SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier Paper 2: Biology 2H

Specimen 2018 Time allowed: 1 hour 15 minutes

Materials
For this paper you must have:
- a ruler
- a calculator.

Instructions
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 70 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 02.3 and 03.3 you need to make sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.

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

Please write clearly, in block capitals.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname

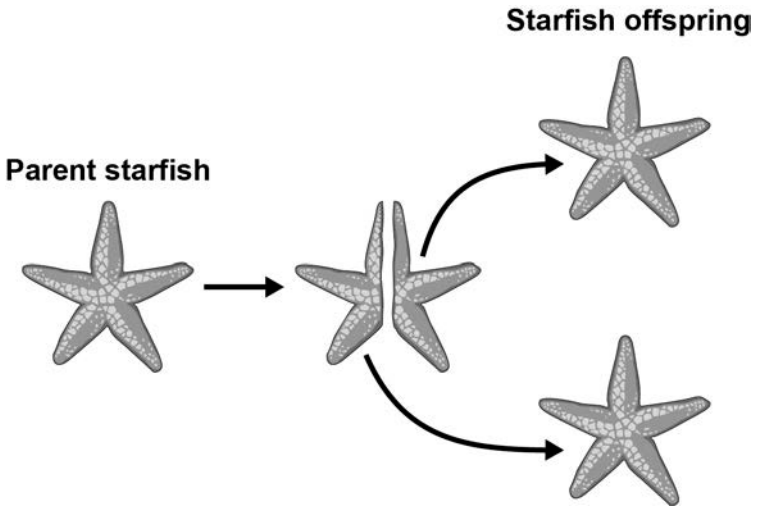
Forename(s)

Candidate signature _____

0 1 Starfish can split in half. Each half can then grow new arms to form offspring.

This process is shown in **Figure 1**.

Figure 1



0 1 . 1 What process produces the starfish offspring?

[1 mark]

Tick **one** box.

- Asexual reproduction ☐
- Fertilisation ☐
- Selective breeding ☐
- Sexual reproduction ☐

0 1 . 2 More cells are produced as the starfish grows more arms.

What process will produce more cells in the starfish as they grow?

[1 mark]

0 1 . 3 All the offspring produced are genetically identical.

What name is given to genetically identical organisms?

[1 mark]

0 1 . 4 Each body cell of the parent starfish contains 44 chromosomes.

How many chromosomes are in each body cell of the offspring?

[1 mark]

Turn over for the next question

0 2 Students used quadrats to estimate the population of dandelion plants on a field.

0 2 . 1 Describe how quadrats should be used to estimate the number of dandelion plans in a field.

[4 marks]

0 2 . 2 The field measured 40 m by 145 m.

The students used 0.25 m^2 quadrats.

The students found a mean of 0.42 dandelions per quadrat.

Estimate the population of dandelions on the field.

[2 marks]

Estimated population of dandelions = _____

0 2 . 3 In one area of the field there is a lot of grass growing in the same area as dandelions.

Suggest why the dandelions may **not** grow well in this area.

[4 marks]

Turn over for the next question

0 3 Neurones pass information around the body.

0 3 . 1 Why are reflex reactions important?

[1 mark]

0 3 . 2 Caffeine is a drug found in coffee.

After a person drinks coffee information passes through neurones in the nervous system more quickly.

Suggest a hypothesis for the effect of caffeine concentration on reaction time.

[1 mark]

0 3 . 3 Two students investigated the effect of caffeine concentration on reaction time.

This is the method used.

1. Student **A** drinks a cup of coffee.
2. Student **B** holds a ruler above Student **A**'s hand.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler as quickly as she can.
5. The distance the ruler falls is recorded.

Suggest how this method could be improved to produce valid results.

[6 marks]

Turn over for the next question

0 4 Moose are animals that eat grass.

Figure 2 shows a moose.

Figure 2

Figure 3 shows a food chain.

