



CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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5090/22

May/June 2022

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

- 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.

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

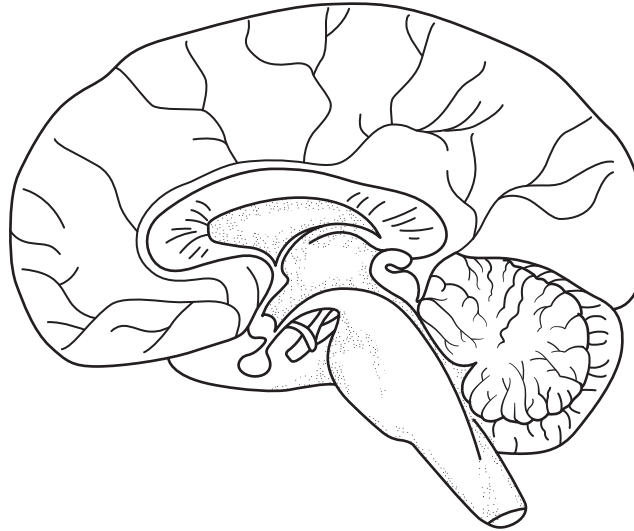
This document has **20** pages. Any blank pages are indicated.

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.

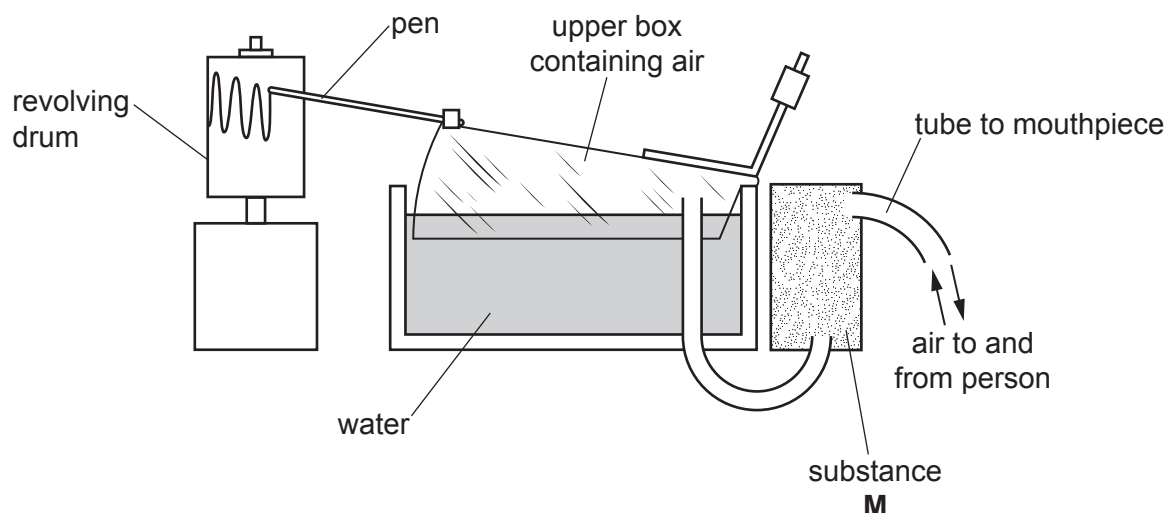
..... [1]

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

.....

 [3]

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]

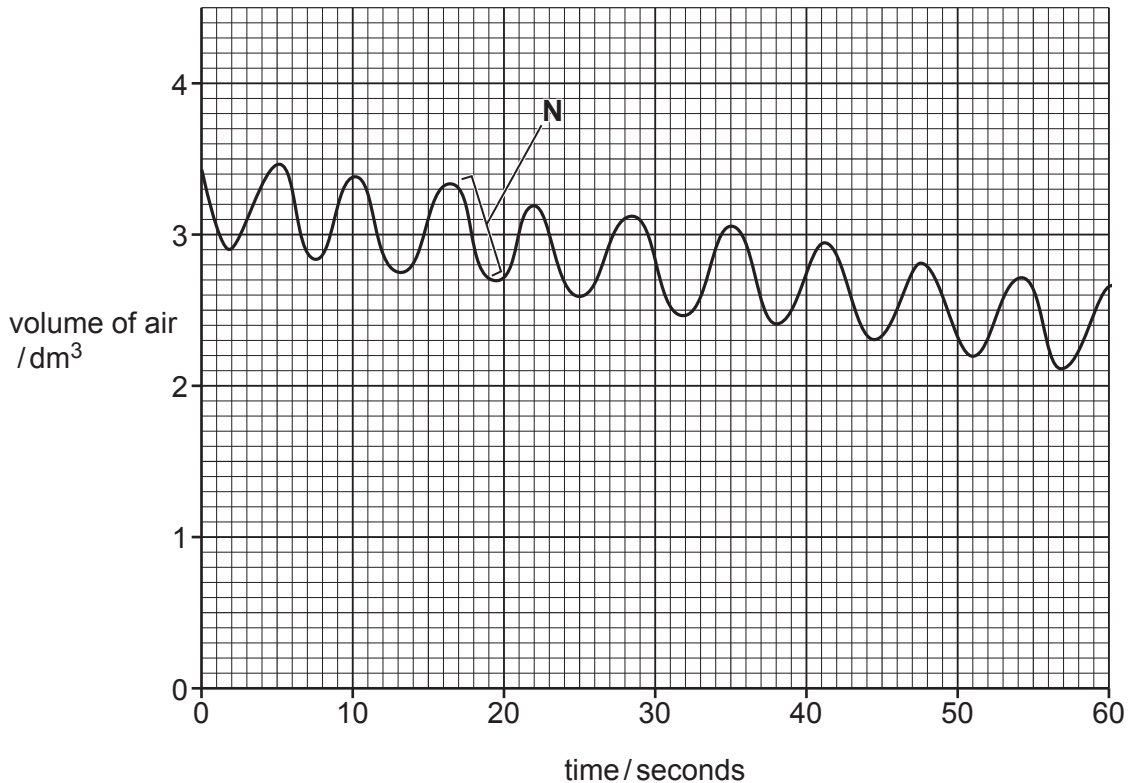
- (iii) Substance **M** is present in the apparatus to absorb an excretory product from expired air.

