Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

WEDNESDAY 24 MAY 2017, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

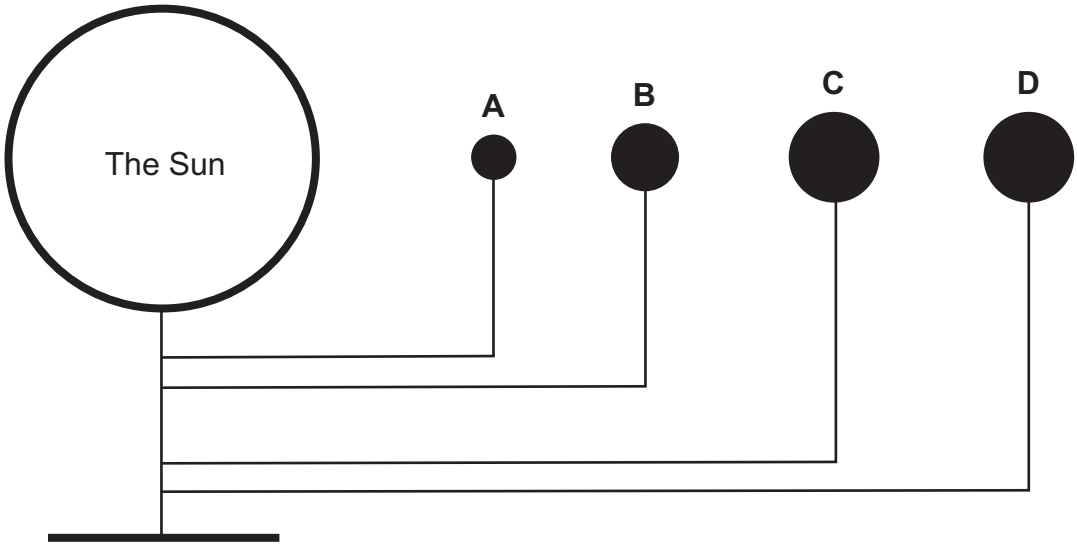
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
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 **9(a)**.

10984

1 The Solar System model below shows the first four planets.



(a) Name the planets labelled **A** and **C**.

A _____

C _____ [2]

(b) Suggest which planet (**A**, **B**, **C** or **D**) will be the coldest.

Answer _____ [1]

(c) Place the following objects in order of size starting with the smallest.

planet **asteroid** **star** **moon**

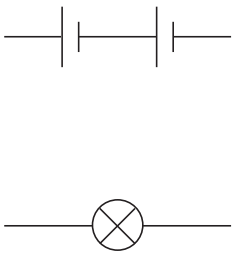
smallest _____

_____

_____

_____ [2]

2 Some students wanted to find the resistance of a bulb. Part of their circuit is shown below.



(a) Complete the circuit by adding an ammeter and a voltmeter using the correct symbols. [2]

(b) The battery supplies 6 V and the current flowing is found to be 2 A.

Use the equation:

$$\textbf{resistance} = \frac{\textbf{voltage}}{\textbf{current}}$$

to calculate the resistance of the bulb.

(Show your working out.)

Answer _____ [2]

(c) Name the unit of resistance.

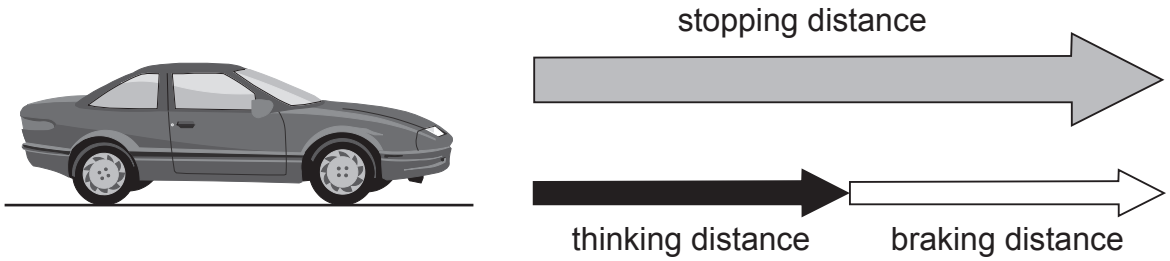
Choose from:

joule **amp** **volt** **ohm**

Answer _____ [1]

[Turn over

3 **(a)** The diagram below shows how the stopping distance of a car is found.

