| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| TOTAL | |

General Certificate of Secondary Education
Higher Tier
June 2012

# Science B

# SCB1HP

**Unit 1 My World**

**H**

**Written Paper**

**Tuesday 12 June 2012 9.00 am to 10.00 am**

**For this paper you must have:**
- a ruler.

You may use a calculator.

**Time allowed**
- 1 hour

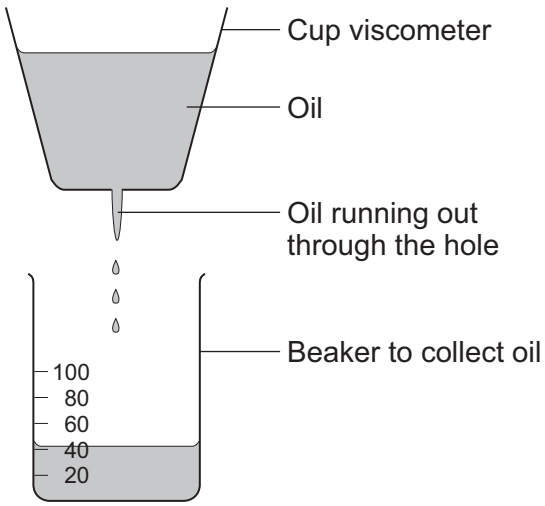
**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 4 (d) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.

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

**1** A student did an experiment to study the viscosity of car engine oil. The student used the apparatus shown in the diagram.



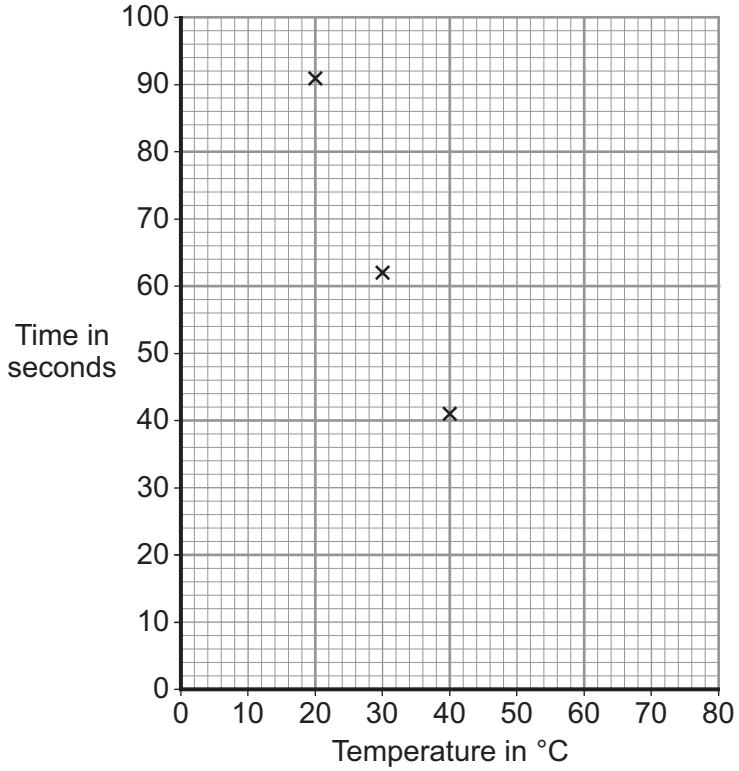

The student used the following method:

1. Pour the oil into the cup viscometer.
2. Measure the time taken for 100 $cm^3$ of the oil to go through the cup viscometer.
3. Repeat the experiment with the same volume of oil at different temperatures.

The student's results are shown in the table.

| **Temperature of oil in °C** | **Time for oil to go through viscometer in seconds** |
|---|---|
| 20 | 91 |
| 30 | 62 |
| 40 | 41 |
| 50 | 25 |
| 60 | 16 |
| 70 | 11 |

