Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

6647299318

BIOLOGY **5090/22**

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 **20** pages. Any blank pages are indicated.

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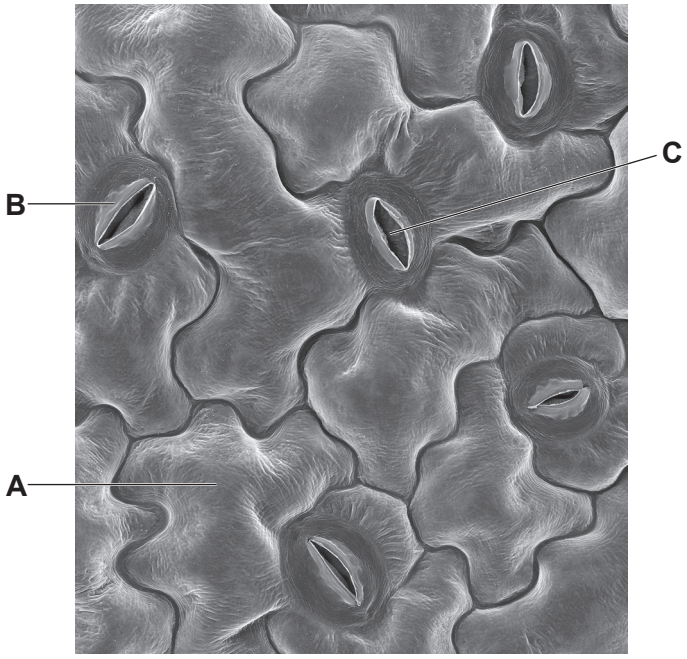
Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 The diagram shows a photomicrograph of the lower surface of a leaf.



(a) **(i)** Name each of the parts labelled **A** to **C**.

cell **A** .....

cell **B** .....

pore **C** .....

[3]

(ii) In an area affected by air pollution, the surface of the leaf becomes covered with particles.

These particles reduce the amount of light entering the leaf and may block all pores of the type labelled **C**.

Explain how this will affect the production of starch by the plant.

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..... [4]

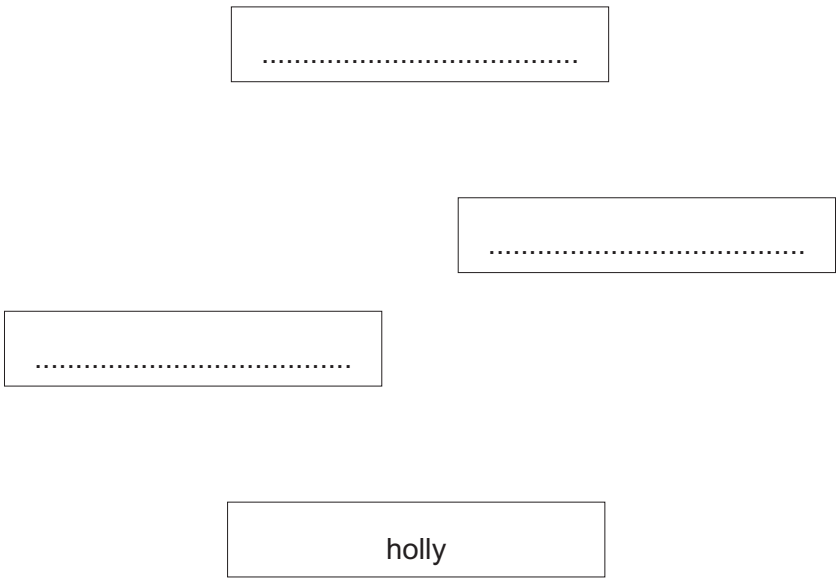
(b) A species of caterpillar, the holly looper, feeds on the leaves of the holly plant.

Holly plants produce red berries that are eaten by a species of bird, the song thrush.

Song thrushes also eat caterpillars and are eaten by hawks.

(i) Use the information above to:

- Complete the food web below by writing the name of **one species** in each box.
- Draw arrows between the boxes to show the direction of energy flow between organisms.



[2]

(ii) State, for the food web above, the number of:

species that are producers .....