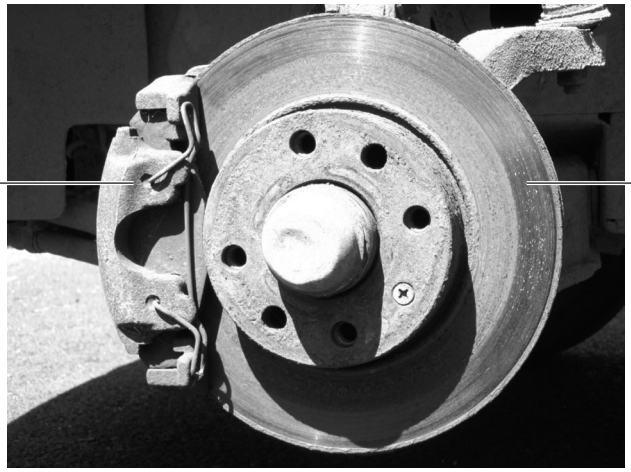


Use this information to complete the table below.

Speed/mph	Thinking distance/m	Braking distance/m	Stopping distance/m
20	6	6	12
30	9	14	23
40	12		36
50	15	38	

[2]

(b) The photograph below shows the brakes on a car.



(i) Name the force produced when the brake pads press on the disc to stop the car.

_____ [1]

(ii) Name the type of energy produced when the brake pads rub against the disc.

_____ [1]

(c) The table below shows the percentage of pedestrians killed when hit by cars at different speeds.

Speed/mph	Percentage killed/%
20	5
30	45
40	85

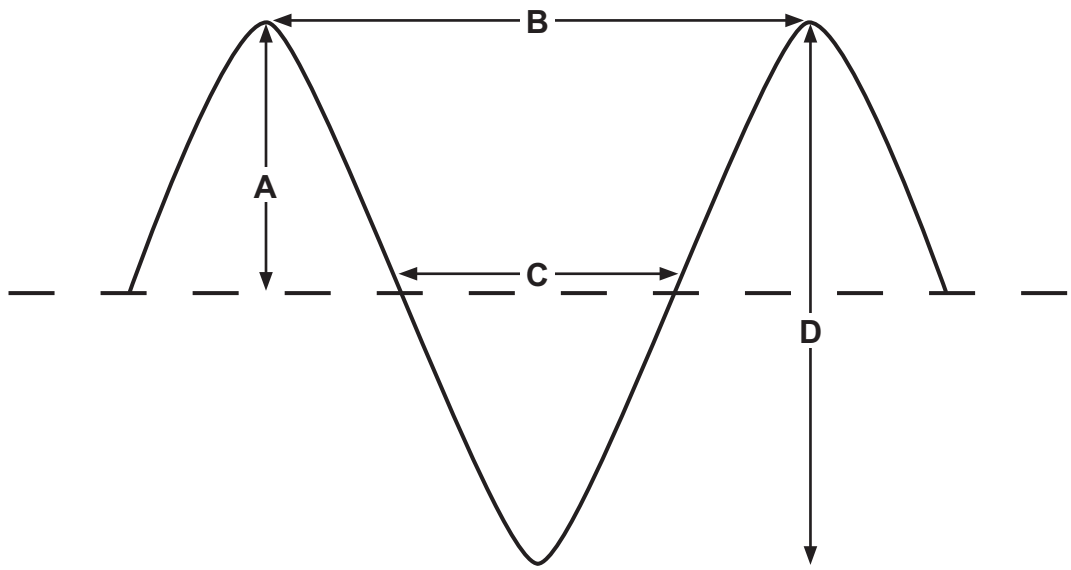
Use information in the table to suggest why many people want the speed limit in built-up areas to be reduced.

