Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0909528984

BIOLOGY **5090/21**

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 **16** pages. Any blank pages are indicated.

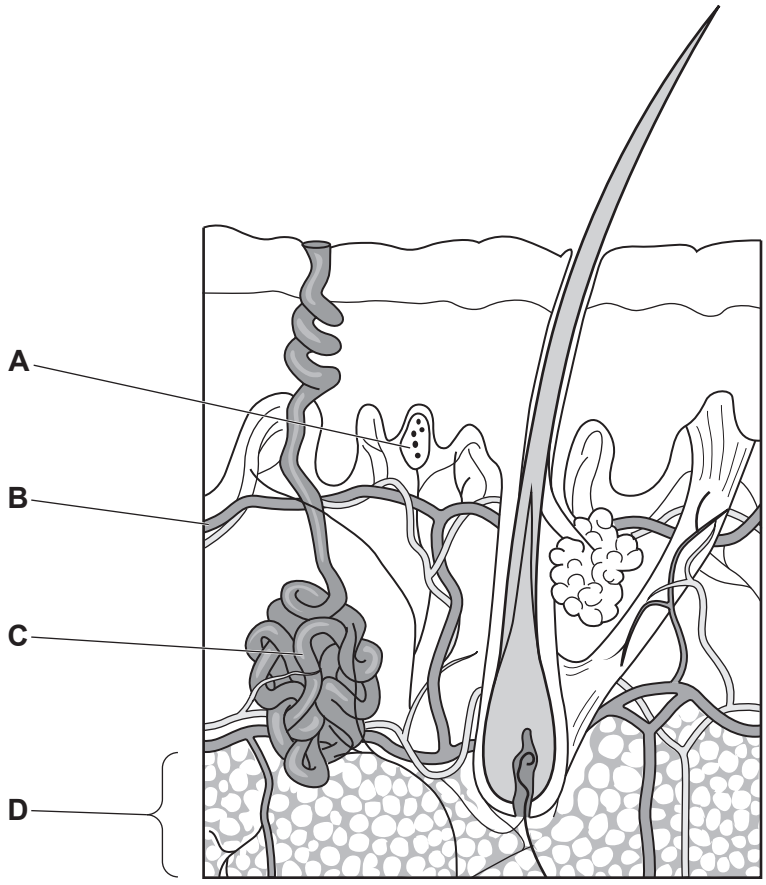
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Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 The diagram shows human skin.



(a) (i) Identify the parts labelled **B** and **C**.

B .....

C .....

[2]

(ii) Describe how part **B** is involved in maintaining a constant body temperature when the external temperature drops.

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..... [3]

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(b) Part **A** is unevenly distributed in human skin.

Name part **A** and suggest reasons for this uneven distribution.

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..... [3]

(c) The thickness of layer **D** can change over several months.

Suggest and explain **one** reason for a **decrease** in the thickness.

.....

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..... [2]

[Total: 10]

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2 A man decides to do some fitness training to improve his ability to provide oxygen to his muscles.

(a) (i) Describe the route an oxygen molecule takes from the atmosphere to reach the muscles.

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..... [4]

(ii) The fitness training is designed to result in changes to the man's body.

Suggest **two** body changes that would improve his ability to provide oxygen to his muscles.

1 .....

