Centre No.						Paper Reference						Surname	Initial(s)
Candidate No.						4	4	3	7	/	6	H	Signature

Paper Reference(s)

4437/6H

London Examinations IGCSE

Science (Double Award)

Paper 6H

Higher Tier

Specimen Paper

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Materials required for examination
Nil

Items included with question papers
Nil

Question Number	Leave Blank
1	
2	
3	
4	
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7	
8	
9	
10	
11	
12	
13	
Total	

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

Information for Candidates

There are 21 pages in this question paper. All blank pages are indicated.
The total mark for this paper is 90. The marks for the various parts of questions are shown in round brackets: e.g. (**2**).

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.

Printer's Log. No.
Specimen

Turn over

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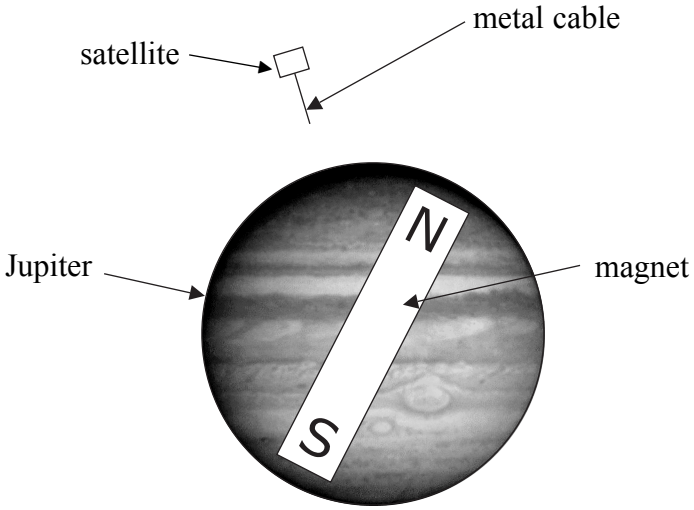
FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time	$E = I \times V \times t$
pressure × volume = constant	$p_1 \times V_1 = p_2 \times V_2$
$\text{frequency} = \dfrac{1}{\text{time period}}$	$f = \dfrac{1}{T}$
$\text{power} = \dfrac{\text{work done}}{\text{time taken}}$	$P = \dfrac{W}{t}$

1. The magnetic field of the planet Jupiter is similar to that of a large permanent magnet placed inside the planet as shown below.

Leave blank



A satellite with a long metal cable hanging from it could generate electricity as it moves through the magnetic field of Jupiter.

(a) State the effect that produces the electricity.

.....

(1)

(b) State and explain what happens to the size of the voltage induced in the metal cable if the satellite moves faster.

.....

.....

.....

(3)

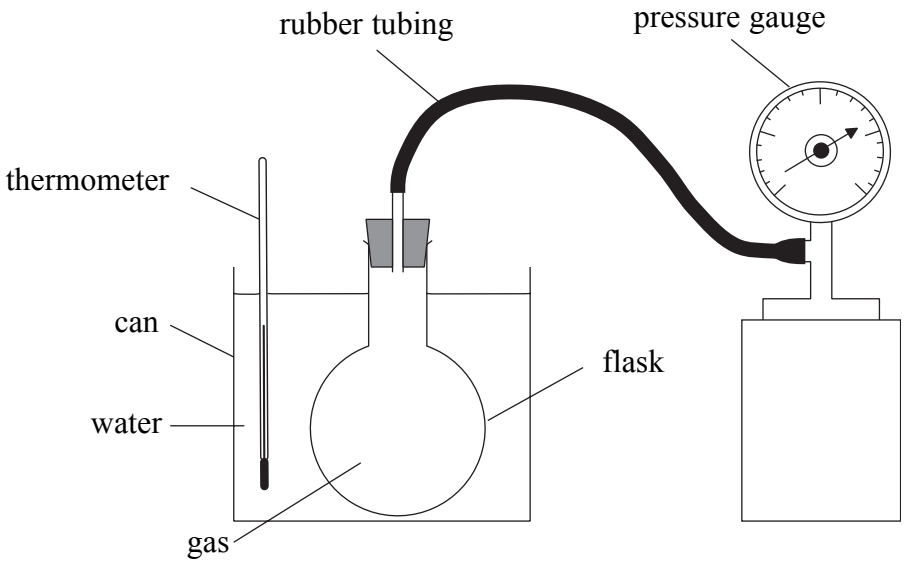
(Total 4 marks)

Q1

Turn over

2. The diagram shows the apparatus used to investigate how the pressure of a gas changes with temperature. As the water is heated the pressure of the gas is measured using the pressure gauge.

