

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4781/01



W16-4781-01

SCIENCE B

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

A.M. THURSDAY, 14 January 2016

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A	1.	10
	2.	10
	3.	8
	4.	8
	5.	10
Section B	6.	12
	7.	6
	8.	6
Total	70	

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** (Pre-Release Article) 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

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.

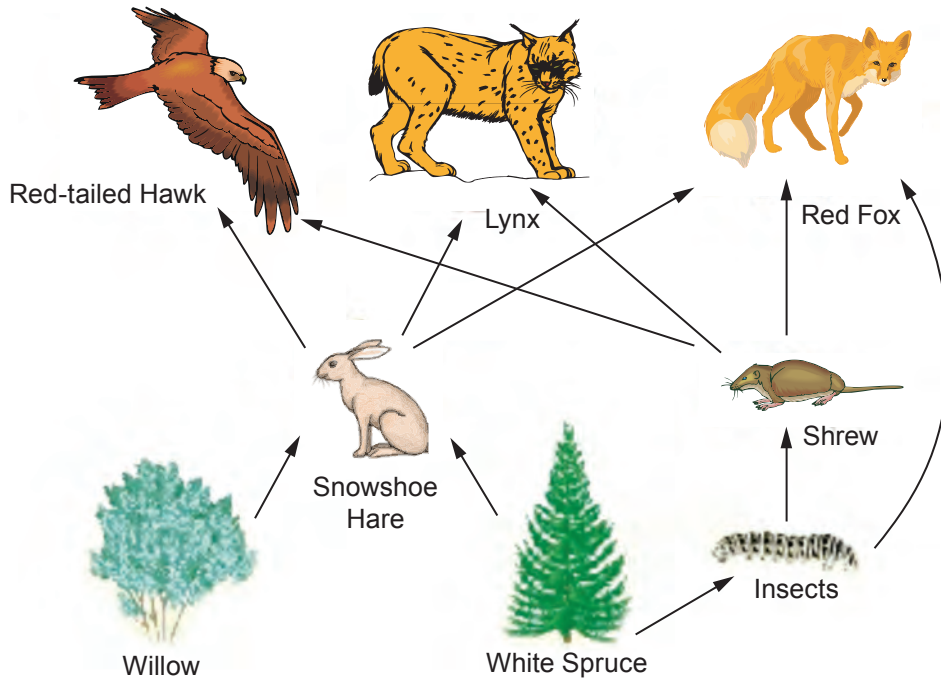
Section B is based upon the **Pre-Release Article**.

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SECTION A

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

1. The picture shows a food web.



(a) Answer each question using the food web.

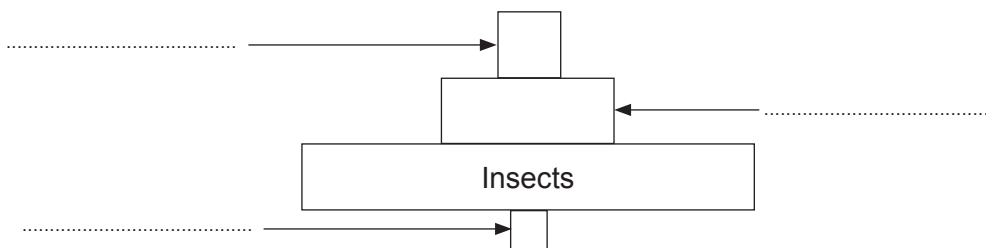
- (i) Name **one** producer. [1]
- (ii) Name **one** herbivore. [1]
- (iii) Name the prey of the shrew. [1]

(b) (i) State **three** factors that will affect the size of the white spruce population. [3]

1.
2.
3.

(ii) Name the source of energy for this food web. [1]

(c) Label the pyramid of numbers below for one food chain in the web: [3]



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2. A homeowner is shopping for a washing machine. He compares information about four different models.

