Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

3537537102

BIOLOGY **5090/22**

Paper 2 Theory **May/June 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 **20** pages. Any blank pages are indicated.

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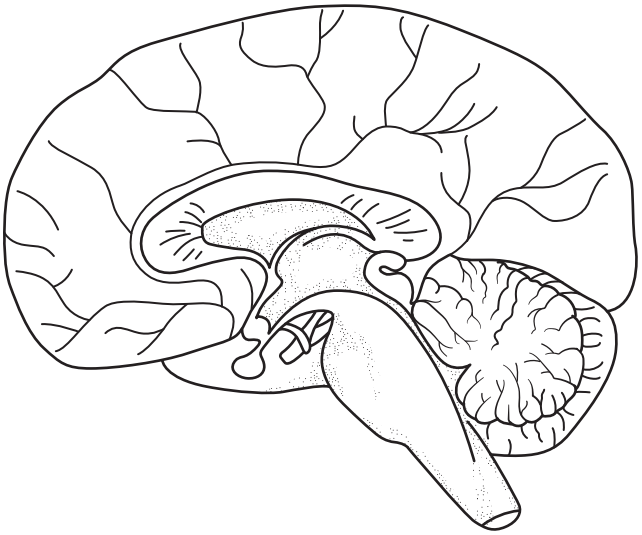
Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 The diagram shows the human brain and the table lists the functions of some parts of the human brain.



part of brain	function
A	memory storage and control of conscious behaviour
B	control of body temperature
C	control of balance and coordination
D	control of unconscious activities such as breathing

(a) Label on the diagram the parts of the brain identified in the table, using label lines and the letters **A** to **D only**. [4]

(b) **(i)** Name **one** structure in the skin that receives impulses from part **B** of the brain to control body temperature.

..... [1]

(ii) Outline how the action of this structure results in the control of body temperature.

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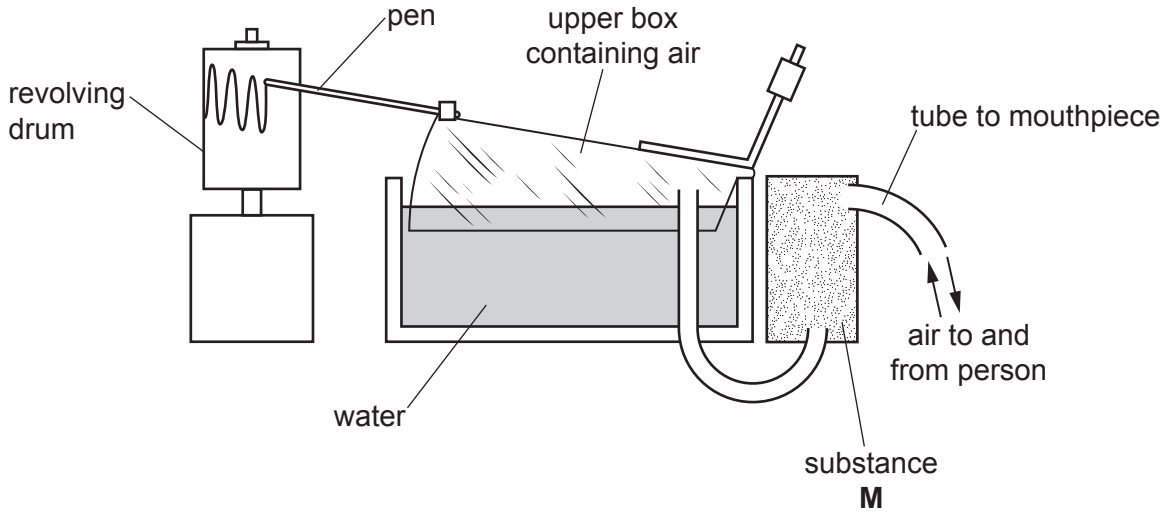
..... [3]

[Total: 8]

2 The diagram shows apparatus used to study breathing.



(a) **(i)** Describe what will happen to the upper box containing air as a person takes **one** breath **in** from the apparatus.

..... [1]

(ii) State the percentage of oxygen in atmospheric air.

..... %

Explain how the percentage of **oxygen** in the air in the upper box will change as a person breathes in **and** out through the apparatus several times.

.....

.....

.....

