Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 3 (Physics)

Foundation Tier

[GSS31]

GSS31

FRIDAY 14 NOVEMBER 2014, MORNING

TIME

1 hour.

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 ten** questions.

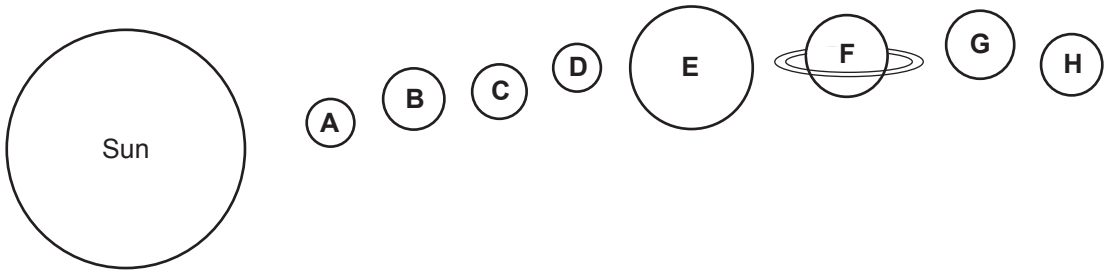
INFORMATION FOR CANDIDATES

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 **10(c)**.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Only	
Marks	Remark

1 **(a)** The diagram below represents the Sun and its eight planets.



(i) Complete the following sentence.

The Sun and its eight planets are known as the

_____ [1]

(ii) Name the planets labelled **B** and **F**.

Choose from:

Mercury **Saturn** **Jupiter** **Neptune** **Venus** **Earth**

Planet **B** _____

Planet **F** _____ [2]

(iii) Suggest which planet (**A**, **B**, **C**, **D**, **E**, **F**, **G** or **H**):

1. takes the shortest time to orbit the Sun once. _____
2. is the coldest. _____ [2]

(b) Put the following in order of size, starting with the smallest.

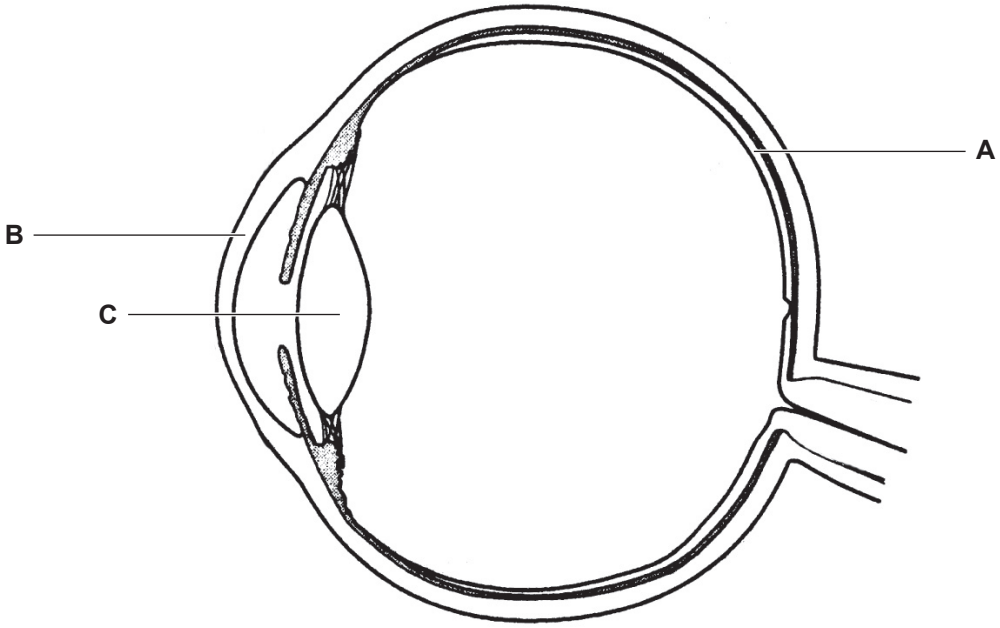
Universe : **Earth** : **Milky Way** : **Moon**

smallest → largest

[2]

Examiner Only	
Marks	Remark

2 The diagram below shows the human eye.



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

Choose from:

cornea **iris** **retina** **pupil**

A _____

B _____ [2]

(b) Name the type of lens labelled **C**.

