Write your name here

Surname	Other names

Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Unit: 4BI0
Paper: 2B

Tuesday 10 January 2012 – Afternoon
Time: 1 hour

Paper Reference
4BI0/2B

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.

Information

- The total mark for this paper is 60.
- 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.
- Keep an eye on the time.
- 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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1/1/1/C1/C1

P 4 0 1 2 5 R A 0 1 1 6

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.

Snail Farming

The photograph shows a snail that is farmed for its meat.

Farming snails has many benefits. Economically, there are many people prepared to pay for the luxury of eating snail meat. The meat itself is high in protein. It is also low in fat, so snail meat is healthy to eat. Also, farming snails helps to conserve natural snail populations which are at risk due to being collected in large numbers in many places.

In the wild, snails grow fastest in warm temperatures and a humid atmosphere. Maintaining these conditions on a snail farm creates problems with insect pests and bacterial infections. Natural predators of the insect pests, such as spiders, are encouraged on farms, as is the constant use of fly swatters and sticky fly traps. To prevent bacterial infections, disinfectant is added to the water used to clean the cages.

Snails are herbivores but on a snail farm they are not fed with green vegetables as might be expected. Green vegetables are not assimilated very well by many organisms. The assimilation efficiency (AE) of an organism is the percentage of total food eaten that is absorbed into the blood after digestion, and not lost as faeces. Carnivores tend to have an AE of 80%, while most leaf-eating herbivores have an AE of about 50%. However, snails have symbiotic microorganisms in their gut that release the enzyme, cellulase, to digest cellulose into glucose. This boosts their AE to about 75%. Nevertheless, snails on a farm are fed with high quality food containing a mixture of amino acids, carbohydrates, vitamins and mineral ions.

The production efficiency (PE) of an animal is the proportion of assimilated food that is turned into new biomass rather than being metabolised. Birds and mammals have a very low PE of 1 to 2%, but snails have a much higher PE. This is because the metabolic use of assimilated food, particularly glucose, is much reduced in snails.

Selective breeding is used on a snail farm to produce fast-growing snails that have thin shells and lay lots of eggs. The eggs are put on damp, sterilised soil and incubated. The young snails that hatch are put in plastic trays that are easy to clean.

(a) Explain why snail meat is healthy to eat (line 4).

(2)

(b) Suggest a reason why conservationists are pleased that snail farming exists.

(1)

(c) Name the organism used in biological control on snail farms.

(1)

(d) The shell of a snail is called an exoskeleton.

Use this information to suggest **one** mineral ion in the diet of farmed snails that would help them to make their shell.

(1)

(e) (i) Suggest why many organisms cannot assimilate green vegetables very well (lines 14 and 15).

(2)

(ii) Calculate the assimilation efficiency (AE) of a snail that ate 4.0 g of food and produced 1.2 g of faeces.
Show your working.

(2)

Answer ..... %

(f) Suggest why the production efficiency (PE) of birds and mammals is much less than the PE of snails (lines 23 and 24).

(2)

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(g) What is meant by the term **selective breeding** (line 26)?

(1)

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(h) Suggest why snail eggs are put on soil that has been sterilised (line 27).

(1)

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(Total for Question 1 = 13 marks)

2 The photograph shows a Siberian tiger.

Siberian tigers are very rare and are in danger of becoming extinct. Scientists hope to use cloning as a method to increase the number of Siberian tigers.

The passage below describes the process of cloning. Complete the passage by writing a suitable word on each dotted line.

(6)

A nucleus is taken from a body ..... of an adult Siberian tiger.

This nucleus is put into an enucleated ..... cell, a cell that has had

its nucleus removed. The cell is given a mild electric shock to help it divide by a type

of cell division called ..... . A ball of cells is produced called

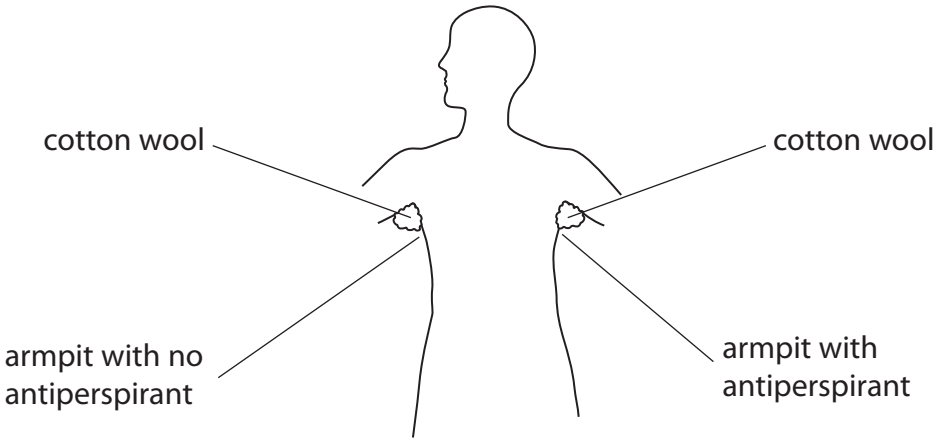
an ..... . The ball of cells is placed into the .....

of a female Bengal tiger. This female tiger is called a ..... mother.

(Total for Question 2 = 6 marks)

3 Antiperspirants are used to reduce sweating under the arms.

An investigation was carried out to find out the effectiveness of an antiperspirant. Ten students put antiperspirant on the skin of their left armpit. No antiperspirant was put on the skin of their right armpit. Each student then weighed two pieces of cotton wool and placed one piece under each armpit. The cotton wool was used to absorb any sweat that was produced.



The ten students exercised at the same intensity for five minutes and then reweighed each piece of cotton wool.
They calculated the percentage increase in the mass of the cotton wool. Their results are shown in the table.

