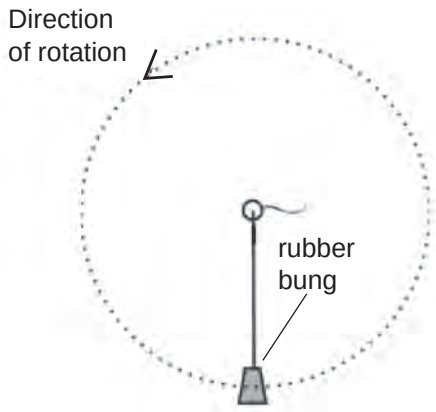
(i) In what way, if at all, will the following changes affect the size of the centripetal force?

Tick (✓) the appropriate boxes. Each row should have **one** tick.

	Effect on the Centripetal Force		
Change	Increases	Decreases	Remains the same
Whirling the bung faster above her head			
Whirling the rubber bung in a circle of greater radius			
Using a rubber bung of greater mass			
Whirling the rubber bung in the opposite direction.			

[4]

The rubber bung is whirling above Jane's head as shown in the diagram below.



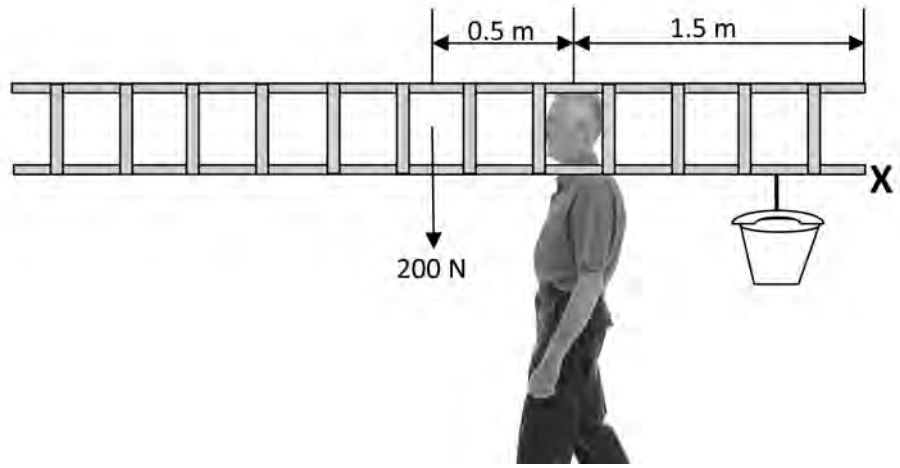
Source: http://www.scribd.com/doc/19550277/SCI-Physics-Full-Lab-Report-Centripetal-Force

(ii) Mark, **carefully**, on the diagram above, the direction in which the bung would move if the nylon thread broke. [2]

[Turn over

5 **(a)** The diagram below represents a window cleaner carrying a ladder and a bucket with water and cloths in it.

The ladder is uniform, 4 m long and weighs 200 N.



© IvonneW / iStock / Thinkstock

The bucket and its contents have a weight of 80 N.

(i) Clearly label, with the letter P, the position of the pivot. [1]

(ii) Which force causes the clockwise moment on the ladder?

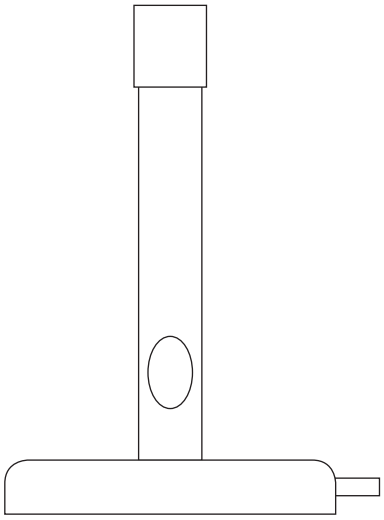
_____ [1]

(iii) Calculate how far from the end **X** of the ladder the bucket should be hung for the ladder to remain balanced.

You are advised to show clearly how you get your answer.

Distance _____ m [4]

(b) The picture below shows a Bunsen burner similar to those found in many school laboratories.



Source: Chief Examiner

(i) Mark, with the letter G, an approximate position for the centre of gravity. [1]

(ii) Explain how the design of the Bunsen burner helps to make it very stable.

