WJEC CBAC

GCSE

4781/01

SCIENCE B
UNIT 1: Space, Energy and Life
FOUNDATION TIER

P.M. THURSDAY, 16 January 2014

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A **1.**	9	
2.	10	
3.	5	
4.	5	
5.	7	
6.	10	
Section B **7.**	18	
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 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**.

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SECTION A

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

1. The koala bear is not really a bear.

Bears have heavy bodies with extremely powerful limbs. Each limb has five strong, sharp claws used for tearing and digging. Most bears are partly carnivorous. They have a long snout.

Koalas are *diprotodont* meaning "two front teeth". They are herbivores. They have a condition called "fused fingers". In diprotodonts, the second and third digits of the feet are completely fused together, except for the claws.

(a) Which features of an animal would scientists use to decide whether to classify it as Diprotodontia? [2]

....

....

....

(b) The scientific classifications of koalas and other animals are shown in the table below.

Level of classification	Polar bear	Grizzly bear	Koala bear	Wombat	Kangaroo
Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia
Order	Carnivora	Carnivora	Diprotodontia	Diprotodontia	Diprotodontia
Family	Ursidae	Ursidae	Phascolarctidae	Vombatidae	....
Genus	*Ursus*	*Ursus*	*Phascolarctos*	*Vombatus*	....
Species	*maritimus*	*horriblis*	*cinereus*	*ursinus*	*rufus*

(i) Which level of classification shows that koalas are **not** related to grizzly bears? [1]

....

(ii) In the 18th century Carl Linnaeus developed the system of giving all living organisms a two-word scientific name.

How does this system help scientists in different countries who are studying these animals? [1]

....

....

(iii) Complete the scientific name for koalas. *Phascolarctos* .... [1]

(iv) The scientific name for a kangaroo is *Macropus rufus* and it belongs to the family Macropodidae.

Use this information to **complete** the table opposite. [2]

(c) Koalas only live in the wild in Australia. The koala only eats leaves from eucalyptus trees.

Give **two** reasons why the koala population is under threat. [2]

1. ....

....

2. ....

....

9

2. The picture shows solar panels installed on the roof of a house. Each solar panel converts the Sun's radiant energy directly into electrical energy.

On a typical summer day in the UK, the solar radiation energy input per second to the panel is 5 000 W. The useful energy transfer per second is 500 W.

(a) (i) Calculate the efficiency of the panel using the equation: [2]

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

% efficiency = ...

(ii) Calculate the maximum current that this panel could supply to the 230 V house circuits using the equation: [2]

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

Current = ... A

(b) On most Summer days it is claimed the panel will generate electricity, as described above, for 10 hours. Calculate the maximum units produced in a day using the equation: [2]

Units produced (kWh) = power (kW) × time (hours)

Units produced = ... kWh

(c) The typical cost of solar panels for a home is £10 000.
It is claimed that the panels will produce a saving of 50p per day.

   (i) Calculate the payback time of buying the solar panels. [2]

Payback time = ... days

   (ii) State what will happen to the payback time if the mean hours of sunshine a year increases. [1]

....

   (iii) State what will happen to the payback time if the cost of one unit of electricity increases. [1]

....

10

3. The table compares PVC and wooden window frames. The data can be used to decide which is the more sustainable option.

	Wooden	PVC
Natural gas consumption in replacing heat lost through the window	178 kg	183 kg
Coal and oil used in production and/or painting	5.37 kg	18.23 kg
Carbon dioxide produced	457 kg	487 kg
Units of phosphate washed into streams	67	1.6
Waste after use without recycling	16.5 kg	28.2 kg

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

(i) Give **one** reason why wooden window frames will not have as much impact on landfill sites as those made from PVC. [1]

....

....

(ii) Give **one** reason why wooden window frames will have more impact on fish compared to those made from PVC. [1]

....

....

(iii) Give **one** reason why wooden window frames will not have as much impact on the atmosphere as those made from PVC. [1]

....

....

(iv) Give **two** reasons why less fossil fuels are used with wooden window frames than PVC. [2]

1. ....

2. ....

5

4. (i) Theories about the universe have changed over time as more evidence has become available. Initially the Steady-State theory was widely accepted. The Big Bang is now widely accepted.

Write the following statements into the table below to show which theory of the universe each one supports. [4]

- Red shift

- CMBR (Cosmic Microwave Background Radiation)

- The universe looks the same at all times

- The universe looks the same at any place

Steady State model of the universe	Big Bang model of the universe
....	....
....	....
....	....
....	....

(ii) In astronomy distances are measured in light years. What is meant by a light year? [1]

....