.....
[3]

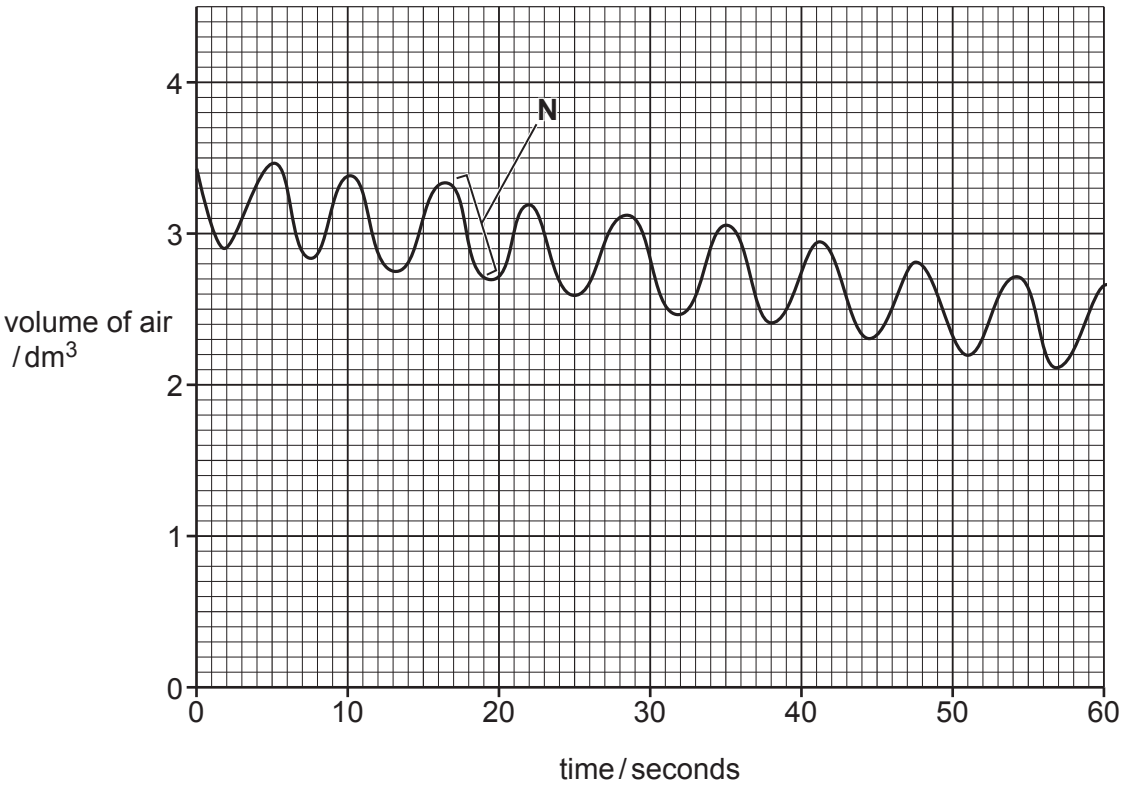
(iii) Substance **M** is present in the apparatus to absorb an excretory product from expired air.

Name this excretory product.

..... [1]

(b) The diagram shows a chart recorded by the pen on the revolving drum.

This chart was recorded for a period of one minute by a person at rest.



(i) Explain how the action of one **named** muscle caused the part of the chart labelled **N**.

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..... [3]

(ii) A second chart was recorded for a period of one minute by the same person after vigorous exercise.

State how an increased **rate** of breathing after exercise would be shown on this second chart.

.....

