Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

5585840654

BIOLOGY **5090/21**

Paper 2 Theory **May/June 2023**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- 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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1 The human body produces over fifty different hormones.

(a) Describe what is meant by the term hormone.

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.....

.....

..... [3]

(b) The list shows some of the hormones produced by the human body:

A adrenaline
B luteinising hormone
C insulin
D progesterone
E oestrogen
F glucagon.

Complete Table 1.1 by writing the correct letters in each box. Each box can contain one or more letters and each letter can be used more than once. The first one has been done for you.

Table 1.1

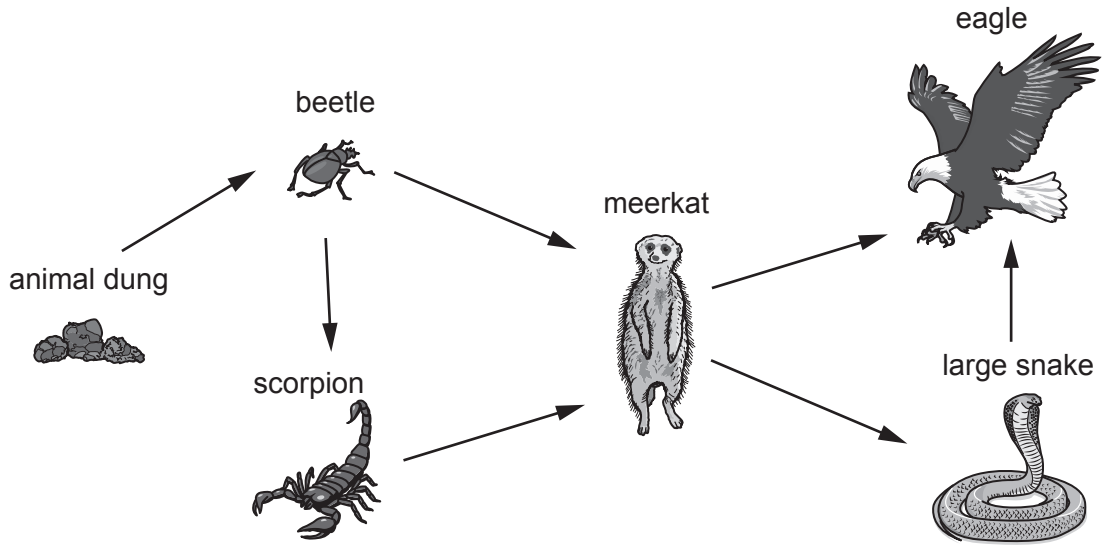
	hormones
produced in the pancreas	**C** and **F**
produced in the pituitary gland	
produced in the ovary	
released to increase blood sugar concentration	
released to build up the uterus lining after menstruation	

[4]

[Total: 7]

2 Meerkats are small mammals that live in deserts which are dry and open habitats.
Deserts are very hot during the day but cold at night.
Meerkats are carnivores which search for food during the daytime.

(a) Fig. 2.1 shows part of a food web from a desert.



not to scale

Fig. 2.1

(i) Using the **visible** characteristics of the organisms in the food web, complete the gaps in Table 2.1 to classify the named organisms.

Table 2.1

organism	vertebrate or arthropod	group	visible classification feature
scorpion			
meerkat		mammal	
snake			
eagle	vertebrate	bird	has feathers

[6]

(ii) Suggest and explain what might happen to the populations of snakes and beetles in the food web if the number of meerkats went down.

.....

.....

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..... [4]

(iii) Suggest and explain why deserts usually have low biodiversity.

.....

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.....

..... [2]

(b) Meerkats are social animals living in groups of about 10–15 individuals. When they are not out in the open, they spend time in networks of burrows, which can be as deep as 1.5 m.

Suggest **three** ways in which these burrows help the meerkats to survive.

1 .....

.....

2 .....

.....

3 .....

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[3]

[Total: 15]

3 Fig. 3.1 shows a young tomato plant growing near a window.
Cells from two positions in the stem are also shown.

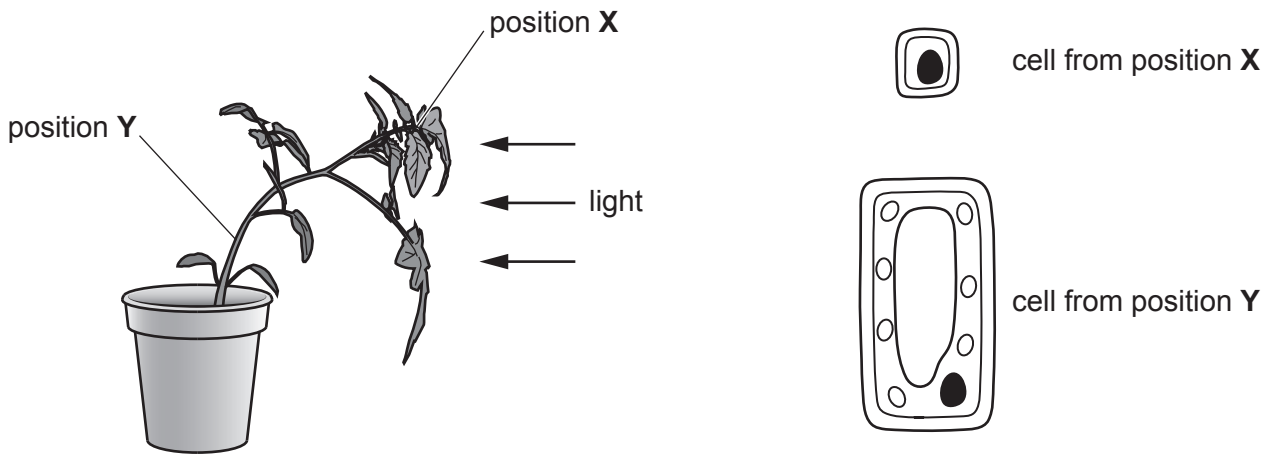

Fig. 3.1

The cells at **X** divide constantly. They then increase in size and some form mature cells like the one shown from position **Y**.