Leave blank



(a) Explain how the gas exerts pressure.

.....

.....

(2)

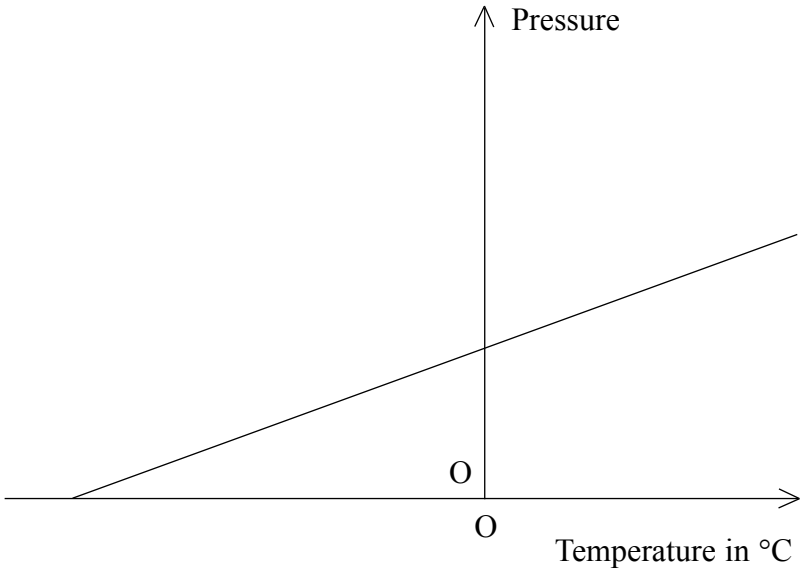
(b) Complete the table to show what happens to the gas in the flask as the temperature is increased. Use the words **increases**, **decreases**, or **stays the same**.

	Increases, decreases, or stays the same
Speed of gas particles	
Pressure in the flask	
Mass of particles	
Volume of gas	

(4)

(c) A sketch graph of the results of the experiment is shown.

Leave blank



(i) What does the graph show about the way in which the pressure of the gas changes with increasing temperature?

.....

(1)

(ii) Write an **X** on the temperature axis to show where the temperature is absolute zero.

(1)

(iii) What is the speed of the gas particles at this temperature?

.....

(1)

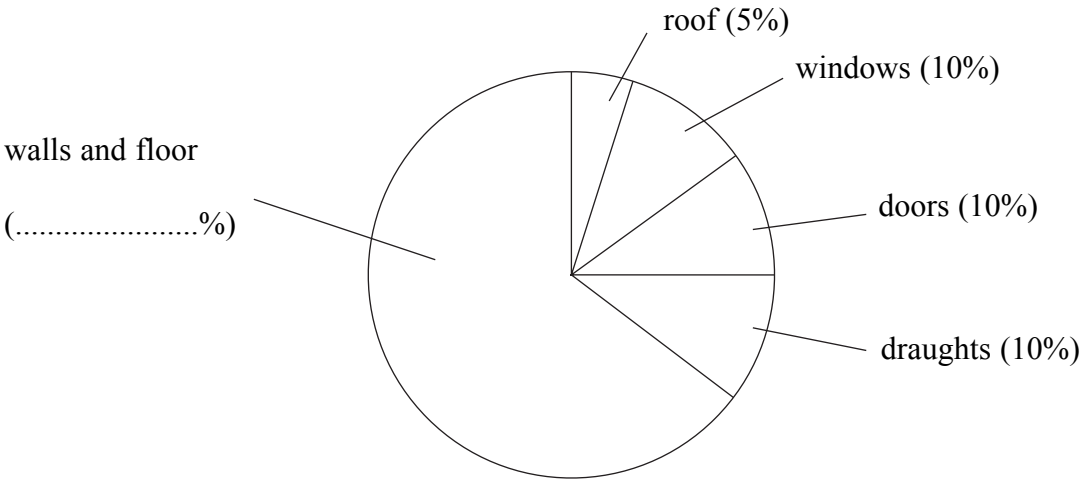
Q2

(Total 9 marks)

Turn over

3. (a) The heat energy losses from a house in a cold climate are shown in the diagram.