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.

.....

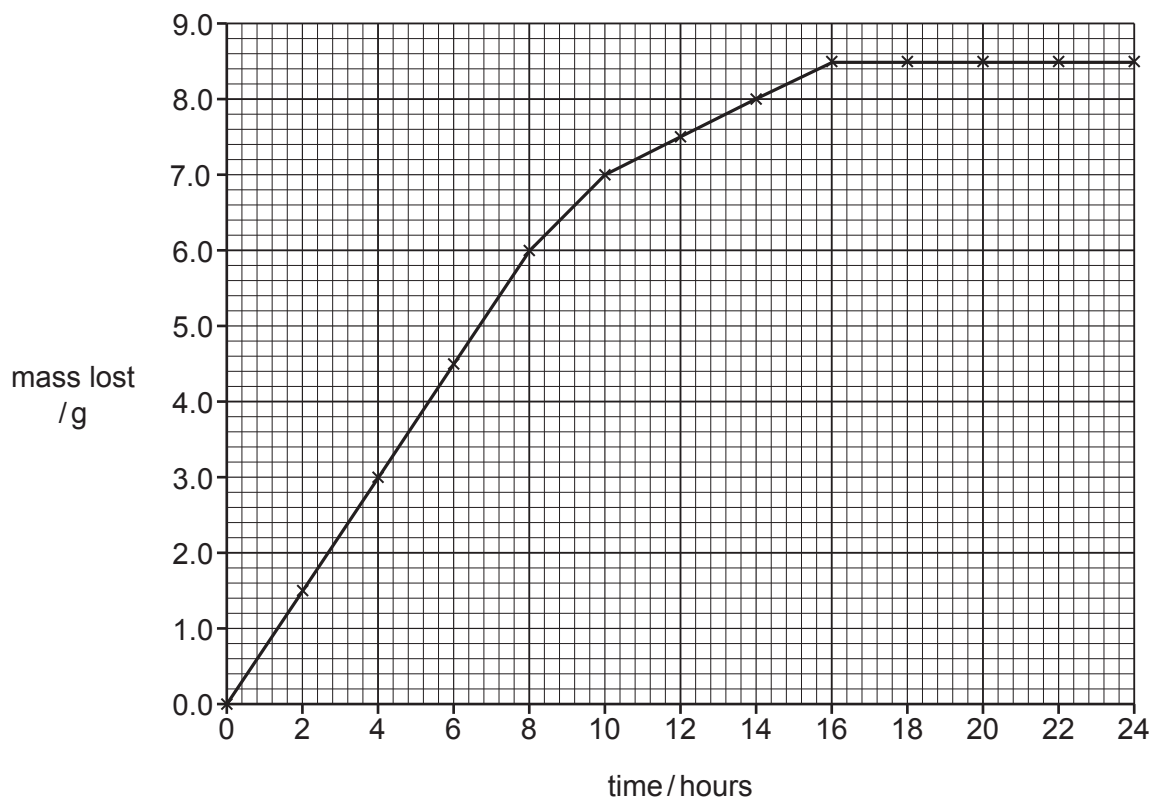
..... [1]

[Total: 9]

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

- (a) In the first investigation, the student dissolved 20.0g of glucose in 100cm³ of water in a beaker. The student then added 3.5g 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.

.....

.....

.....