**1 (a)** Use the data in the table to complete the graph. Draw a line of best fit.




*(2 marks)*

**1 (b)** Use your graph to answer the questions below.

**1 (b) (i)** How long would it take for the oil to go through the viscometer at a temperature of 35 °C?

time = ..... seconds

*(1 mark)*

**1 (b) (ii)** Describe the pattern shown on the graph.

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*(2 marks)*

**1 (c)** The student did the experiment again, using a more viscous oil.

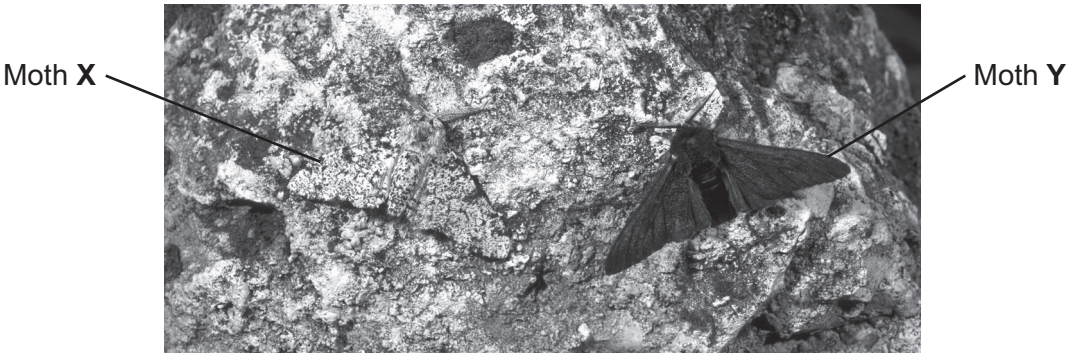
On the graph, sketch the results you would expect the student to get using the more viscous oil.

*(2 marks)*

7

**2** The photograph shows two varieties of moth, **X** and **Y**. The moths belong to the same species.

The moths are resting on a tree trunk in open countryside.




**2 (a)** A student investigated the populations of different moths that live in a woodland. The woodland the student studied was not polluted by smoke or soot.

The student captured 66 moths of variety **X**.

The student marked each moth with a spot of paint on the underside of one wing, and then released all the moths.

A few days later, the student captured 62 moths of variety **X**. 12 of the captured moths had a spot of paint on the underside of one wing.

**2 (a) (i)** Why did the student put the paint on the underside of the wing and not on the top?

Tick (✓) **one** answer.

So it is easier to collect the results. ☐

So the paint can not be seen by predators. ☐

So the paint does not poison the moth. ☐

*(1 mark)*

**2 (a) (ii)** Use the information from the experiment and the equation below to estimate the population size of moth variety **X** in the woodland.

$$\text{Population size} = \frac{\text{number captured first time} \times \text{number captured second time}}{\text{number in second capture with paint spot}}$$

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Answer = .....

*(2 marks)*

**2 (b)** Which variety of moth, **X** or **Y**, is more likely to be eaten by insect-eating birds in the woodland?

Give the reason for your answer.

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*(1 mark)*

**2 (c)** In the 19th century there was a lot of smoke pollution, which caused the tree trunks in the woodland to become very dark.

Suggest how the numbers of moth **X** and moth **Y** would have been different in the 19th century from what they are today. Explain your answer.

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*(3 marks)*

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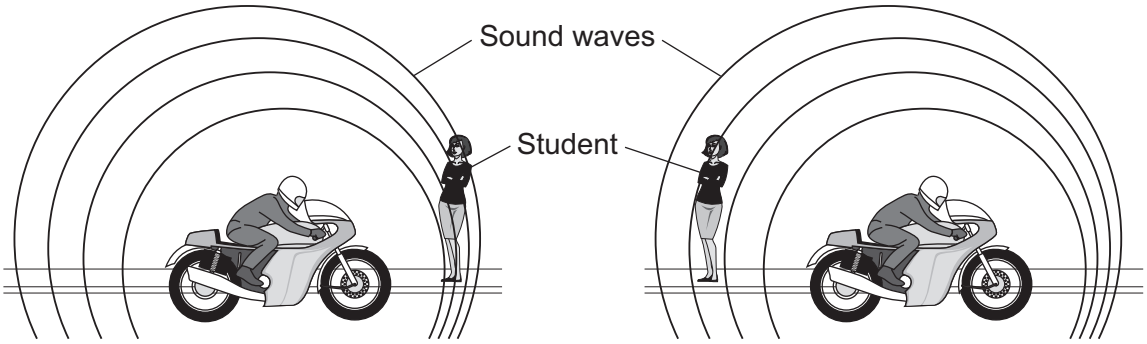
**3** The diagrams show a motor bike passing a student.




**3 (a)** The motor bike produces a sound with a frequency of 120 Hz.

The table gives information about how the movement of the motor bike towards and away from the student affects the sound she hears.

| | **Frequency of sound heard by the student in Hz** | |
|---|---|---|
| **Speed of motor bike in metres per second** | **Motor bike moving towards student** | **Motor bike moving away from student** |
| 20 | 127.25 | 112.75 |
| 30 | 130.91 | 109.09 |
| 40 | 134.55 | 105.45 |
| 50 | 138.18 | 101.85 |
| 60 | 141.82 | 98.18 |

Use information from the diagrams and the table to explain how the movement of the motor bike affects the sound the student hears.

You should answer in terms of frequency and wavelength.