Leave blank



(i) Complete the diagram to show the percentage heat energy loss through the walls and floor.

(1)

(ii) Complete the table below to show how the heat energy loss from parts of the house can be reduced. The first one has been done for you.

Part of the house	Method used for reducing heat energy loss
Roof	Glass-fibre insulation in the loft
Doors	....
Floor	....

(2)

Specimen Papers and Mark Schemes – London Examinations IGCSE in Science (Double Award) (4437)
Publication code: UG014359 Issue 1, July 2004

(b) Double glazing is used to reduce the heat energy loss from houses through the windows. The table compares the heat energy loss for ordinary windows and for double-glazed windows.

Leave blank

Type of window	Heat energy loss in joules per second
Ordinary window	224
Double-glazed window	116

The size of the windows and the temperature inside and outside the house are the same in each case.

(i) How many joules per second does using double glazing save?

Saving = ... J/s

(1)

(ii) What is the heat energy loss through an ordinary window in one hour?

.....

.....

Heat energy loss = ... J

(3)

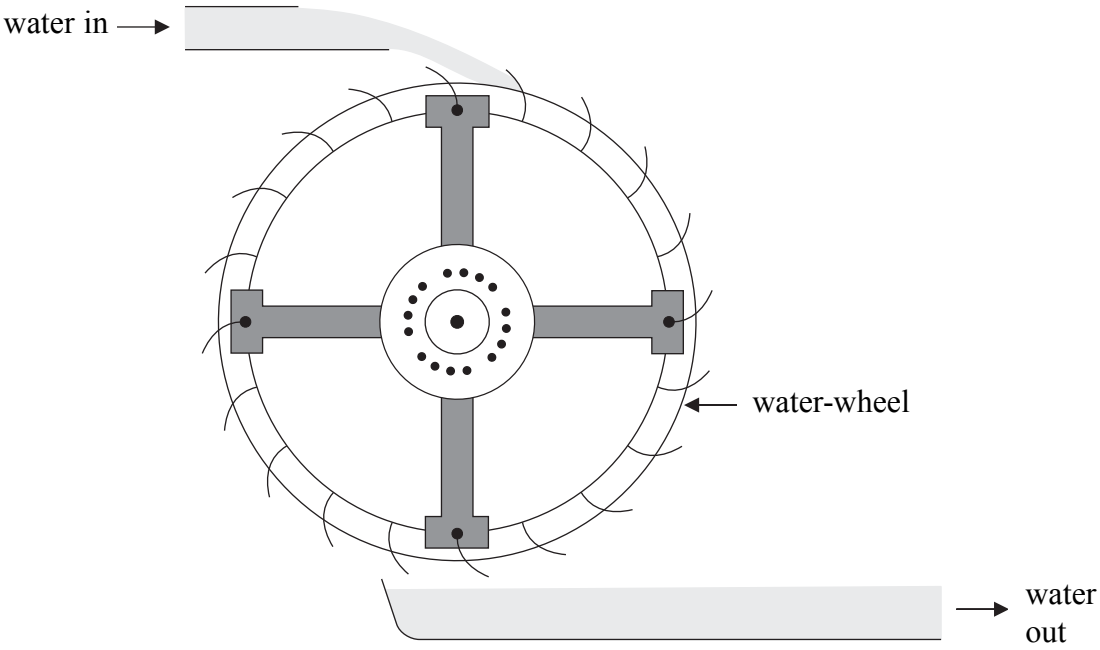
Q3

(Total 7 marks)

Turn over

Leave blank

4. Water flows onto a water-wheel as shown in the diagram. The wheel is turned when the water strikes the blades. This is used to run a generator, which produces an electric current.



(a) State two main energy changes that take place during this process to produce electricity.

1 .....

2 .....

(2)

(b) The power delivered by the water is 2000 W. The electrical power produced is 1400 W. Calculate the overall efficiency of the process.

.....

.....

Efficiency = ...

(2)

(c) Suggest a reason why the process is not 100% efficient.

.....

(1)

Q4

(Total 5 marks)

Leave blank

5. (a) The atoms $^{14}_{7}N$ and $^{15}_{7}N$ are isotopes of nitrogen.

