

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4781/01

SCIENCE B

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

P.M. FRIDAY, 6 June 2014

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	6	
3.	4	
4.	7	
5.	10	
6.	8	
7.	4	
8.	24	
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 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(a)(ii)**.

BLANK PAGE

SECTION A

Answer all questions in the spaces provided.

1. (a) Tick (✓) the correct box to complete each statement below. [3]

(i) According to the theory of evolution, new species evolve by:

artificial selection

natural selection

unnatural selection

(ii) Individuals in a species show a wide range of variation because of differences in their:

genes

hormones

cells

(iii) The individuals most likely to survive to reproduce are those:

with no immunity to disease

poorly suited to the environment

well suited to the environment

(b) (i) Describe what is meant by the term *biodiversity*. [2]

.....
.....

(ii) Explain why the number of different species is not distributed evenly on Earth. [2]

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

4781
010003

7

2. Intensive farming methods include the use of pesticides, fertilisers, herbicides, and 'battery' farming. These methods increase food production but there are disadvantages.

Complete the table using words from the box below.

The first line has been completed for you. Do **not** use a word more than once.

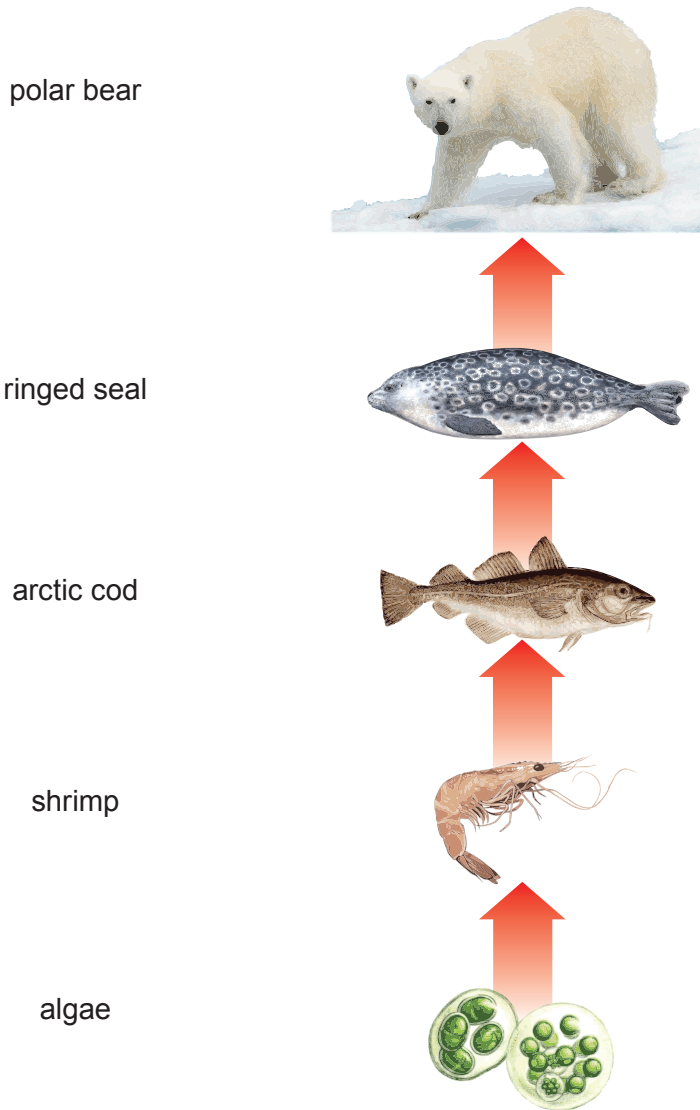
[6]

input	nutrients	plants	output	biodiversity	indoors	rivers
insects	warm	sunlight	animals	poison		

Intensive farming method	Reason for use	Disadvantage
Pesticide spray	Removes animals that feed on the crop	May poison useful organisms
Herbicide spray	Removes competing	Reduces
Fertiliser spray	Adds to the soil	Causes dense plant growth in
'Battery' farming	Increases	Keeps animals

6

3. About 150 tonnes of the highly toxic heavy metal mercury enters the environment every year. Some of this will enter the food chain below.