Circle the correct answer.

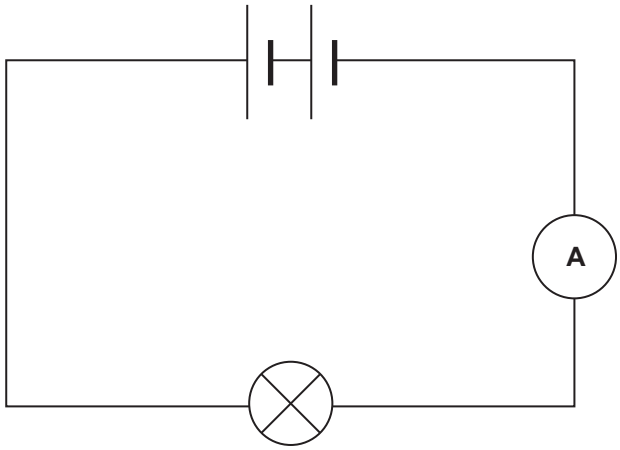
convex **contact** **concave**

[1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

3 The circuit below was set up to measure the resistance of a bulb, but the voltmeter has still to be added.



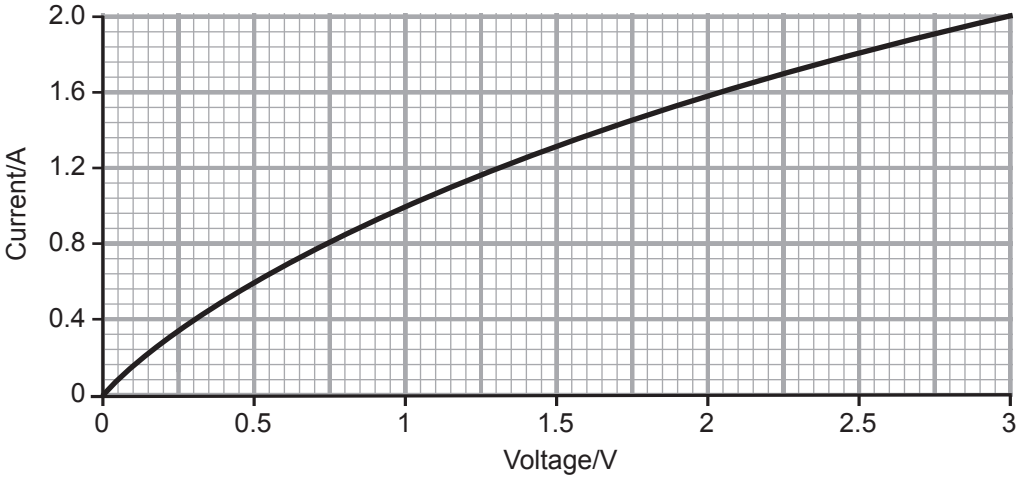
(a) Using the correct symbol, show how a voltmeter is connected in the circuit above to measure the voltage across the bulb. [2]

(b) State **one** way of changing the voltage in this circuit.

_____ [1]

Examiner Only	
Marks	Remark

(c) The graph below shows the current through the bulb as the voltage changes.



(i) Use the graph to find the current when the voltage is 3 V.

