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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | Candidate Number

Monday 1 June 2020

Afternoon (Time: 1 hour 15 minutes) | Paper Reference **4BI1/2BR**

Biology

Unit: 4BI1

Paper: 2BR

You must have:
Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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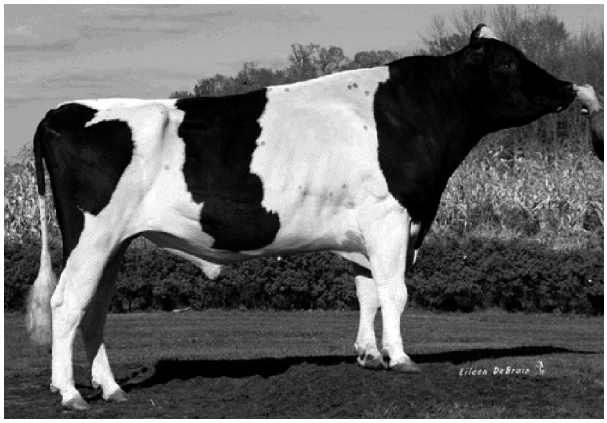
Answer ALL questions.

1 Read the passage below.

Use the information in the passage and your own knowledge to answer the questions that follow.

Toystory

Toystory is a bull who was born in 2001. The photograph shows Toystory.



In the world of dairy farming Toystory is a famous bull. He fathered 500 000 offspring but did not mate with any cows. He was able to father so many offspring because his semen was collected and then used to fertilise cows using artificial insemination.

Toystory's mother was a high milk producer and his father was a popular bull. He was sold for $4 000 by his owner to a specialist breeding company called Genex.

Genex started to collect semen from Toystory when he was four years old. The semen is carefully collected, using a teaser animal and an artificial rubber vagina.

The semen is divided into many separate samples. These samples are put in small straws and frozen in liquid nitrogen. The straws can then be sold and sent to dairy farmers around the world to inseminate their cows. A total of 2.4 million samples of semen from Toystory was sold in more than 50 countries around the world.

Toystory's reputation grew as the offspring he fathered went on to be high milk producers. His semen straws sold for over $60 each. Bull semen can now be sold as sexed or unsexed samples, with sexed samples being more expensive to purchase.

Toystory was highly valued because his offspring produced large quantities of milk of a desired composition. His semen was effective at getting cows pregnant, his daughters gave birth easily and were strong. He had a rare mix of fertility, genetics and appearance.

One of his daughters sold for $300 000 in 2009. His record number of offspring is unlikely to be beaten. This is because bulls are often retired earlier as new genetic advances are discovered.

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(a) Suggest why Genex waited until Toystory was four years old before beginning to collect his semen (line 9).

(1)

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(b) Explain how the semen from the bull is used to fertilise cows using artificial insemination.

(2)

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(c) (i) Suggest why the semen is stored in liquid nitrogen (line 13).

(1)

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.....

(ii) Sexed semen is guaranteed to produce offspring of one sex.

Suggest why dairy farmers would prefer to used sexed semen (line 19).

(1)

.....

.....

(d) Determine the percentage success of Toystory's semen samples in producing offspring (line 2 and line 15).

(2)

percentage success = ... %

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(e) Describe how scientists could investigate which of two bulls is the best to use as a father in dairy farming.

(3)

(f) Explain why the composition of milk is important to consumers (line 22).

(2)

(g) (i) Scientists are now using cloning to produce animals.

Describe the stages that are required to clone a bull.

(4)

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(ii) Give two advantages of using cloning rather than selective breeding to produce offspring.

(2)

1 .....

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2 .....

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(Total for Question 1 = 18 marks)

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2 Deforestation is the cutting down of trees.

