Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5945716744

BIOLOGY **5090/21**

Paper 2 Theory **May/June 2021**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Section A: answer **all** questions.
- Section B: answer **all** questions.
- Section C: answer **either** Question 8 **or** Question 9.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

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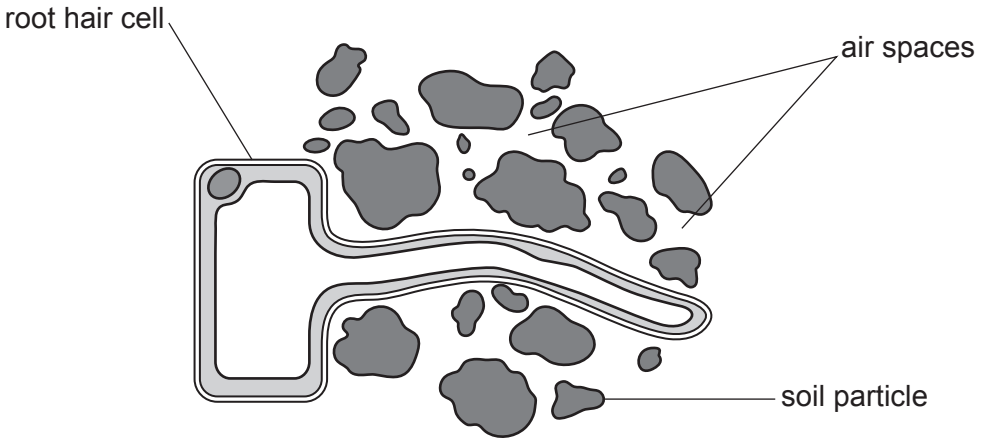
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Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 The diagram shows a root hair cell from a lemon tree and some soil particles.



(a) (i) State **one** feature, visible in the diagram, which shows that a root hair cell is a plant cell.

..... [1]

(ii) Describe how mineral ions pass from the soil into the root hair cell.

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..... [4]

(b) The lemon tree has grown in the same soil for many years so the soil now lacks magnesium.

Describe and explain the effect on the lemon tree of a lack of magnesium.

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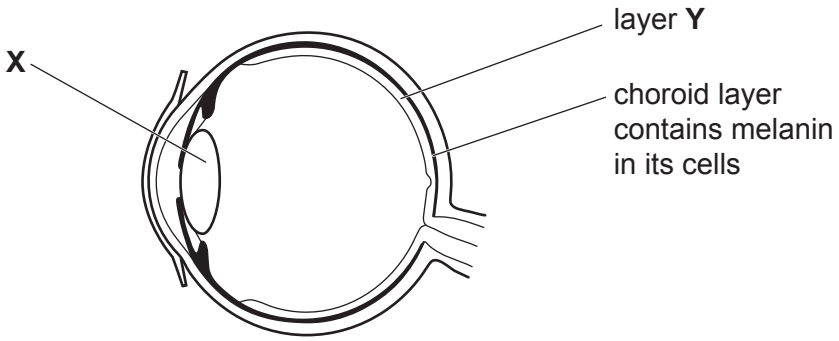
..... [2]

[Total: 7]

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[Turn over

2 A person visits an eye doctor to have an eye test. On the wall of the doctor's room is a diagram of an eye.



(a) (i) Name the part labelled **X**.

..... [1]

(ii) Describe **one** way in which the structure of **X** is related to its function.

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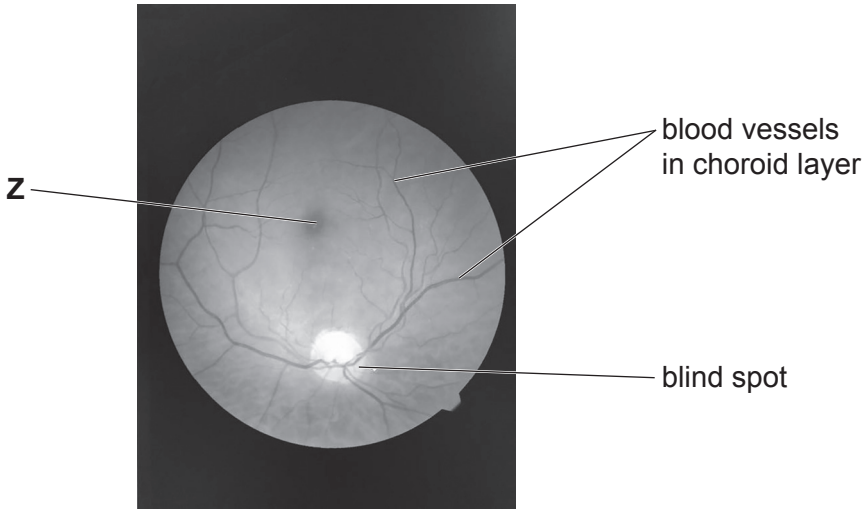
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..... [2]

(iii) Name layer **Y**.

..... [1]

(b) As part of the eye test, the doctor shines a bright light into the eye and takes a picture. The picture shows layer **Y** and the choroid layer behind it.



(i) Name structure **Z**.

..... [1]

(ii) Layer **Y** does not contain blood vessels.
Explain how the blood vessels in the choroid layer are important for layer **Y**.

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..... [4]

(c) When the bright light is shone into the eye there is a pupil reflex which causes the pupil to become smaller.

Explain how named parts of the eye and of the nervous system are involved in this pupil reflex.

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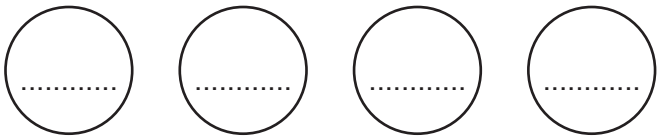
..... [4]

(d) Some people inherit a condition which prevents the production of the dark pigment melanin in their choroid and skin cells. The gene involved has two alleles, **A** (dominant) and **a** (recessive). Only people with two recessive alleles have this condition.