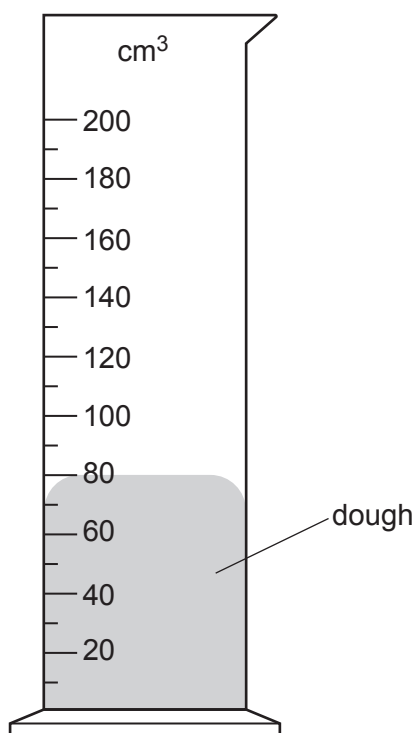
..... [2]

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 cm³

80 °C cm³

[2]

- (iii) Explain the results of this investigation.

.....

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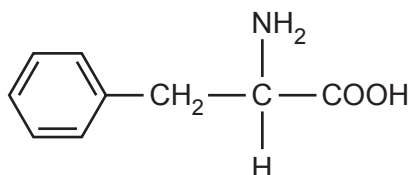
..... [3]

[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.

.....

 [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*.

.....

 [2]

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

.....

.....

.....

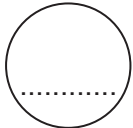
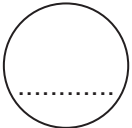
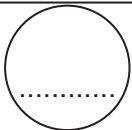
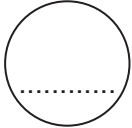
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.....

..... [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		
		
		

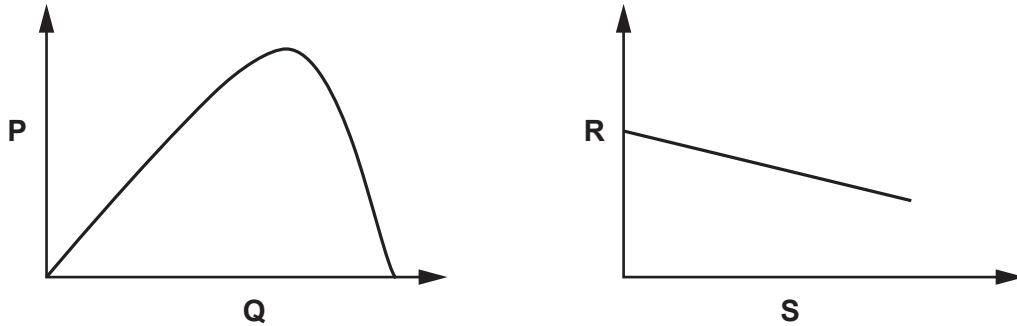
probability of offspring with the condition [3]

[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.

.....

.....

.....

..... [3]

[Total: 7]

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(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

.....

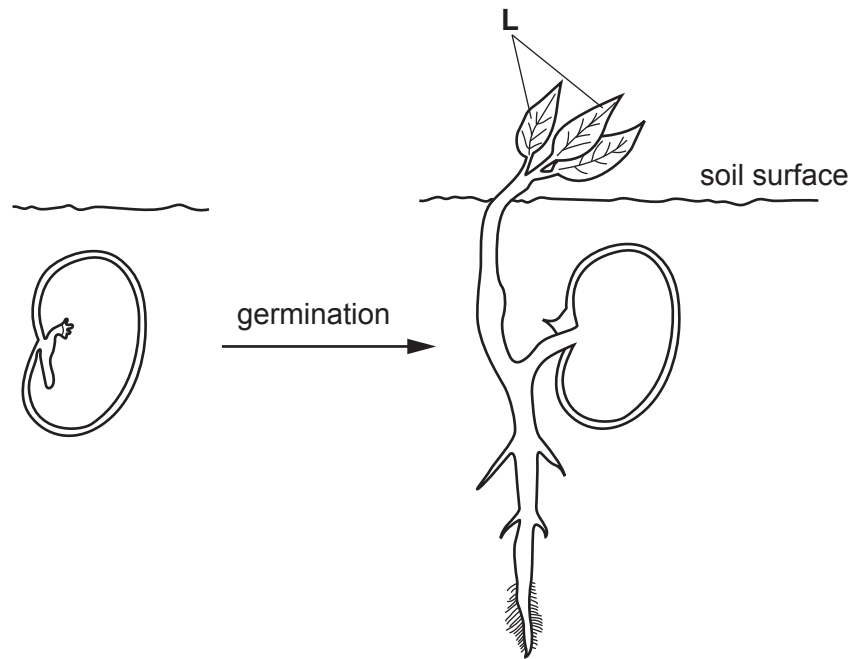
one effect of malnutrition resulting from a lack of this component.

.....

[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.

.....

.....

.....

..... [3]

[Total: 10]

Write your answers in the spaces provided.

[6]

[4]

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

[4]

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

[6]

[Total: 10]

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