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

Tuesday 14 January 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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P 6 2 0 5 9 A 0 1 2 0

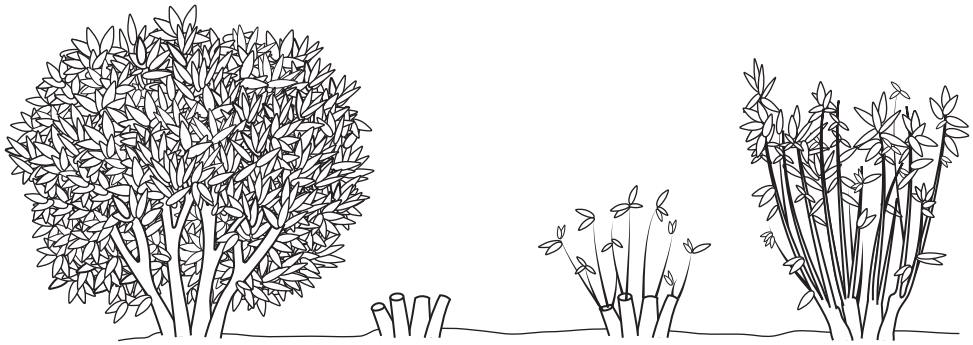
Pearson

Answer ALL questions.

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

Coppicing

Coppicing is a traditional woodland management technique that was commonly used until about 70 years ago. Coppicing involves repeatedly cutting trees near to their base and allowing them to regrow. This provides a sustainable supply of timber. Coppicing has several benefits compared with replanting. Coppiced trees already have developed root systems, making regrowth quicker. They are also less likely to be eaten by species such as deer. Coppicing also reduces shading.



Tree to be coppiced | Cut close to base in winter | Shoots rapidly regrow from base the following spring | Coppice ready for harvest between 7–20 years

The demand for coppiced timber is beginning to increase again, as timber prices rise and other uses of coppiced timber develop. These uses include wood for biofuel. Much of this wood is used for heating schemes for homes and small factories. One exception is the huge Drax power station in North Yorkshire, United Kingdom, which has been using coppiced wood to generate electricity since 2004.

Coppicing is still a popular conservation practice because of the benefits it provides to trees and wildlife. Trees naturally lose their branches, which extends their lifespan. Coppicing is an artificial way of removing branches and increasing the lifespan of the tree.

Coppicing also increases woodland biodiversity, as greater amounts of light can reach the ground, allowing other plant species to grow. Many of these species are food sources for butterflies and other insects, providing food for birds and mammals such as bats.

In managed coppiced woodland the varied age structure of the vegetation also provides good habitat and shelter for different bird species.

Coppicing is a good way to ensure that there is a range of different light levels in a woodland, which leads to an increase in plant biodiversity.

(a) Suggest what is meant by the term **sustainable** (line 3).

(1)

(b) Explain why having a developed root system makes regrowth quicker (lines 4 to 5).

(2)

(c) Coppiced wood can be used as a biofuel (lines 8 to 9).

Give similarities and differences in the use of biofuel compared with the use of fossil fuels.

(3)

(d) New growth in woodland is often destroyed by species such as deer (lines 5 to 6).

Suggest one way to protect woodland from this damage.

(1)

(e) Coppicing increases biodiversity in woodland ecosystems (line 17).

Describe a method to investigate the effect of coppicing on the biodiversity of plants in a woodland.

(5)

(f) Coppicing increases the number of insects in woodland.

A farmer owns a field next to a coppiced woodland.

(i) Give one reason why more insects in the woodland might be an advantage for the farmer.

(1)

(ii) Give one reason why more insects in the woodland might be a disadvantage for the farmer.

(1)

(g) Explain why a range of different light levels in a woodland leads to an increase in plant biodiversity (lines 23 to 24).

(2)

(Total for Question 1 = 16 marks)

2 Insulin is a hormone produced in the human body.

(a) Which organ produces insulin?

(1)

- ☒ **A** brain
- ☒ **B** liver
- ☒ **C** ovary
- ☒ **D** pancreas

(b) Describe the role of insulin.