_____

_____ [1]

[Turn over

4 **(a)** The diagram below represents a sound wave.



Which letter (**A**, **B**, **C** or **D**) shows:

(i) the wavelength?

Answer _____ [1]

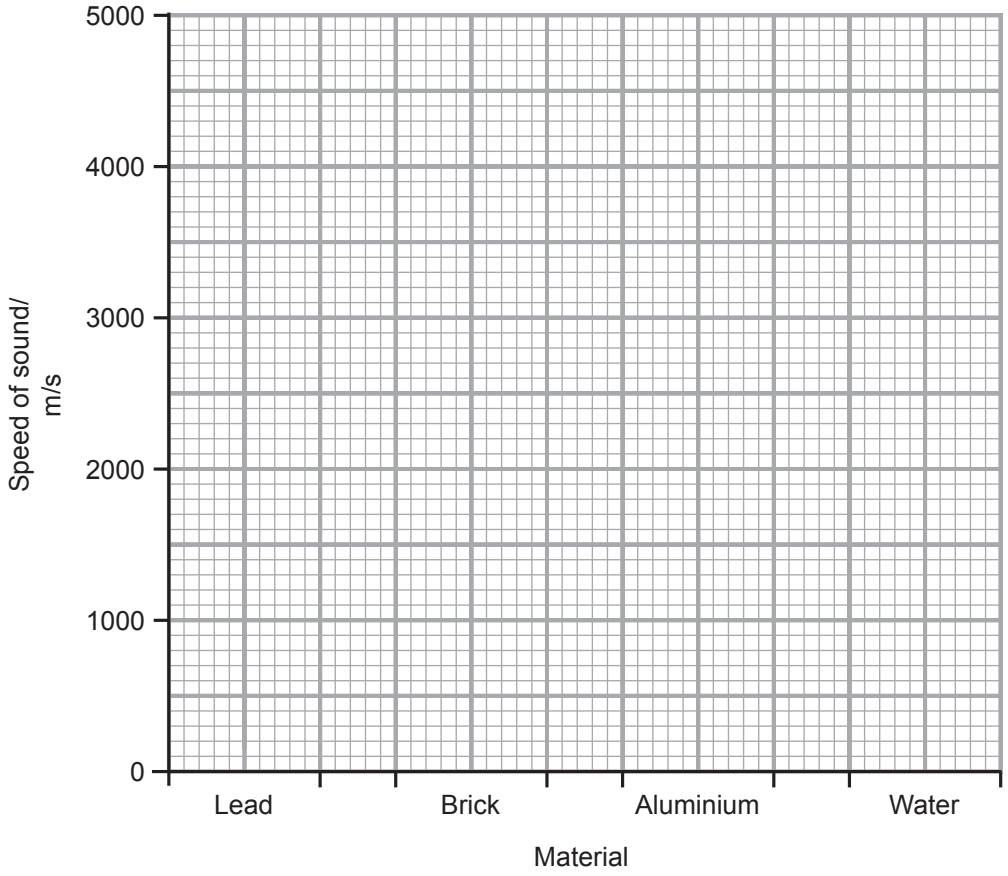
(ii) the amplitude?

Answer _____ [1]

(b) The table below shows the speed of sound through different materials.

Material	Speed of sound/ m/s
Lead	2000
Brick	4300
Aluminium	5000
Water	1500

(i) Draw a **bar graph** for this information on the grid below.



[2]

(ii) Which material will sound take the shortest time to pass through?

Answer _____ [1]

[Turn over

(c) The table below shows the relationship between the depth of seawater and the speed of a wave.

Depth of seawater/m	Speed of wave/ m/s
10	9.9
20	14.0
30	17.2
40	19.8

State the trend shown by this data.