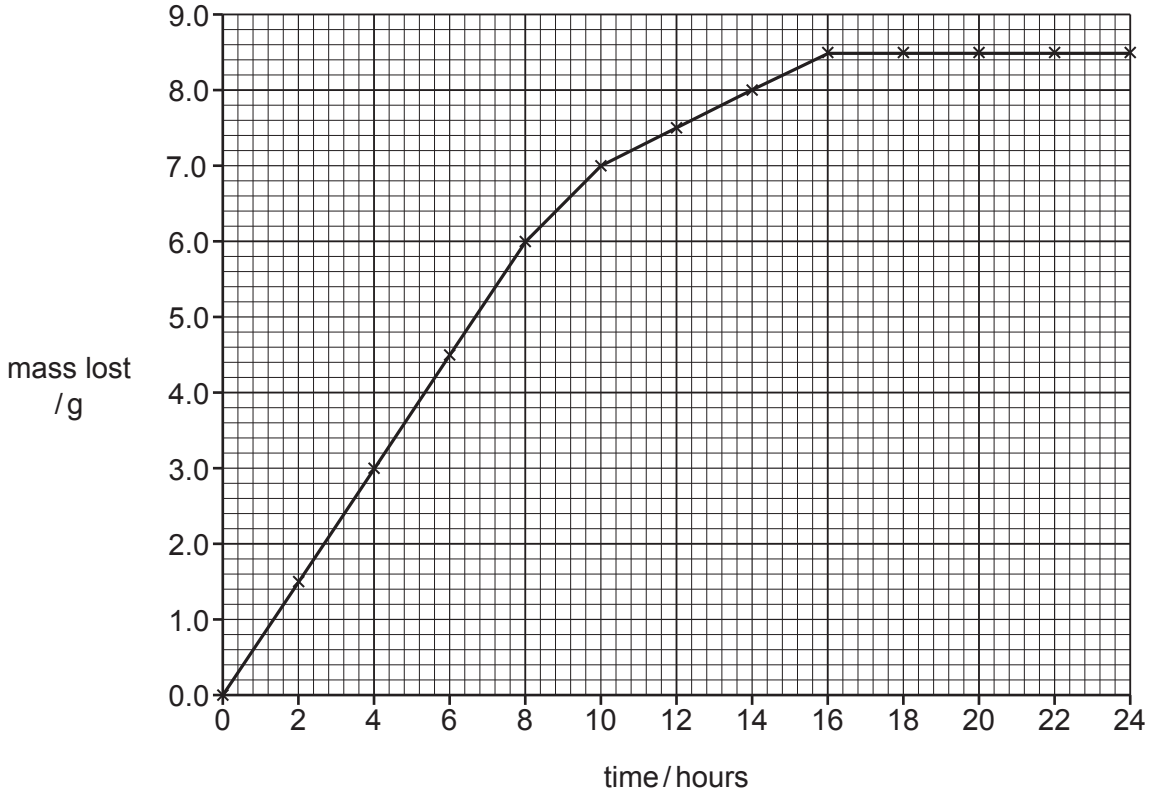
..... [1]

[Total: 9]

3 A student carried out two investigations into the action of yeast.

(a) In the first investigation, the student dissolved 20.0 g of glucose in 100 cm^3 of water in a beaker. The student then added 3.5 g of yeast and used a balance to measure the loss in mass from the beaker over the next 24 hours.

The results of this investigation are shown in the graph.



(i) Calculate the rate at which mass was lost during the first 6 hours.

Space for working.

..... g per hour [2]

(ii) Explain why mass was lost during the investigation.

.....

.....

.....

.....

..... [3]

(iii) The student then repeated this first investigation changing **only** the mass of yeast.

Draw a line on the graph on page 6 to show the pattern of results you would expect the student to obtain when using 7.0 g of yeast. [2]

(b) In a second investigation, the student prepared three samples of bread dough.

Each sample of dough had a volume of 50 cm^3 and contained:

- 1 g of yeast
- 25 cm^3 of water
- 40 g of flour.

(i) Starch molecules in the flour are used to provide the yeast with a source of glucose.

Describe how the action of a **named** chemical, produced by yeast cells, makes glucose available from starch.

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.....

.....

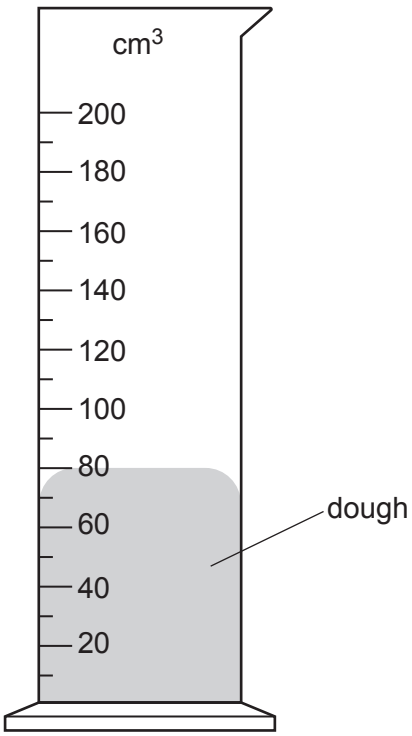
..... [2]

Each sample of dough was placed at the bottom of a 200 cm^3 measuring cylinder.