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*(4 marks)*

**3 (b)** As distant galaxies move away from the Earth, the wavelength of the light we detect on Earth increases.

What is the name of this effect?

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*(1 mark)*

**3 (c)** The effect described in **3 (b)** provides evidence to support the theory that the universe began from a very small initial point. What is the name of this theory?

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*(1 mark)*

**6**

**Turn over for the next question**

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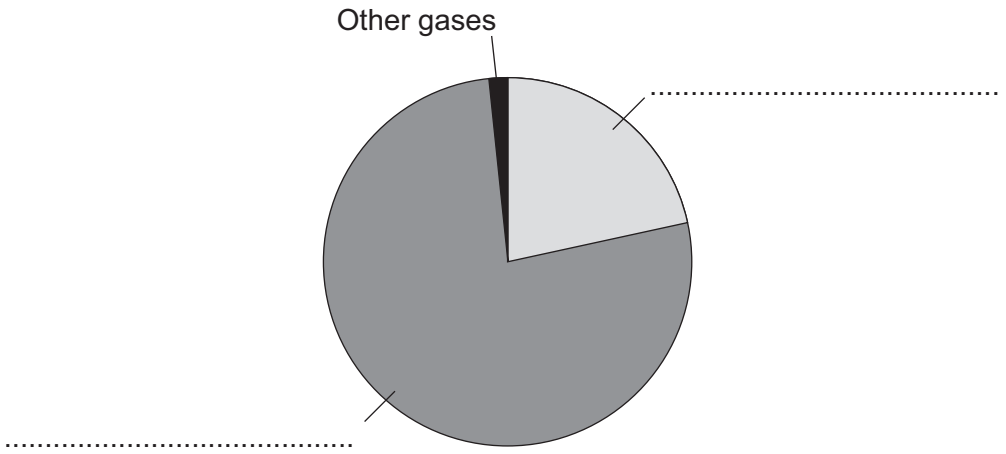
**ANSWER IN THE SPACES PROVIDED**

**4 (a)** The atmosphere on Earth today is very different from the Earth's early atmosphere.

The pie chart shows the proportions of different gases in the atmosphere today.




Use the correct names of gases from the atmosphere to complete the labels in the pie chart.

*(2 marks)*

**Question 4 continues on the next page**

**4 (b)** Two scientists passed an electrical discharge through a mixture of the gases thought to be in the early atmosphere. This formed organic molecules essential to life.

**4 (b) (i)** Name the two scientists.

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*(1 mark)*

**4 (b) (ii)** The mixture of gases these scientists used included water vapour and carbon dioxide.

Name **two** other gases that the scientists used in the experiment.

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*(2 marks)*

**4 (c)** Nitrogen is a gas in the Earth's present-day atmosphere. Nitrogen can be reacted with hydrogen to form a useful compound.

Write a balanced equation for the formation of this compound.

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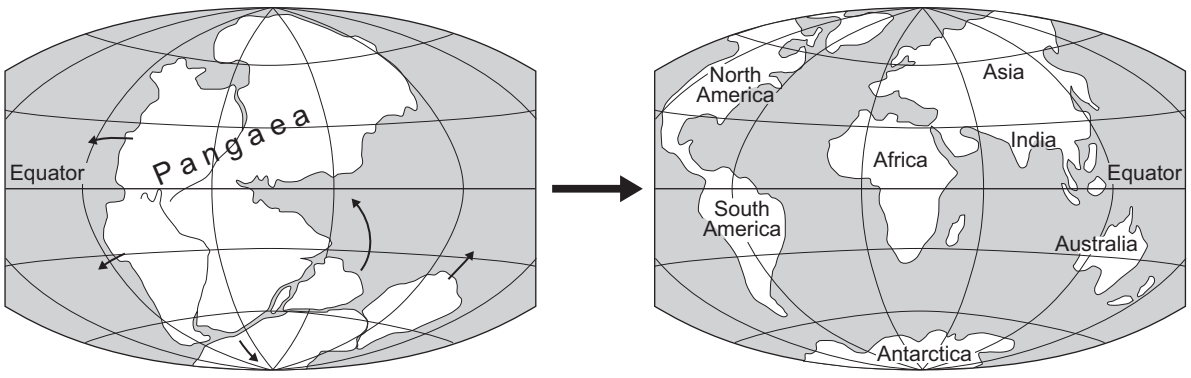
*(3 marks)*

**4 (d)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate*.

The diagrams show the position of the areas of land on the Earth 3 billion years ago and the areas of land on Earth today. The arrows show the direction of movement of the areas of land.




**3 billion years ago** **Today**

Over 3 billion years the continents have separated. Explain how the continents have moved.

