Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **5090/21**

Paper 2 Theory **May/June 2017**

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Section A
Answer **all** questions in this section.
Write your answers in the spaces provided on the Question Paper.

Section B
Answer **both** questions in this section.
Write your answers in the spaces provided on the Question Paper.

Section C
Answer **either** question 8 **or** question 9.
Write your answers in the spaces provided on the Question Paper.

You are advised to spend no longer than one hour on Section A.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **15** printed pages and **1** blank page.

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CAMBRIDGE International Examinations

Section A

Answer **all** questions in this section.

1 *Spirulina* is classified in the group bacteria. *Spirulina* is green in colour and is able to synthesise its own food.

(a) List **three** characteristics of bacteria.

1 .....

2 .....

3 ..... [3]

(b) **(i)** Suggest the name of the chemical that gives *Spirulina* its green colour.

..... [1]

(ii) Write, in words or symbols, the equation for the process by which *Spirulina* synthesises its own food.

..... → ..... [2]

(c) *Spirulina* can be eaten by humans.

The United Nations World Health Organization (WHO) made the following statement about *Spirulina*:

'For WHO Spirulina represents an interesting food for multiple reasons. Rich in iron and protein, it can be given to children without any risk. We at WHO consider it to be a very suitable food.'

Use your knowledge of animal nutrition to suggest and explain why WHO considers *Spirulina* to be a 'very suitable food'.

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

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2 A potometer is used to measure water uptake by a plant. Fig. 2.1 shows the stem and flower of a plant in a potometer. As water is taken up, the bubble moves in the direction shown.

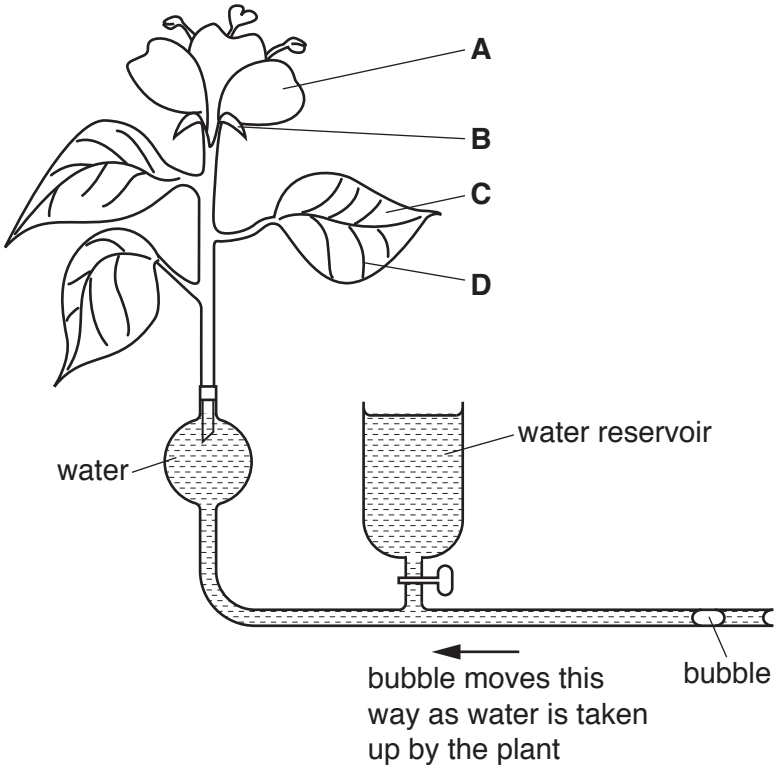

Fig. 2.1

(a) Name the parts **A**, **B**, **C** and **D** in Fig. 2.1.

A .....

B .....

C .....

D ..... [4]

(b) Describe the pathway taken by water as it moves from the potometer, through the plant stem and into the surrounding air.

.....

.....

.....

.....

.....[3]

(c) **(i)** In an experiment, the bubble moved a distance of 60 mm in 10 minutes.
Calculate the average rate at which the bubble moved in mm per min.

..... mm per min
[1]

(ii) The experiment was repeated in an area of lower light intensity.