(2)

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(c) Some humans cannot produce insulin and need injections of insulin every day.

This insulin can be obtained from cows, but this insulin might cause an immune response in the human body.

Why does cow insulin cause an immune response in humans?

(1)

- ☒ **A** insulin acts as an antibody
- ☒ **B** insulin acts as an antigen
- ☒ **C** insulin is a large molecule
- ☒ **D** insulin is a pathogen

(d) The insulin now used for injections is obtained from bacteria that have been genetically modified.

Describe how these bacteria are genetically modified to produce human insulin.

(3)

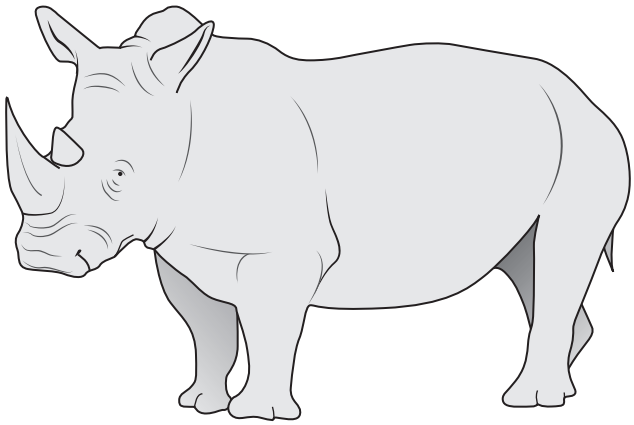
(e) An industrial fermenter is used to grow the genetically modified bacteria.

Explain why the fermenter is cleaned using steam before the genetically modified bacteria are added.

(3)

(Total for Question 2 = 10 marks)

3 The diagram shows a northern white rhino.



The northern white rhino is in danger of becoming extinct.

In 2018, there was only one left in the world.

This represents a 99.95% decrease in numbers from 1960 to 2018.

(a) Calculate the population size of the northern white rhino in 1960.

(3)

population size = ...

(b) Cloning was considered as a method to increase the northern white rhino population.

In 2018, the only northern white rhino left was an old female. Old females produce too few eggs for cloning to be successful.

Suggest two reasons why many eggs are needed for cloning to be successful.

(2)

1 .....

.....

2 .....

.....

(c) Scientists are considering using semen from a southern white rhino to fertilise an egg from the northern white rhino.

Fertilisation would take place in a test tube and produce a zygote.

(i) Name the cell in semen that fertilises the egg.

(1)

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(ii) Explain what the scientists should do with the zygote so that it develops into a fetus.

(4)

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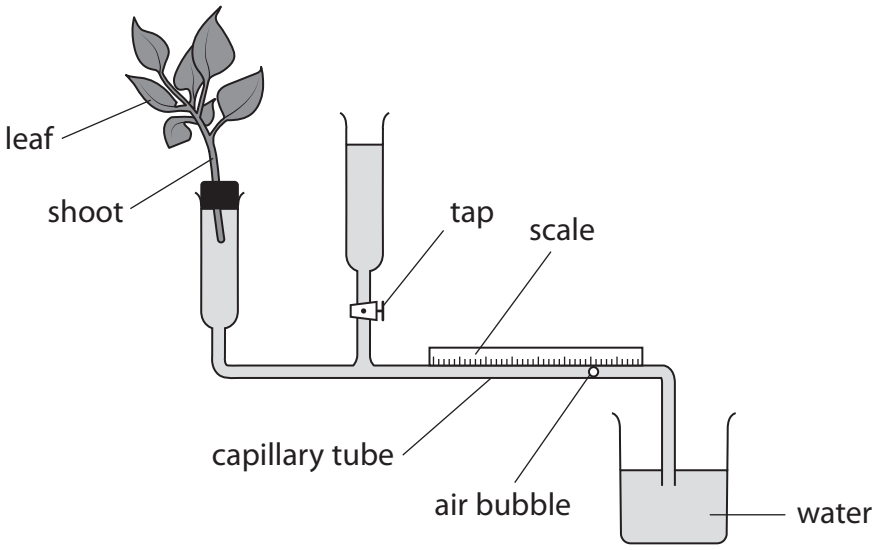
(Total for Question 3 = 10 marks)

4 A student uses this apparatus to investigate the effect of windy conditions on transpiration.



This is the student's method.