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*(6 marks)*

14

**Turn over for the next question**

**5 (a)** The table shows what happens to the total energy taken in by different organisms.

| Organism | Total amount of energy in MJ per day | | |
|---|---|---|---|
| | In waste | Released during respiration | Used for growth |
| Producer | 18 | 12 | 8 |
| Primary consumer | 14 | 22 | 4 |
| Secondary consumer | 12 | | 4 |

**5 (a) (i)** Calculate the percentage of the total energy the primary consumer takes in that is released during respiration.

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Answer ..... %

*(2 marks)*

**5 (a) (ii)** 60% of the total energy the secondary consumer takes in is released during respiration.

Calculate the amount of energy the secondary consumer releases during respiration.

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Answer ..... MJ

*(2 marks)*

**5 (a) (iii)** The producer releases less energy during respiration than the primary consumer. The primary consumer releases less energy during respiration than the secondary consumer.

Explain why.

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*(3 marks)*

**5 (b)** Producers convert carbon dioxide from the atmosphere into organic molecules.

Name **three** organic molecules producers make in this way.

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*(2 marks)*

9

**Turn over for the next question**

**6** Limestone is used in a blast furnace to help remove impurities in iron.

**6 (a)** The use of limestone in a blast furnace releases locked up carbon dioxide into the atmosphere.

How did carbon dioxide from the atmosphere become locked up in limestone rock?

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*(3 marks)*

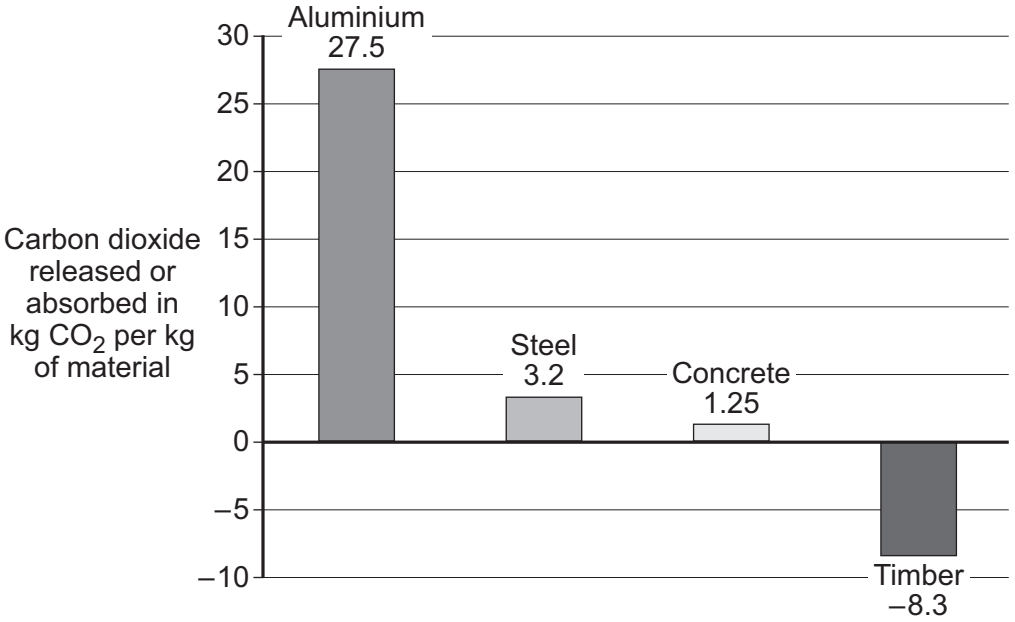
**6 (b)** Complete and balance the chemical equation for the production of iron in the blast furnace.

$Fe_2O_3$ + ..... ⟶ .....Fe + .....

*(3 marks)*

**6 (c)** Carbon dioxide can be released or absorbed during the production of materials for building.

The chart shows the amount of carbon dioxide released or absorbed in producing materials for building.




Suggest reasons for the amount of carbon dioxide released or absorbed in the production of these building materials.

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*(4 marks)*

10

**Turn over ▶**

**7** The Weka is a flightless bird that lives in New Zealand. New Zealand is an island.

Scientists know that the ancestors of the Weka flew to New Zealand from elsewhere about 125 000 years ago.

When birds fly, they use ten times more energy than when they run.

**7 (a)** The area where the Weka settled had no predators. Suggest why and how the Weka evolved to be flightless.

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*(5 marks)*

**7 (b)** There is a population of Wekas on a small island off the coast of New Zealand today.

Rats, which eat the Wekas, were accidentally introduced onto the island 50 years ago.

Suggest **two** adaptations in the Weka population on the island that have helped the species to survive.

Suggest why each adaptation would help the species to survive.

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*(2 marks)*

7

**END OF QUESTIONS**

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