Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

0412623629

BIOLOGY **5090/21**

Paper 2 Theory **October/November 2021**

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 **12** pages.

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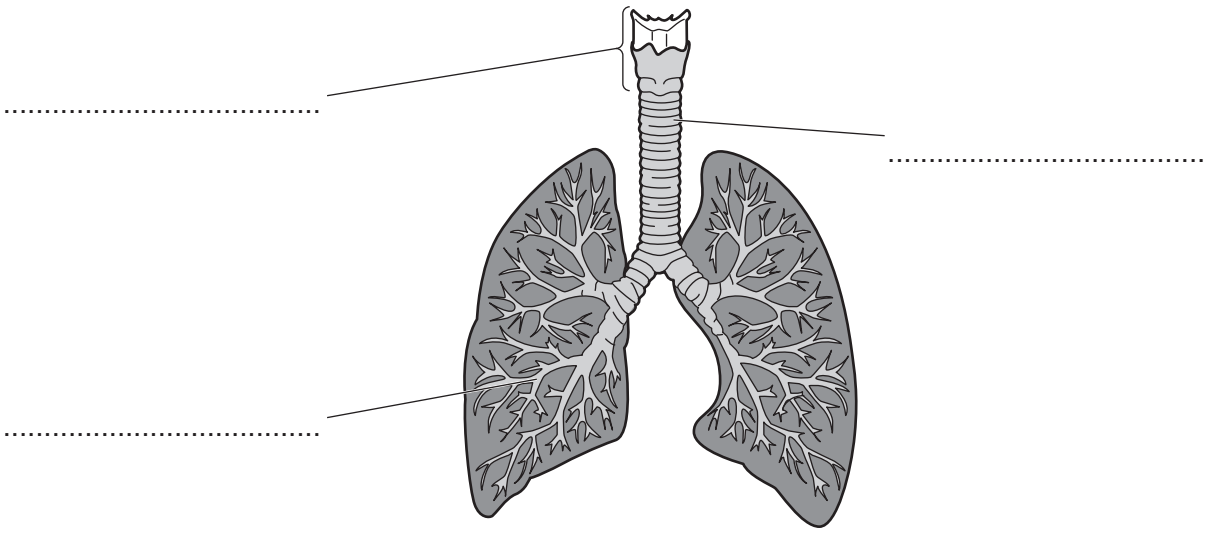
Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 The diagram shows the human lungs and associated structures.



(a) Complete the diagram by naming the labelled parts. [3]

(b) Explain why a human needs lungs.

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..... [3]

[Total: 6]

2 A farmer is growing a crop of tomato plants.

(a) The tomato plants carry out photosynthesis.

Describe the process of photosynthesis.

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..... [3]

(b) The farmer grows the tomato plants in a glasshouse instead of in an open field.

(i) Suggest reasons why this is an advantage to the farmer.

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..... [3]

(ii) Suggest **one** disadvantage, other than cost, of growing plants in this way.

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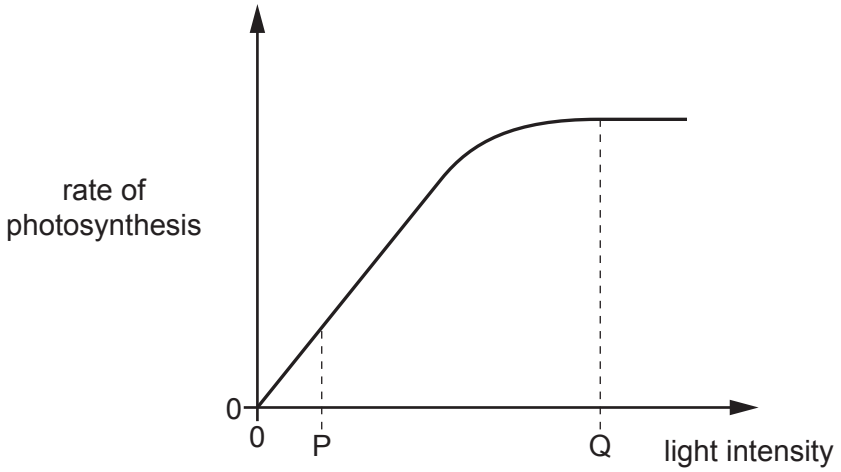
..... [1]

(c) The graph shows how the rate of photosynthesis can vary with light intensity when all other environmental conditions are kept the same.



(i) Explain how this graph shows that light intensity is the limiting factor for photosynthesis at light intensity P but not at light intensity Q.

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..... [2]

(ii) Name **one** environmental condition that could be limiting photosynthesis at light intensity Q.

..... [1]

[Total: 10]

3 A man is cooking in a hot kitchen and sweat is being released by sweat glands in his skin.

(a) **(i)** Explain the term homeostasis with reference to sweating.

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..... [2]

(ii) Explain how receptors and blood vessels in the man's skin are also involved in homeostasis when he is in the hot kitchen.

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..... [4]

(b) Sweat contains very small quantities of the waste product urea.