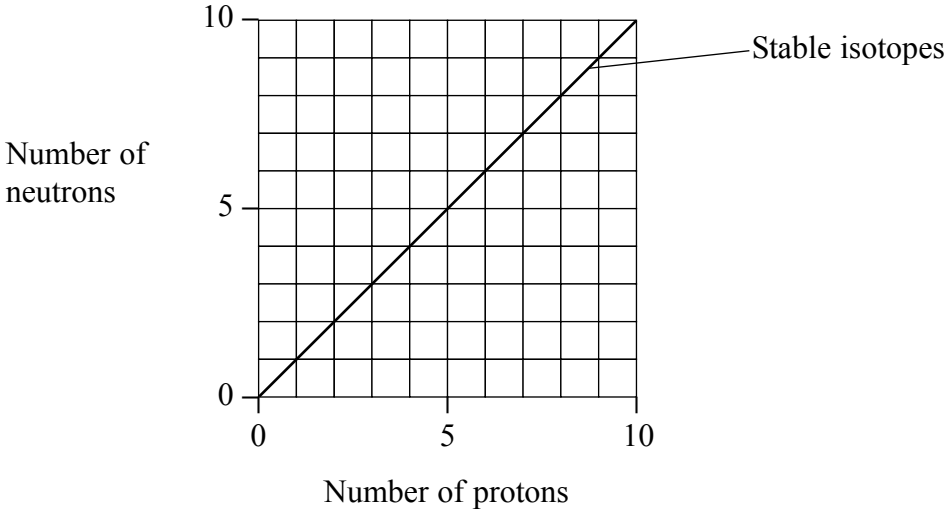
Write down one similarity and one difference between the nuclei of these isotopes.

similarity .....

difference .....

(2)

(b) The graph shows the relationship between the number of neutrons and the number of protons in some stable nuclei.



(i) What is the relationship between the number of protons and the number of neutrons for these stable nuclei?

.....

(1)

(ii) Use an **X** to mark the position of $^{15}_{7}N$ on the graph.

(1)

(iii) What does this tell you about $^{15}_{7}N$?

.....

(1)

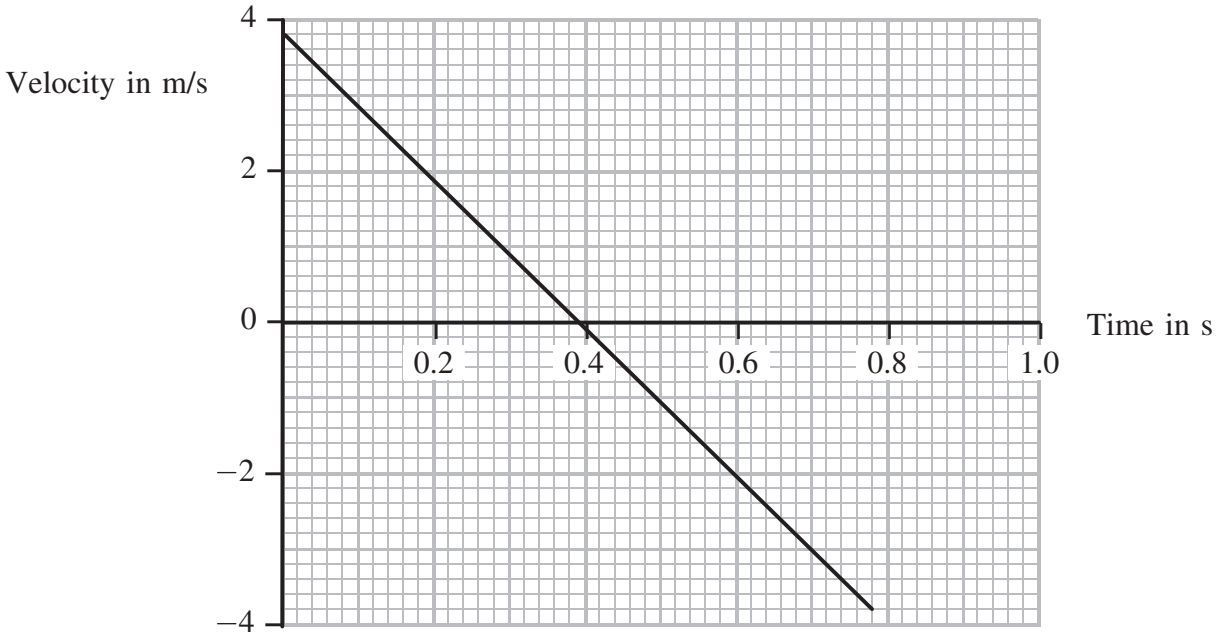
Q5

(Total 5 marks)

Turn over

6. The graph shows how the upwards velocity of an athlete changes after leaving the ground.

Leave blank



(a) After what time does the athlete reach his maximum height?