(a) State the *source* of energy for the food chain. [1]

(b) (i) How does mercury get into the body of shrimps? [1]

.....

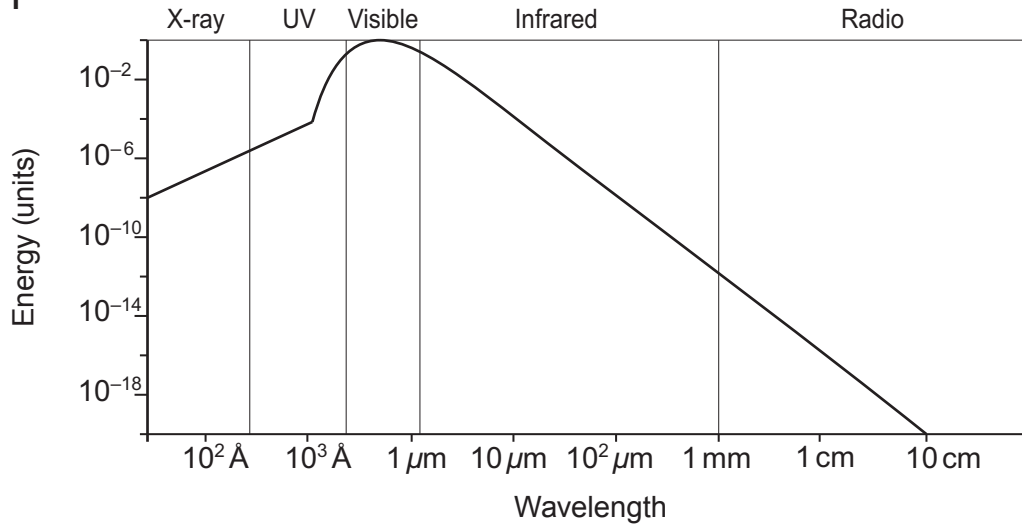
(ii) Explain why the effect of mercury is most harmful to the polar bear. [2]

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

4781
010005

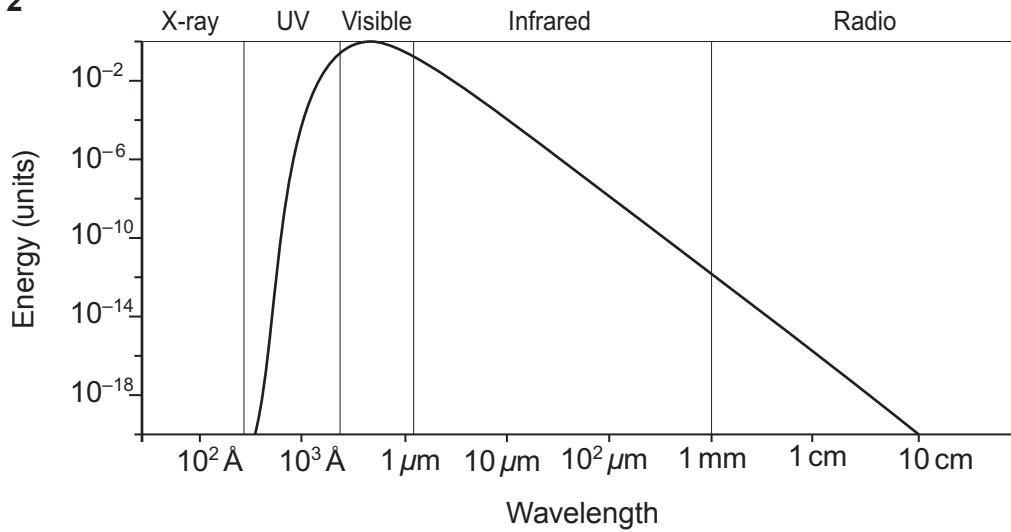
4. Graph 1 shows the energy given out by the Sun at different wavelengths.

Graph 1



Graph 2 shows the expected energy given out by the Sun at the same wavelengths.

Graph 2



(i) Name **two** regions of the electromagnetic spectrum **not** shown on the graphs. [2]

1

2

(ii) State **one** similarity between graphs 1 and 2. [1]

.....

