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	
8	
TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2014

Science A
Unit Biology B1

BL1HP

H

Biology
Unit Biology B1

Friday 6 June 2014 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler.

You may use a calculator.

A

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 2 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 Food chains show the flow of energy through the organisms in a habitat.

1 (a) **Figure 1** shows a food chain.

Figure 1

grass ⟶ **sheep** ⟶ **human**

The biomass in each stage of the food chain changes as food passes along the food chain.

Draw a pyramid of biomass for this food chain.

Label the pyramid.

[2 marks]

1 (b) **Table 1** shows three food chains, **A**, **B** and **C**.

Table 1

	Food chain
A	plants → sheep → human
B	plants → grasshoppers → frogs → trout → human
C	plants → human

1 (b) (i) In which food chain, **A**, **B** or **C**, will the greatest proportion of biomass and energy of the plants be passed to humans? ☐

[1 mark]

1 (b) (ii) Give reasons why the food chain that you chose in part **(b)(i)** passes on the greatest proportion of biomass and energy to humans.

[3 marks]

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6

Turn over for the next question

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

Animals and plants have features (adaptations) that allow them to survive in the conditions in which they normally live.

Describe how animals and plants are adapted to survive in dry conditions such as deserts.

For each adaptation that you give, describe how the adaptation helps the animal or plant to survive in dry conditions.

To obtain full marks you should refer to **both** animals and plants.

[6 marks]

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Extra space .....

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6

Turn over for the next question

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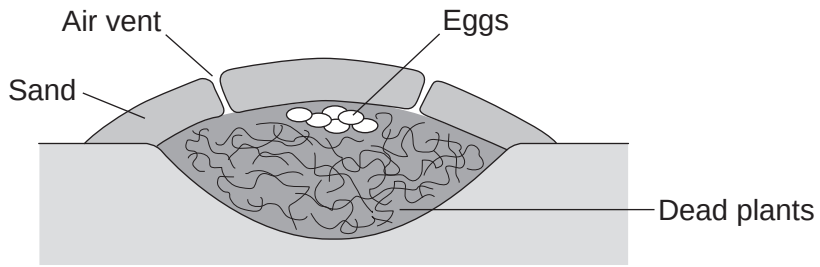
3 Most birds sit on their eggs to keep them warm until they hatch.

Megapode birds:

- dig a large hole in sand
- fill the hole with dead plants
- lay their eggs on top of the dead plants
- cover the surface with a thick layer of sand.

Figure 2 shows a megapode bird's nest.

Figure 2



3 (a) The dead plants in the nest decay. The decaying process helps to keep the eggs warm for many weeks.

Suggest how.

[3 marks]

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3 (b) (i) Megapode birds open and close the air vents of the nest at different times of the day.

Suggest reasons why it is necessary to open and close the air vents.

[3 marks]

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3 (b) (ii) The sex of a megapode bird that hatches from an egg depends on the temperature at which the egg was kept.

Use this information to suggest why it is important for megapode birds to control the temperature of their nests.

[1 mark]

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7

Turn over for the next question

4 The MMR vaccine is used to protect against measles.

4 (a) Apart from measles, which **two** other diseases does the MMR vaccine protect against?

[1 mark]

..... and .....

4 (b) Read the information.

> Measles is a dangerous disease caused by a virus.
> Normally, MMR vaccinations are given at 1 year old and again at 4 years old.
> Each vaccination is 90% effective in protecting against the measles virus.
>
> In April 2013, there were 630 cases of measles in children aged 4 and over in a small area of the UK. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

4 (b) (i) Calculate the percentage of the children who caught measles in April 2013 who had **not** been vaccinated against MMR.

[2 marks]

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Percentage = ...

4 (b) (ii) Suggest **one** advantage to the population as a whole of children having the second MMR vaccination.

[1 mark]

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4 (c) (i) What does a vaccine contain?

[1 mark]

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4 (c) (ii) Explain how a vaccination prevents infection.

[3 marks]

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4 (d) (i) Antibiotics can only be used to treat some infections.

Explain why antibiotics **cannot** be used to treat measles.

[2 marks]

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4 (d) (ii) Why do antibiotics become less useful at treating an infection if the antibiotic is overused?