Time = ... s

(1)

(b) What height does the athlete reach?

.....

.....

Height = ... m

(3)

(c) (i) Calculate the acceleration of the athlete.
Give the correct unit.

.....

.....

Acceleration = ...

(4)

(ii) What is the direction of the acceleration?
Explain how you can tell from the graph.

.....

.....

(2)

(d) The mass of the athlete is 65 kg.
Calculate the force required to cause this acceleration. Give the correct unit.

Leave blank

.....

.....

Force = ...

(3)

(e) Describe the force that causes the athlete's acceleration.

.....

(1)

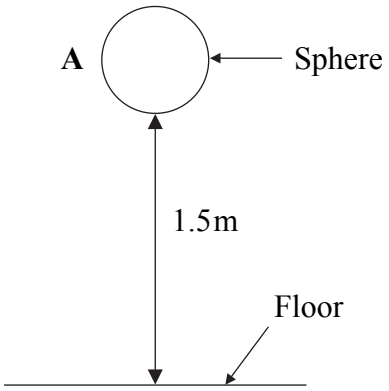
Q6

(Total 14 marks)

Turn over

7. A sphere of mass 6.0 kg is raised a distance of 1.5 m above the floor, to position **A**, as shown in the diagram below.

Leave blank



(a) Name the type of energy possessed by the sphere at **A**.

.....

(1)

(b) Calculate the amount of this type of energy possessed by the sphere at **A**. Assume the acceleration free fall, $g = 10\ m/s^2$.

.....

.....

Energy = ...

(3)

The sphere is now dropped onto the floor.

(c) Name the type of energy that the sphere possesses just before it strikes the floor.

.....

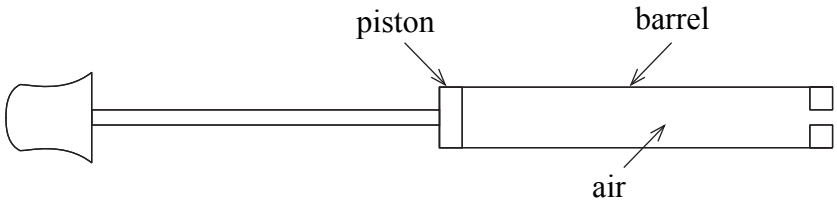
(1)

Q7

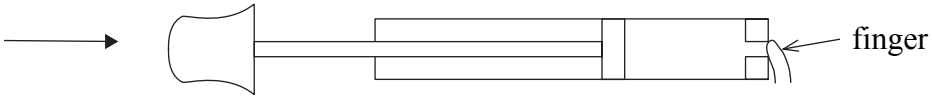
(Total 5 marks)

8. The diagram shows a bicycle pump which can be used for pumping air into a bicycle tyre. The volume of the air in the barrel is 18 cm^3 and the air pressure is 100 000 Pa.

Leave blank



A finger is placed over the end of the pump. The piston is moved very slowly to the position shown below so that the volume of the air trapped in the barrel is 6 cm^3.



(a) (i) Calculate the new air pressure in the pump.

.....

.....

.....

Pressure = ...

(3)

(ii) State two assumptions that you have made in your calculation.

1 .....

2 .....

(2)

(b) What, if anything, has happened to the diameter of the air molecules in the trapped air as a result of changing the volume of the air in the pump?

.....

