Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4781/01

S16-4781-01

SCIENCE B

UNIT 1: Space, Energy and Life
FOUNDATION TIER

A.M. FRIDAY, 10 June 2016

1 hour 15 minutes

	For Examiner's use only		
	Question	**Maximum Mark**	**Mark Awarded**
Section A	**1.**	**8**	
	2.	**7**	
	3.	**8**	
	4.	**8**	
	5.	**9**	
	6.	**6**	
Section B	**7.**	**11**	
	8.	**13**	
	Total	**70**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.
You will also need a copy of the Resource Folder to answer **Section B**.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

Section B is based upon the Pre-Release Article.
The number of marks is given in brackets at the end of each question or part-question.
You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question **7***(c)*.

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SECTION A

Answer **all** *questions in the spaces provided.*

1. The table shows information about planets in our Solar System. Use this to answer the questions that follow.

Planet	Mean distance from the Sun (AU)	Diameter (Mm)	Time to spin on axis	Time to orbit the Sun (Earth years)	Number of known moons
Mercury	0.4	5	59 days	0.24	0
Venus	0.7	12	243 days	0.6	0
Earth	1.0	13	23 hours, 56 mins	1	1
Mars	1.5	7	24 hours, 37 mins	2	2
Jupiter	5.2	143	9 hours, 55 mins	12	63
Saturn	9.5	120	10 hours, 39 mins	29	61
.....	19.2	51	17 hours, 14 mins	84	27
Neptune	30.0	50	16 hours, 7 mins	165	13

(a) (i) Complete the table. [1]

(ii) Vesta is one of the largest asteroids. Estimate the distance of Vesta from the Sun and its time to orbit the Sun. [2]

distance of Vesta from the Sun = ... AU

time for Vesta to orbit the Sun = ... Earth years

(iii) Pluto is too small to be classed as a planet. Estimate the diameter of Pluto. [1]

..... Mm

(b) It is suggested that Venus does not have any moons because it is too small to hold them in orbit.

(i) Name **two** planets that are smaller than Venus. [2]

..... and .....

(ii) Which of these planets disproves the suggestion? ..... [1]

(c) Name the planet with the shortest day. [1]

.....

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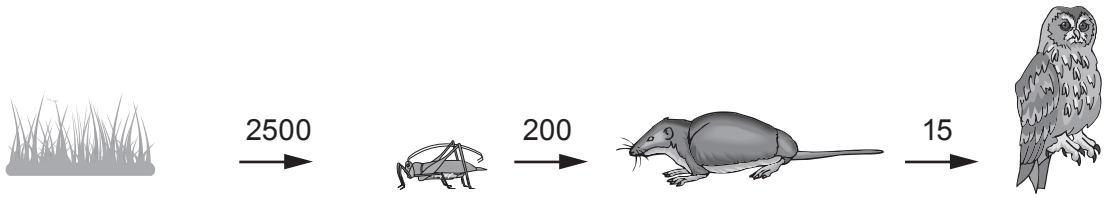
2. The diagram shows the flow of energy through a food chain (in kJ).



(a) (i) Name the energy source for the food chain. ..... [1]

(ii) Name the green plant in this food chain. ..... [1]

(iii) Name the predator of the shrew. ..... [1]

(b) (i) Calculate the reduction in useful energy from shrews to owls. [1]

energy reduction = ... kJ

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(ii) Calculate the efficiency of the energy transfer from shrews to owls.
Use the equation: [2]

$$\text{efficiency \%} = \frac{\text{useful output energy}}{\text{total input energy}} \times 100$$

efficiency % = ...

(iii) Give **one** reason for the decrease in useful energy transferred through the food chain. [1]

.....

.....

7

Turn over.

Examiner only

3. Some builders sharing a house were worried about their electricity bill.

They decided to record how much electricity they used.
They found that they used 145 units in one week.
One unit of electricity costs 18 p.

(a) Calculate the cost of electricity for one week. [2]

Use the equation:

total cost = cost of 1 unit × units used

cost = ... p

(b) Cooking using an electric oven costs the builders £4.80 a week.
They found that if they did the cooking using a microwave they would use only **5 units** in a week.