The three measuring cylinders were then placed in water-baths at different temperatures for 60 minutes. The temperatures chosen were 20 °C, 40 °C and 80 °C.

After this time, the student measured the volume of dough in each measuring cylinder.

The diagram shows the volume of dough in the measuring cylinder from the water-bath at a temperature of 20 °C at the end of the investigation.



(ii) Estimate the volumes of the dough at the end of the investigation in the other two measuring cylinders, from water-baths at temperatures of:

40 °C ..... cm^3

80 °C ..... cm^3

[2]

(iii) Explain the results of this investigation.

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.....

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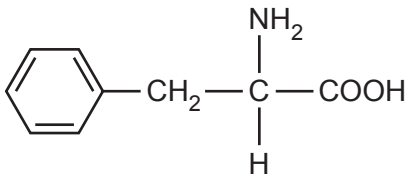
..... [3]

[Total: 14]

4 There are many different types of amino acid.

One of these is phenylalanine.

The diagram shows the structure of a molecule of phenylalanine.



(a) Phenylalanine is metabolised by an enzyme with the name PAH.

(i) Name the human organ that metabolises amino acids such as phenylalanine.

..... [1]

(ii) Explain how the shape of a PAH enzyme molecule is important to enable phenylalanine to be metabolised.

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..... [3]

(b) A rare gene mutation reduces the activity of the PAH enzyme. The mutation results in an increased concentration of phenylalanine in the blood. This condition can cause damage to the brain.

(i) Describe what is meant by the term *gene mutation*.

.....

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..... [2]

(ii) Explain how a person with the condition should change their diet to reduce the risk of damage to the brain.

.....

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..... [3]

(iii) The gene mutation produces a recessive allele, **h**. A person with a heterozygous genotype is described as a carrier. A carrier will **not** show symptoms of the condition.

Complete the genetic diagram to show the probability of two carriers reproducing to have offspring with the condition.

gametes	.....	.....
.....	.....	.....
.....	.....	.....

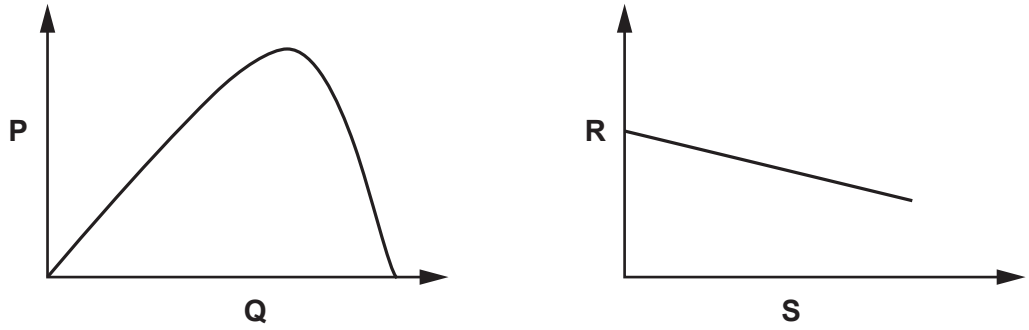
probability of offspring with the condition .....
[3]

[Total: 12]

5 **(a)** Biological processes in plants are affected by environmental factors.

The graphs each show the effect of changing one environmental factor on a biological process.

The labels on the axes for each graph have been replaced with the letters **P**, **Q**, **R** and **S**.



Identify the correct axis label for each of **P**, **Q**, **R** and **S**.

Select from the following possible labels.

temperature **carbon dioxide concentration** **rate of transpiration**

light intensity **rate of photosynthesis** **air humidity**

P .....

Q .....

R .....

S .....

[4]

(b) Describe the process of transpiration in the leaf of a plant.

.....

.....