(1)

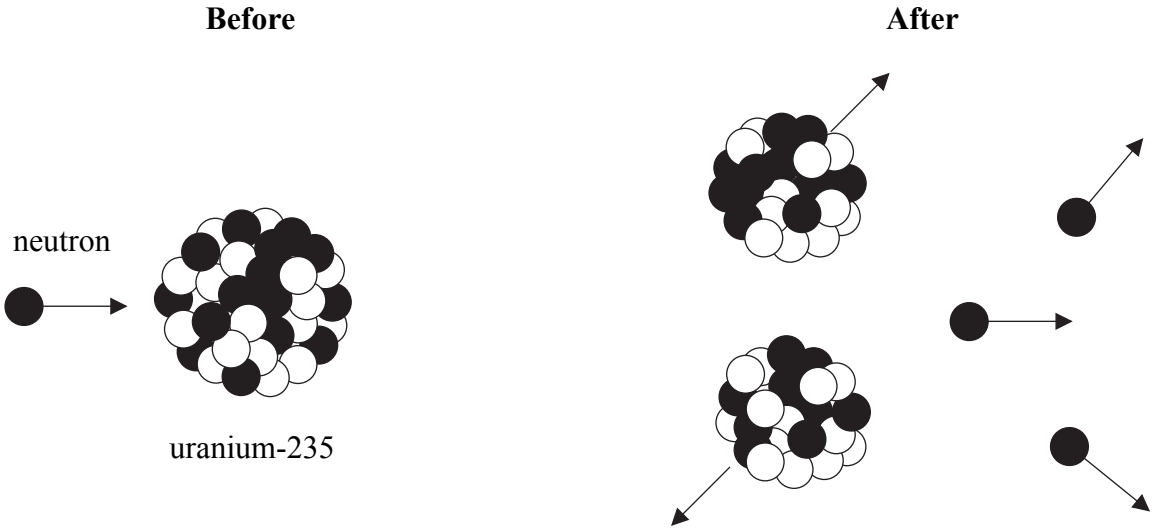
Q8

(Total 6 marks)

Turn over

9. Uranium-235 is used as a fuel in nuclear reactors.
The diagram illustrates the process that takes place in a reactor.

Leave blank



(a) Name the process shown in the diagram.

.....

(1)

(b) During this process, energy is released. In what form is this energy?

.....

(1)

(c) Explain how this process could lead to a chain reaction.

.....

.....

.....

.....

(3)

(d) Name a component of a nuclear reactor and state its function.

Component .....

Function .....

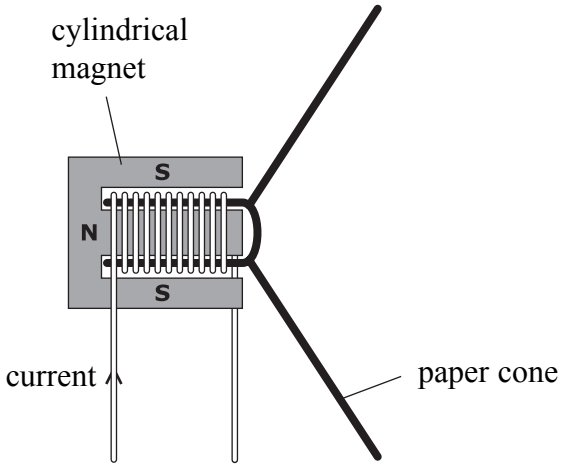
(2)

Q9

(Total 7 marks)

10. The diagram shows a moving coil loudspeaker.

Leave blank



(a) (i) When the current is in the direction shown in the diagram, the paper cone moves to the right.
Describe the movement of the paper cone when the direction of the current is reversed.

.....

(1)

(ii) Explain why the paper cone moves when a current passes in the coil.

.....

.....

.....

.....

(2)

(b) An alternating current passes in the coil.
Describe the movement of the paper cone.

.....

.....

(1)