Predict and explain what would happen to the rate at which the bubble moved.

prediction.....

.....

explanation.....

.....

.....

.....[3]

[Total: 11]

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3 Fig. 3.1 shows an organ, **X**, and its associated blood vessels **P**, **Q** and **R**.

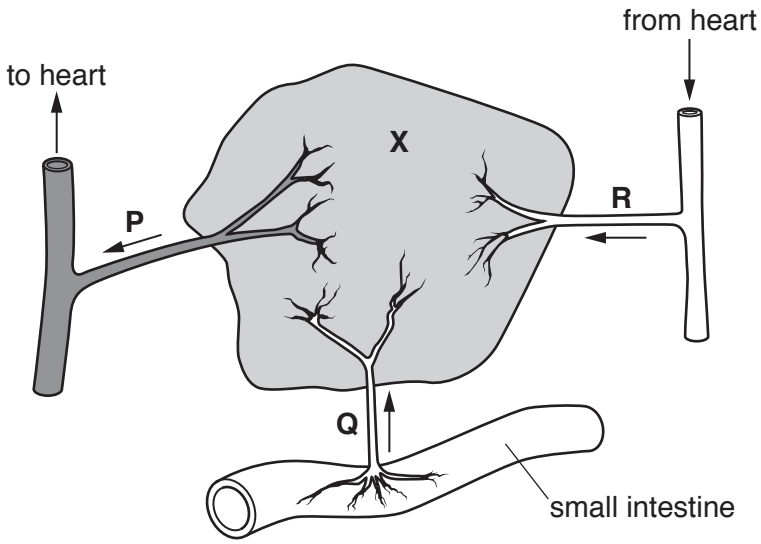

Fig. 3.1

Organ **X** is involved in the following processes:

- the metabolism of amino acids,
- the breakdown of chemical substances, including alcohol.

(a) Name organ **X** and each of its associated blood vessels.

organ **X** .....

blood vessel **P** .....

blood vessel **Q** .....

blood vessel **R** ..... [4]

(b) Compare the structure of the blood vessels **P** and **R** in Fig. 3.1.

.....

.....

.....

.....

.....[3]

(c) **(i)** Oestrogen is an example of a type of chemical substance, produced by a gland, that alters the activity of one or more specific target organs before being destroyed by organ **X**. Name this type of chemical substance.

..... [1]

(ii) With reference to **oestrogen**, complete Table 3.1.

Table 3.1

gland where produced	
target organ	
effect on target organ	

[3]

[Total: 11]

4 Fig. 4.1 shows a Bengal tiger.

Fig. 4.1

Fur colour in the Bengal tiger is controlled by a single gene. The dominant allele of the gene results in orange fur. A single change in this gene produces a recessive allele, which results in white fur in tigers with the homozygous recessive genotype.

(a) **(i)** Define the term *gene*.

.....

.....

.....

.....[3]

(ii) State the term used to describe a change in a gene.

..... [1]

(b) Using the letters **T** (orange) and **t** (white) to represent the alleles that control fur colour, draw a labelled genetic diagram to show how two tigers with orange fur may give rise to offspring with white fur.

[5]

(c) Bengal tigers have dark stripes on their fur.

Suggest why each of the following is true for the pattern of dark stripes:

it is **not** affected by whether the fur is orange or white

.....

.....

.....

it is unique to each individual

.....

.....

.....[3]

[Total: 12]

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5 The statements **E** to **K** relate to the process of reproduction.

E produces genetically identical offspring

F produces more individuals of the same species

G involves only one parent

H involves fusion of nuclei

I requires gametes

J forms a diploid zygote

K involves only cell division by mitosis

Table 5.1 shows a comparison of sexual and asexual reproduction.

Table 5.1

sexual reproduction only	asexual reproduction only	both sexual and asexual reproduction
	E	

Complete Table 5.1 by writing each letter in the correct box to match it to sexual reproduction only, asexual reproduction only, or to both.

The first letter has been written in the correct box for you. Use each letter **once** only. [6]

[Total: 6]

Section B

Answer **both** questions in this section.

