Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2213398051

BIOLOGY **5090/21**

Paper 2 Theory **October/November 2022**

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.

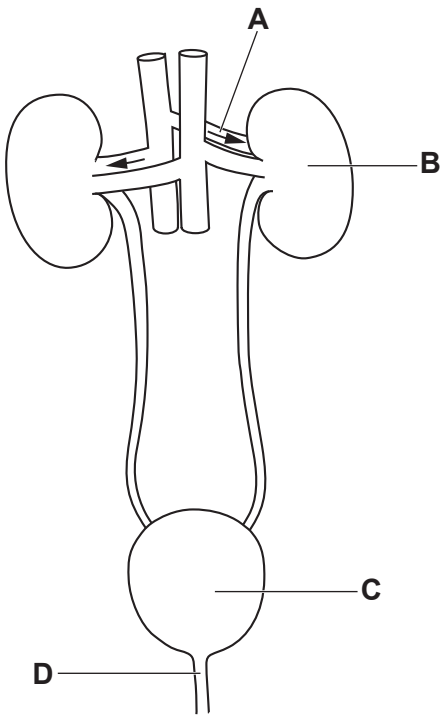
BLANK PAGE

Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 The diagram shows parts of the human body involved in excretion.



(a) Name the liquid that passes out of the human body through tube **D** and the waste product it contains.

liquid .....

waste product .....

[2]

(b) Describe how parts **A**, **B** and **C** are involved in removing the waste product that passes out of tube **D**.

.....

.....

.....

.....

..... [3]

[Total: 5]

2 Grapes are fruits that grow on a plant called a grape vine.
A farmer grows a variety of grape vine called the sultana.
The grapes produced are sold to be eaten fresh or used to make dried fruit called sultanas.

grape vine

bunch of grapes

(a) 100 g of fresh grapes produced by the vine contains 15.5 g of sugars.
Describe and explain how the plant produces sugars and transports sugars to the fruit.

.....

.....

.....

.....

.....

.....

..... [5]

(b) The sultana grape variety produces fruits without seeds. This is because of a gene mutation.

(i) State the meaning of the term mutation.

.....

..... [2]

(ii) All the sultana grape plants growing in the farmer's fields are genetically identical.
Explain why they are all genetically identical.

.....

.....

.....

..... [3]

(c) The farmer sprays insecticide on the grape vines to improve his crop of grapes. Explain how this has an impact on the biodiversity of his fields.

.....

.....

.....

.....

..... [3]

(d) The skins of the grapes are naturally covered in a white powdery coating. This is wild yeast, a fungus.

(i) List **two** similarities in structure between grape cells and yeast cells.

1 .....

2 .....
[2]

(ii) Suggest how the yeast is able to grow on the grape skins.

.....

..... [1]

(iii) State **two** ways in which yeast can be used by humans.

1 .....

2 .....
[2]

[Total: 18]

3 Guinea pigs are small mammals. In some countries they are produced for food and in others they are bred as pets.

(a) Guinea pigs can have either straight hair or curly hair. The allele for straight hair, **T**, is dominant to the allele for curly hair, **t**.

(i) Explain the difference between a gene and an allele.

.....

.....

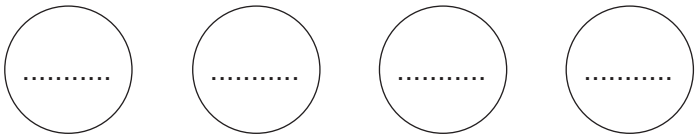
..... [2]

(ii) A breeder has two straight-haired guinea pigs, male and female, and is surprised when one of the offspring has curly hair.