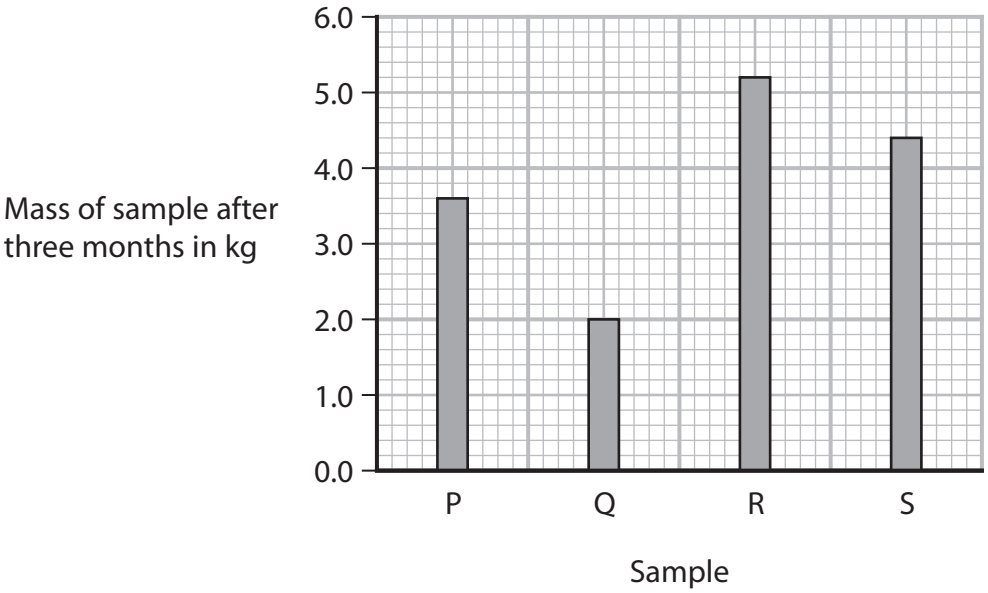
After deforestation many dead leaves are left on the forest floor.

A student investigates the decomposition of these leaves.

This is her method.

- collect four samples of dead leaves each with a mass of 6.0 kg
- label the samples P, Q, R and S
- cut sample P into small pieces and keep at 10 °C
- cut sample Q into small pieces and keep at 20 °C
- do not cut sample R and keep at 10 °C
- do not cut sample S and keep at 20 °C
- measure the mass of each sample after three months

The graph shows her results.



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(a) Explain the results obtained by the student.

(4)

(b) Calculate the difference between the rate of decomposition in sample P and the rate of decomposition in sample Q.

(3)

Give your answer in kg per month.

difference = ... kg per month

(c) The student needs to control biotic variables in her investigation.

Give two biotic variables she should control.

(2)

1 .....

2 .....

(Total for Question 2 = 9 marks)

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3 Plant roots absorb water from soil.

This water is transported to the leaves and then moves into the air.

(a) Which of these processes is used to absorb water from the soil?

(1)

☒ **A** active transport

☒ **B** diffusion

☒ **C** evaporation

☒ **D** osmosis

(b) Name the tissue that transports water to the leaves.

(1)

.....

(c) Name the process that moves water vapour into the air.

(1)

.....

(d) Which of these reduces the movement of water from the leaves into the air?

(1)

☒ **A** high light intensity

☒ **B** low air humidity

☒ **C** low air temperature

☒ **D** windy conditions

(e) Give two uses of water in a plant.

(2)

1 .....

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2 .....

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(Total for Question 3 = 6 marks)