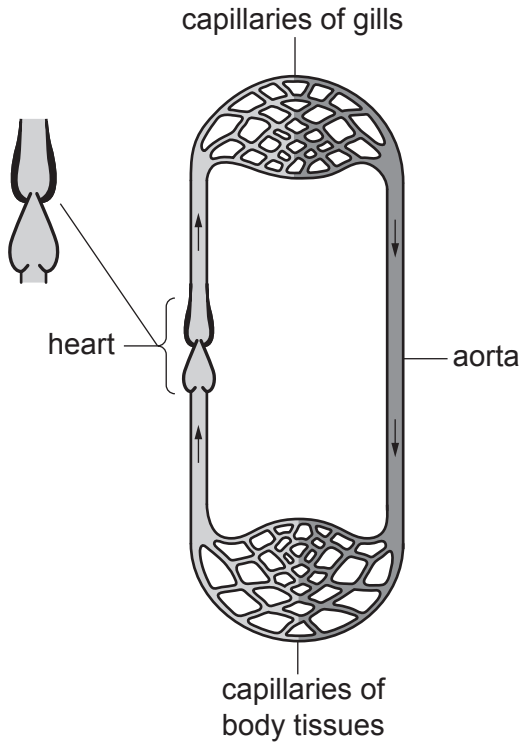
species that are consumers .....

trophic levels. ..... [3]

[Total: 12]

2 The diagram shows the circulatory system of a fish.

The lungs of a human and the gills of a fish both have a large surface area for gas exchange.



(a) **(i)** State **two** differences between the structure of the heart of a fish and the structure of the heart of a human.

1 .....

.....

2 .....

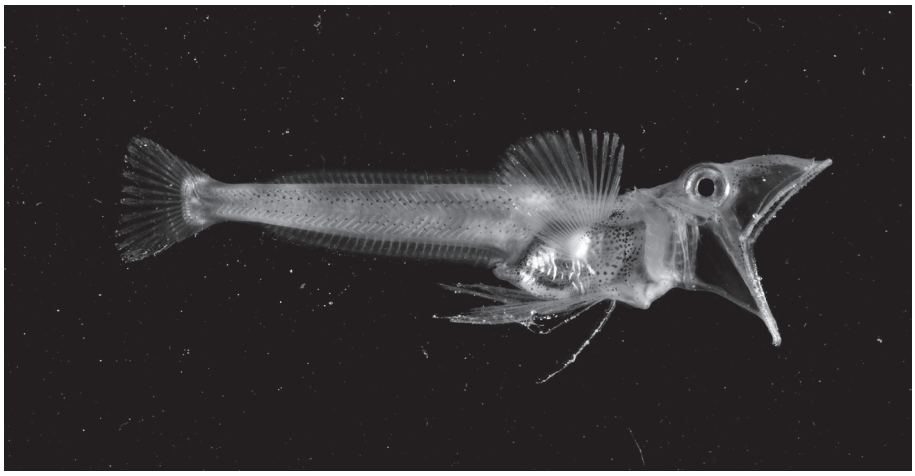
.....
[2]

(ii) Draw a ring around the correct words to complete the sentence below.

higher than **the same as** **lower than**

The pressure of blood in the aorta of a fish will be ..... the pressure of blood in the aorta of a human. [1]

(b) The photograph shows an Antarctic icefish.



The blood of Antarctic icefish is colourless.

(i) State which component of human blood is **not** present in the blood of an Antarctic icefish.

..... [1]

Antarctic icefish live in the Antarctic Ocean where the water temperature is very cold.

Aerobic respiration is an enzyme-controlled reaction.

More oxygen is able to dissolve in water at a lower temperature.

Antarctic icefish have a larger heart, wider blood vessels and a greater volume of blood than fish of the same size that live in warmer water.

(ii) Suggest how Antarctic icefish with colourless blood are able to survive in the low temperatures of the Antarctic Ocean.

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..... [5]

[Total: 9]

3 The table shows the mass of each component in 250 cm^3 of cow's milk.

component	mass / g
carbohydrate	11
fat	8
protein	8

(a) **(i)** A 250 cm^3 drink of cow's milk provides 14% of the total mass of protein required each day in the diet of an average adult human.

Calculate the total mass of protein required in the diet of an average adult human each day.

You **must** state your answer to one decimal place and include correct units.

..... [3]

(ii) State **two** important uses of protein in the diet.

1 .....

2 .....
[2]

(b) The table below lists four components of a balanced diet for an average adult human.

For each component listed, the percentage of the daily requirement provided by 250 cm^3 of milk is shown.

component	**percentage of daily requirement provided by 250 cm^3 of milk**
vitamin C	0
vitamin D	30
calcium	30
iron	0

Discuss how a 250 cm^3 drink of cow's milk contributes to the health of an adult human for each of the components listed in the table.