_____

_____

_____

_____

_____

_____

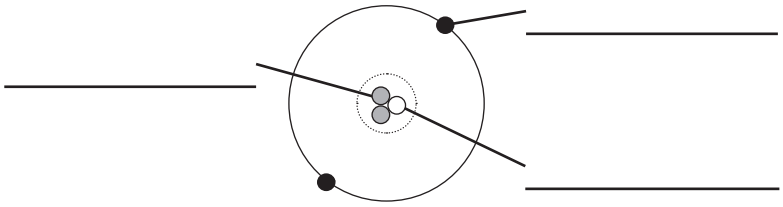
_____ [3]

[Turn over

6 The diagram below represents a neutral atom of an isotope of the chemical element helium.

Carefully label the particles with their names in the spaces provided.

(a) (i)



[3]

(ii) Normal helium nuclei are represented by the symbol $^{4}_{2}He$.
Complete the diagram below to show the correct symbol for the nucleus shown above.

[1]

(b) If government is to meet its Carbon Emissions Target, to help in the reduction of global warming, it has been suggested that more nuclear power stations should be built.

(i) What is the name of the process used, in today's nuclear power stations, to produce energy?

_____ [1]

(ii) There is much debate as to whether more nuclear power stations should be built. Suppose the government was to suggest building one such station in Northern Ireland.

Would you be in favour of this? Circle your answer.

Yes No

Explain your choice with two reasons, **not including global warming**.

Reason 1:

Reason 2:

[2]

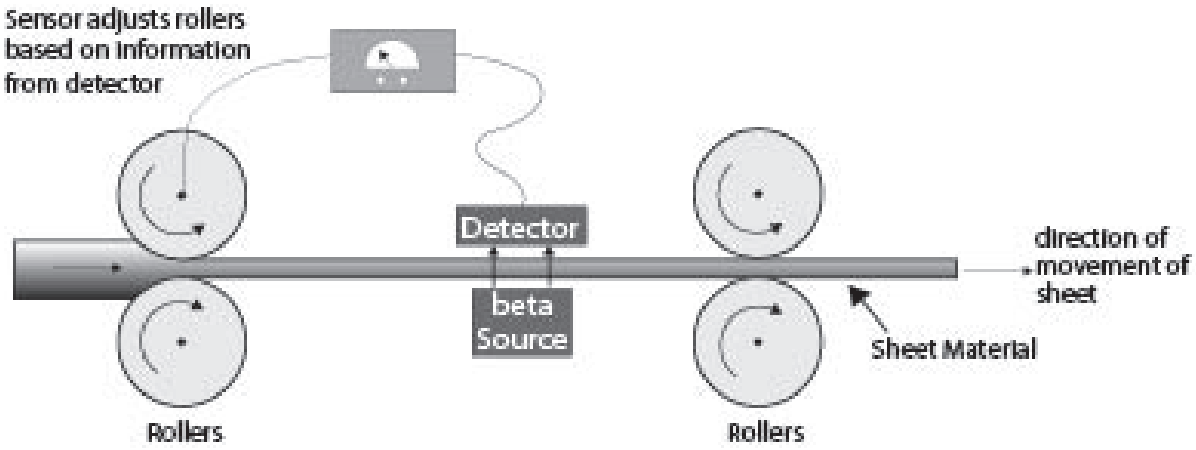
(c) Radioactivity is also known as ionising radiation.

What do you understand by this?

[1]

[Turn over

(d) There are many uses to which radioactivity can be put. The diagram below represents a thickness control unit for the production of steel plate.



(i) Which type of emitter, alpha, beta or gamma, should the radioactive source be? Explain your choice.

Type of source: _____

Explanation:

_____

_____

_____ [2]

(ii) Explain briefly how the pressure on the rollers can be controlled by the system to maintain a constant thickness for the sheet of steel.

_____

_____

_____

_____

_____

_____

_____

_____ [2]

(e) A sample of radioactive sodium has its activity measured as 200 counts per second immediately after it is produced.

The radioactive sodium has a half-life of 12 hours. What would the activity of the source be 1 day later?

You are advised to show clearly how you get your answer.

Activity = _____ counts per second [3]

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
Total Marks	

Examiner Number