Student	Percentage increase in mass of cotton wool (%)	
	Without antiperspirant	With antiperspirant
1	2.4	1.9
2	2.7	1.6
3	2.9	2.0
4	2.6	1.8
5	2.6	1.7
6	2.5	1.6
7	2.6	2.0
8	2.7	1.7
9	2.5	0.0
10	2.5	1.7
Average	**2.6**	**?**

(a) The results for the left armpits with antiperspirant contain one anomalous result.

Calculate the **correct** average for the percentage increase in mass of the cotton wool with antiperspirant. Show your working.

(2)

Answer .....

(b) The results for the right armpits without antiperspirant are not all the same.

Suggest **two** reasons to explain this.

(2)

1 .....

.....

2 .....

.....

(c) Which of the following formulae, A, B, C or D, should be used to calculate the percentage increase in the mass of each piece of cotton wool.

Put a cross ☒ in the correct box.

(1)

☒ **A** $\%\ \text{increase} = \dfrac{\text{mass after exercise} - \text{initial mass}}{\text{initial mass}} \times 100$

☒ **B** $\%\ \text{increase} = \dfrac{\text{mass after exercise} - \text{initial mass}}{\text{mass after exercise}} \times 100$

☒ **C** $\%\ \text{increase} = \dfrac{\text{mass after exercise}}{\text{initial mass}} \times 100$

☒ **D** $\%\ \text{increase} = \dfrac{\text{initial mass}}{\text{mass after exercise}} \times 100$

(d) Exercise increases the rate of sweating, but people also sweat at rest.

(i) Explain how the rate of sweating of a person at rest is affected if that person is in hot air.

(2)

(ii) Explain how the rate of sweating of a person at rest is affected if that person is in air with a high humidity.

(2)

(Total for Question 3 = 9 marks)

4 Ian wanted to investigate how gas exchange in a flowering plant changed with light intensity.

He set up an experiment using four tubes. Each of the tubes contained orange hydrogencarbonate indicator solution and was sealed with a cork. Ian added a fresh leaf to tubes A, B and C. Tube D had no leaf.

The tubes were then left in the following conditions:

- Tube A was placed in direct sunlight.
- Tube B was covered with aluminium foil to prevent any light entering the tube.
- Tube C was covered with thin cloth which allowed some light to enter the tube.
- Tube D was also placed in direct sunlight.

He left the tubes in the laboratory for one hour and then returned to look at the colour of the indicator solution in the tubes.

(a) Suggest a hypothesis for Ian's investigation.

(2)

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(b) Give **two** variables that Ian should keep constant in his investigation.

(2)

1 .....

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2 .....

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(c) State the purpose of Tube D in the investigation.

(1)

(d) Ian recorded his results in a table.

Tube	Colour of indicator at start	Colour of indicator after one hour
A	orange	purple
B	orange	yellow
C	orange	orange
D	orange	orange

(i) Explain the change in colour of the indicator in Tube A.

(2)

(ii) Explain the change in colour of the indicator in Tube B.

(2)

(e) Suggest why the indicator did not change colour in:

(i) Tube C

(1)

(ii) Tube D

(1)

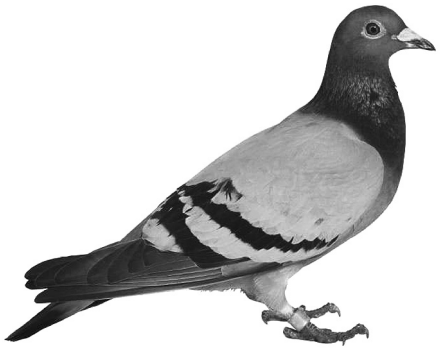
(f) Limewater is an indicator that can be used to show an increase in the level of carbon dioxide.

Suggest why it would **not** be a suitable indicator for use in this investigation.

(1)

(Total for Question 4 = 12 marks)

5 Pigeons are birds that eat seeds. They are hunted by predators called hawks.



(a) Use this information to draw a food chain in the space below.

(2)

(b) Pigeons often feed in small groups. The size of the group of pigeons affects the success rate of a hawk in catching a pigeon. Pigeons use their eyes to see an approaching hawk.

The table gives information about the success that a hawk has in catching pigeons when pigeons are in different group sizes.

Number of pigeons in group	Average distance when pigeons first see hawk (metres)	Success rate of hawk catching a pigeon (%)
1	3	80
2 to 10	16	58
11 to 50	30	17
more than 50	40	6

(i) Use the information in the table to describe and explain the relationship between the size of a group of pigeons and the success rate of the hawk.

(2)

(ii) Describe the changes that would take place in the eye of a pigeon to help it focus on an approaching hawk.

(4)

(iii) Describe what happens to protein from pigeon meat when it is in a hawk's stomach.

(3)

(Total for Question 5 = 11 marks)

6 Most simple genetic crosses, such as those studied by Mendel, investigate phenotypes determined by a pair of alleles, where one allele is dominant over the other allele.

Mendel crossed homozygous tall pea plants with homozygous dwarf pea plants.
All the offspring were tall.

(a) Use a genetic diagram to show the parent genotypes, the gametes formed and the genotypes of the offspring.

(3)

(b) Mendel then made sure that the tall offspring plants could only self-pollinate, rather than being pollinated by other plants. The seeds produced grew to give new plants with a 3 : 1 phenotypic ratio.

(i) Suggest how Mendel made sure that the pea plants self-pollinated.

(2)

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(ii) Give the genotypes of the offspring he obtained from the self-pollinated pea plants.

(1)

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(c) What is meant by the term **dominant allele**?

(1)

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(d) Some phenotypes are controlled by codominant alleles.

What is meant by the term **codominant alleles**?

(2)

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(Total for Question 6 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

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