(a) Cells at positions **X** and **Y** differ in size and shape.
Give **two other** differences between these cells.

1 .....

.....

2 .....

.....
[2]

(b) Explain how the movement of water molecules is involved in this increase in cell size.

.....

.....

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.....

.....

..... [3]

(c) The tomato plant is responding to the light.
Name this response and explain how auxin and cell elongation are involved.

name of response .....

explanation .....

.....

.....

.....

.....

.....
[5]

(d) The diploid number of chromosomes in a tomato plant cell is 24.
State how many chromosomes a cell from position **Y** will contain and explain your answer.

number .....

explanation .....

.....

.....
[2]

[Total: 12]

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4 Fig. 4.1 shows a label from a snack bar.

Nutrition Facts

One bar: 70 g

	mass in g	percentage of recommended daily value
fat	7	11%
dietary fibre	3	12%
sugars	10	–
protein	30	56%
	vitamin C	0%
	iron	30%

Fig. 4.1

(a) **(i)** Explain how the nutrition provided by the snack bar is suitable for a person training for a sporting event.

.....

.....

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.....

.....

..... [4]

(ii) Calculate how many grams of dietary fibre are required in the diet to obtain 100% of the recommended daily value.

..... g [2]

(b) Describe what happens to protein in the digestive system.

.....

.....

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.....

.....

..... [5]

[Total: 11]

5 Myopia is an eye condition. If a person has myopia, near objects can be seen clearly but not those that are far away.
It can happen when the eyeballs grow slightly too long as shown in Fig. 5.1.

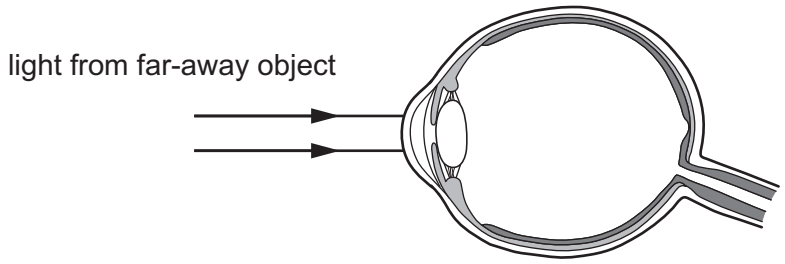

Fig. 5.1

(a) **(i)** Explain how parts of the eye are involved in producing a clear image of a near object.

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.....

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.....

..... [4]

(ii) Suggest why individuals with long eyeballs cannot see far-away objects clearly.
You may draw on the diagram of the eye in Fig. 5.1.

.....

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..... [1]

(b) A country carried out two national health surveys separated by approximately 30 years.
Table 5.1 shows the information that was obtained about myopia.

Table 5.1

	percentage of people with myopia			
	males		**females**	
age	**1971–72**	**1999–2004**	**1971–72**	**1999–2004**
12–17	21.7	30.9	26.4	37.0
18–24	22.5	29.7	32.5	46.4
25–34	20.2	38.9	27.8	49.1

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(i) Comment on how the percentage of people with myopia has changed in this population.

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.....

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.....

..... [3]

(ii) It is thought that myopia is the result of a combination of genetic and environmental factors.
It has been suggested that the changing percentages of people with myopia is a result of changes in human activities.
Suggest a change in human activity and how it could make a person less able to see far-away objects clearly.

.....

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.....

..... [2]

(c) Iris colour is genetically determined. The allele for blue colour, **b**, is recessive to the allele for brown colour, **B**.
Explain why it is **not** possible to have a heterozygous blue-eyed person.

.....

.....

.....

.....

..... [3]

[Total: 13]

6 **(a)** The human heart pumps blood which circulates around the body in blood vessels.

(i) Name the chamber of the heart with the thickest wall.

..... [1]

(ii) State what causes the sound of the heartbeat.

..... [1]

(iii) Name the blood vessel that carries blood from the aorta to the liver.

..... [1]

(iv) State **one** function of blood plasma.

..... [1]

(b) Explain the difference between antibodies and antibiotics.

.....

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..... [3]

(c) Describe how the process of natural selection has led to the development of strains of antibiotic-resistant bacteria.

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..... [5]

[Total: 12]

7 The carbon cycle is fundamental to all ecosystems.
Carbon is continuously cycled between living organisms and the atmosphere, as shown in Fig. 7.1.

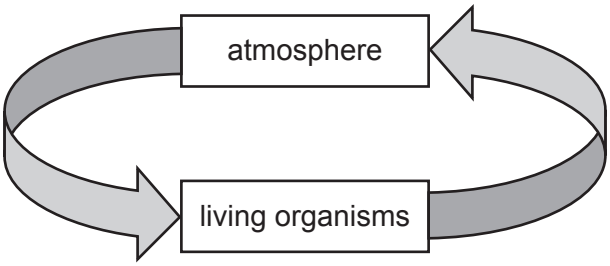

Fig. 7.1

(a) Describe how carbon is cycled between living organisms and the atmosphere.

.....

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..... [5]

(b) Woodland ecosystems are often managed by humans.
If trees in a woodland are chopped down, they can then be:

1. burned
2. removed and made into objects
3. left in the ecosystem.

Compare the effects of these three different forms of management on the woodland ecosystem itself and more widely on the planet.

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..... [5]

[Total:10]

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