

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4781/01

**SCIENCE B**

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

**FOUNDATION TIER**

P.M. WEDNESDAY, 5 June 2013

1¼ hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	4	
3.	12	
4.	8	
5.	6	
6.	7	
7.	5	
8.	24	
<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.  
**Section B** is based upon the Pre-Release Article.

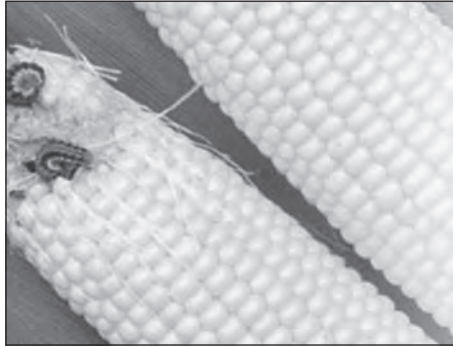
**INFORMATION FOR CANDIDATES**

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 used in your answer to question **8(e)**.

**SECTION A**

*Answer all questions in the spaces provided.*

1. Some insects feed on and destroy sweetcorn crops. Scientists have developed genetically modified sweetcorn that produces a poison, which kills these insects.



For each statement below, tick (✓) a box to show if it is an advantage **or** disadvantage of using this crop. [4]

	Advantage	Disadvantage
The farmer no longer uses insecticide to kill insects	<input type="checkbox"/>	<input type="checkbox"/>
No build up of insecticides to toxic levels in food chains	<input type="checkbox"/>	<input type="checkbox"/>
The insects can become resistant to the poison	<input type="checkbox"/>	<input type="checkbox"/>
Other insects are at risk of being killed	<input type="checkbox"/>	<input type="checkbox"/>

2. Complete the sentences below.

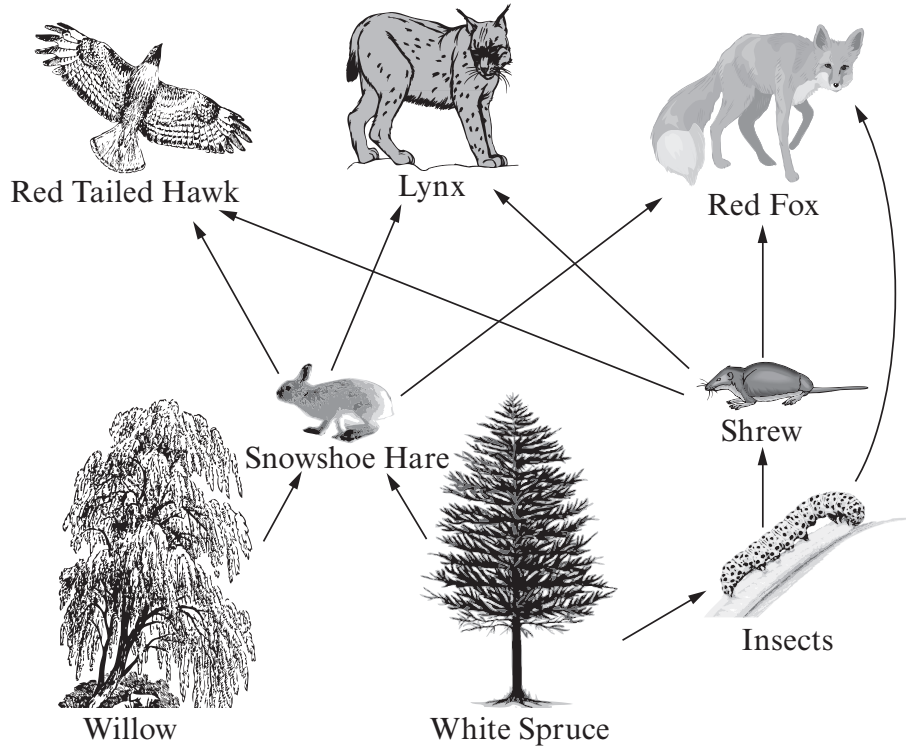
(i) The surface of the Earth is changing because of the movement of tectonic  
..... [1]

(ii) Earthquakes and ..... occur most often at the boundaries  
between the ..... [2]

(iii) The sudden jerking movements of plates cause ..... [1]