Answer _____ A [1]

(ii) Use the equation:

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

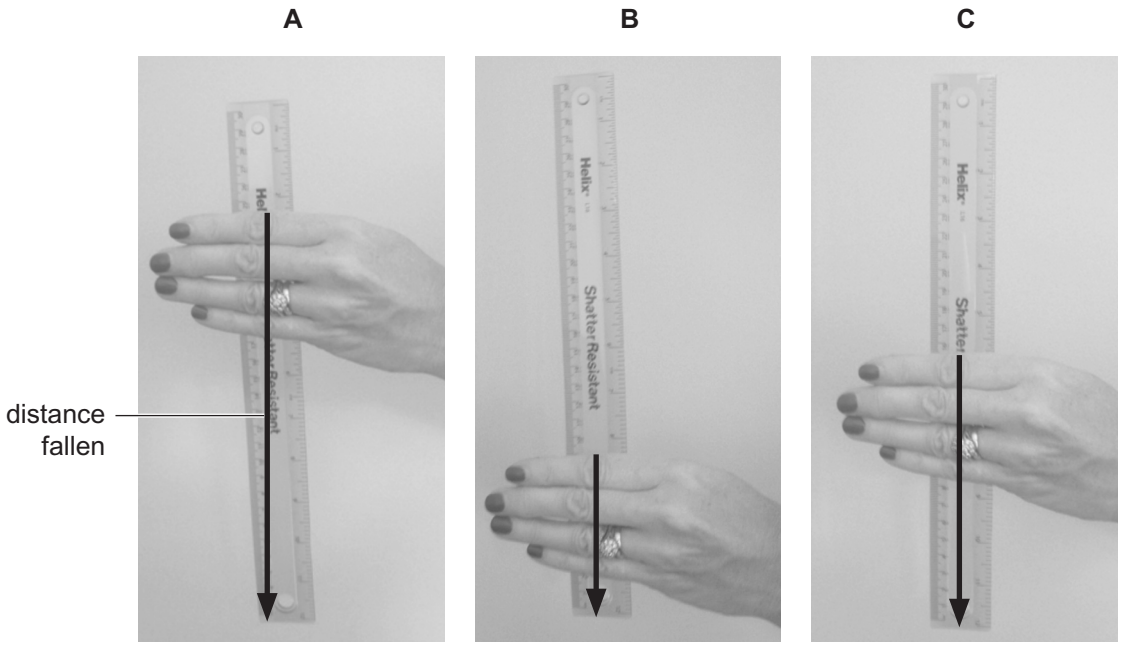
to calculate the resistance of the bulb when the voltage is 3 V.

(Show your working out.)

Answer _____ Ω [2]

Examiner Only	
Marks	Remark

4 The photographs below show how reactions can be measured by catching a falling ruler. The ruler is released by one student and caught by another.



Source: Principal Examiner

(a) Which photograph (**A**, **B** or **C**) showed the quickest reaction? Explain your answer.

_____

_____

_____ [2]

(b) The results for a similar investigation are shown below.

Attempt	Reaction time/s
1	0.25
2	0.20
3	0.15

(i) Calculate the average reaction time for these results.

Answer _____ s [1]

Examiner Only

Marks	Remark

(ii) What change, if any, would you expect to see in the average reaction time if the person drank alcohol before the investigation?

_____ [1]

(c) The table below shows the blood alcohol content for men of different body mass after drinking alcohol.

	Blood alcohol content/%		
Body mass / **Number of alcoholic drinks**	50 kg	60 kg	70 kg
1	0.04	0.03	0.02
2	0.08	0.06	0.05
3	0.12	0.11	0.08

Give **two** trends from this data.

1. _____

_____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

5 **(a)** The table below shows the lowest and highest frequencies of sound that can be heard by four birds.

Bird	Lowest frequency/Hz	Highest frequency/Hz
Mallard	300	8000
Starling	700	8700
Chaffinch	200	29 000
House sparrow	675	18 000

(i) Name the bird which can hear the **smallest range** of frequency.

_____ [1]

(ii) Name the bird that can hear ultrasound. Explain your answer.

_____

_____

_____ [2]

(iii) The house sparrow can hear up to 18 000 Hz. Convert this into kHz.

Answer _____ kHz [1]

(b) What is the lowest frequency that humans can hear?

