WJEC CBAC

New GCSE

4781/01

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

A.M. TUESDAY, 12 June 2012

1¼ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	5	
2.	12	
3.	9	
4.	6	
5.	7	
6.	7	
7.	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 **7**(c).

CJ*(S12-4781-01)

SECTION A

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

1. *(a)* The beaks of birds have developed so they can compete for food.

Draw lines to match **each** bird with its description. [3]

Long, flat bill which is used like a shovel

Spear-like beak to catch fish in water

Large bill which stretches to hold fish

Uses its beak like a drill to bore through bark of trees

(b) Below is a picture of a hawk.

Explain how its beak is adapted for feeding. [2]

....

....

(4781-01) **Turn over.**

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2. The supply and demand of electrical energy, to and from the National Grid, is monitored by engineers.

The table shows how the amount of electrical energy generated by renewable sources has changed between 2000 and 2010.

Renewable Source	Energy generated (GWh) in each year			
	2000	2004	2008	2010
Wind: Onshore	945	1736	5792	7137
Wind: Offshore	1	199	1305	3046
Solar photovoltaic	1	4	17	33
Hydroelectricity	214	1636	2494	1821
Biomass	3042	6393	8057	10321
Total renewable generation	**4203**	**9968**	**17665**	**22358**

(a) (i) Calculate the increase in **total renewable generation** between 2000 and 2010. [1]

Increase = ... GWh

(ii) Explain why the use of these renewable sources has increased over this time. [3]

....

....

....

(iii) One of the above renewable forms of energy is only generated during the day. How much energy was generated in 2010 by this source? [1]

.... GWh

(b) (i) Name **one** source of biomass. .... [1]

(ii) Name the renewable source in the table that involves burning material.

.... [1]

(c) There is a debate about whether our future electrical energy needs will be met from renewable sources alone or whether nuclear power will also be needed. The table below compares a wind turbine with a nuclear power station.

	Wind	Nuclear
Overall cost of generating electricity (p/kWh)	5.4p	2.8p
Maximum power output (MW)	3.5	3 500
Lifetime	15 years	50 years
Waste produced	none	radioactive substances, some remain dangerous for thousands of years
Lifetime carbon footprint (g of CO_2/kWh)	4.64 g/5.25 g (onshore/offshore)	5 g

Adapted from *www.guardian.co.uk*

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

(i) How many wind turbines are needed to produce the same amount of electricity as a nuclear power station? [1]

....

(ii) Which method of power generation has the longer lifetime? .... [1]

(iii) Which method of power generation has the largest carbon footprint?

.... [1]

(iv) State **one** advantage of offshore wind turbines. [1]

....

(d) Give **one** reason why wind power is unreliable. [1]

....

(4781-01)

Turn over.

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3. Surveyors produce energy certificates for houses that are for sale. They examine information about energy usage and the insulation installed.
The table shows the energy loss from different parts of a house. It shows how these figures change as improvements are made.

House part	Insulation	Energy loss per second (J/s)
Cavity walls	None	650
	Foam	190
	Energy saved	**460**
Windows	Single glazed	410
	Double glazed	200
	Energy saved	....
Loft	None	780
	Fibre glass	250
	Energy saved	**530**

(a) (i) Complete the table. [1]

(ii) Use the data in the table to decide which type of insulation the surveyor would advise the homeowner to install first. [1]

....

(iii) Give **one** reason for your answer. [1]

....

....

(b) A homeowner installs **loft insulation** and **cavity wall insulation**.

(i) Using the figures in the table, find the heat energy savings achieved **each second**. [1]

Energy savings = ... J/s

(ii) Write down the homeowner's power savings including the unit in your answer.

.... [2]

(c) (i) The electrical heating is used 10 hours a day. During this time, assume the homeowner saves 1.5 kW of electrical power used to heat the home by installing insulation.

Calculate the number of units saved each day using the equation: [1]

Units used (kWh) = power (kW) × time (h)

Units saved = ... kWh

(ii) The cost per unit is 12p. Calculate the savings made every day using the equation: [2]

Cost = units used × cost per unit

Money saved per day = ... p

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4. During the last 100 years, the increase in the world's population has resulted in more land being used to produce food.

(a) (i) What effect does this have on the amount of land covered by forests? [1]

....

(ii) Explain how this affects wildlife. [2]

....

....

....

(b) There are pressures to increase the use of intensive farming methods to meet the demand for food.

(i) Tick (✓) **two** methods of intensive farming in the list below. [1]

Farming method	Tick (✓) **two** methods
Using artificial fertilisers	
Using a tractor	
Using crop rotation	
Using artificial insecticides	

(ii) State **two** reasons why intensive farming produces food cheaper than organic farming. [2]

1. ....