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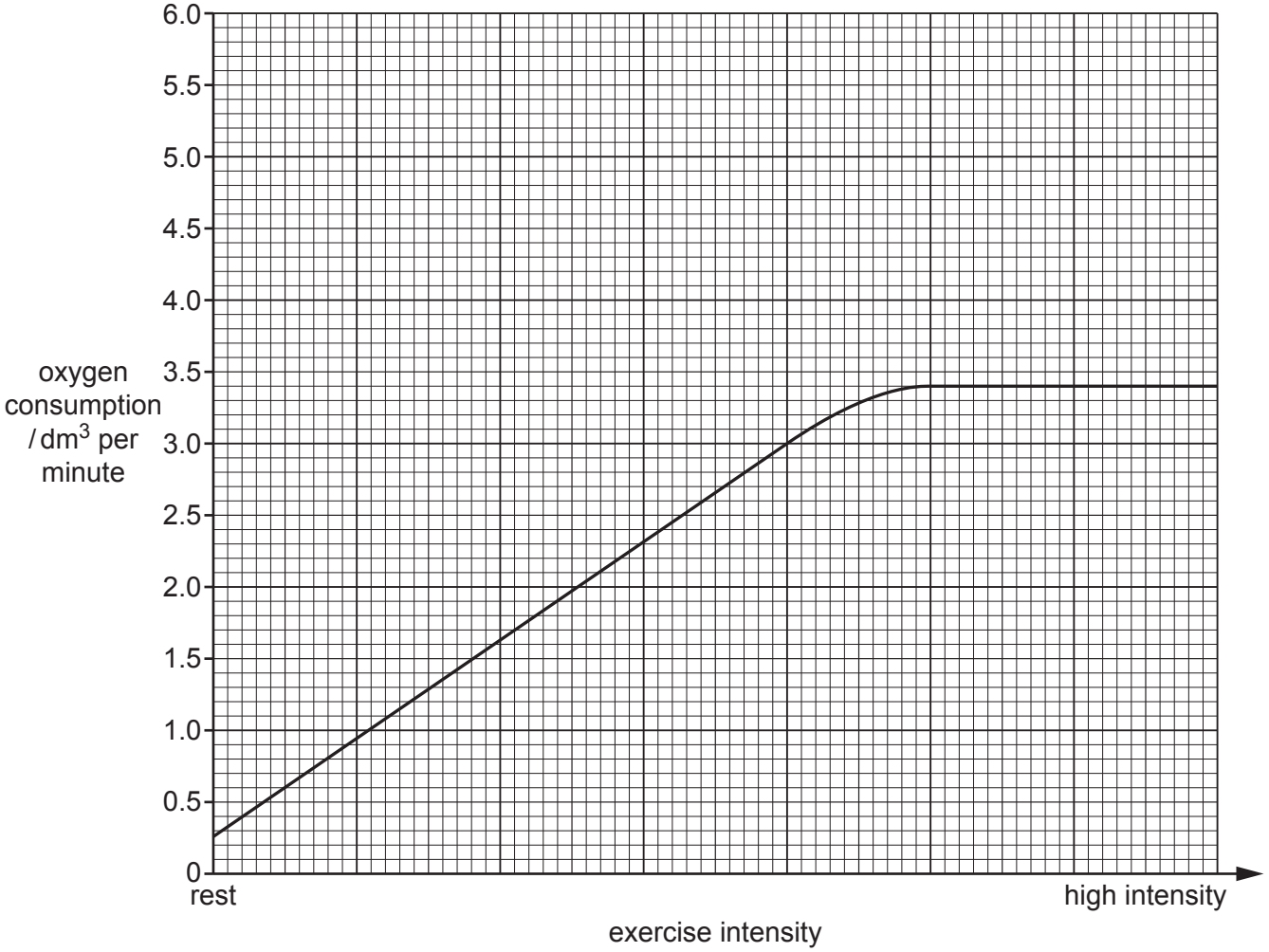
2 .....

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[2]

(b) The man measures how much oxygen his body uses (his oxygen consumption) at different intensities of exercise, from rest to high intensity.

His results are shown in the graph.



(i) State the name of the chemical process that uses oxygen to release energy in the muscles.

..... [2]

(ii) Use the graph to determine the maximum volume of oxygen the man consumes in one minute.

..... [1]

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(iii) The graph shows that it is possible for the man to increase the intensity of his exercise beyond the point at which he has reached his maximum oxygen consumption.
He can only do this for a short period of time.

Explain why.