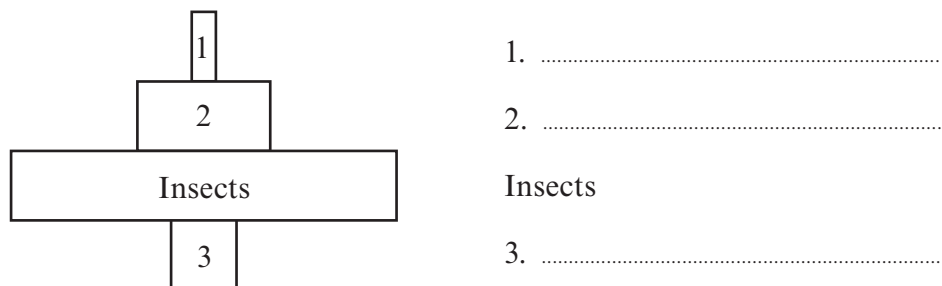
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3. The diagram below shows a food web.



(a) Use information in the food web to answer the questions that follow.

- (i) Name the prey of the shrew. .... [1]
- (ii) Name **one** producer. .... [1]
- (iii) Name **one** carnivore. .... [1]
- (iv) Complete the labelling of the pyramid of numbers below, using names from the food web above. *One part has been done for you.* [3]



(b) State **three environmental** factors that will affect the size of the **willow** population. [3]

- 1. ....
- 2. ....
- 3. ....

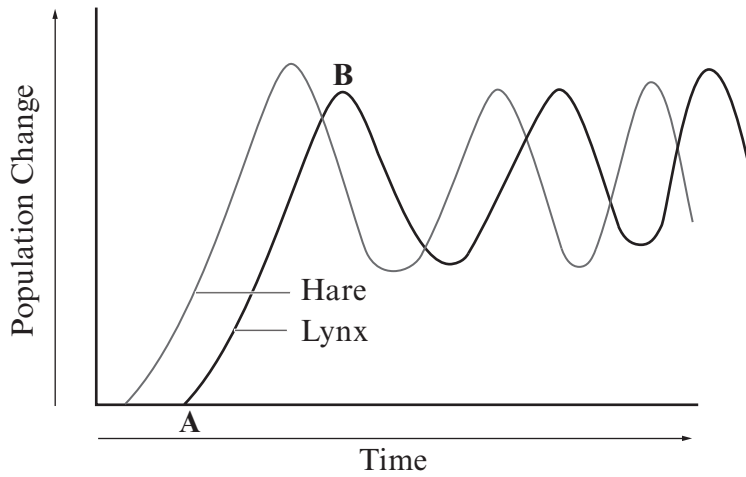
(c) In the natural habitat, the lynx is a predator of the snowshoe hare.



(i) State **one** way in which the hare is adapted to its environment. [1]

.....

(ii) The population of lynx and hares changes in the pattern shown in the graph.



Use only the information in the graph to answer the following questions.

I. Give **one** reason why the lynx population increases from **A** to **B**. [1]

.....

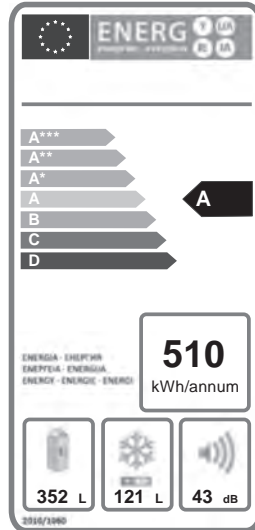
II. Give **one** reason why the lynx population decreases after **B**. [1]

.....

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4. A homeowner is shopping for a refrigerator.

She sees a label attached to each one. An example of a label is shown below.



The homeowner is given a leaflet containing information about four similar size refrigerators. The information is shown in the table below.

Model	Voltage V	Current A	Power W	Power kW	Units used in a year kWh	Annual Cost £
<b>A</b>	230	0.70	161	0.161	310	37.20
<b>B</b>	230	0.78	.....	.....	345	41.40
<b>C</b>	230	0.67	154	0.154	297	35.64
<b>D</b>	230	0.69	158	0.158	305	.....

(a) (i) Calculate the amount of time the model **A** uses electricity during the year using the equation:

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

Time = ..... h [2]

(ii) Complete the gaps in the table for model **B** using the equation:

$$\text{power} = \text{voltage} \times \text{current} \quad [3]$$

(iii) Calculate the annual cost of running model **D** using the equation:

[2]

annual cost = cost of one unit (12p) × units used in a year

Total cost = .....

(b) Model **C** was £5 more expensive to buy than model **B**. Give **one** reason why you would still recommend that the homeowner buys model **C**.

[1]

.....  
.....