[1 mark]

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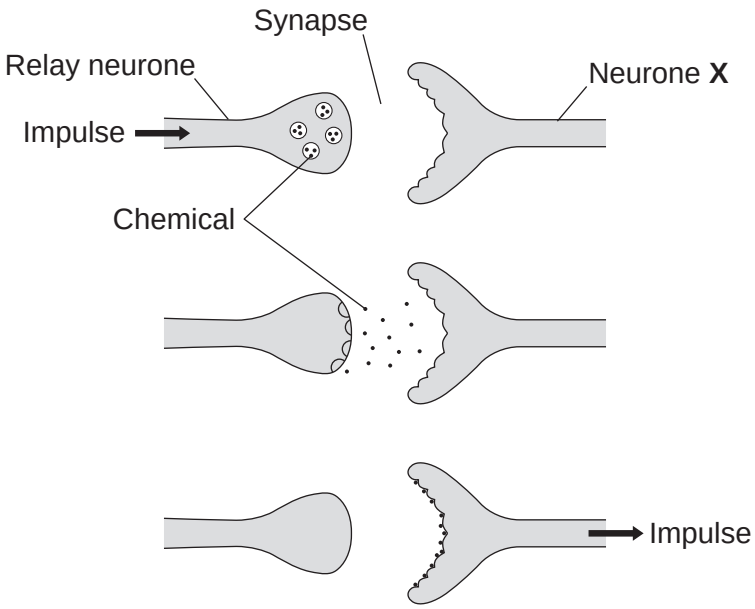
11

5 **Figure 3** shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone **X**.

Figure 3



5 (a) What type of neurone is neurone **X**?

[1 mark]

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5 (b) Describe how information passes from the relay neurone to neurone **X**.
Use **Figure 3** to help you.

[3 marks]

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5 (c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. **Table 2** shows the results.

Table 2

Toxin	**Effect at the synapse**
Curare	Decreases the effect of the chemical on neurone **X**
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

[2 marks]

Curare .....

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Strychnine .....

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6

Turn over for the next question

6 Drugs may harm the human body.

6 (a) The drug thalidomide was originally developed in the 1950s.

6 (a) (i) What was the drug thalidomide originally developed to treat?

[1 mark]

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6 (a) (ii) Soon after it was developed, thalidomide was found to be useful in treating another condition.

What was this other condition?

[1 mark]

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6 (a) (iii) Describe **one** harmful effect of thalidomide.

[1 mark]

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6 (a) (iv) Suggest why this harmful effect had **not** been detected during clinical drug trials on thalidomide.

[1 mark]

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6 (b) Using a recreational drug may cause a person to become dependent on the drug.

6 (b) (i) What happens in the body to make someone dependent on a drug?

[1 mark]

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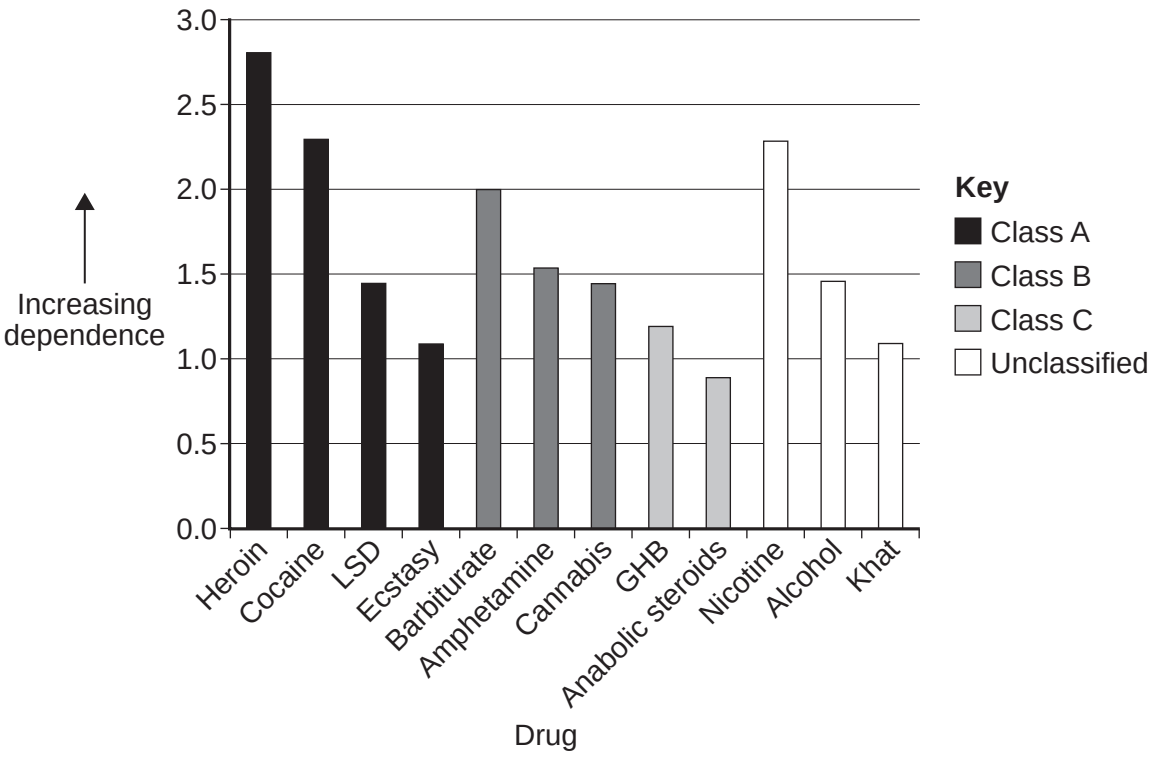
6 (b) (ii) Doctors rated different recreational drugs according to how dependent users had become on them. **Figure 4** shows the results.