(i) Calculate the cost of using the microwave for a week. [1]

cost = ... p

(ii) Calculate the saving per week if the microwave is used instead of the electric oven. [1]

saving = ... p

(iii) The cost of the microwave was £54.60. Calculate how many weeks it took for the saving on the electricity bill to cover the cost of buying the microwave. [2]

answer = ... weeks

(c) The builders used a kettle for a total of 3.5 hours per week.
The kettle used 8.4 units per week.
Calculate the power of the kettle. [2]

Use the equation:

$$\text{power (kW)} = \frac{\text{number of units}}{\text{time (h)}}$$

power = ... kW

8

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4. *(a)* The stages in the process of natural selection are shown below. They are not in the correct order. ***One*** *of the statements is not relevant*.

A Genes passed on to future generations
B These individuals are more likely to survive
C Some individuals have advantageous traits
D These individuals successfully reproduce
E The genes undergo genetic modification

Arrange the statements in order by placing the letters in the boxes below. [4]

....

(b) The following statements are views about genetic modification (GM) of crops.

A It could reduce the use of artificial chemicals
B It could result in designer food containing certain nutrients
C It could result in allergic reactions
D It could result in less biodiversity
E It could result in higher yields

Complete the table below to show whether **each** statement is an advantage or disadvantage of GM. *One has already been done as an example*. [4]

Advantage	Disadvantage
A	

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8

Turn over.

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5. The table shows properties of types of waves in the electromagnetic (em) spectrum.

Spectrum of Electromagnetic Radiation			
Type	Typical wavelength (cm)	Frequency (Hz)	Energy (eV)
radio waves	100	3×10^{8}	10^{-6}
microwave	10	3×10^{9}	10^{-5}
infrared	0.01	3×10^{12}	0.01
.....	7×10^{-5}	4.3×10^{14}	2
ultraviolet	4×10^{-5}	7.5×10^{14}	3
.....	10^{-7}	3×10^{17}	10^{3}
gamma rays	10^{-9}	3×10^{19}	10^{5}

(a) (i) Complete the table. [2]

(ii) Describe how the wavelength changes from gamma rays to radio waves. [1]

.....

(iii) Describe how the frequency changes from gamma rays to radio waves. [1]

.....

(iv) Name the em waves with the highest energy. ..... [1]

(b) Show how you can calculate the speed of em waves by substituting values from the table into the equation below: [2]

wave speed = frequency × wavelength

wave speed = ... × .....

(c) State **two** decisions that are made before modern space science projects go ahead. [2]

1. .....

2. .....

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6. *(a)* State **two** uses of land that can lead to a reduction of habitats. [2]

1. .....

2. .....

(b) Name **two** schemes designed to maintain biodiversity. [2]

1. .....

2. .....

(c) We have become more sustainable by reusing plastic carrier bags. State **two** other ways to increase sustainability. [2]

1. .....

2. .....

6

Turn over.

Examiner only

SECTION B

Answer **all** *questions in the spaces provided.*

Use the information in the separate Resource Folder to answer the following questions.

7. Use the information in **Diagram 1** to answer the questions below.

(a) Complete the table below: [3]

Stored carbon pool	Quantity (billions of tonnes)
soil	2300
fossil pool	10000
atmosphere	.....
oceans (total)	.....
plant biomass	.....

(b) Humans contribute 9 billion tonnes of carbon to the atmosphere every year. The net increase in the atmosphere is only 4 billion tonnes.

Give **two** reasons for this difference. [2]

1. .....

2. .....

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(c) Explain how carbon is recycled between the land and the atmosphere. [6 QWC]

11

Turn over.

Examiner only

8. *(a)* Read the information about carbon footprint and **Table 1** to answer the questions below.