8

5. (a) (i) Explain why burning fossil fuels affects the Earth's climate.

[2]

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

(ii) Explain why destroying forests to clear land affects the climate.

[2]

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

(b) State **two** effects global warming has on the Earth.

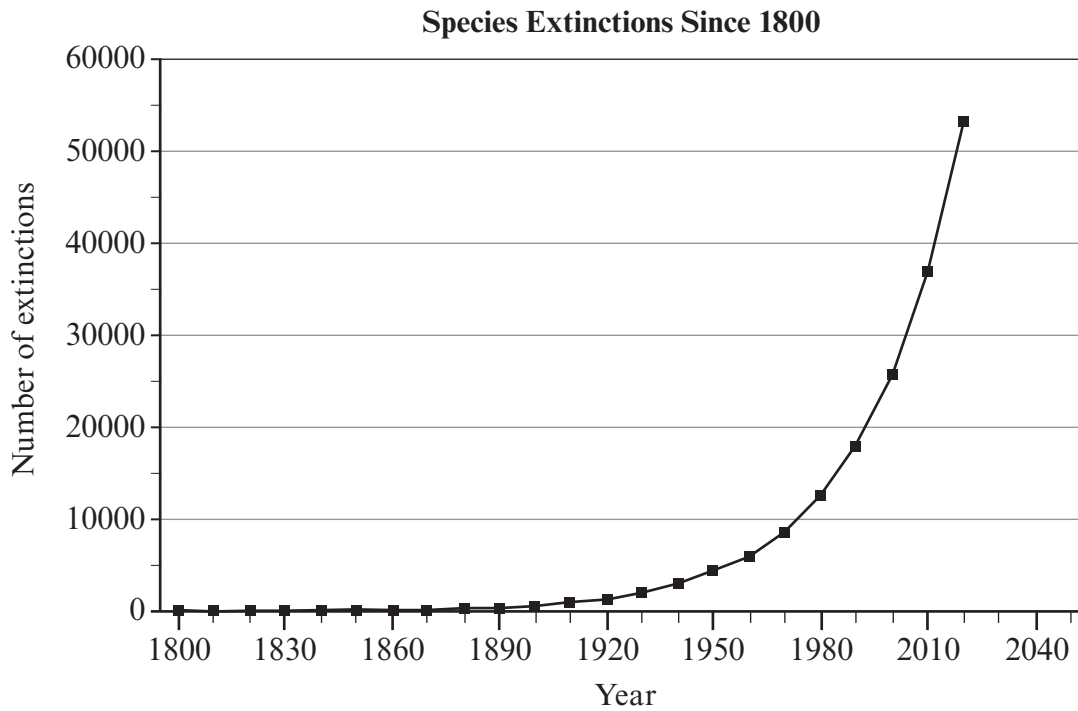
[2]

- 1. ....
- 2. ....

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6. (a) The graph below shows how the number of extinctions of different species has changed over time.



Describe the trend shown by the graph.

[2]

.....

.....

.....

- (b) One animal in danger of becoming extinct is the giant panda. Only about 1,600 remain in the wild.



Giant pandas live in a few mountain ranges in central China. They once lived in lowland areas, but are now restricted to the mountains. Giant pandas live in forests with a plentiful supply of bamboo for them to eat.



(i) State **two** reasons why an increase in the human population requires the use of more land. [2]

1. ....

2. ....

(ii) Explain why an increase in the human population has threatened the survival of giant pandas. [2]

.....

.....

.....

(iii) State **one** way the extinction of giant pandas can be prevented. [1]

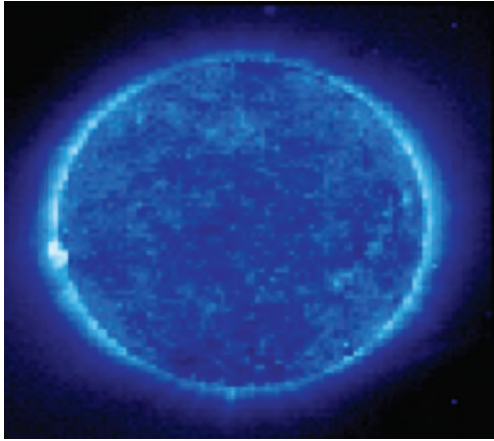
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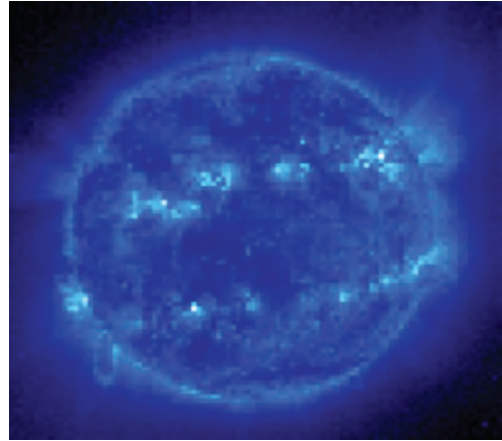
7. In February 2010 NASA's Solar Dynamics Observatory (SDO) was launched into space. SDO has sent back millions of stunning images of the Sun.