_____

_____ [1]

(d) **(i)** The table below shows the electromagnetic spectrum. Complete the table using the wave types given below.

infrared : X-rays : visible light

gamma rays		ultraviolet			microwaves	radio waves

[2]

(ii) State **one** feature all electromagnetic waves have in common.

_____ [1]

(iii) State **one** feature that is different for all electromagnetic waves.

_____ [1]

(e) Shown below are the results from an investigation into hearing in two different age groups.

The number (out of 20 for each group) who could hear each frequency is recorded.

Frequency/kHz	Number who could hear each frequency	
	Teenagers	Pensioners
12	20	20
14	20	18
16	20	15
18	20	12
20	20	0
22	0	0

State **two** conclusions that can be drawn from this investigation.

1. _____

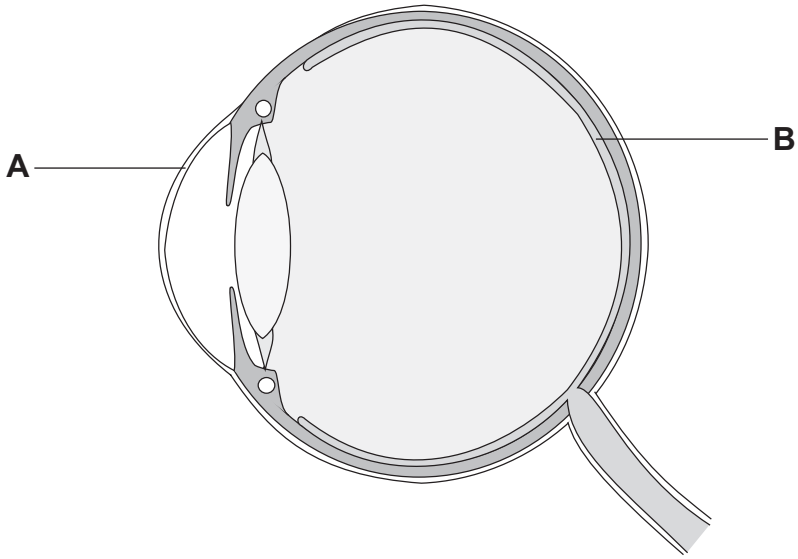
_____

2. _____

_____ [2]

[Turn over

5 The diagram below shows the human eye.



(a) Name the parts labelled **A** and **B**.

A _____

B _____ [2]

(b) Name the type of lens found in the human eye.

_____ [1]

(c) In recent years the lenses used in glasses to correct vision have become thinner.
Suggest **one** reason why most people who need glasses prefer thinner lenses.

_____

_____ [1]

6 Shown below are the readings of a household electricity meter at the start and the end of a month.

Start of the month

0	7	3	4	0

End of the month

0	7	6	5	0

(a) Calculate the number of units of electricity that were used during the month.

Answer _____ units [1]

(b) Each unit of electricity costs 20p.

Use the equation:

cost = units used × cost per unit

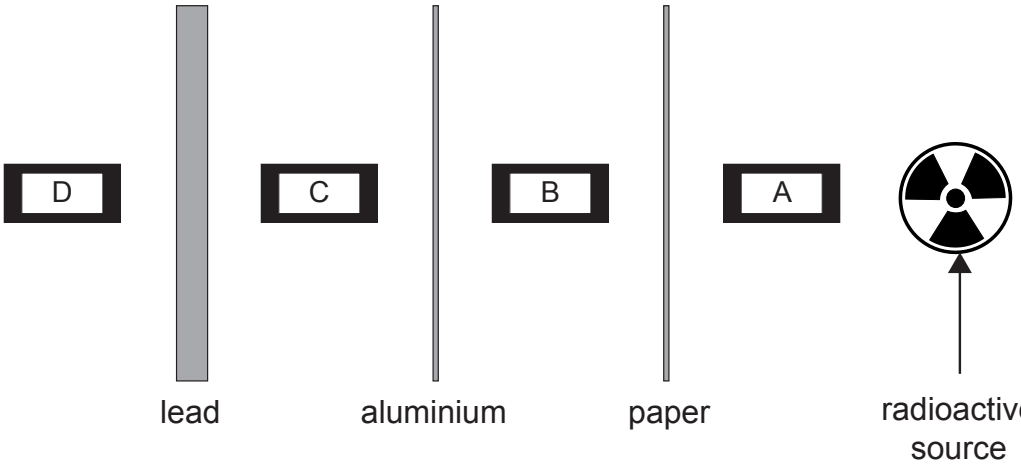
to calculate the cost of the electricity which has been used. Give your answer in pounds.