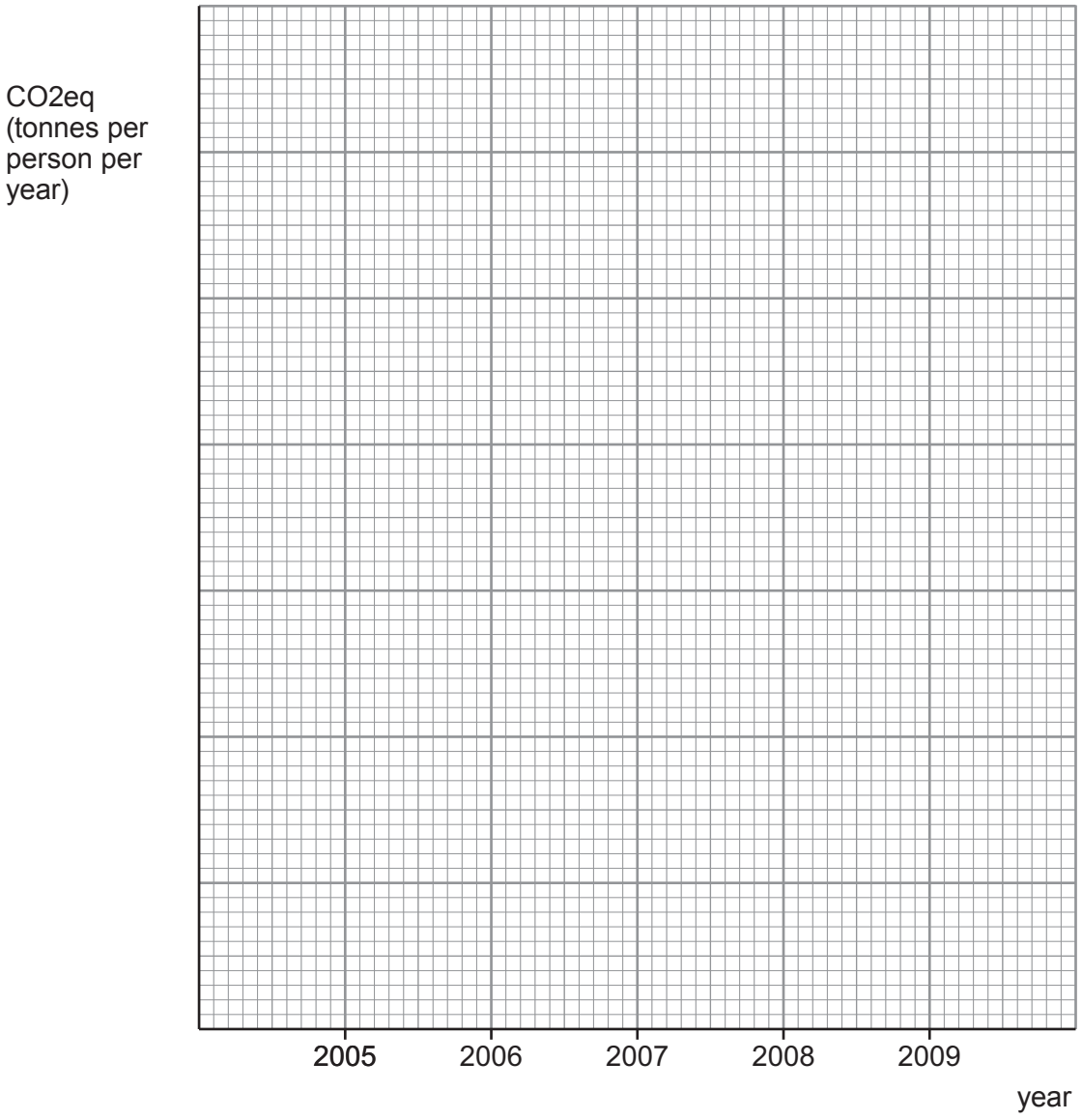
(i) State the countries which produced the lowest carbon dioxide emissions in 2009. [1]

.....

(ii) Name the country with the biggest increase in carbon dioxide emissions in tonnes per person per year between 2005 and 2009. [1]

.....

(iii) Plot a graph on the grid below to show how carbon dioxide emissions per person has changed over time in the UK. [4]



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(iv) Use the data to estimate the year in which the carbon dioxide emissions per person in the UK will reach the maximum allowed for sustainable living. Show how you arrived at your answer. [3]

year = ...

(b) A homeowner installs photovoltaic cells on the roof of their house and a log burner in their living room.
Describe how this will alter the pie chart of their personal CO_2 contributions shown in **Diagram 2**. [2]

.....

.....

(c) A farmer supplies 2000 kg of beef to the food industry every year. He is told that if he changed to supplying 2000 kg of poultry instead, he would reduce his carbon footprint. Use the information in **Table 2** to calculate the savings in his carbon footprint. [2]

Savings in carbon footprint = ... kgCO2eq

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END OF PAPER