2. ....

5. The table gives information about the planets in the solar system.

	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
Distance from the Sun (AU)	0.39	0.72	1	1.52	5.20	9.53	19.19	30.06
Orbit time (years)	0.24	0.62	1	1.88	11.86	....	84.01	164.79
Orbital speed (km/s)	47.89	35.04	29.79	24.14	13.06	....	6.81	5.43
Equatorial radius (km)	2439	6052	6378	3397	71490	60268	25559	25269
Polar radius (km)	2439	6052	6357	3380	66854	54360	24973	24340
Mass of planet (Earth=1)	0.06	0.82	1		317.89	95.18	14.53	17.14
Number of moons	0	0	1	2	28	30	24	8

(i) **Estimate** values to complete the table for Saturn. [2]

(ii) **Estimate** the distance from the Sun to the asteroid belt. .... AU [1]

(iii) Give **one** reason why it is difficult to estimate the mass of Mars. [1]

....

....

(iv) Planets are circular/spherical if their polar radius and equatorial radius are the same.

Name **one** planet that is spherical. .... [1]

(v) It is thought that the larger the mass of a planet the more moons will orbit around it. Explain whether the information supports this hypothesis. [2]

....

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....

6. *(a)* <u>Underline</u> the correct word or phrase in each bracket in the following paragraph. [3]

The Universe was created by the Big Bang about 13.5 (thousand / million / thousand million) years ago. The Universe continues to (expand / shrink / stay the same) as shown by red shift measurements. Other evidence for the Big Bang theory is the Cosmic (Infra-red / Microwave / Ultra-violet) Background Radiation.

(b) Electromagnetic waves are used to make observations of space.

(i) Complete the diagram of the electromagnetic spectrum in the correct order. [2]

Gamma rays	X-rays	....	Visible light	....	Microwaves	Radio waves

(ii) Explain the advantage of space based telescopes over Earth based telescopes. [2]

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SECTION B

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

This section is based upon the Pre-Release Article which is found in the separate resource folder.

7. National Trust wardens monitor the wildlife living in woodland.

   (a)   Use the information in **Table 1** of the pre-release article to construct a **food web** below for the woodland habitat. [6]

(b) Give **one** example, from this food web, of a woodland organism that is: [6]

(i) at more than one trophic level; ....

(ii) a primary consumer; ....

(iii) a secondary consumer; ....

(iv) a tertiary consumer; ....

(v) a herbivore; ....

(vi) a carnivore. ....

(c) The government has announced that badger culls (killing) will be allowed. The Mammal Society is against this policy since badgers could disappear in certain areas. This would affect woodland habitats. Explain how the killing of badgers could affect the other organisms living in the woodland habitat shown in Table 1. [6] QWC

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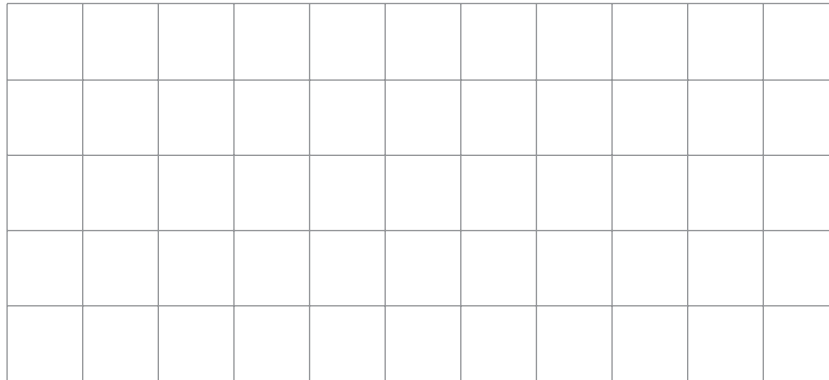
Turn over for next question.

(d) (i) Complete the table below for one food chain in the woodland habitat. [1]

Organism	Number in chain	Average mass of each organism (g)	Total mass (g)
Leaves	100	0.5	....
Aphids	500	0.01	....
Ladybirds	10	0.1	....

(ii) Draw on the grid below, a pyramid of biomass to scale, for the food chain shown in the table above. [3]

(e) The table shows information about the energy transfer through the trophic levels of the woodland habitat.

Trophic level	Energy (J/m²/year)	Efficiency of energy transfer to next level
1	25 000	15.0%
2	3 750	12.3%
3	460	....
4	23	

Calculate the value missing from the table. [2]

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