....

5

5. *(a)* Add ticks (✓) to the table to show the effect (if any) of each process on carbon dioxide levels in the atmosphere. *You should only add **one** tick (✓) to each row. One row has been completed for you as an example.* [4]

Process	Increases CO_2	Decreases CO_2	No effect on CO_2
Animal respiration	✓		
Photosynthesis			
Burning gas			
Plant respiration			
Cutting down trees			

(b) The graph shows the carbon dioxide levels in the atmosphere for the past 50 years.

The wavy line records the variation in levels during each year. Every year the maximum occurs in May, at the beginning of the plant growing season. Every year the minimum occurs in November, at the end of the growing season. The solid trend line shows the same data but with the yearly variations removed.

Atmospheric Carbon Dioxide During the Past 50 Years
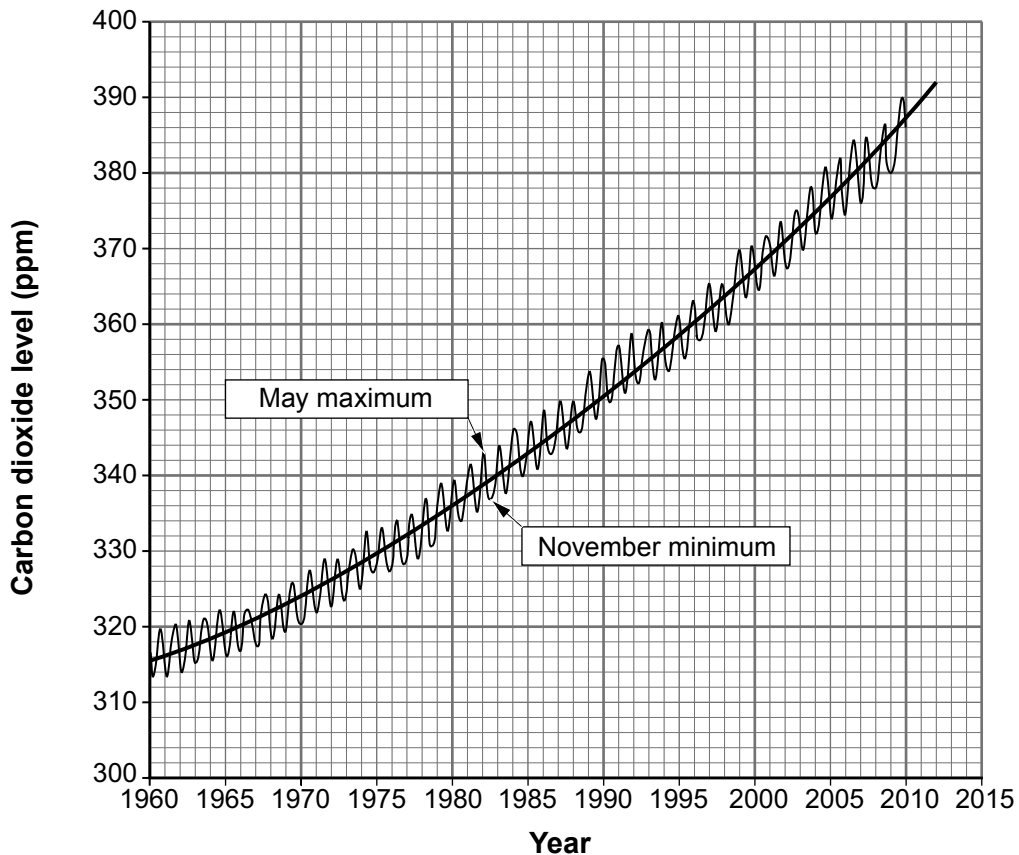
(i) Give **one** reason why the maximum carbon dioxide level occurs in May. [1]

....

(ii) Describe the trend in carbon dioxide levels over time shown by the graph. [1]

....

....

(iii) Continue the graph to estimate the carbon dioxide level (ppm) in 2015. ....

[1]

7

6. The **Least Weasel** is the smallest member of the weasel family. The photographs below show this weasel during summer and winter.

The table gives some facts about the Least Weasel.

Least Weasel facts

Predators	foxes, eagle owls, buzzards.
Food	mice, rabbits, gerbils.
Reproduction	3 to 9 offspring in each litter
Body feature	• dense fur coat • yellow brown in summer • white in winter • feet with hairy soles

Use **only the information above** to answer the questions below.

(i) Name **one** prey of the Least Weasel. .... [1]

(ii) Name **one** animal that feeds on the Least Weasel. .... [1]

(iii) State whether the Least Weasel is an omnivore, carnivore or herbivore. .... [1]

(iv) Name **one** body feature that helps the Least Weasel to keep warm in winter. [1]

....