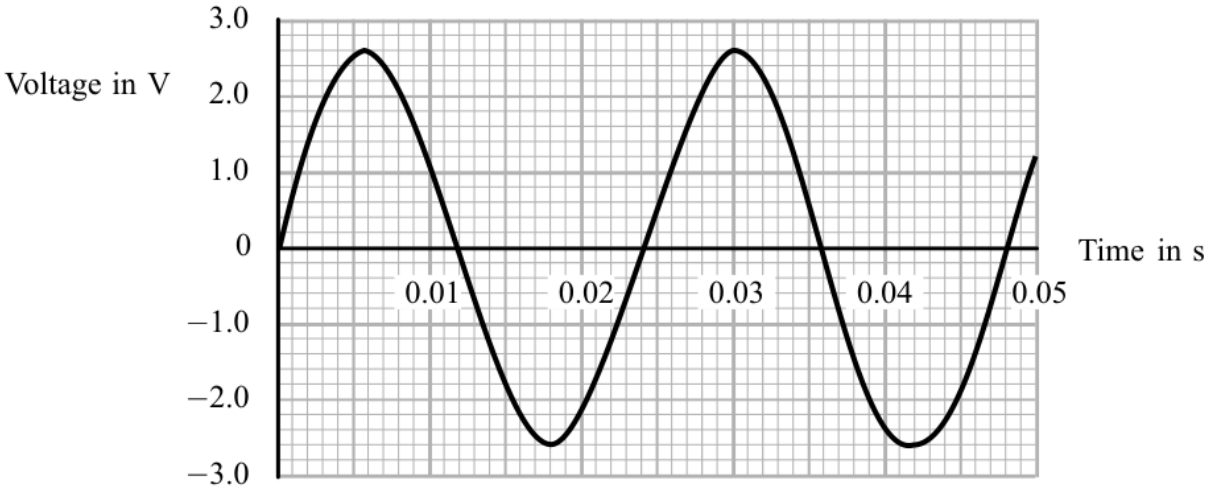
Q10

(Total 4 marks)

Turn over

11. The graph shows how the output voltage of a bicycle dynamo changes with time.

Leave blank



(a) (i) How can you tell that the dynamo produces an alternating voltage?

.....

(1)

(ii) Use the graph to write down the values of

the amplitude of the voltage .....

the period of the voltage .....

(2)

(iii) Calculate the frequency of the alternating voltage.

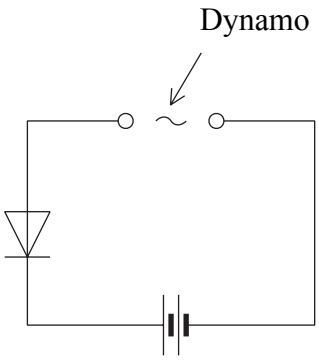
.....

Frequency = ...

(2)

(b) The dynamo can be used to recharge a battery. The diagram shows the circuit that is used.

Leave blank



Suggest why the diode is included in the circuit.

.....

..... **Q11**

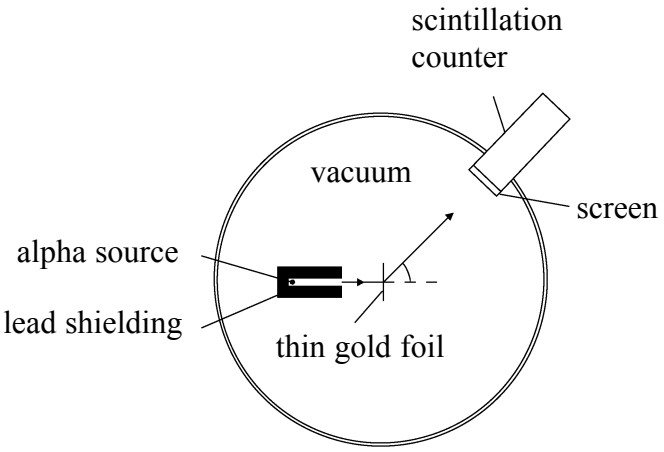
(2)

(Total 7 marks)

Turn over

12. The diagram shows the arrangement used by Geiger and Marsden to investigate the deflection of alpha particles when fired at thin gold foil.

Leave blank



(a) Explain why the experiment was carried out in a vacuum.

.....

.....

(2)

(b) The alpha source was surrounded by lead shielding with a long narrow opening in front of it. Suggest two reasons for this.

1 .....

2 .....

(2)

(c) The scintillation counter produced a flash when an alpha particle hit the screen. Describe the energy changes that take place when an alpha particle hits the screen.

Leave blank

.....

.....

.....

(2)

(d) Some scientists thought that the atom consisted of equally-spaced positive and negative charges.

(i) What evidence from the experiment suggested that this was not true?

.....

.....

.....

(2)

(ii) What model of the atom did this experiment suggest?

.....

(1)

Q12

(Total 9 marks)

Turn over

Leave blank

13. (a) Carbon-14 is an unstable form of carbon.
It decays by beta emission into nitrogen.

(i) What is meant by the term **beta emission**?

.....

.....