State the name of the organ where most urea is made in the body.

..... [1]

(c) The table shows the concentrations of some chemicals found in the sweat, urine and blood plasma of a healthy human.

chemical	**concentration of chemical / mmol per dm^3**		
	sweat	urine	blood plasma
urea	22	393	6
sodium	66	110	141
chloride	59	103	99

(i) Use the data in the table to compare the chemical composition of urine and blood plasma.

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..... [4]

(ii) A patient has kidney disease and is about to start dialysis treatment.

Suggest and explain the concentration of urea in the sweat of the patient compared to that of a person who does not have kidney disease.

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..... [3]

[Total: 14]

4 The kapok tree is a flowering plant that grows rapidly to become one of the tallest trees in a tropical rainforest ecosystem. Climbing plants wind up its stem and the tree provides a habitat for insect-eating birds and frogs. Bats feed on the nectar from its flowers and pollinate them so they can produce small, light seeds. Insects feed on its leaves and when the leaves fall to the ground they will come into contact with soil bacteria and fungi.

(a) **(i)** Use the information provided to draw a food chain for this tropical rainforest in the space provided.
The chain should contain **three** organisms.

[2]

(ii) Suggest and explain ways in which being tall may be helpful for the survival of this tree species.

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..... [3]

(iii) Explain why the bacteria and fungi found in the rainforest soil are important in this ecosystem.

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..... [3]

(b) Every year large areas of tropical rainforest are destroyed by burning.
A large percentage of the mass of a kapok tree is made of the element carbon.

(i) Name **one** substance, found in plants but not in animals, that contains carbon.

..... [1]

(ii) Explain how burning trees contributes to global warming.

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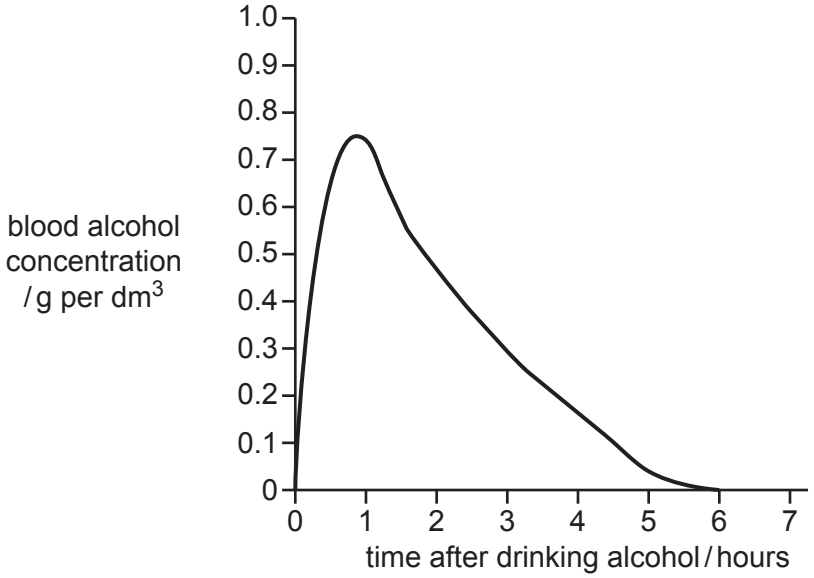
..... [2]

[Total: 11]

5 The graph shows how blood alcohol concentration changes after a person drinks alcohol.



(a) Suggest how the shape of the graph can be explained by what happens in parts of the body after drinking alcohol.

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..... [4]

(b) The graph shows that the highest blood alcohol concentration for this person after drinking alcohol is 0.75 g per dm^3.

Suggest **two** reasons why the highest blood alcohol concentration may be different for two people after drinking the same volume of alcohol.

1 .....

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2 .....

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[2]

(c) Describe the short-term effects of a high blood alcohol concentration.

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..... [3]

[Total: 9]

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 **(a)** Explain the 'lock and key' hypothesis of enzyme action using a **named** example.

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..... [5]

(b) Explain, using examples, why proteins are essential for all living organisms.

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..... [5]

[Total: 10]

7 **(a)** Explain the role of the nucleus and cell division in the inheritance of characteristics from parents to offspring.

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..... [6]

(b) If people are exposed to ionising radiation, this may affect the inheritance of characteristics by their children.

Suggest how this exposure to radiation may affect inheritance of characteristics.

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..... [4]

[Total: 10]

Section C

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

Write your answers in the spaces provided.

8 **(a)** Water enters living organisms and is transported to all their cells.

Compare the transport of water in a human and a flowering plant.

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(b) Water in humans and flowering plants contains dissolved mineral ions.

Suggest reasons why the mineral ion requirements of humans and plants are different.

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..... [4]

[Total: 10]

9 **(a)** Sperm cells and pollen grains are both involved in sexual reproduction.

Compare the functions of a sperm cell and a pollen grain and describe how the structure of each is related to its function.

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..... [6]

(b) Suggest reasons why sexual reproduction may be better for the survival of a species than asexual reproduction.

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..... [4]

[Total: 10]

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