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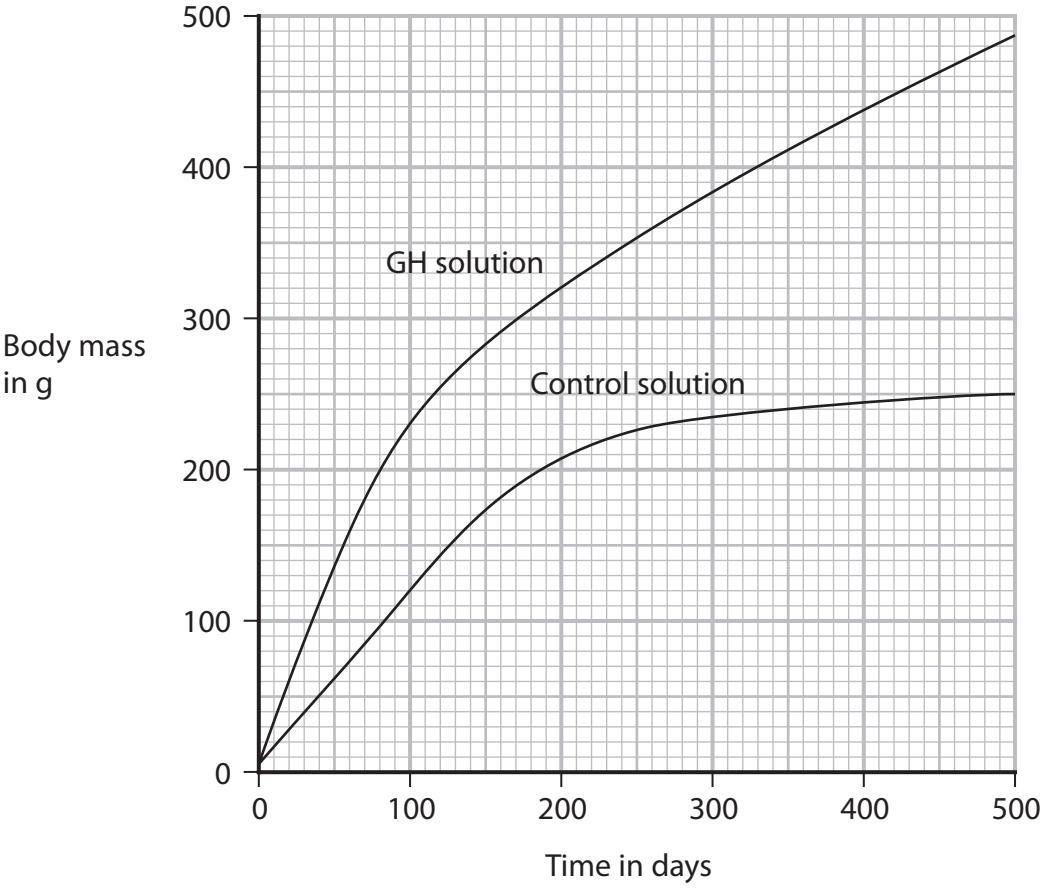
4 A scientist investigates the effect of growth hormone (GH) on the body mass of rats.

This is his method.

- give one rat a GH solution every day for 500 days
- give another rat a control solution every day for 500 days
- measure the mass of each rat each week for 500 days

The graph shows his results.



(a) Suggest how the control solution differs from the GH solution.

(1)

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(b) Calculate the average rate of growth of the rat given GH solution from 100 days to 500 days.

Give your answer in g per day.

(2)

rate of growth = ... g per day

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(c) The scientist controlled all the variables in his investigation.

Suggest two abiotic variables he controls.

(2)

1 .....

2 .....

(d) The scientist repeats his investigation using more rats.

Explain why using more rats improves his investigation.

(2)

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(e) GH increases transcription in cells.

Explain why this affects the growth of rats.

(3)

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(Total for Question 4 = 10 marks)

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5 Human populations are at risk from infectious disease.

(a) Describe the different types of pathogen.
Refer to a disease that each type of pathogen causes in your answer.

(6)

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(b) Explain how vaccination protects humans from pathogens.

(3)

(Total for Question 5 = 9 marks)

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6 Variation in a population can have different causes.

(a) Which of these will **not** lead to an increase in genetic variation in a population of plants?

(1)

☒ **A** asexual reproduction

☒ **B** insect pollination

☒ **C** mutation

☒ **D** wind pollination

(b) Explain how a change in the DNA of a microorganism can reduce its ability to digest a substance.

(5)

(c) Explain why a change in DNA may not affect the phenotype of an organism.

(4)

(Total for Question 6 = 10 marks)

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7 Gas exchange in a flowering plant changes depending on conditions.

(a) Complete the passage by writing a suitable word or words in each blank space.

(5)

Plants carry out photosynthesis to produce ..... . To enable this process to occur the leaf cells absorb carbon dioxide and release oxygen.

At the same time the cells in the leaves are respiring. This means that they are using ..... and producing carbon dioxide. If the leaves are in bright sunlight, then the rate of photosynthesis will be ..... than the rate of respiration.

If the leaves are in dim light, then the rate of respiration will be greater than the rate of photosynthesis and there will be a net production of ..... .

In conditions when there is no net absorption or release of carbon dioxide the rate of photosynthesis and respiration are ..... and the plant is at its compensation point.

(b) Describe how you could use hydrogen-carbonate indicator to investigate the effect of light intensity on net gas exchange in a leaf.

(3)

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(Total for Question 7 = 8 marks)

TOTAL FOR PAPER = 70 MARKS

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