Figure 3

Grass ⟶ Moose ⟶ Wolves

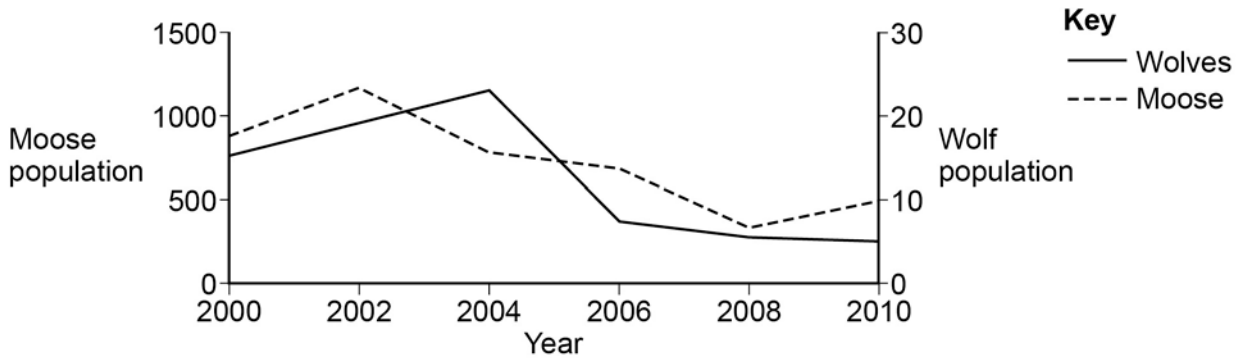
0 4 . 1 Name the secondary consumer shown in **Figure 3**.

[1 mark]

Figure 4 shows how the moose population and wolf population have changed in one area.

This is a predator-prey cycle.

Figure 4



0 4 . 2 In 2004 the line on **Figure 4** for wolves is above the line for moose.

How does **Figure 4** show that there are more moose than wolves in 2004?

[1 mark]

0 4 . 3 Suggest why the moose population decreased between 2002 and 2004.

Use information from **Figure 4**.

[1 mark]

Question 4 continues on the next page

0 4 . 4 The number of wolves is one biotic factor that could affect the size of the moose population.

Give **two** other biotic factors that could affect the size of the moose population.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 5 Moose have distinct characteristics such as antlers.

Describe how moose may have evolved to have large antlers.

[5 marks]

_____

_____

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0 5 Different antibiotics destroy bacteria in different ways.

- Some antibiotics disrupt the bacterial cell membrane.
- Some antibiotics disrupt the bacterial cell wall.

0 5 . 1 Antibiotics that disrupt the bacterial cell membrane often cause more side effects in humans compared with antibiotics that disrupt bacterial cell walls.

Suggest why.

[1 mark]

0 5 . 2 Some antibiotics prevent ribosomes functioning.

Suggest how this damages the bacterium.

[1 mark]

0 5 . 3 Drug manufacturers are spending less on research into new antibiotics.

One reason why is because new antibiotics are rarely prescribed.

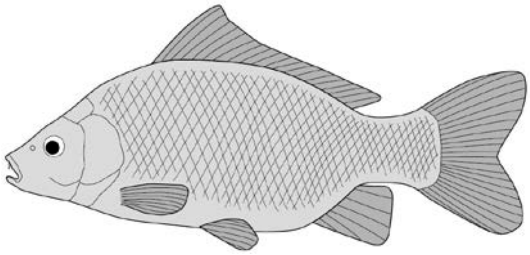
Some people think that governments should pay drug manufacturers to develop new antibiotics.

Suggest why.

[3 marks]

0 6 **Figure 5** shows a carp.

Figure 5



0 6 . 1 A mutation causes a blue colour in some carp.

What is a mutation?

[1 mark]

0 6 . 2 Suggest how a mutation could cause a different colour in carp.

[1 mark]

0 6 . 3 Two alleles control the body colour of carp:

- brown (**B**)
- blue (**b**).

The brown allele is dominant to the blue allele.

Two carp that are heterozygous for colour are crossed and produce 2.6×10^5 offspring.

Approximately how many of the offspring are expected to be blue?

Draw a genetic diagram to explain your answer.

Give your answer in standard form.

[5 marks]

Number of offspring expected to be blue = _____

Question 6 continues on the next page

0 6 . 4 A scientist wanted to find out whether a brown carp has the genotype **BB** or **Bb**.

Describe what genetic cross a scientist could do to determine this.

[2 marks]

0 7 The UK contains large areas of peat bogs that have been present for thousands of years.

0 7 . 1 Peat is removed from peat bogs.

The peat can be mixed with air and added to garden compost.

The release of carbon dioxide from peat is a problem.

Give **two other** reasons why gardeners should use less peat-based compost in the future.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 2 Explain why mixing peat with air leads to the release of carbon dioxide.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

Turn over for the next question

0 8 In the 18th century a binomial system of grouping similar organisms was developed.

Before the binomial system was developed the common briar rose had the following names:

- *Rosa sylvestris inodora seu canina*
- *Rosa sylvestris alba cum rubore folio glabro*.