Complete the genetic diagram to show how this is possible.

genotypes of parents ..... × .....

gametes



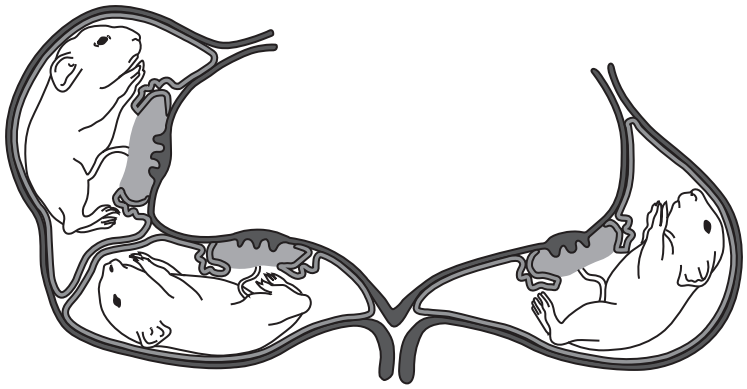
possible offspring genotypes ....

possible offspring phenotypes ....
[4]

(b) Baby guinea pigs develop in the mother's uterus for between 59 and 73 days.

The mother usually gives birth to between two and four offspring.

The diagram shows the uterus and developing offspring.



The offspring of both humans and guinea pigs develop in a uterus.

Using the information provided and your knowledge of human development, discuss the similarities **and** differences in the development of offspring of humans and guinea pigs.

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

4 Amylases are enzymes that are made in specific cells of animals and plants and also by bacteria. In humans, amylase is secreted into the alimentary canal in saliva and in pancreatic juice.

(a) (i) Explain what is meant by the term enzyme.

.....

..... [2]

(ii) Outline **two** structural features of enzyme molecules.

1 .....

.....

2 .....

.....

[2]

(iii) Name both the substrate and product of amylase.

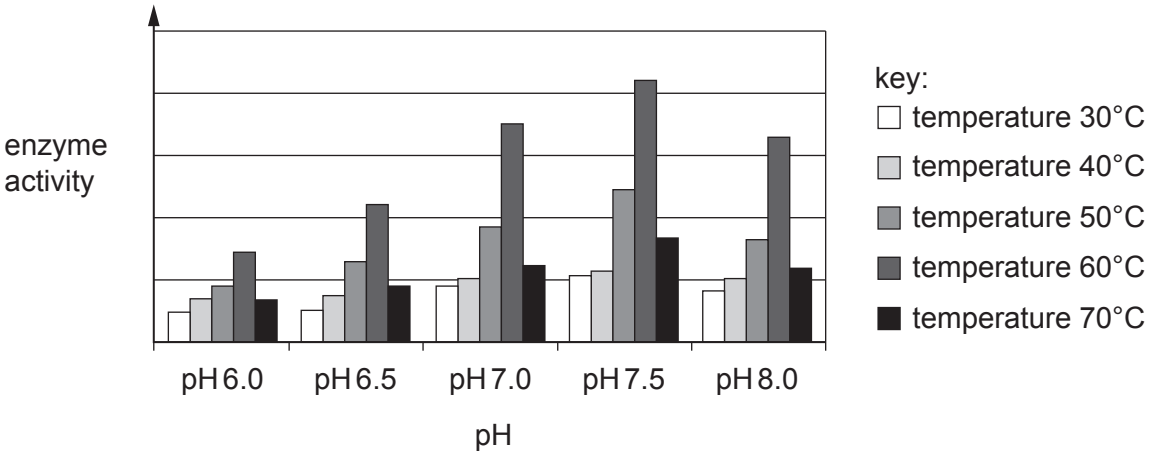
substrate .....

product .....

[2]

(b) Amylase produced by bacteria can be used as part of an industrial process that converts plants such as corn into biofuel. Biofuels can be used instead of diesel or petrol.

The bar chart shows how the activity of amylase is affected by temperature and pH.



(i) Describe what the data in the bar chart show about the activity of the enzyme and explain why this information is useful for the producers of biofuels.

.....

.....

.....

.....

.....

..... [4]

(ii) Biofuels can be burnt in vehicle engines.

Suggest how biofuels can result in pollution and cause environmental change.

.....

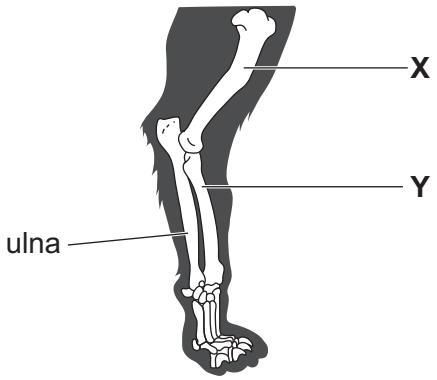
.....