(Show your working out.)

Answer £ _____ [2]

[Turn over

7 **(a)** Lynda carried out an investigation to find which type of radiation a radioactive source emitted.
Four radiation counters (**A**, **B**, **C** and **D**) were placed as shown below.



The results from her investigation (including background radiation) are given below.

Counter	Radiation count/cpm			
	Test 1	Test 2	Test 3	Average
A	221	222	220	221
B	10	12	11	
C	11	11	11	11
D	10	9	11	10

(i) Complete the table by calculating the average at counter **B**. [1]

(ii) Why did Lynda repeat this investigation three times?

_____

_____ [1]

(iii) Name the type of radiation emitted from this source. Explain your answer.

_____

_____

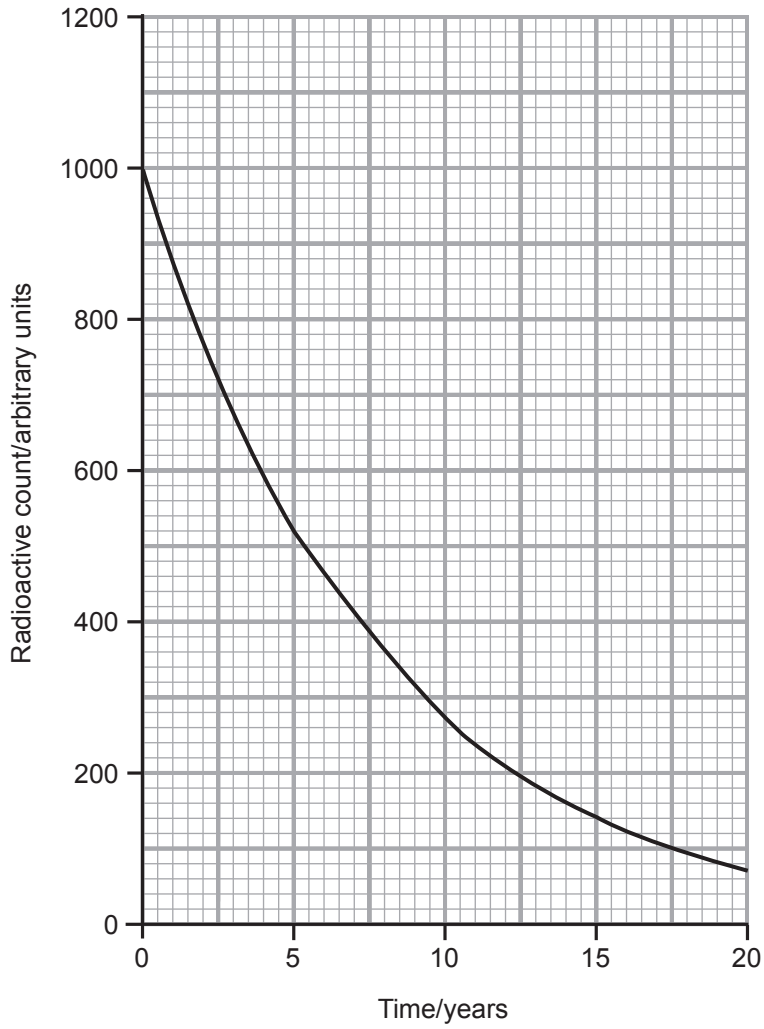
_____ [2]

(iv) From these results, suggest a value for background radiation.

