

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4781/01



S15-4781-01

**SCIENCE B**

**UNIT 1: Space, Energy and Life  
FOUNDATION TIER**

P.M. FRIDAY, 5 June 2015

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	9	
3.	8	
4.	10	
5.	12	
6.	6	
7.	9	
8.	6	
9.	3	
<b>Total</b>	<b>70</b>	

**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(a).

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**SECTION A**

*Answer all questions in the spaces provided.*

1. *Reduce, reuse and recycle* schemes are used to improve sustainability.

(a) Complete the table to state whether each method is an example of a reduce, reuse or recycle scheme. [5]

Method	Scheme Reduce, reuse or recycle?
charging shoppers for carrier bags	.....
crushing and melting aluminium drink cans to make new ones	.....
using low energy lamps	.....
donating clothes and furniture to charity shops	.....
insulating homes	.....

(b) Some of these methods reduce the waste sent to landfill sites. State **two** benefits of reducing landfill waste. [2]

1. ....

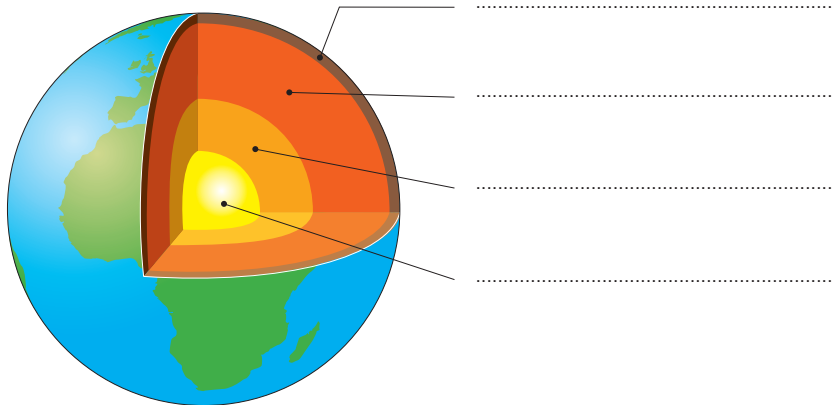
2. ....

2. The diagram below shows the structure of the Earth.

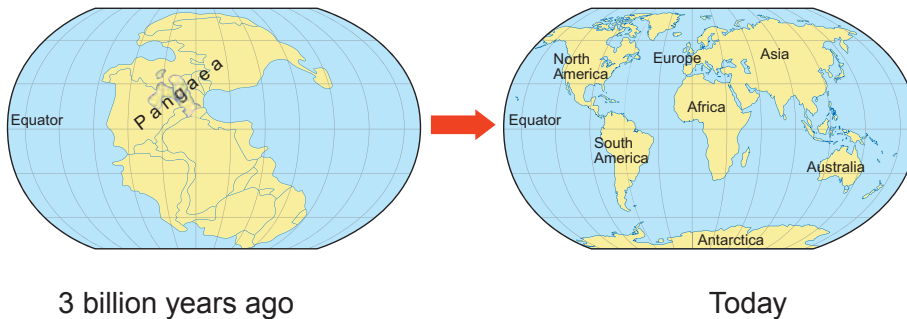
(a) Label the **four** parts shown using words from the box.

[4]

**solid iron core    mantle    crust    liquid outer core    continent**



(b) The diagrams below show how the surface of the Earth has changed over a long period of time. There was only one mass of land 3 billion years ago. This was called Pangaea.



Complete the paragraph below which explains how these changes have happened. [5]

The ..... is broken into sections called tectonic plates. The plates float on the ..... . The ..... are on the plates. Convection currents in the ..... move the tectonic plates very .....

3. The table below shows what happens to the energy taken in each day by living things in a food chain.

Living thing	Energy (MJ) per day		
	As waste	Released during respiration	Used for growth
plant	18	12	8
caterpillar	14	22	4
bird	16	30	4

- (a) (i) Calculate the total energy taken in by the plant each day. [1]

Energy taken in = ..... MJ

- (ii) The bird takes in 50 MJ of energy every day. Calculate the percentage of energy released during respiration. [2]

Percentage = ..... %

- (iii) State how the amount of energy released during respiration changes as you move higher in the food chain shown in the table. [1]

.....

Give **one** reason for this change. [1]

.....


