AQA

General Certificate of Secondary Education
Foundation Tier
June 2014

Science A
Unit Biology B1

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.

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 9 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 Figure 1 shows a cell.

![Figure 1](image)

1 (a) Draw a ring around the correct answer to complete each sentence.

1 (a) (i) In the nucleus of a cell, genes are part of
- chromosomes.
- membranes.
- receptors.

1 (a) (ii) Different genes control different
- characteristics
- gametes
- nuclei
of an organism.

1 (a) (iii) Studying the similarities and differences between organisms allows us to
- classify
- clone
- grow
the organisms.

1 (b) Complete the following sentence.

Living things can be grouped into animals, microorganisms and

[1 mark]
A student investigated growth in plants.

The student:
- planted a seed in damp soil in a plant pot
- put the plant pot in a dark cupboard.

**Figure 2** shows the result after 5 days.

**Figure 2**

2 (a) **Draw a ring around the correct answer to complete each sentence.**

2 (a) (i) After the 5 days, the root had grown **in the direction of the force of gravity.**

2 (a) (ii) After the 5 days, the shoot had grown **towards water.**
2 (b) After the plant had grown, the student put the plant pot by a window with lots of light.

Figure 3 shows this.

![Figure 3](image)

2 (b) (i) Complete Figure 4 to show the appearance of the student's plant after 20 days by the window.

[1 mark]

![Figure 4](image)

2 (b) (ii) Explain the advantage to the plant of growing in the way that you have drawn in part (b)(i).

[2 marks]

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3 A healthy diet contains the right balance of different foods and the right amount of energy.

3 (a) An unbalanced diet can lead to health problems.

One problem caused by an unbalanced diet is being overweight.

Name one health problem, other than being overweight, that is linked to an unbalanced diet. [1 mark]

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3 (b) Sugar is a type of carbohydrate.

3 (b) (i) Eating too much sugar can make a person overweight.

Suggest why. [1 mark]

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3 (b) (ii) Which other substance in food is linked to people being overweight?

Draw a ring around the correct answer. [1 mark]

fat mineral ions vitamins
3 (c) Sugar substitutes taste sweet. Taking sugar substitutes helps to reduce the chance of becoming overweight.

Table 1 gives information about four sugar substitutes, A, B, C and D.

<table>
<thead>
<tr>
<th>Sugar substitute</th>
<th>Number of times sweeter than sugar</th>
<th>Effects on health</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>x 200</td>
<td>Harmful to some people</td>
</tr>
<tr>
<td>B</td>
<td>x 250</td>
<td>Not known</td>
</tr>
<tr>
<td>C</td>
<td>x 600</td>
<td>Not known</td>
</tr>
<tr>
<td>D</td>
<td>x 500</td>
<td>None</td>
</tr>
</tbody>
</table>

3 (c) (i) Which sugar substitute, A, B, C or D, is the sweetest? [1 mark]

3 (c) (ii) A person is advised to use sugar substitute D and not sugar substitutes A, B or C.

Suggest a reason why. [1 mark]

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3 (c) (iii) A food has a sugar substitute in it.

Why must it say on the packet which sugar substitute it is? [1 mark]

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4. Drugs affect the human body.

4 (a) Draw **one** line from each drug to the correct information about the drug. **[4 marks]**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannabis</td>
<td>Used to boost heart rate</td>
</tr>
<tr>
<td>Steroid</td>
<td>Used to treat leprosy</td>
</tr>
<tr>
<td>Stimulant</td>
<td>May cause mental illness in some people</td>
</tr>
<tr>
<td>Thalidomide</td>
<td>Used to increase muscle growth</td>
</tr>
<tr>
<td></td>
<td>Used to treat measles</td>
</tr>
</tbody>
</table>

4 (b) New drugs must be tested and trialled before being used.

4 (b) (i) New drugs are tested in a laboratory before they are trialled on people.

What are new drugs tested on in a laboratory? **[1 mark]**

...........................................................................................................................................
4 (b) (ii) Why is it important that drugs are trialled before doctors give them to patients?

Tick (✓) two boxes. [2 marks]

- To check that the drug works
- To check the cost of the drug
- To find out if the drug is legal
- To find the best dose to use

4 (b) (iii) In a double blind drug trial, only some people know which patients have been given the drug.

Who knows which patients have been given the drug?

Tick (✓) one box. [1 mark]

- The patient and the doctor
- Only the doctor
- Only scientists at the drug company

Question 4 continues on the next page
Doctors trialled four different treatments for reducing the risk of heart disease. Each treatment was trialled on the same number of patients for 5 years. The patients did not have heart disease at the start of the trial.

Figure 5 shows the results.

4 (c) (i) How many patients who took aspirin needed treatment for heart disease during the trial?