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..... [3]

[Total: 7]

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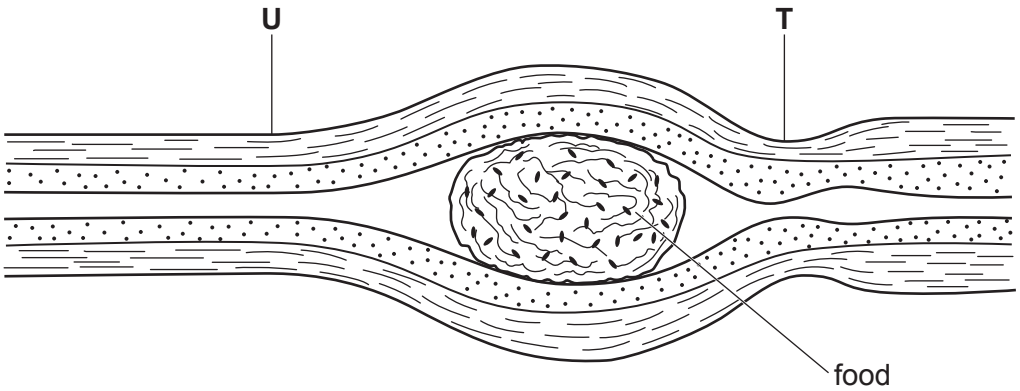
Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 The diagram shows food inside part of the small intestine.



(a) Describe and explain how food is moved between the two points, **T** and **U**, labelled on the diagram.

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..... [7]

(b) State, for a normal healthy movement of food through the small intestine,

one necessary component of a balanced diet

.....

one food that is a good source of this component

.....

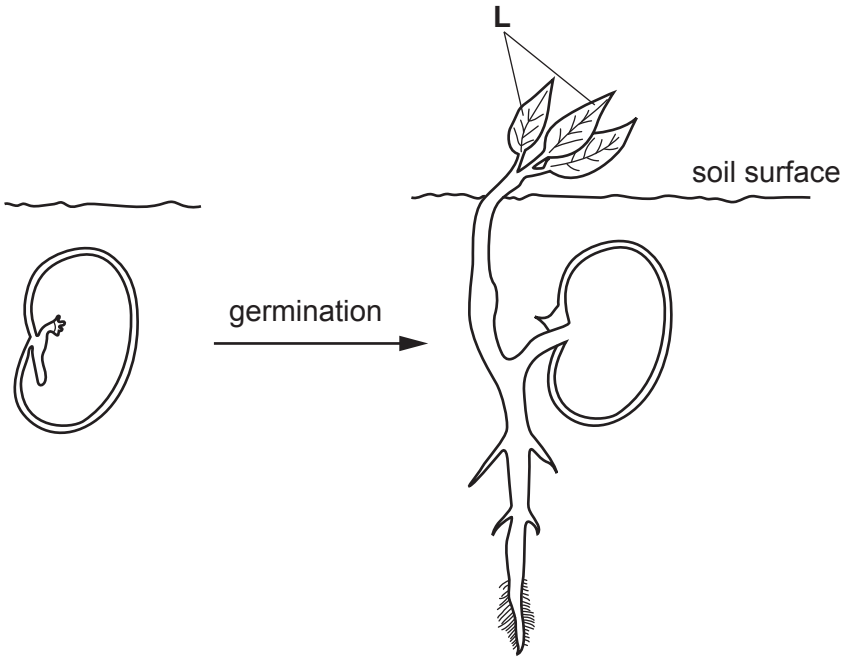
one effect of malnutrition resulting from a lack of this component.

.....

[3]

[Total: 10]

7 The diagram shows a cross-section through a seed before germination and the same seed after it has become a seedling.



(a) Outline the importance of the following in seed germination:

enzymes .....

.....

.....

.....

.....

.....

cell division .....

.....

.....

.....

.....

.....

[7]

(b) Explain why it is important that the structures labelled **L** in the seedling are above the soil surface.

.....

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..... [3]

[Total: 10]

Section C

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

Write your answers in the spaces provided.

8 **(a)** Compare the pulmonary artery and the vena cava in terms of their structure and function.

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..... [6]

(b) Explain the role of platelets and the importance of this role.

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..... [4]

[Total: 10]

9 **(a)** Compare the ureter and the urethra in terms of their functions in adult humans.

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..... [4]

(b) Explain how the process of dialysis maintains the correct chemical composition of the blood for a person with kidney disease.

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..... [6]

[Total: 10]

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