Two people, each with a heterozygous genotype, have children together.

(i) Complete the genetic diagram to show the possible genotypes and phenotypes of the children.

genotypes of parents ..... × .....

gametes 

possible genotypes of children ....

possible phenotypes of children ....

[4]

(ii) State the probability of these two people having a child who does **not** produce melanin.

..... [1]

[Total: 18]

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3 A sycamore tree is a producer for many food chains in a forest ecosystem.

(a) Explain what is meant by:

(i) a producer

.....

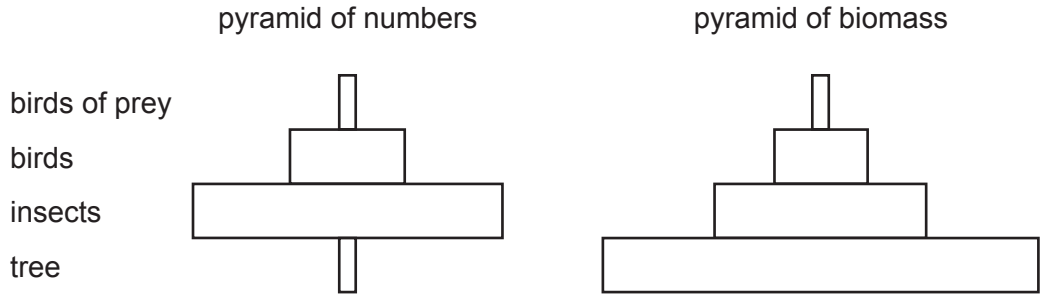
..... [1]

(ii) a food chain.

.....

..... [1]

(b) The diagrams show a pyramid of numbers and a pyramid of biomass for a sycamore tree.



Explain the different shapes of the two pyramids.

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..... [4]

(c) Sycamore trees produce flowers that are insect-pollinated.
Suggest **two** features of flowers which adapt them for insect-pollination.

1 .....

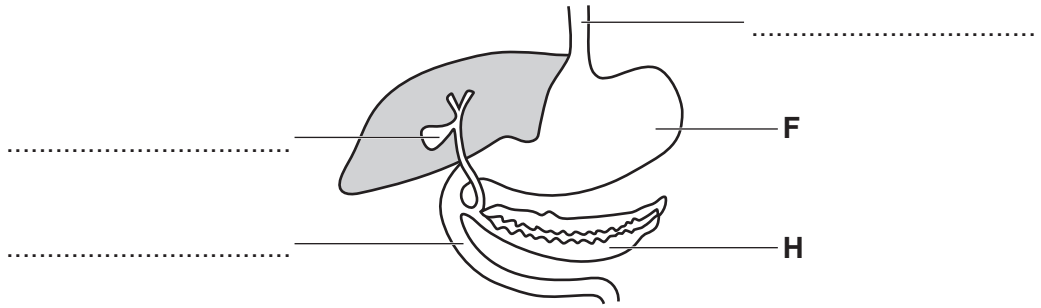
2 .....
[2]

(d) State the type of cell division that produces pollen grains.

..... [1]

[Total: 9]

4 The diagram shows part of the human alimentary canal and its associated organs.



(a) Complete the three labels on the diagram by naming the structures. [3]

(b) Describe the functions of the structure labelled **F**.

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..... [3]

(c) Name structure **H** and describe its role in homeostasis.

name .....

role.....

.....

.....

[2]

[Total: 8]

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5 A farmer is using a tool, called a mattock, to weed her crop.



(a) Explain how the muscles and bones in her right arm help her to lift the tool.

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..... [4]

(b) The farmer has not used any insecticides or artificial fertilisers on the crop.
Explain ways in which this may help the local environment.

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..... [4]

[Total: 8]

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 **(a)** Yoghurt is a milk product.
Outline the role of microorganisms in the process of yoghurt production.

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..... [5]

(b) The diagram shows a food label from a pot of yoghurt.

contents	nutritional values in 100 g of yoghurt
energy	344 kJ
fat	4.5 g
total carbohydrates	5.5 g
sugar	5.5 g
fibre	0.0 g
protein	4.2 g
salt	0.1 g
calcium	0.125 g
water	81%

Yoghurt can contribute to a balanced diet but adult humans cannot survive by eating only yoghurt.

Explain this statement using the information on the label.

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..... [5]

[Total: 10]

7 **(a)** Excess amino acids are broken down in liver cells to form molecules of urea.

Describe the pathway taken by a molecule of urea, from the liver of a mammal until it reaches the soil.

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..... [7]

(b) Urea is a molecule which contains nitrogen.
Suggest why it is important that molecules that contain nitrogen are added to the soil.

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..... [3]

[Total: 10]

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Section C

Answer **either** Question 8 **or** Question 9.

Write your answers in the spaces provided.

8 **(a)** Rice, maize and wheat plants are the main carbohydrate source for more than 60% of the human population.

Describe how plants like these produce carbohydrates using materials from the environment.

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..... [5]

(b) Many scientists predict that, as the world's human population increases, there will be a shortage of food.

Suggest and explain why an increase in human population is predicted to lead to a global human food shortage.

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..... [5]

[Total: 10]

9 **(a)** Describe how air is breathed in, using the rib cage and diaphragm, so that it reaches the alveoli.

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..... [5]

(b) Bronchitis is a condition that can be triggered by breathing in substances that cause the bronchi to become inflamed and produce a large amount of mucus.

Suggest how this condition can affect a person and explain how a person may be able to avoid developing the condition.

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..... [5]

[Total: 10]

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