6 **(a)** Describe the role of the cilia in the trachea.

.....

.....

.....

.....

.....[3]

(b) Fig. 6.1 shows components of the human gas exchange surface and an associated blood vessel.

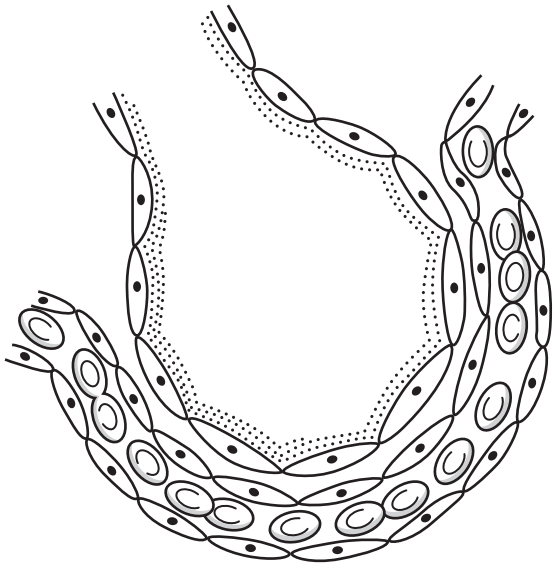

Fig. 6.1

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State the characteristics, and describe the roles, of each of the components shown in Fig. 6.1. You should make reference to **named** structures in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[7]

[Total: 10]

7 Fig. 7.1 shows bacteria growing on the surface of a dish containing nutrient jelly. Paper discs, such as **M** and **N**, were soaked in solutions of different antibiotics and placed on top of the growing bacteria. A clear area on the jelly indicates that bacteria in that area have been killed.

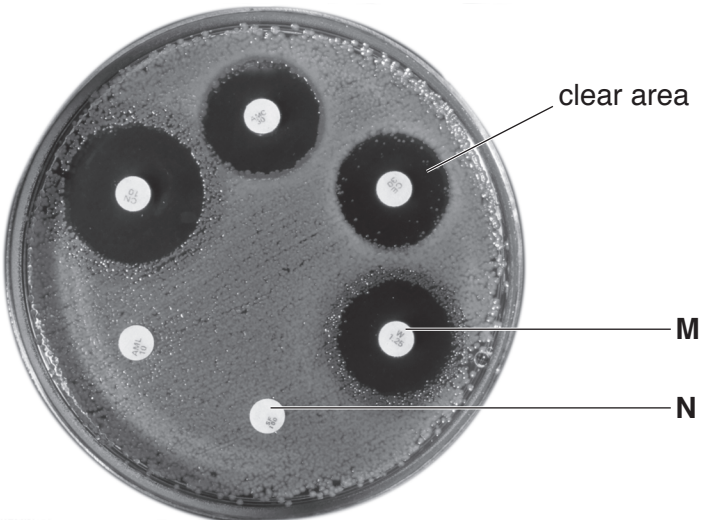

Fig. 7.1

(a) Use the information above, and your knowledge of the process of natural selection, to describe and explain the difference in appearance of the jelly surrounding discs **M** and **N**.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

(b) Describe how the process of artificial selection differs from that of natural selection. Include reference to the production of **one named** economically important plant or animal in your answer.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

Section C

Answer **either** question 8 **or** question 9.

8 **(a)** With reference to **named** components, describe how the structure of one animal cell (for example from fresh liver) would appear different from a plant cell (for example from an onion epidermis).

.....

.....

.....

.....

.....

.....

.....[4]

(b) State the relationship between structure and function for **both** of the following:

xylem vessels

.....

.....

.....

.....

red blood cells

.....

.....

.....

.....[6]

[Total: 10]

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9 Compare each of the following processes:

(a) aerobic respiration and anaerobic respiration

.....

.....

.....

.....

.....[3]

(b) anaerobic respiration in muscles and anaerobic respiration in yeast

.....

.....

.....

.....

.....[3]

(c) diffusion and active transport

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.....

.....

.....

.....[4]

[Total: 10]

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