(iii) State **one** difference between graphs 1 and 2. [1]

.....

- (iv) Use the graphs to find the wavelength of the longest radio waves given out by the Sun. [1]

..... cm

- (v) Calculate the frequency of the longest radio waves emitted from the Sun. You will need to use your answer from (iv) and the equation: [2]

$$\text{frequency} = \frac{\text{wave speed}}{\text{wavelength}}$$

Speed of light = 30 000 000 000 cm/s

Frequency = Hz

4781
010007

7

5. The photographs below show different features on Mars.

(a) Use words from the list below to complete the labels.

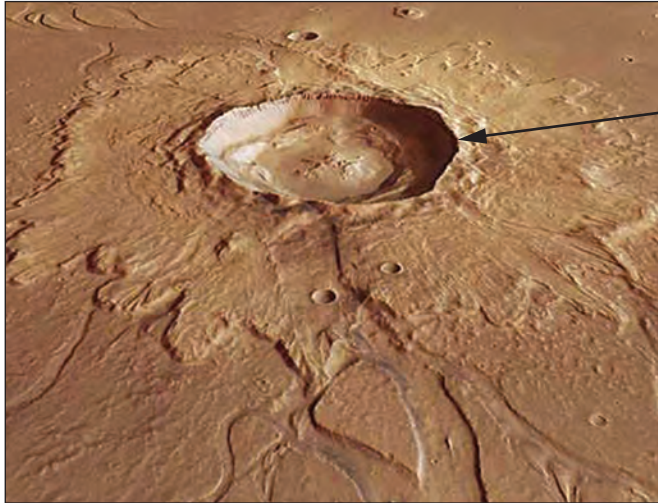
[2]

volcano

ice cap

crater

Photograph 1



Photograph 2



Photograph 3



- (b) (i) Name the substance that flows from a volcano when it erupts. [1]
.....
- (ii) What does the presence of a volcano suggest about the early core of Mars? [1]
.....
.....
- (iii) It has been suggested that the surface of Mars may be made from tectonic plates. Give **one** reason how the presence of volcanoes supports this idea. [1]
.....
- (c) There are many more craters on the surface of Mars than on the surface of Earth.
- (i) How were these craters formed? [1]
.....
- (ii) Give **one** reason why this suggests there is a 'thinner' atmosphere on Mars. [1]
.....
.....
- (d) (i) Only **frozen** water has been found on Mars, for example, at the ice cap. What does this tell us about the climate on Mars? [1]
.....
.....
- (ii) Carbon dioxide makes up 95% of the atmosphere on Mars. **Explain** how you would expect this to affect Mars' climate. [2]
.....
.....
.....

6. Large areas of land are used to grow trees that will be cut up to make wood chips. The wood chips are used instead of gas, coal or oil, as fuel in boilers.

(a) Explain why the supply of wood chips is renewable. [2]

.....

.....

.....

(b) (i) Name **one** gas given out when wood chips are burned. [1]

.....

(ii) Name the gas **used by** trees during photosynthesis. [1]

.....

(iii) Give **one** reason why using wood chips as a fuel is carbon neutral. [1]

.....

(c) Some coal power stations have been converted to run on wood chips.
They also act as combined heat and power (CHP) stations.
 These make use of the heat in water to provide central heating for the power station and houses nearby.

One CHP station receives 500 MW of power from burning wood chips. Of this, 220 MW is distributed for district heating and 180 MW is transferred to the National Grid.

(i) Calculate the total useful output power. [1]

Useful output power = MW

(ii) Calculate the efficiency of the power station using the equation: [2]

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

Efficiency = %

7. Less landfill waste will be produced if people 'reduce, reuse and recycle'.

Complete the table below to state whether each action is an example of reduce, reuse or recycle.
The first one has been done for you. [4]

Action	Is it an example of reduce, reuse or recycle?
Place glass bottles in bottle bank	recycle
Make compost from left over fruit and vegetable peelings
Buy food with less packaging
Buy 'bags for life'
Don't buy more than you need

4

(b) Refer to the information about **double-glazing** and **Graph 1** to answer the following questions.