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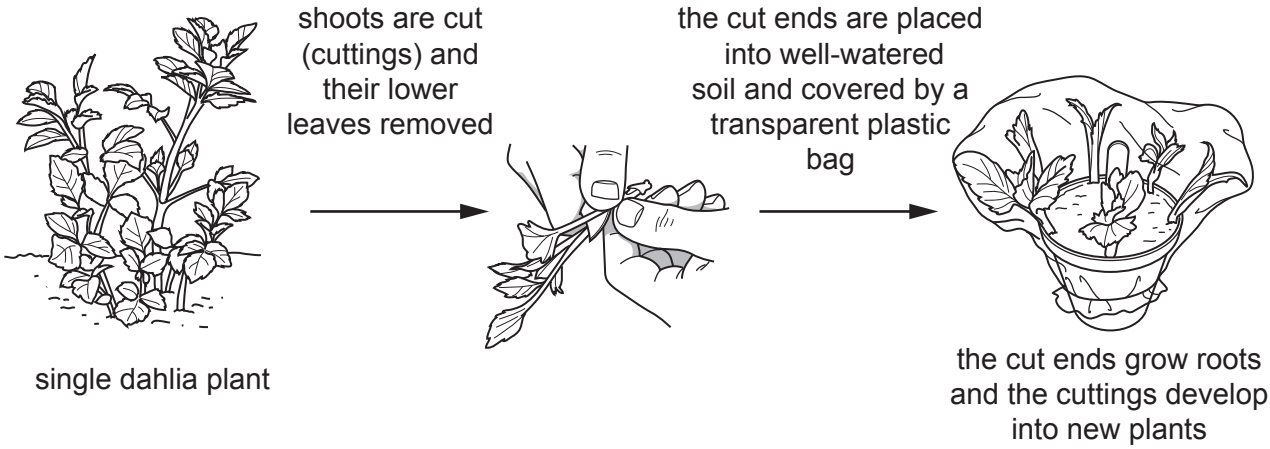
..... [3]

(iv) After four weeks of fitness training the man measures his oxygen consumption again.

On the graph, sketch a line to show the expected results of successful fitness training. [2]

[Total: 14]

3 A gardener grows a species of dahlia, a flowering plant.
Each year the gardener chooses his best plants and takes cuttings to make new plants.



(a) (i) Removing the lower leaves and placing the cuttings in a transparent bag helps prevent them wilting until the roots develop.

Suggest and explain how these two steps help to prevent wilting.

removal of lower leaves .....

.....

.....

covering with transparent bag .....

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.....

[3]

(ii) Taking cuttings is a commercial application of asexual reproduction.

Define asexual reproduction.

.....

..... [2]

(b) The stems of the dahlia cuttings contain xylem vessels.

Describe **two** functions of xylem vessels in young stems of dahlias.
For each function explain **one** way in which xylem structure is adapted for this function.

function 1 .....

.....

adaptation .....

.....

function 2 .....

.....

adaptation .....

..... [4]

(c) The gardener's dahlia cuttings grow into full-sized plants with flowers.

The gardener decides that he would like to produce a plant that combines the disease-resistant characteristics of one of these plants with the red petal colour of another.

With reference to named parts of the flowers, describe how he could achieve this.

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..... [5]

[Total: 14]

4 The human liver contains a high concentration of enzymes called transaminases.
These enzymes are important in the metabolism of amino acids.
Amino acids are absorbed from the alimentary canal and carried to the liver by a blood vessel.

(a) Name the part of the alimentary canal where absorption occurs and the blood vessel that carries the amino acids to the liver.

part of alimentary canal .....

blood vessel .....
[2]

(b) There are different types of transaminase.
Each type has a specific active site.

Explain why this means that each type catalyses a specific reaction.