- (b) Crops can be sprayed with a pesticide which kills large numbers of caterpillars. Explain the effect of spraying crops on the other living things in this food chain. [3]

.....  
 .....  
 .....  
 .....

4. Infra-red (I-R) radiation from the Sun travels through space at a speed of  $3 \times 10^8$  m/s. I-R radiation is one part of the electromagnetic (em) spectrum. Other regions of the em spectrum include **visible light, ultraviolet, radio waves** and **microwaves**.

- (a) (i) Complete the **first column only** to show the missing regions of the em spectrum in order of increasing wavelength. [2]

Region of em spectrum	Typical wavelength (m)
visible light	.....
I-R	$4 \times 10^{-6}$ (0.000004)
.....	.....
.....	.....


 Increasing wavelength

- (ii) Typical wavelengths (in metres) for each region of the em spectrum are listed below in a random order.

0.02	$5 \times 10^{-7}$ (0.0000005)	600
------	--------------------------------	-----

Use these values to complete the **wavelength column** in the table. [2]

- (iii) State the speed of visible light through space. .... m/s [1]
- (iv) State which region of the em spectrum, **in the table**, has the highest frequency. [1]

.....

(b) (i) The following statements describe how the greenhouse effect occurs on Earth.

	Statement
<b>A</b>	I-R from the Sun arrives on Earth
<b>B</b>	Gases emit I-R back to Earth
<b>C</b>	The surface warms up by absorbing I-R
<b>D</b>	Gases in the atmosphere absorb I-R
<b>E</b>	Earth emits I-R

Arrange the statements in the correct order in the boxes below.  
The first box has been completed for you.

[3]

<b>A</b>	.....	.....	.....	.....
----------	-------	-------	-------	-------

(ii) Name **one** greenhouse gas. ....

[1]

10

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5. Homeowners who generate electricity from solar power save money and get paid for the energy they produce.

(a) State **two** ways using solar power benefits the **environment**. [2]

1. ....

.....

2. ....

.....

(b) The total savings for a typical **2.4 kW** household installation of solar panels are:

- £1 100 a year from the Generation Tariff
- £80 a year from the Export Tariff
- £120 a year reduction of current electricity bills.

(i) Calculate the total saving in a year. [1]

Saving = £ .....

(ii) If the solar panels cost £7 800 to install, calculate the payback time. [2]

Payback time = ..... years

(iii) State **how** the payback time for the solar panel will be affected if the power output from the panel is less than 2.4 kW. [1]

.....

(iv) Give **two** reasons why the power output from the panel may be less than 2.4 kW. [2]

1. ....

2. ....



- (c) (i) One unit of electricity costs 15 p. Calculate how many units must have been produced to save the homeowner £120 (12 000 p).

[2]

Examiner  
only

Use the equation:

$$\text{number of units} = \frac{\text{saving}}{\text{cost per unit}}$$

Number of units = .....

- (ii) Calculate the number of hours of sunshine required by the 2.4 kW solar panels to generate the number of units for your answer in (c)(i).

[2]

Use the equation:

$$\text{time} = \frac{\text{number of units}}{\text{power}}$$

Time = ..... hours

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**SECTION B**

*Answer all questions in the spaces provided.*

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

**6.** Use **Diagram 1** to answer the following questions.

(a) Describe how the diagram shows the universe has changed over time. [1]

.....

(b) Explain why the diagram does not support the Steady-State theory of the universe. [2]

.....

.....

.....

(c) Imagine **C** is our galaxy, the Milky Way. Compare how the distances of galaxies **A** and **D** from the Milky Way have changed from the early universe to some time later. [2]

.....

.....

(d) Arrange galaxies **A**, **B**, **D** and **E**, in order of speed of travel away from **C** from fastest to slowest. [1]

*Fastest* ..... *Slowest*

6



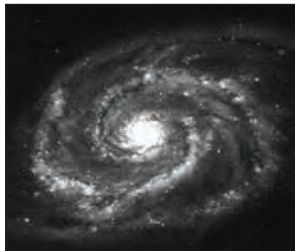
(b) Write down the class of each galaxy shown in the diagrams below.

[3] Examiner only

*The first one has been done for you.*



Class E0



Class .....



Class.....