Model	Price (£)	Power (W)	Power (kW)	Units used per year (kWh/y)	Annual running cost (£)	Annual running cost (p)
A	350	2 200	2.2	220		
B	345	2 400		240	38.40	3 840
C	320	2 700	2.7	270	43.20	4 320
D	340	2 100	2.1			3 360

- (a) (i) Calculate the annual running cost for model **A** using the equation: [2]

annual cost = cost of one unit (16p) x units used in a year

cost =

- (ii) State the power of model **B** in kW. [1]

power = kW

- (iii) Calculate the length of time model **C** uses electricity during the year, by using the equation: [2]

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

time = h

- (iv) State the annual running cost of model **D** in £. [1]

cost = £

- (v) The information assumes all models are used for the same time. Calculate the units used per year by model **D**. [1]

units used =

- (b) Complete the table below to select which model you would recommend as the best value for money. [3]

Model	Cost to buy (£)	Annual running cost (£)	10 year running cost	Total cost over 10 years
B	345	38.40
C	320	43.20

Best value for money = model

10

3. The table gives information about different regions of the electromagnetic (em) spectrum.

Region	Wavelength (m)	Frequency (Hz)
radio	2	150 000 000
microwave		
infra-red		
visible		
.....		
.....		
.....		

- (i) Complete the table by placing X-rays, gamma rays and ultraviolet in the correct positions. [2]
- (ii) Calculate the speed of em waves in space using information from the table and the equation:

wave speed = frequency x wavelength [2]

speed = m/s

- (iii) Complete the following sentences by underlining the correct word(s) in brackets. [4]

As you move down the table from radio waves the **wavelength** (*decreases / stays the same / increases*).

As you move down the table from radio waves the **frequency** (*decreases / stays the same / increases*).

As you move down the table from radio waves the **wave speed** (*decreases / stays the same / increases*).

As you move down the table from radio waves the **wave energy** (*decreases / stays the same / increases*).

8

4. (a) (i) In the table below, tick (✓) the statements that show the effects of raw sewage. [3]

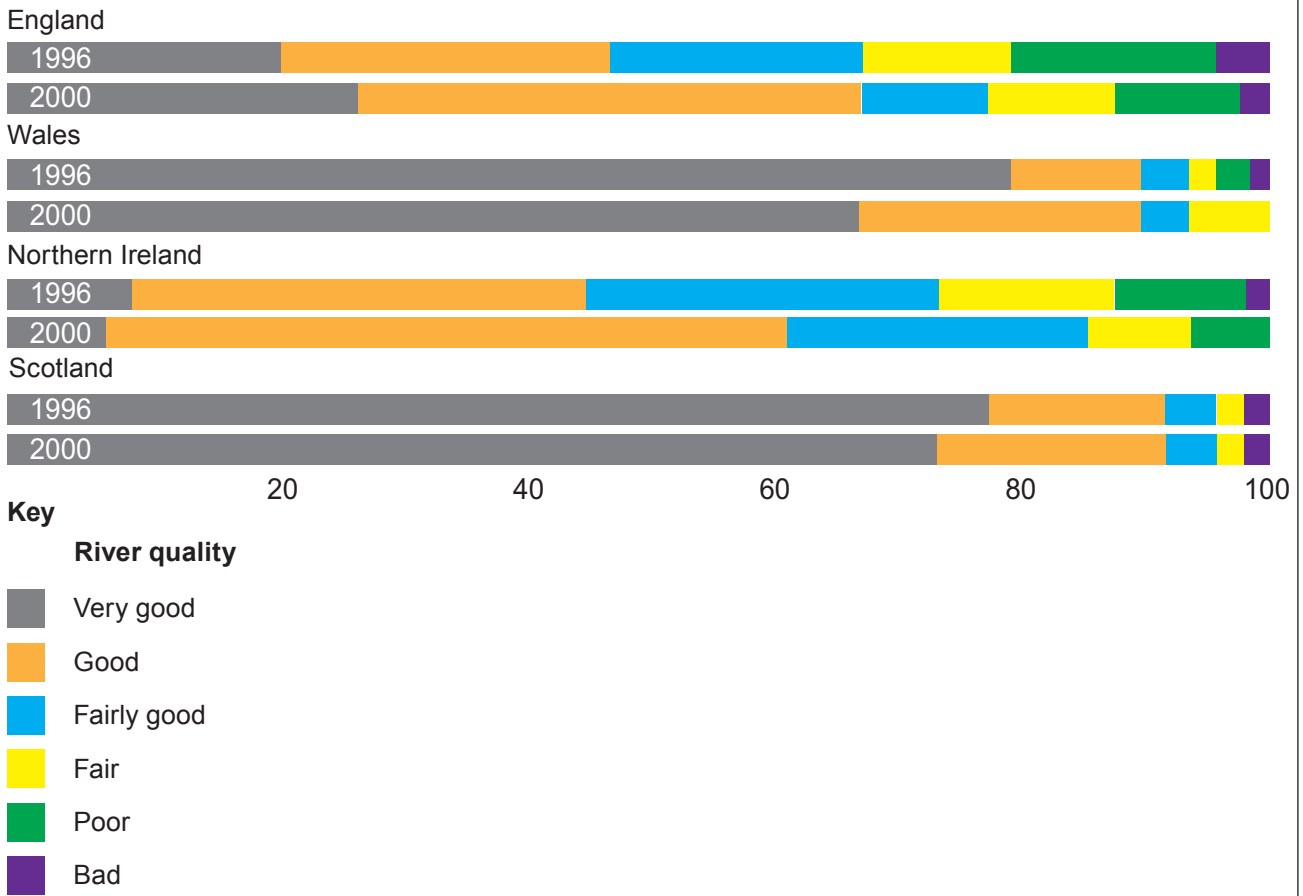
Effect	(✓)
increases the number of bacteria in water	
increases oxygen content of water	
causes diseases in surfers	
decreases oxygen content of water	
increases biodiversity of river animals	