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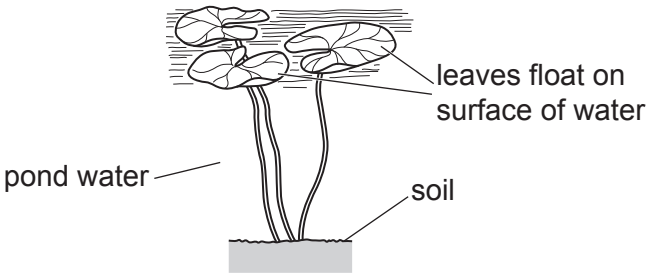
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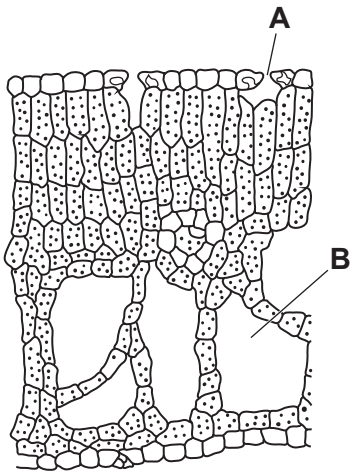
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5 A plant species lives in ponds.
The diagrams show the whole plant and a section through one of its leaves.

plant



section through leaf



(a) The leaves are adapted to float on the surface of the water.

(i) Suggest **one** advantage to the plant of the leaves floating on the surface of water.

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..... [1]

(ii) Name the parts of the leaf labelled **A** and **B**.

A .....

B .....

[2]

(iii) With reference to parts **A** and **B**, describe and explain how the structure of the leaf is adapted to a pond environment.

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..... [3]

(b) The plant is part of a food web in a pond.

State its trophic level.

..... [1]

[Total: 7]

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 There are many different types of virus that can infect animal cells.

(a) Compare the **structure** of a typical virus with a typical animal cell.

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..... [4]

(b) (i) Human immunodeficiency virus (HIV) is one type of virus.

Describe how HIV is transmitted.

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..... [3]

The table shows the numbers of people infected with HIV globally and the numbers receiving treatment in different years.

year	millions of people infected with HIV	millions of people receiving treatment for HIV
2000	24.9	0.77
2010	31.7	7.7
2015	35.6	17.0
2018	37.9	23.3

(ii) Use the information in the table to describe changes in the numbers of people infected and treated between the years 2000 and 2018.

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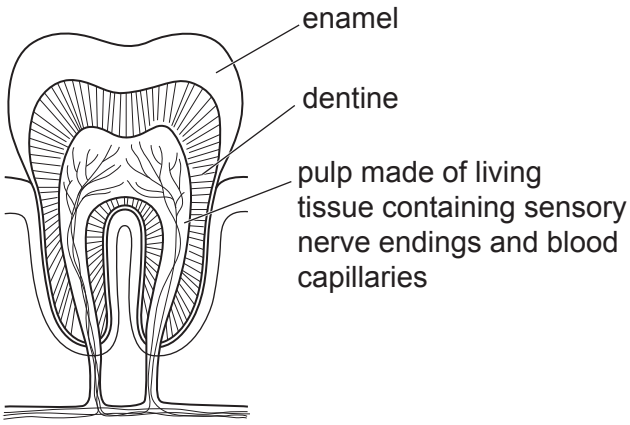
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..... [3]

[Total: 10]

7 The diagram shows a section through a molar tooth of a human.



(a) (i) State the function of a molar tooth.

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..... [1]

(ii) The pulp is a living tissue.

Describe the movement of molecules in the pulp between the blood capillaries and the cytoplasm of the surrounding cells.

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..... [4]

(b) Toothache is caused by inflammation of the pulp tissue and is often a sign of dental decay.

Describe the cause of dental decay and how it can be prevented.

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..... [5]

[Total: 10]

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Section C

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

Write your answers in the spaces provided.

8 The functions of the body are coordinated by nerve impulses and hormones.

(a) Compare these two types of coordination.

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..... [4]

(b) A girl sees a vehicle travelling towards her at speed as she crosses a road. This triggers nerve impulses and the release of adrenaline in her body.

Describe the role of the nerve impulses and adrenaline in helping her to react to this situation.

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..... [6]

[Total: 10]

9 The world produces over 100 million tonnes of nitrogen-containing fertiliser annually. Farmers spread this artificial fertiliser over their soil.

(a) Describe how nitrogen from the fertiliser can pass from the soil to eventually become part of the food which humans eat.

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(b) Discuss the advantages and disadvantages of the use of artificial nitrogen-containing fertilisers.

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..... [5]

[Total: 10]

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