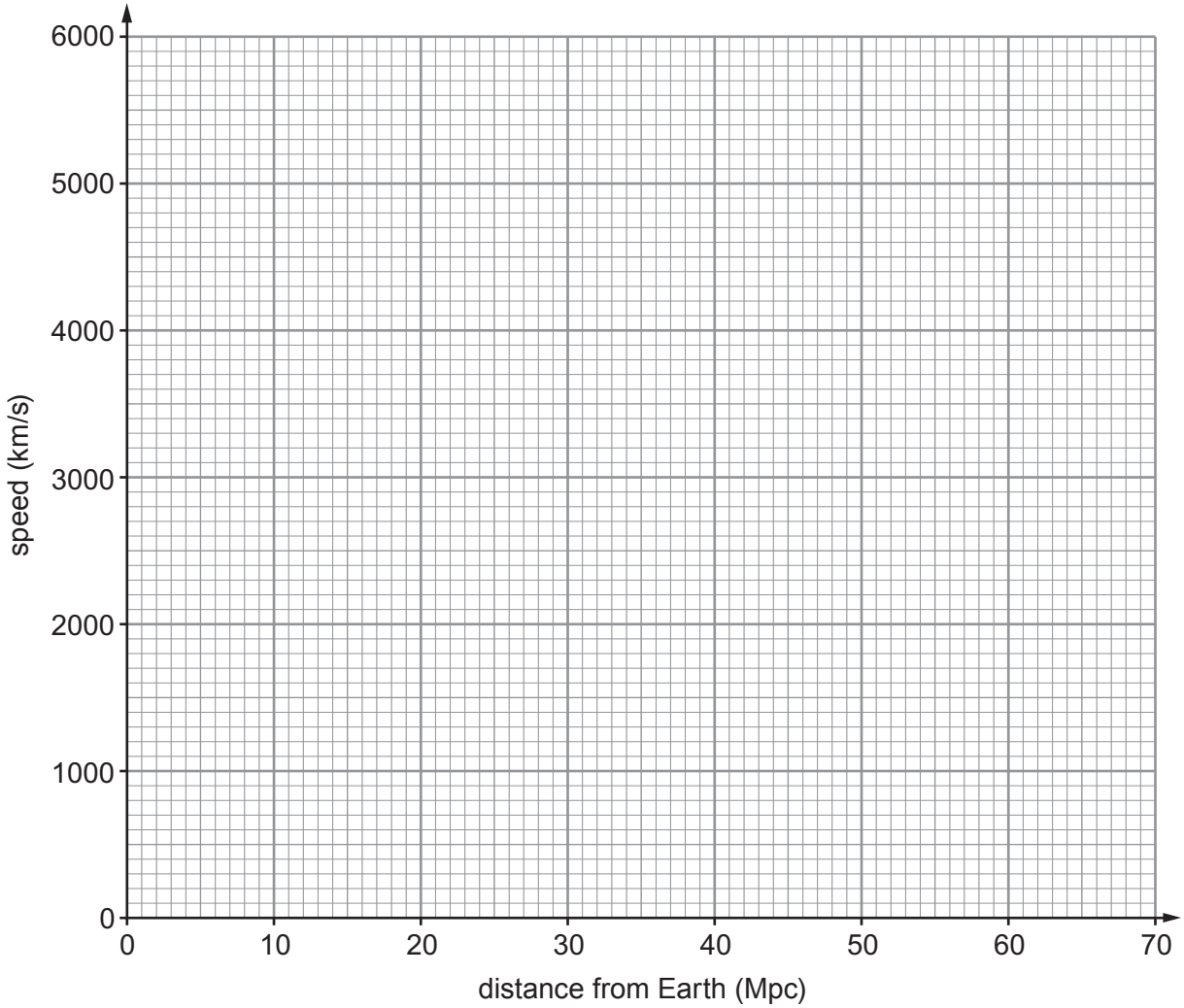


Class .....

9

8. (a) Use the data in **Table 2** to plot a graph on the grid below.  
Use **only** the data for the six galaxies from NGC-4486 to NGC-5548.  
Add a straight line of best fit that goes through the origin.

[3]



- (b) Use your graph to find a value for the Hubble constant.

[3]

Hubble constant = ..... km/s/Mpc

6

9. Refer to **Diagram 3** to answer this question.

Describe how the surface temperature of our Sun will change as it becomes a red giant similar to Aldebaran and then a white dwarf similar to Sirius B. You should include data in your answer.  
[3]

.....

.....

.....

.....

**END OF PAPER**

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