(i) I. Describe how the rate of loss of energy is related to the size of the air gap. [1]

.....

.....

.....

II. Give **one** reason why makers of double-glazing are unlikely to use an air gap larger than 20 mm. [1]

.....

.....

(ii) A house has a window area of 24 m^2 . The air gap used in the windows is 15 mm. There is a 20°C temperature difference between the inside and outside of the house.

Calculate the rate of loss of energy through the windows of the house. [2]

Rate of loss of energy = W

(c) Refer to the information about **cavity walls** and **Table 2** to answer the following questions.

(i) I. Which of the materials used in the wall will be most effective at reducing heat loss? [1]

II. Give **one** reason for your answer. [1]

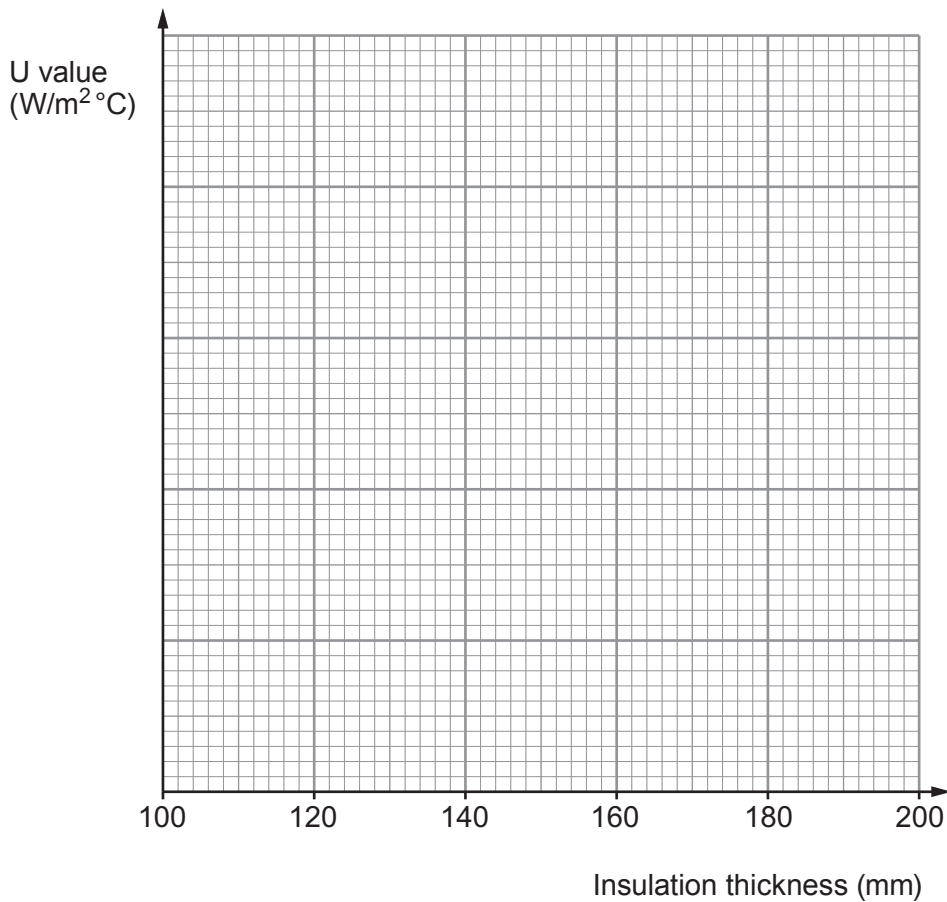
.....

(ii) Calculate the **total** R value for the wall. [1]

R value = W

(d) Refer to the information about **loft insulation** and **Table 3** to answer the following questions.

(i) Plot a graph of U value against insulation thickness for insulator **B**. [4]



- (ii) Use your graph to find the thickness of insulator **B** that needs to be used to achieve a U value of $0.16 \text{ W/m}^2\text{°C}$. [1]

Thickness = mm

- (e) A heating system uses 2000W of electrical power to keep a house at constant temperature.

Calculate the cost of using the heating for 24 h. Include the **unit** in your answer. [4]
One unit of electricity costs 14p.

Cost =

END OF PAPER