[1 mark]

Number of patients = .............................................

4 (c) (ii) Based only on the evidence in Figure 5, which would be the best treatment to reduce the risk of developing heart disease?

[1 mark]

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4 (c) (iii) Suggest one other factor that a doctor might consider before deciding which treatment to use for a patient.

[1 mark]

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Most cows produce milk with a fat content of 3.4%.

Cow S produces milk with a fat content of 1.2%.

Only cow S has the gene to produce this low-fat milk.

A farmer plans to develop more cows like cow S.

Figure 6 shows how the farmer plans to do this.

**Figure 6**

Cow S  Bull (male)

Fertilise an egg cell from cow S with a sperm cell from a bull

Original embryo

Take cells from original embryo

Allow cells to develop into new embryos

Put new embryos into host mothers

Host mothers give birth to calves

5 (a) (i) An egg cell from cow S is fertilised by a sperm cell from a bull. This is part of sexual reproduction.

What is the scientific name for sex cells such as egg cells and sperm cells? [1 mark]
5 (a) (ii) After fertilisation, cells are taken from the original embryo.

These cells develop into new embryos.

Which part of the host mother’s body should each new embryo be put into?  

............................................................................................................................................  [1 mark]

5 (b) (i) The calves born to all of the host mothers are genetically identical to each other.

Draw a ring around the correct answer to complete the sentence.  

The calves are genetically identical to each other because

- are formed from the same original embryo.
- they have the same host mother.
- have the same two parents.

5 (b) (ii) What term is used to describe the method of producing calves shown in Figure 6?

Tick (✓) one box.  

- Adult cell cloning  
- Embryo transplantation  
- Genetic modification  

5 (b) (iii) Why are the calves born to the host mothers not genetically identical to cow S?  

............................................................................................................................................  ............................................................................................................................................  [1 mark]
This question is about evolution in humans.

**Figure 7** shows:

- the estimated brain volume of different species of humans
- the time when the different species existed on Earth.

The data is plotted for modern humans (*Homo sapiens*) and for three types of extinct ancestors of humans.

![Figure 7](image_url)

**Key**

Each point plotted on the graph shows the estimate for one human.

6 (a) (i) As humans evolved, their brain volume changed.

What has happened to human brain volume over the past 4 million years? 

[1 mark]
6 (a) (ii) Why is the evidence for estimated brain volume for *Homo sapiens* stronger than the evidence for *Australopithecus afarensis*?  
[1 mark]

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6 (b) In a book, the brain volume of a different species, *Australopithecus africanus*, is stated to be about 600 cm³.  

Use evidence from Figure 7 to estimate when *Australopithecus africanus* lived on Earth.  
[1 mark]

Estimate = .................................. million years ago

6 (c) Scientists believe that modern humans evolved by natural selection from *Australopithecus afarensis*.

6 (c) (i) Complete the following sentence.  
[1 mark]

In the nineteenth century, the scientist who suggested the theory of evolution by natural selection was Charles .........................................................

6 (c) (ii) In the nineteenth century, many people did not accept this scientist’s theory.  

Give one reason why.  
[1 mark]

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Turn over for the next question
7 Figure 8 shows the pathway for a simple reflex action.

Figure 8

- Sharp pin
- Neurone X
- Gap
- Neurone Y
- Neurone Z
- Muscle
- Spinal cord

7 (a) What type of neurone is neurone X?
   Draw a ring around the correct answer.
   [1 mark]
   - motor neurone
   - relay neurone
   - sensory neurone

7 (b) There is a gap between neurone X and neurone Y.
7 (b) (i) What word is used to describe a gap between two neurones?
   Draw a ring around the correct answer.
   [1 mark]
   - effector
   - receptor
   - synapse

7 (b) (ii) Draw a ring around the correct answer to complete the sentence.
   [1 mark]
   - Information passes across the gap as
     - a chemical
     - an electrical impulse
     - pressure
7 (c) Describe what happens to the muscle when it receives an impulse from neurone Z. How does this reflex action help the body?

[2 marks]

What happens to the muscle ............................................................................................................................................

How this helps the body ............................................................................................................................................

Turn over for the next question
Food chains show the flow of energy through the organisms in a habitat.

(a) Figure 9 shows a food chain.

![Food Chain Diagram](image)

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]
8 (b) Table 2 shows three food chains, A, B and C.

Table 2

<table>
<thead>
<tr>
<th>Food chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

8 (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]

8 (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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Turn over for the next question
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]

Extra space

[6]
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 10 shows a megapode bird’s nest.

Figure 10

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

Suggest how.

[3 marks]
10 (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.  

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[3 marks]

10 (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.

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[1 mark]

END OF QUESTIONS