- (ii) Name **two** types of chemicals used in intensive farming that cause water pollution. [2]

1.

2.

(b) The chart shows how river quality in the UK changed over a 4 year period.



Use the information in the chart to answer the following questions.

(i) Name the country with the least 'very good' water in 1996. [1]

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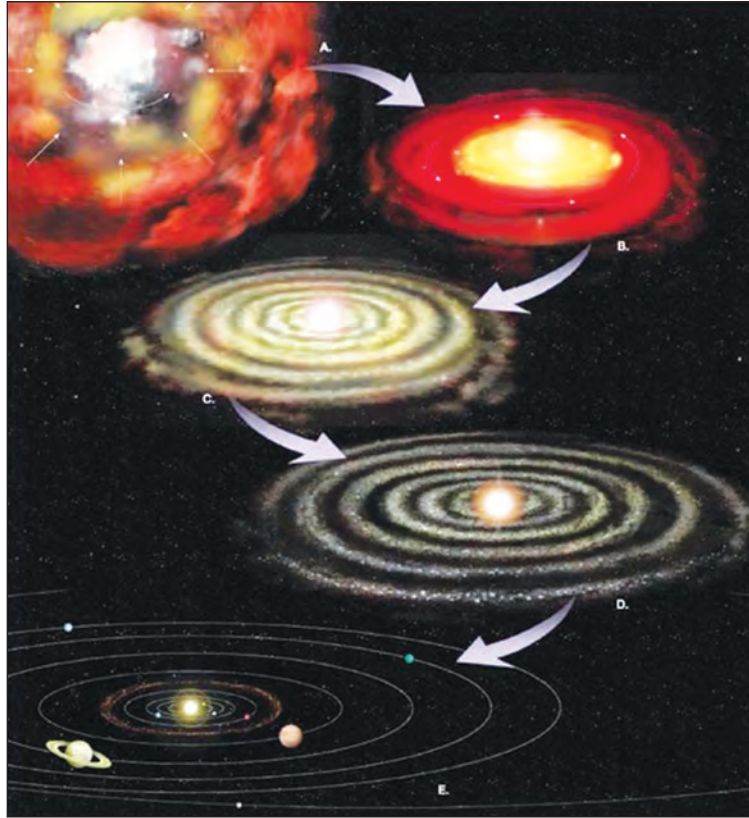
(ii) Name **one** country with **no** 'bad' water quality in 2000. [1]

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(iii) Name the country with the biggest drop in 'very good' water quality between 1996 and 2000. [1]