- measure water uptake for 30 minutes without a fan blowing air at the shoot
- measure water uptake for 30 minutes with a fan blowing air at the shoot
- measure the total surface area of the leaves

The student divides the water uptake by the total surface area of the leaves.

The table shows the student's results.

Conditions	Water uptake after 30 minutes in cm^3 per $cm^2 \times 10^{-4}$
without fan	10.5
with fan	12.5

(a) Explain how the student sets up and uses this apparatus to measure the water loss.

(4)

(b) Give two abiotic factors that the student should control in his investigation.

(2)

1 .....

2 .....

(c) The total surface area of the plant leaves is 200 cm^2.

Calculate the time in minutes for the plant to take up 1.0 cm^3 of water without a fan.

(3)

time = ... minutes

(d) The student concludes that plants will grow better in windy conditions.

Evaluate this conclusion.

(6)

(Total for Question 4 = 15 marks)

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5 The molecules RNA and DNA are both involved in inheritance and protein synthesis.

(a) Give two differences between the structure of a DNA molecule and the structure of an RNA molecule.

(2)

1 .....

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2 .....

.....

(b) This sequence shows the order of bases on a DNA strand.

CATCATCCTCATCTA

(i) Give the sequence of bases in the mRNA that would be produced from this strand.

(1)

.....

(ii) The sequence of bases in the mRNA is used to code for the amino acids in a protein.

Calculate the number of bases required to code for an amino acid chain of 1400 amino acids.

(1)

number of bases = ...

(c) A mutation results in a change in the sequence of bases in a DNA strand.

Discuss what effect a change in the sequence of bases could have on the functioning of the enzyme produced.

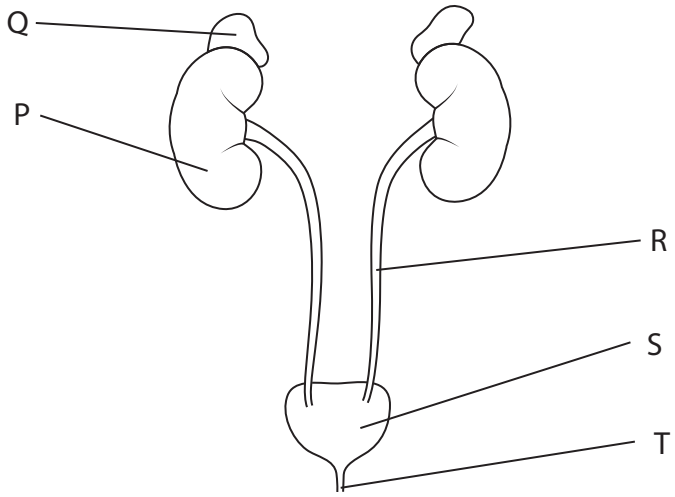
(4)

(d) Give one way that the incidence of mutation could be increased.

(1)

(Total for Question 5 = 9 marks)

6 The diagram shows some structures in the human abdomen.



(a) Which structure is used to store urine?

(1)

- ☒ **A** organ P
- ☒ **B** organ Q
- ☒ **C** organ R
- ☒ **D** organ S

(b) Which structure produces adrenaline?

(1)

- ☒ **A** organ P
- ☒ **B** organ Q
- ☒ **C** organ R
- ☒ **D** organ S

(c) (i) Identify two substances that would be carried in structure R.

(2)

1 .....

2 .....

(ii) Tube T is used for excretion and reproduction in males, but only for excretion in females.

Explain this difference in function.

(2)

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(d) The volume and concentration of urine produced varies depending on the water content of the body.

Explain how very warm weather results in a change in the concentration and volume of the urine.

(4)

(Total for Question 6 = 10 marks)

TOTAL FOR PAPER = 70 MARKS

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