In the binomial system, the same rose is called *Rosa canina.*

0 8 . 1 One advantage of the binomial system is that the name is shorter than the names used before this system.

Suggest **two other** advantages of the binomial system.

[2 marks]

1 _____

_____

2 _____

_____

0 8 . 2 Classification systems have changed in the last 50 years.

Give **one** reason why we now have more information to classify organisms.

[1 mark]

_____

_____

0 8 . 3 ‘Archaea’ is one of the groups in the three-domain system of classification.

Give **two** features of the domain Archaea.

[2 marks]

1 _____

_____

2 _____

_____

Turn over for the next question

0 9 People with Type 1 diabetes cannot control the concentration of glucose in their blood.

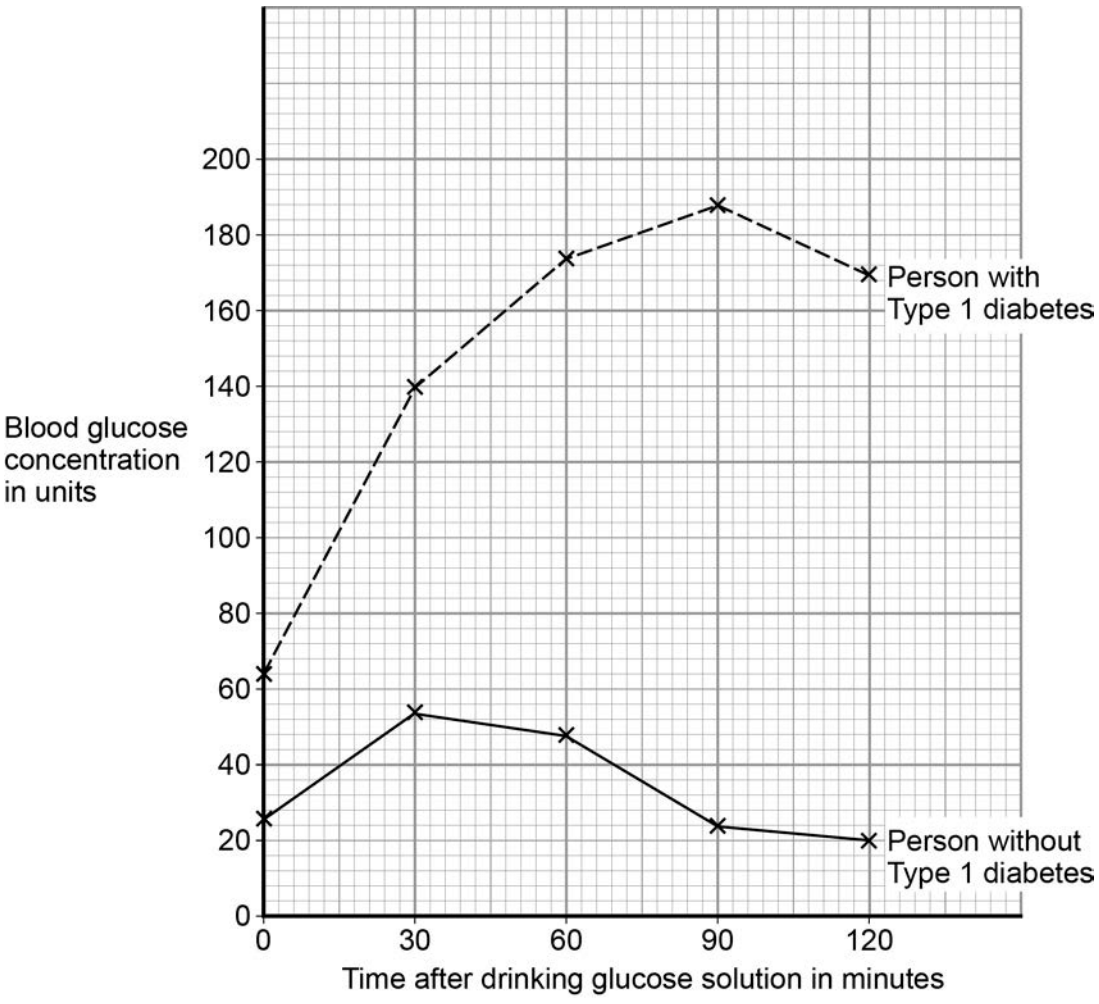
This is because they do **not** produce the hormone insulin.

The same concentration and volume of glucose solution is given to two people.

- Person with Type 1 diabetes.
- Person without Type 1 diabetes.