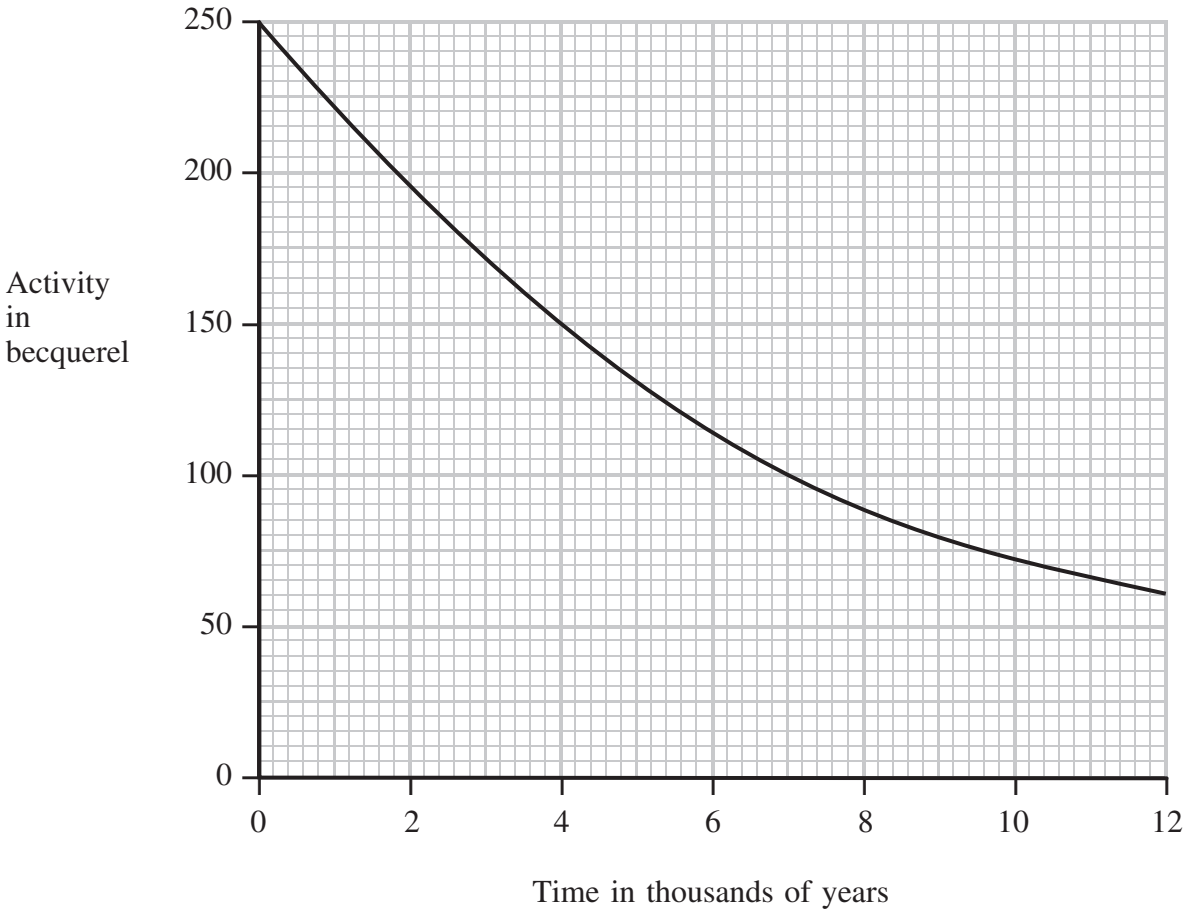
(2)

(ii) Complete the nuclear equation for this process.

$$^{14}_{6}C \longrightarrow {}^{0}_{-1}\beta + {}^{\cdots\cdots}_{\cdots\cdots}N$$

(2)

(b) Trees contain carbon-14 which is radioactive.
The graph shows how the activity of some wood changes after a tree has died.



(i) Use the graph to determine the half-life of carbon-14.

Leave blank

Half-life = ...

(1)

(ii) What fraction of the original carbon-14 is still present after two half-lives have elapsed since the tree died?

.....

(1)

(iii) A different radioactive sample has an initial activity of 200 becquerel and a longer half-life than carbon-14. Add to the graph a curve to show how its activity varies with time.

Q13

(2)

(Total 8 marks)

TOTAL FOR PAPER: 90 MARKS

END

Turn over