Answer _____ cpm [1]

[Turn over

(b) Gamma sources such as cobalt-60 are used in hospitals. The graph below can be used to find the half-life of cobalt-60.



(i) What is meant by the term half-life?

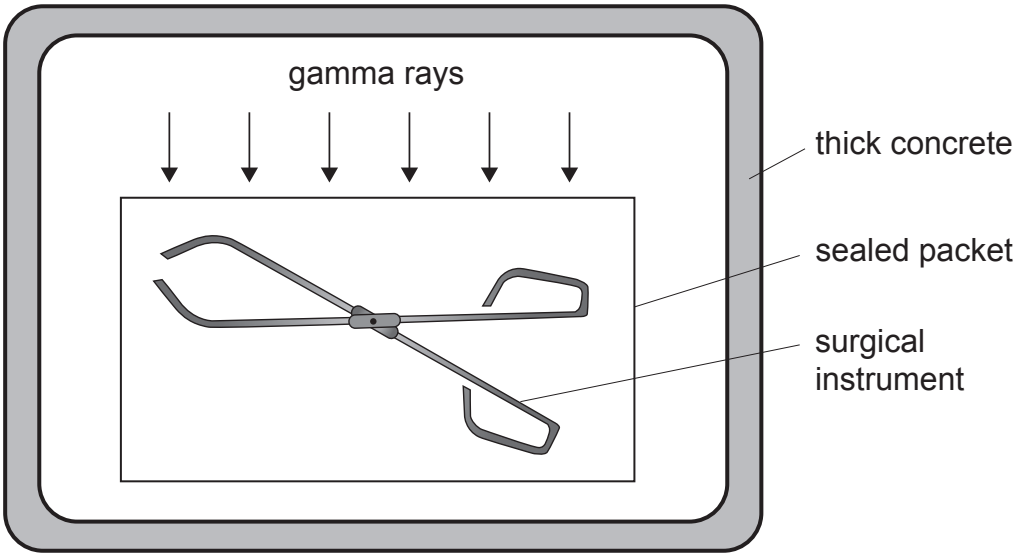
_____

_____ [2]

(ii) Use the graph to find the half-life of cobalt-60.

Answer _____ years [1]

(c) Many surgical instruments are sterilised using gamma radiation.



(i) The sterilisation takes place in a box made of thick concrete. Explain fully why a concrete box is necessary for health and safety.

_____

_____

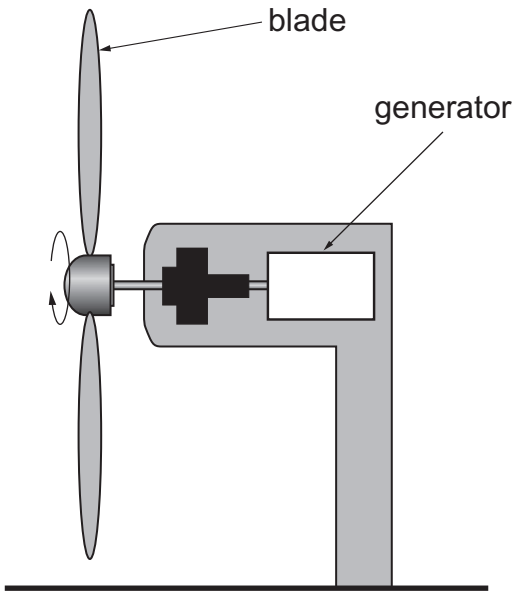
_____ [2]

(ii) Give **one** other medical use for gamma radiation.

_____ [1]

[Turn over

8 The diagram below shows part of a wind turbine.



(a) Wind is a renewable form of energy. What is meant by the term renewable?