.....

..... [2]

[Total: 12]

5 Lions are carnivorous mammals that hunt their prey.
The forelimb of a lion has the same basic structure as the arm of a human.
The diagram shows the bones in the forelimb of a lion.



(a) State the name of:

bone **X** .....

the muscle between bones **X** and **Y**. .....
[2]

(b) Lions can only run quickly for a short time. This means they have to get close to their prey before accelerating to maximum running speed.

(i) Name the process used to release energy in the muscles of the forelimb when the lion starts to run after its prey.

..... [1]

(ii) Explain why the lion can only run at maximum speed for a short time.

.....

.....

..... [2]

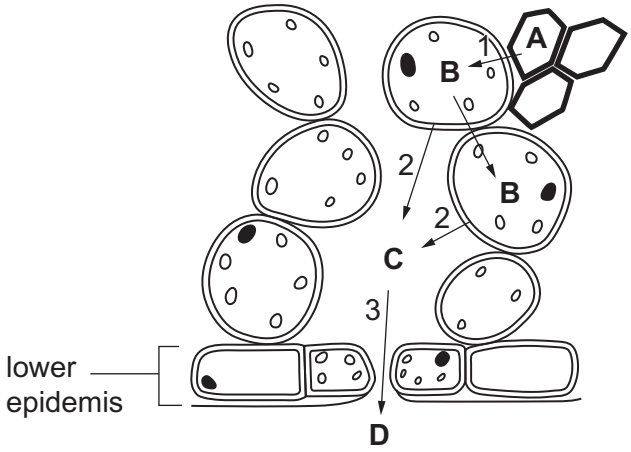
[Total: 5]

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 The diagram shows some cells from the lower part of a transpiring leaf.



(a) (i) Identify cell type **B**.

B ..... [1]

(ii) Water travels from **A** to **D**. The arrows on the diagram represent the movement of water molecules during transpiration. With reference to these arrows, name and define each process taking place.

arrow 1 .....

.....

.....

arrow 2 .....

.....

.....

arrow 3 .....

.....

.....

[6]

(b) Leaves from different plant species transpire at different rates in the same environmental conditions.
Suggest and explain structural differences in the lower surface of these leaves which might produce differences in the transpiration rate.

.....

.....

.....

.....

.....

..... [3]

[Total: 10]

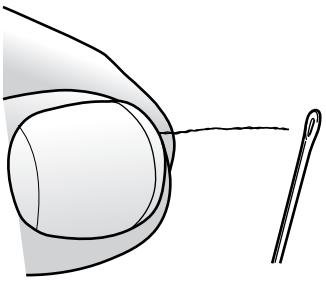
7 Humans have receptors to detect stimuli in their environment and a nervous system to coordinate responses to these stimuli.

(a) Complete the table showing different parts of the nervous system, their location in the human body and some of their functions.
One row has already been completed.

part of the nervous system	location in the body	function
medulla	brain	controls automatic functions such as breathing
	nerve in body	carries nerve impulses from the central nervous system to muscles and glands
	brain	problem solving, language, memory and interpreting visual information
	brain	regulates body temperature
relay neurone		
cerebellum		fine motor control and balance

[5]

(b) A man is threading a needle.



To do this, each of the man's eyes produces a focused image of the needle.

Explain how different parts of the eye function to produce a focused image of a near object.

.....

.....

.....

.....

.....

..... [5]

[Total: 10]

Section C

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

Write your answers in the spaces provided.

8 Malnutrition is a global problem.
In early 2020 the world population was approximately 7.8 billion people. Of these it is estimated that 1.9 billion adults were overweight and 462 million underweight.

(a) Explain what is meant by a balanced diet and outline its components.

.....

.....

.....

.....

.....

.....

..... [4]

(b) Discuss the effects on health of being underweight and of being overweight.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 10]

9 **(a)** Describe the composition of human blood.

.....

.....

.....

.....

.....

.....

.....

..... [5]

(b) A blood test is one way of assessing a person's health and fitness. After a small sample of blood has been taken, its composition can be analysed.

Suggest and explain ways in which a blood test can help to determine a person's health and fitness.

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 10]

BLANK PAGE