(a) (i) Two X-ray images of the Sun are shown below.

1



2

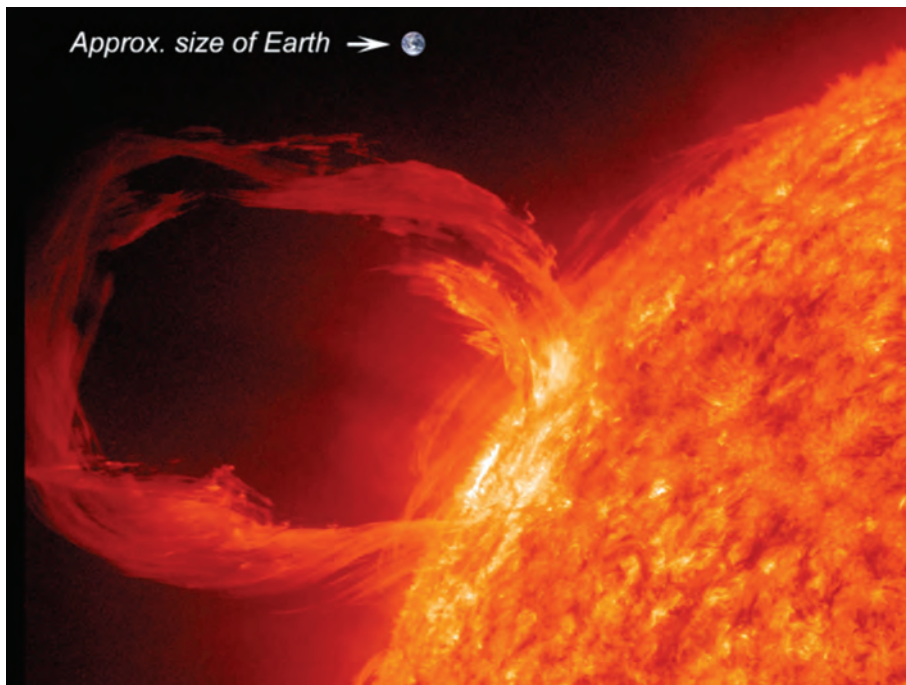


State the difference in the activity of the Sun shown in the pictures 1 and 2. [1]

.....

.....

(ii) The picture below was taken in UV light.



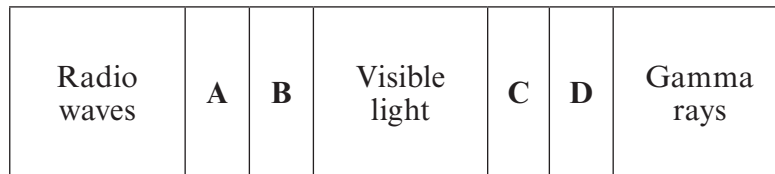
Describe what the picture shows is happening on the surface of the Sun. [1]

.....

.....

- (iii) State **one** advantage of taking these pictures from NASA's SDO rather than from an Earth based observatory. [1]
- .....

- (b) Both X-rays and UV light are parts of the electromagnetic (em) spectrum. The diagram below shows the parts of the em spectrum.



- (i) To which part of the spectrum, **A**, **B**, **C** or **D** do X-rays belong? ..... [1]
- (ii) To which part of the spectrum, **A**, **B**, **C** or **D** does UV light belong? ..... [1]

**SECTION B**

*Answer all questions in the spaces provided.*

**Use the information in the separate resource booklet to answer the following questions.**

- 8.** (a) Explain how the shape of the blades causes the wind turbine to turn in the wind. [2]

.....

.....

.....

- (b) Use the information in **Table 1** to answer the questions below.

- (i) What is the range of wind speeds in which wind turbine **5** will operate? [1]

.....