_____

_____ [1]

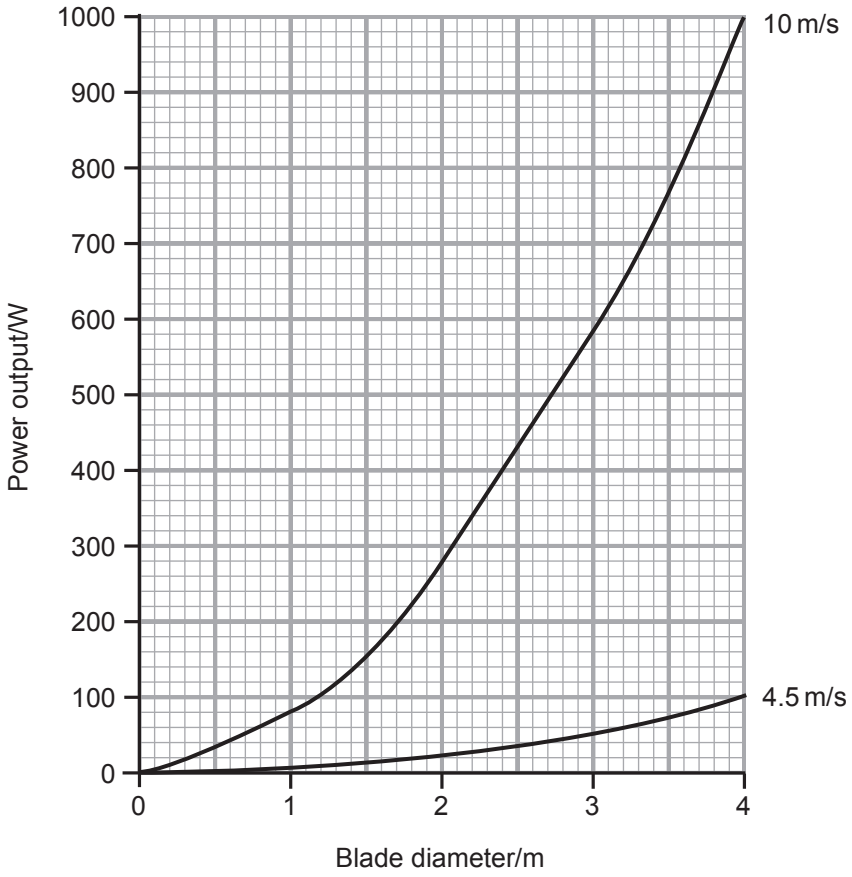
(b) When the wind turns the blades, the generator makes electricity.
Explain fully how the generator makes electricity.

_____

_____

_____ [2]

(c) The graph below shows the effect of blade diameter on the power produced at two different wind speeds.



Give **two** conclusions that can be made from this information.

1. _____

_____

2. _____

_____ [2]

[Turn over

(d) People in a local housing estate are concerned about the noise which will be produced if a wind turbine is built near them.

Wind speed/ m/s	Average noise/arbitrary units	
	Before wind turbine	After wind turbine
5	33	34
10	42	44
15	50	52

Suggest why the information in this table should reduce their concern.

_____

_____ [1]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

9 **(a)** The photograph below shows a star.

© John Chumack / Science Photo Library

Describe fully the formation of a star.

Your answer should include:
- the gases involved
- the force involved

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

(b) Our understanding of the Solar System has changed over the centuries as shown in the table below.

Astronomer	Dates	Idea
Ptolemy	100–170	he believed the Earth was the centre of the Universe
Copernicus	1473–1543	he believed the Sun was the centre of the Solar System
Brahe	1546–1601	he liked Copernicus' model but did not think the Earth could be moving as people would notice it
Kepler	1571–1630	he showed that the planets' orbits were elliptical
Galileo	1564–1642	he showed that Copernicus' model was right and Ptolemy's was wrong

(i) What name is given to the model of the Solar System proposed by Ptolemy?

_____ [1]

(ii) Using the information and your knowledge, give **two** differences between Ptolemy's model and the current model.

1. _____

_____

2. _____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number