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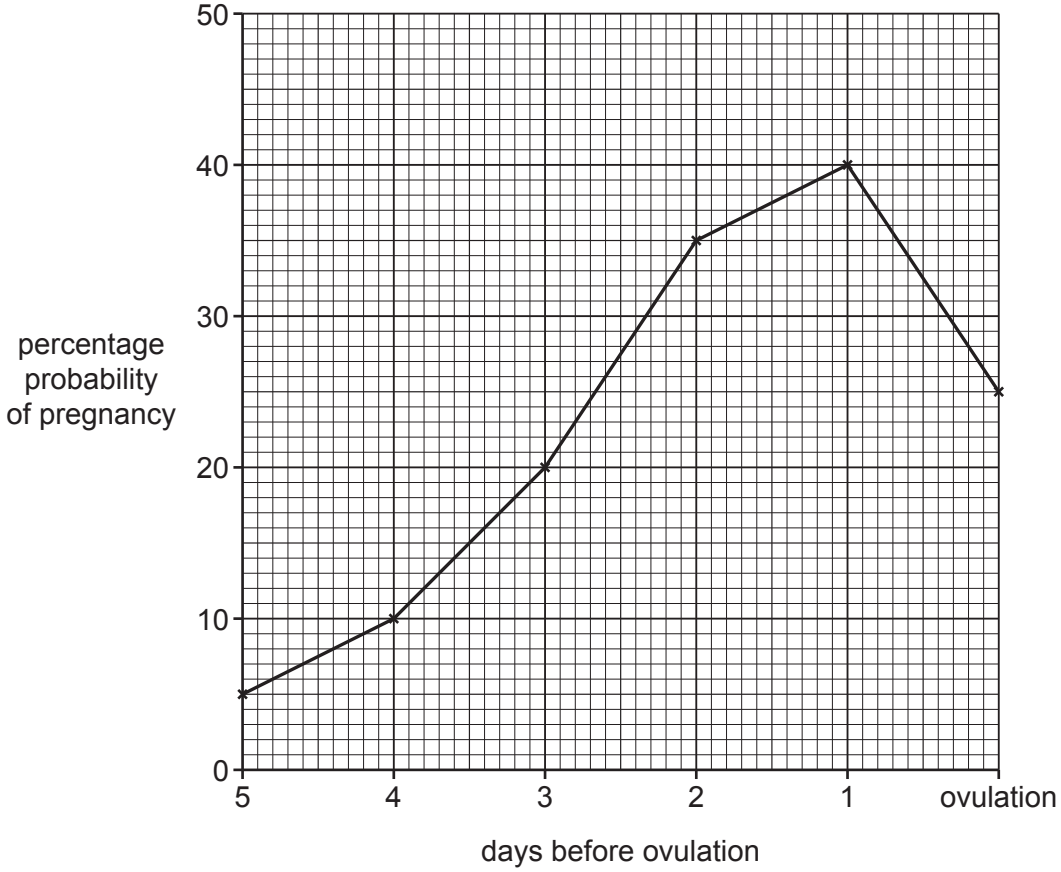
..... [4]

[Total: 9]

4 A study investigated the probability of pregnancy resulting from sexual intercourse on specific days of the menstrual cycle.

The graph shows the results of this study.



(a) **(i)** The study shows a probability of 20% that sexual intercourse three days before ovulation will result in pregnancy.

State how many times more likely pregnancy is if sexual intercourse takes place two days later.

..... [1]

(ii) Explain the role of **named** hormones in the menstrual cycle during the days investigated by this study.

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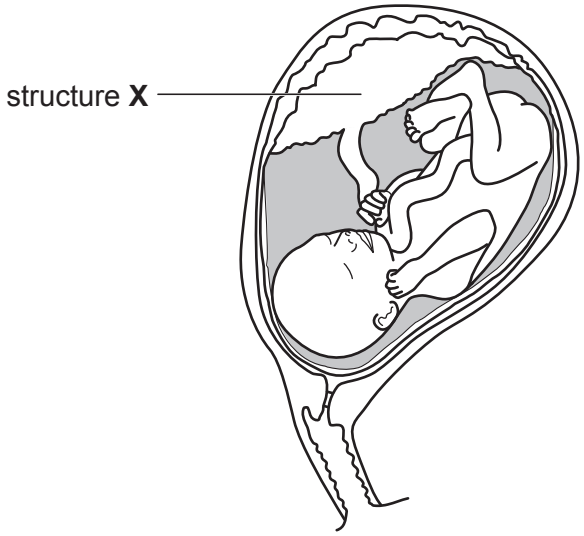
..... [5]

(b) The diagram shows a fetus developing in the uterus of a pregnant female human.



Name structure **X** and describe the functions of this structure.

name .....

functions .....

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[3]

[Total: 9]

5 Some laundry detergents used to wash clothes contain enzymes.

These enzymes break down the molecules that cause stains.

(a) Suggest enzymes that may be components of a laundry detergent that will break down stains made of:

starch .....