- (ii) State the value of the swept area by wind turbine **2**. ..... [1]

- (iii) I. State the maximum power output of wind turbine **2**. ..... [1]

- II. To give the maximum power output recorded in **Table 1**, the wind power must be 1500 kW.

Calculate the efficiency of wind turbine **2** using the equation: [2]

$$\% \text{ Efficiency} = \frac{\text{useful output power}}{\text{total input power}} \times 100$$

% Efficiency = .....

(c) A wind turbine has a blade diameter of 80 m.

(i) Calculate the swept area of the blades.

[2]

Swept area = ..... m<sup>2</sup>

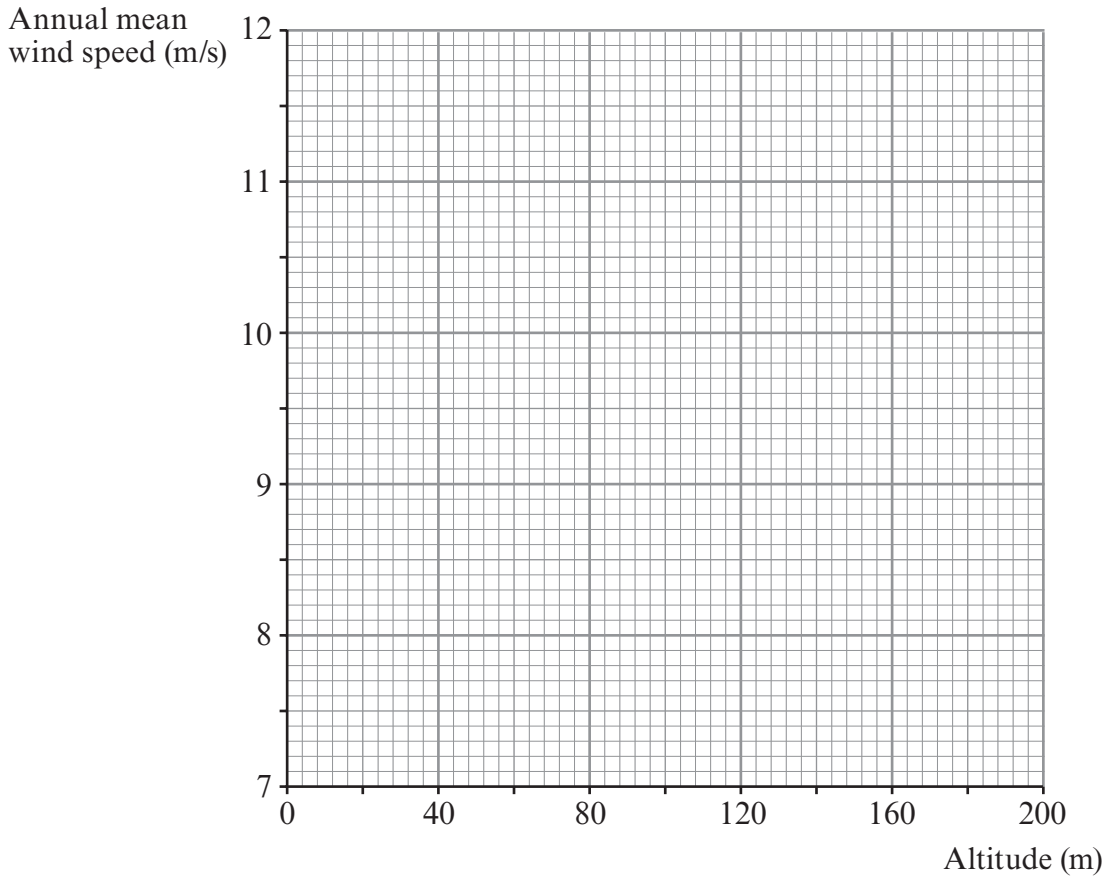
(ii) The turbine is placed at an altitude of 160 m.  
Calculate the mean kinetic energy/second delivered to the turbine.  
(Use  $(\text{wind speed})^3 = 1300 \text{ m}^3/\text{s}^3$ )

[2]

Mean kinetic energy/second = ..... J/s

(d) (i) Use the information in **Table 2** to answer the questions below.

I. Plot a graph on the grid below to show how **annual mean wind speed** varies with **altitude**. [3]



II. Explain why the maximum power output of a wind turbine is affected by altitude. [2]

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

(ii) Use the information in **Table 3** to explain why the power output of the wind turbine will be different in summer and winter. [2]

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