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5. (a) Use the detail in the picture to help you describe how the Sun and the Solar System were formed. [4]



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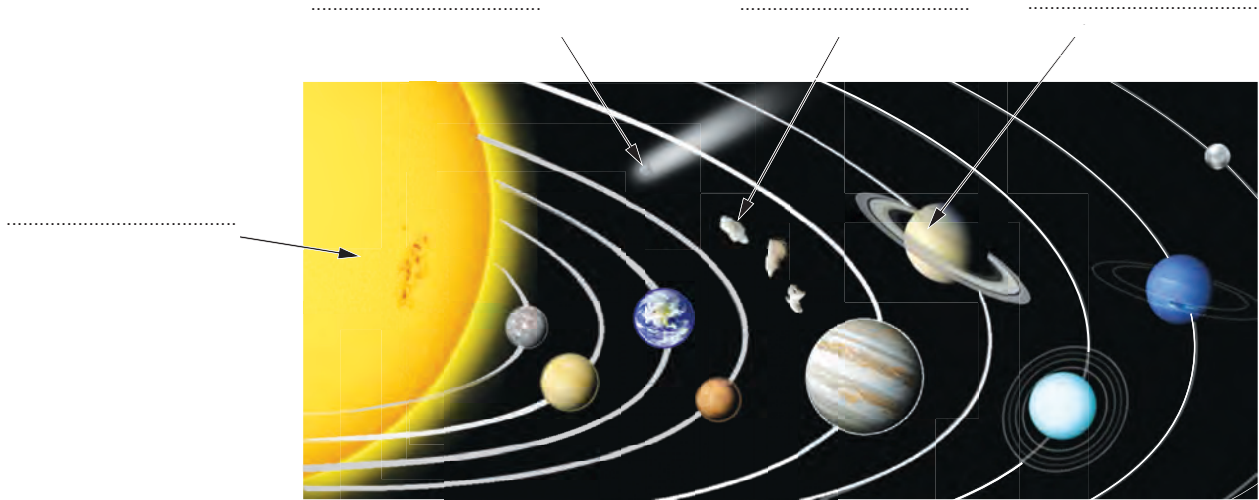
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- (b) (i) The diagram shows structures found within the Solar System. Label the structures shown by the arrows. [4]



- (ii) Name the cloud that forms the outer edge of the Solar System. [1]

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- (iii) Name the bodies that orbit some planets but are not shown on the diagram. [1]

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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. (a) Use the information in **Table 1** to answer the question below.

Calculate the drop in the power generated by non-renewable sources from 2010 to 2050.
 Assume that the maximum power generated remains at a constant 34 GW. [2]

Drop in power generation by non-renewable sources = GW

- (b) (i) Use the information in **Table 2** to answer the following questions.

A 10 MW power station needs 60 000 tonnes of willow crop per year.

- I. Calculate the area of land needed to grow this amount of willow crop. [1]

area km²

- II. Calculate the energy content of 60 000 tonnes of willow crop. [1]

energy content = units

- (ii) Explain why burning biofuels is more environmentally friendly than burning fossil fuels. [2]

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- (c) Use the information about wind power on **page 5** to answer the following question.
Complete the table by ticking (✓) the correct column for each steady wind speed.
One has been completed as an example. [3]

Steady wind speed (m/s)	Zero power output	Rated output power	Between zero and rated output power
2.9	✓		
27.2			
19.6			
12.2			

- (d) Describe the advantages of tidal water turbines compared to wind turbines using your knowledge and the information in **Table 3**. [3]

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8. Use the information about solar panels on **page 7** to answer the questions that follow.

(i) Calculate the efficiency of a solar panel using the equation:

[2]

$$\text{percentage efficiency} = \frac{\text{useful output power}}{\text{total input power}} \times 100$$

percentage efficiency =

(ii) Household voltage is 230 V. Calculate the maximum current that can be drawn from a solar panel of area 1 square metre, using the equation:

[2]

$$\text{current} = \frac{\text{power}}{\text{voltage}}$$

current = A

(iii) Calculate the energy (Wh) produced by a 5 square metre solar panel in 6 hours of good sunlight.

[2]

energy = Wh

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