Answer _____ Hz [1]

Examiner Only	
Marks	Remark

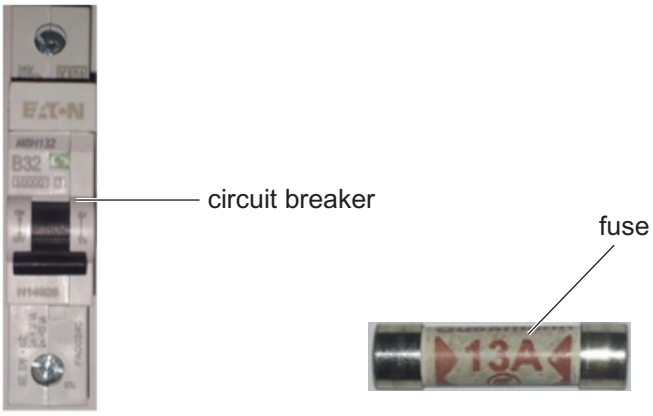
6 **(a)** Explain fully how a fuse operates as a safety device.

_____

_____

_____ [2]

(b) Circuit breakers are also used as electrical safety devices.



Source: Principal Examiner

Give **two** advantages of using circuit breakers instead of fuses.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

7 **(a)** Given below are the names of some telescopes and the electromagnetic wave they detect.

Name of telescope	Electromagnetic wave
Lovell	radio
COBE	microwave
Spitzer	infrared
Hubble	visible
Galaxy Evolution Explorer	ultraviolet
XMM Newton	X-rays
Fermi Large Area	gamma

(i) All electromagnetic waves can travel through a vacuum.
Give **one** other feature of all electromagnetic waves.

_____

_____ [1]

Each type of electromagnetic wave comes from a main source in Space as shown in the table below.

Source	Electromagnetic wave
cool gas	radio
background radiation	microwave
cool stars	infrared
surface of stars	visible
very hot stars	ultraviolet
hot gas	X-rays
materials around black holes	gamma

Use the information from both tables to answer the following questions.

(ii) Name the telescope which could be used to observe very hot stars.

_____ [1]

(iii) Which **source** will be detected using the XMM Newton telescope?

_____ [1]

(b) European astronomers have discovered a planet the same size as Earth orbiting a star in the Alpha Centauri system. The Alpha Centauri system is 4.3 light years away. Explain fully why astronauts could not travel to this planet.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 **(a)** The table below shows the amount of natural radiation which occurs in some foods. This forms part of the radiation that constantly surrounds us.

	Radioactive isotope	
Food	**Potassium/ pCi/kg**	**Radon/ pCi/kg**
Bananas	3520	1.00
Carrots	3400	1.30
Potatoes	3400	1.75
Lima beans	4640	3.50

(i) What name is given to this radiation that constantly surrounds us?

_____ [1]

(ii) Name the food which gives the **lowest** combined dose of radiation.