Figure 4



It is illegal (against the law) to take Class A, B or C drugs.
Unclassified drugs are legal.

Some people think that some legal drugs should be made illegal.
What evidence is there in **Figure 4** to support this view?

[2 marks]

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6 (b) (iii) Suggest **one** other piece of information about legal drugs that would need to be considered before the classification of these drugs was changed.

[1 mark]

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8

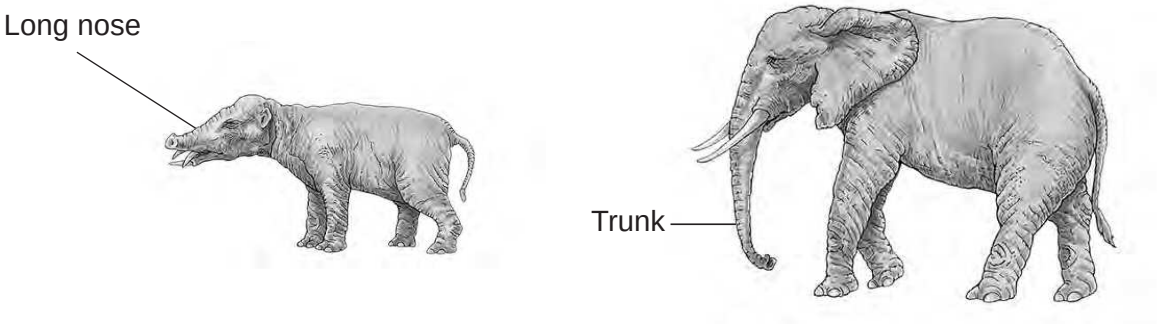
7 **Figure 5** shows:

- *Phiomia,* an ancestor of elephants
- a modern African elephant.

Phiomia lived about 35 million years ago.

Figure 5

Phiomia **African elephant**



Both *Phiomia* and the African elephant reach up into trees to get leaves.

In the 1800s, Darwin and Lamarck had different theories about how the long nose of *Phiomia* evolved into the trunk of the African elephant.

7 (a) (i) Use Darwin's theory of natural selection to explain how the elephant's trunk evolved.

[4 marks]

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7 (a) (ii) Lamarck's theory is different from Darwin's theory.

Use Lamarck's theory to explain how the elephant's trunk evolved.

[2 marks]

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7 (b) (i) In the 1800s, many scientists could **not** decide whether Lamarck's theory or Darwin's theory was the right one.

Give **two** reasons why.

[2 marks]

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7 (b) (ii) Before the 1800s, many people had a different idea to explain where all the living things on Earth came from.

What idea was this?

[1 mark]

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9

Turn over for the next question

8 Read the information.

Insects can be both useful and harmful to crop plants.
Insects such as bees pollinate the flowers of some crop plants. Pollination is needed for successful sexual reproduction of crop plants.
Some insects eat crops and other insects eat the insects that eat crops.

Corn borers are insects that eat maize plants.
A toxin produced by the bacterium *Bacillus thuringiensis* kills insects.
Scientists grow *Bacillus thuringiensis* in large containers. The toxin is collected from the containers and is sprayed over maize crops to kill corn borers.

A company has developed genetically modified (GM) maize plants. GM maize plants contain a gene from *Bacillus thuringiensis*. This gene changes the GM maize plants so that they produce the toxin.

8 (a) Describe how scientists can transfer the gene from *Bacillus thuringiensis* to maize plants.

[3 marks]

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8 (b) Would you advise farmers to grow GM maize plants?

Justify your answer by giving advantages and disadvantages of growing GM maize plants.

Use the information from the box and your own knowledge to help you.

[4 marks]

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END OF QUESTIONS

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Figure 5: © Getty Images