(v) How do the Least Weasel's feet help it to move around in icy conditions? [1]

....

(vi) Describe how the change of fur colour in winter helps the weasel to survive. [2]

....

....

(vii) Many weasels are eaten, but the number of living weasels stays about the same from year to year. Suggest **one** reason for this. [1]

....

(viii) Suggest **one** reason why farmers growing crops do not consider weasels to be a pest. [1]

....

(ix) Suggest **one** reason why farmers who grow crops think weasels are a benefit to them. [1]

....

10

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 **Table 1** to answer the questions that follow.

    (a) (i) Which planet is closest in size to Earth? .... [1]

    (ii) Which planet has a day length longer than its year? .... [1]

    (iii) Name the only planet that does not have an atmosphere. .... [1]

    (b) Suggest a relationship between the number of moons around a planet and **one** *other* factor in **Table 1**. [2]

    ....

    ....

    (c) (i) Describe how the temperature on a planet depends on the distance from the Sun. [1]

    ....

    (ii) Explain why Venus does not follow this trend. [2]

    ....

    ....

    ....

    (d) Ceres is a dwarf planet found in the asteroid belt.

    (i) **Estimate** its temperature. .... °C [1]

    (ii) **Estimate** its orbital time around the Sun. .... Earth years [1]

(e) (i) Plot a graph to show how the time it takes a planet to orbit the Sun depends on distance from the Sun.
Only include the planets **Earth**, **Mars**, **Jupiter** and **Saturn** in your graph. [4]
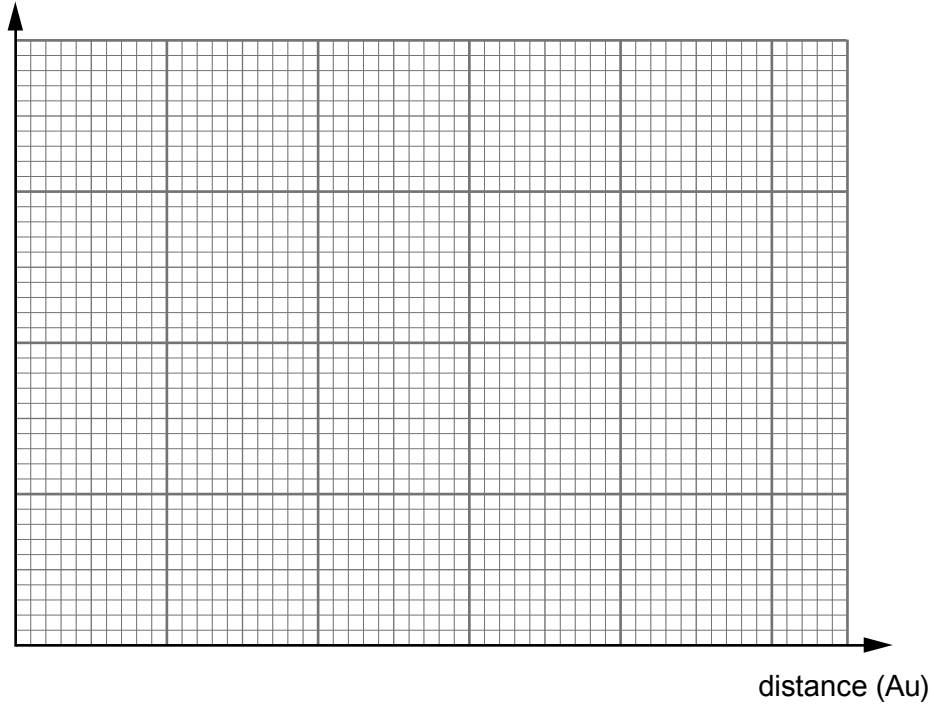
distance (Au)

(ii) It was once thought that the time of orbit would be proportional to distance from the Sun.

Does your graph agree with this statement? .... [1]

Give **one** reason for your answer.

....

(f) Answer the following questions using **only** information from the Resource Folder.

(i) Give **one** reason why an Earth-based telescope would not be able to see the surface of Venus. [1]

....

....

(ii) Give **one** reason why an Earth-based telescope may not be able to see the rings around Uranus. [1]

....

....

(g) **Draw** a diagram to show the path of a comet as it orbits the Sun. [1]

● **Sun**

18

Examiner
only

8. Use only the information in the Resource Folder to compare the four inner planets with the four outer planets of the Solar System. (6 QWC)

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END OF PAPER