_____ [1]

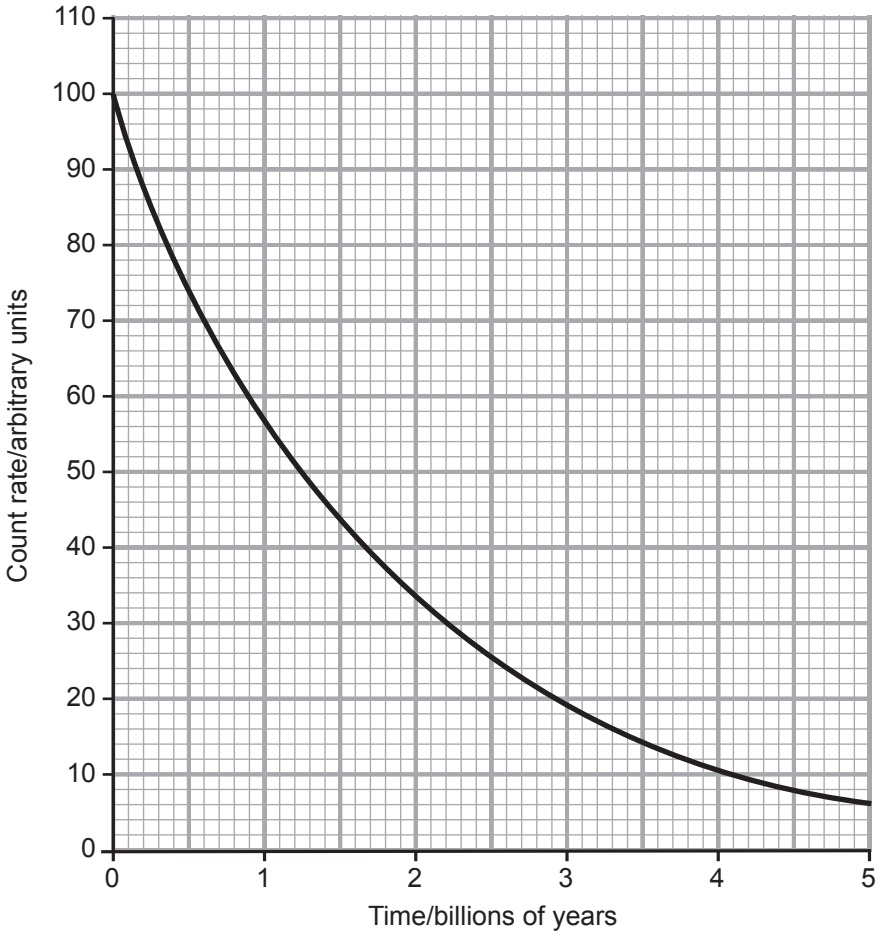
(b) A person receives about 30 millirem of radiation each year from these sources. Radiation of 1 millirem shortens a person's life by 70 seconds.

Explain why we should **not** be concerned about eating foods containing natural radiation.

_____

_____ [1]

(c) The graph below shows how the count rate of potassium-40 varies with time.



(i) Describe fully the trend shown by these results.

_____

_____

_____ [2]

(ii) Use the graph to find the half-life of potassium-40.

Answer _____ billion years [1]