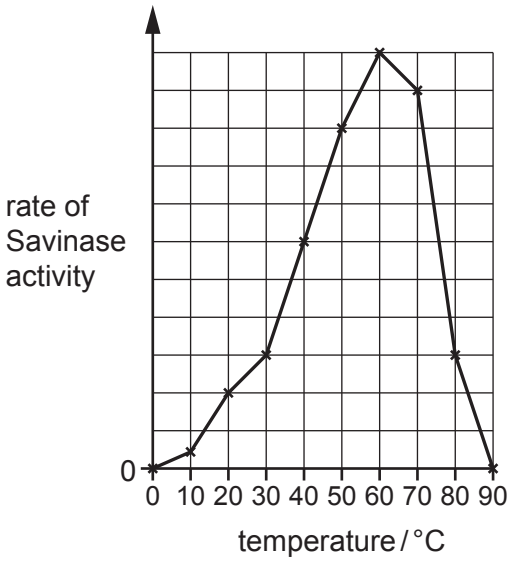
fat. .....

[2]

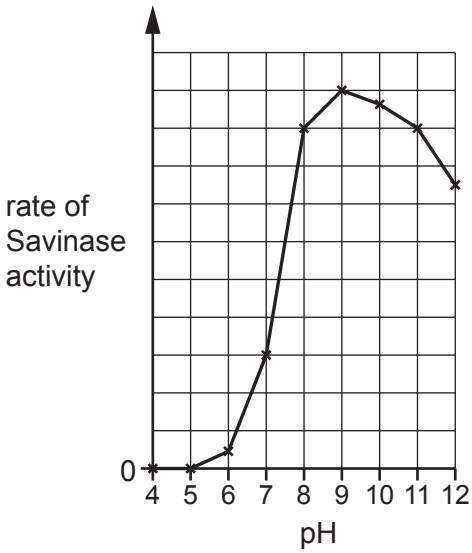
(b) Savinase is a protease enzyme produced by genetically engineered bacteria.

The enzyme is a component of laundry detergents.

The graphs show the results of an investigation into the effects of temperature and pH on the rate of Savinase activity.



effect of temperature



effect of pH

(i) Describe how the effect of temperature on Savinase activity differs from the effect of temperature on a protease that functions in the human stomach.

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..... [3]

(ii) Suggest why laundry detergents that contain Savinase also contain chemicals that dissolve to form an alkaline solution.

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..... [2]

(iii) After washing clothes using laundry detergents, the waste water is sometimes released into the environment.

This waste water contains inorganic phosphate ions that are also found in fertilisers.

Explain the harmful effect on aquatic life of releasing this waste water into the environment.

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..... [4]

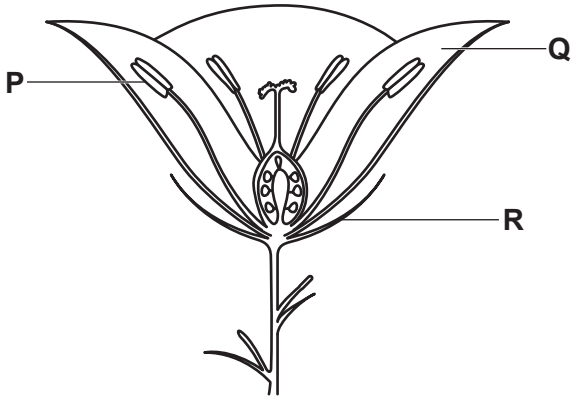
[Total: 11]

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 The diagram shows a cross-section of an insect-pollinated flower.



(a) Complete the table to show the name of structures **P**, **Q** and **R** and **one** function of each structure.

structure	name	function
P		
Q		
R		

[6]

(b) **(i)** Describe the surface of a pollen grain from an insect-pollinated flower.

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Explain how this feature is an advantage in insect-pollination.

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[2]

(ii) Explain how a pollen grain from a wind-pollinated flower is adapted for pollination.

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[2]

[Total: 10]

7 Costa Rica is a small country that covers approximately 0.03% of the Earth's surface.

Approximately 5% of the world's plant and animal species can be found in Costa Rica.

The table shows the percentage of Costa Rica's land surface covered in forest at different times between 1940 and 2010.

year	percentage forest cover
1940	75
1950	72
1961	53
1977	31
1983	26
1987	21
1997	42
2000	47
2005	51
2010	53

(a) Describe, with reference to data in the table, how the percentage of forest cover changed between 1940 and 2010.

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..... [2]

(b) Explain the possible negative effects of the change in forest cover between 1940 and 1987.

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..... [5]

(c) Suggest reasons for the change in forest cover between 1987 and 2010.

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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)** Define the term *drug*.

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..... [3]

(b) Describe the possible effects of abuse of a **named** drug.

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..... [7]

[Total: 10]

9 **(a)** Outline the importance of a seed being provided with a good supply of oxygen.

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..... [3]

(b) Outline the importance of a plant being provided with a good supply of water.

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..... [7]

[Total: 10]

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