Figure 6 shows how the blood glucose concentration of these people changes after they each drink a glucose solution.

Figure 6



0 9 . 1 The blood glucose concentration increases at a faster rate in the person with diabetes compared to the person without diabetes.

Calculate how much faster the rate of increase in blood glucose concentration is in the person with diabetes.

Give the rate of increase for the first 30 minutes after drinking the glucose solution.

Give your answer in units / h.

[2 marks]

_____ Units / h

0 9 . 2 The blood glucose concentration of the person without diabetes starts to change 30 minutes after drinking the glucose solution.

Explain why the blood glucose concentration changes.

[2 marks]

Question 9 continues on the next page

People with diabetes should try to keep their blood glucose concentration within the same range as a person without diabetes.

Most people with Type 1 diabetes regularly check their blood glucose concentration using a meter, as shown in **Figure 7**.

The meter reading is used to estimate how much insulin they need to inject.

Figure 7

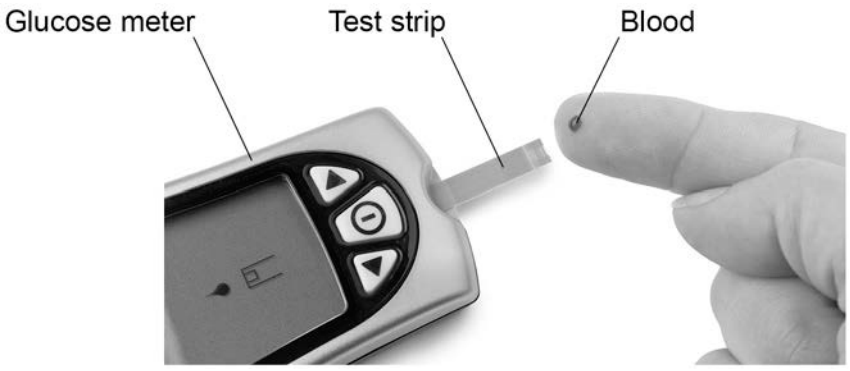
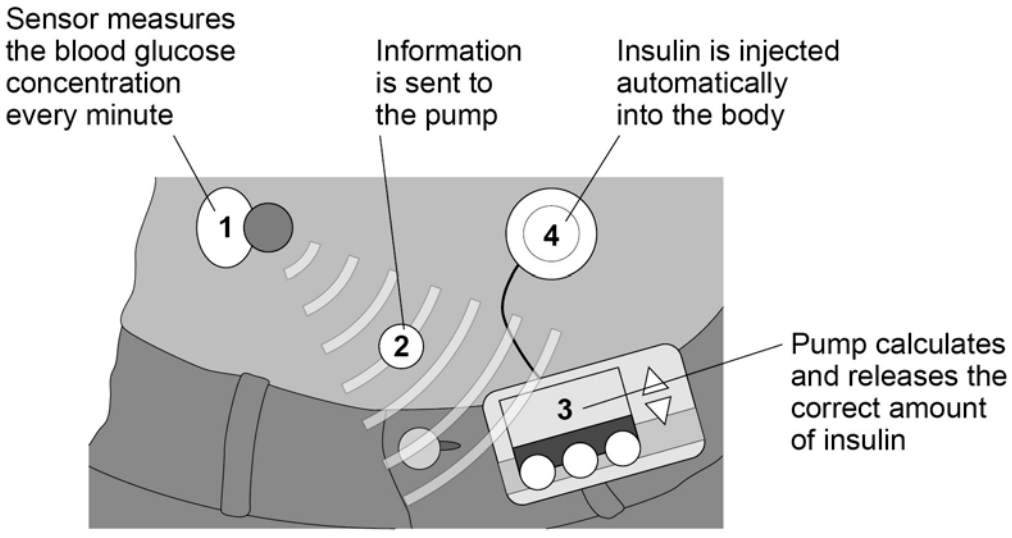


Figure 8 shows a new system.

It is connected to the person all the time.

Figure 8



The new system:

- gives better control of blood glucose concentration
- reduces the number of times the glucose concentration falls too low.

0 9 . 3 Evaluate the two systems as methods for controlling blood glucose concentrations for people with Type 1 diabetes.

Give a justified conclusion to your evaluation.

[4 marks]

0 9 . 4 How does the body respond if slightly too much insulin is injected into the body.

[5 marks]

END OF QUESTIONS

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Figure 2: Moose © Jeff R Clow/Getty Images
Figure 7: Glucose meter © Vincente Barcel? varona/Thinkstock