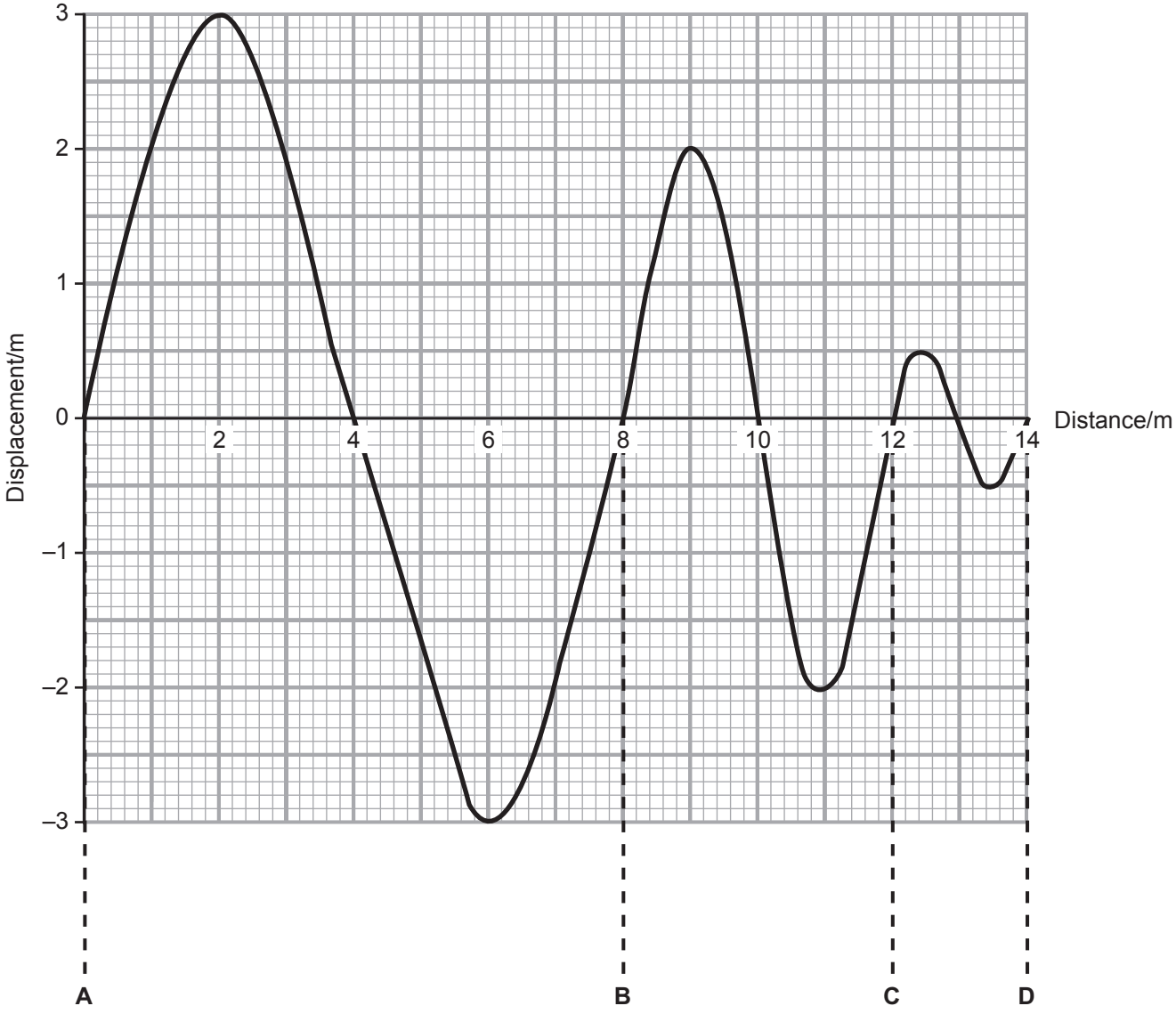
(iii) A radioactive source has a half-life of five days.
What fraction of the original source will be left after ten days?

Answer _____ [1]

Examiner Only

Marks	Remark

9 The diagram below shows a sound wave travelling through the air.



Examiner Only	
Marks	Remark

(a) What is the amplitude of the section labelled **A**–**B**?

Answer _____ m [1]

(b) (i) What is the wavelength of the section labelled **B**–**C**?

Answer _____ m [1]

(ii) Sound waves travel at a speed of 330 m/s in air.

Use the equation:

$$\textbf{frequency} = \frac{\textbf{speed}}{\textbf{wavelength}}$$

to calculate the frequency of the section labelled **B**–**C**.

(Show your working out.)

Answer _____ Hz [2]

Examiner Only	
Marks	Remark

10 (a) Explain fully how fossil fuels are formed.

_____

_____

_____

_____ [3]

(b) The table below shows the electrical energy (GWh) generated in Northern Ireland from different energy sources between 2008–2012.

Year / Energy source	2008	2009	2010	2011	2012
Coal	2077	1402	1858	1450	2403
Hydroelectric	26	31	36	20	21
Wind, wave, solar	568	754	639	893	1047
Oil	369	112	107	88	79
Gas	6568	5674	4884	5397	3732
Total	**9608**	**7973**	**7524**	**7848**	**7282**

(i) Name all the fossil fuels shown in the table above.

_____ [1]

(ii) Give the trend in **total** energy generated between 2008–2012. Describe the significant changes in the energy sources used over this period.

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(c) A company is proposing to develop an offshore wind farm fifteen kilometres off the coast of Northern Ireland. This would involve up to 100 turbines.
Discuss the advantages and disadvantages of the plan to build this wind farm.

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

[6]

THIS IS THE END OF THE QUESTION PAPER