Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

3781772737

BIOLOGY **5090/22**

Paper 2 Theory **October/November 2019**

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 **16** printed pages.

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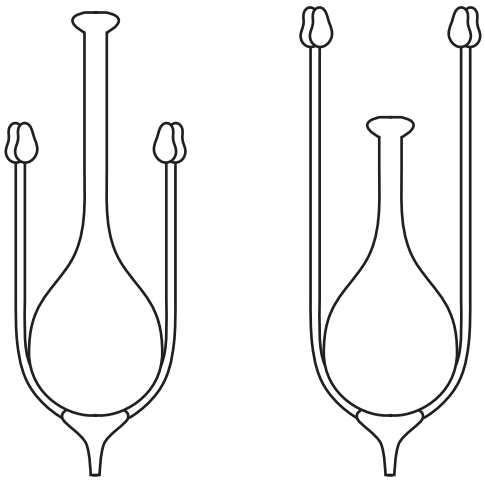
Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 A species of flowering plant has flowers of two types. Some of the plants of this species have flowers called **pin** and some of the plants have flowers called **thrum**. The diagrams show sections through parts of these two types of flower.



pin flower

thrum flower

(a) Describe how the structure of the **pin** type of flower differs from that of the **thrum** type of flower.

.....

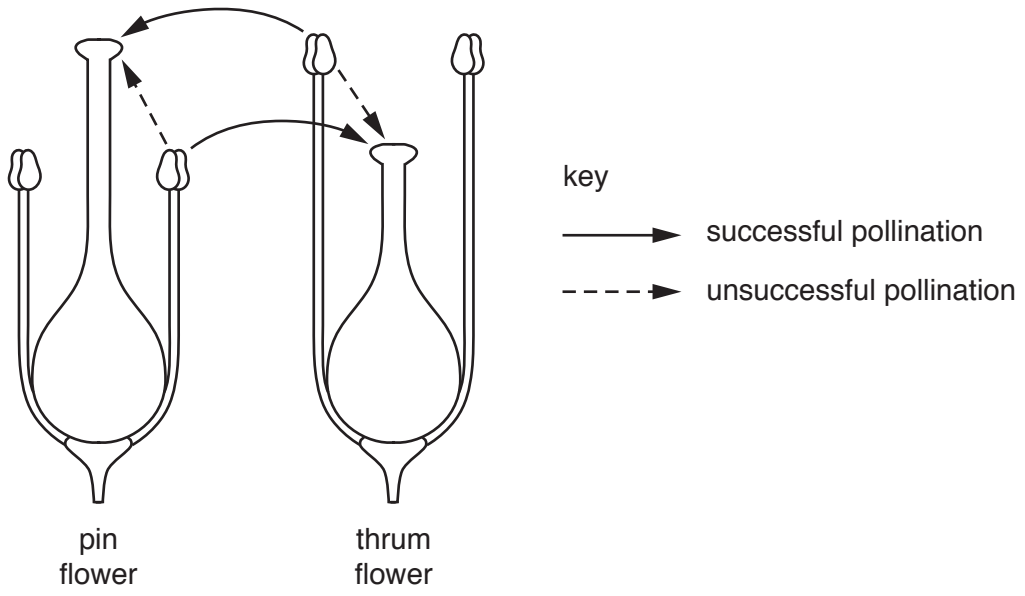
.....

.....

.....

..... [3]

(b) Pollination in this species of plant is not always successful in leading to fertilisation. Examples of successful pollination and of unsuccessful pollination are shown in the diagram below.



Use information from the diagram to name the type of pollination that is successful **and** suggest the advantage to the species of this type of pollination.

type of pollination .....

advantage .....

.....

.....
[3]

(c) The gene responsible for the production of the different types of flower has two alleles. One allele (**T**) is dominant to the other allele (**t**).

A plant with flowers of the **pin** type has a homozygous recessive genotype.

A plant with flowers of the **thrum** type has a heterozygous genotype.

(i) Use the letters **T** and **t** to show the genotype of each of the following:

a plant with flowers of the **pin** type .....

a plant with flowers of the **thrum** type ..... [2]

(ii) A plant with flowers of the **pin** type was successfully pollinated by a plant with flowers of the **thrum** type.

Complete the genetic diagram shown below **and** state the likely ratio of new plants being produced with flowers of the **pin** and **thrum** types.

		plant with flowers of the pin type	
	gametes	.....	.....
plant with flowers of the thrum type	.....	.....	.....
	.....	.....	.....

ratio of new plants with flowers of the **pin** and **thrum** types:

..... [3]

[Total: 11]

2 Plants absorb light energy to use in the process of photosynthesis.

(a) **(i)** Name the part of a plant cell where photosynthesis takes place.

..... [1]

(ii) State the equation, in words or symbols, for photosynthesis.

..... [2]

(b) Photosynthesis also takes place in some bacteria. Suggest **and** explain the colour of these bacteria.

.....

.....

..... [2]

(c) These bacteria are able to absorb more light than plants because they have additional chemicals that absorb light. Scientists have suggested that it may be possible to transfer a gene that codes for one of these additional chemicals into the DNA of plants used to produce crops that humans eat.

(i) Name the process that scientists would use to transfer the gene from these bacteria into the DNA of a plant.

..... [1]

(ii) Suggest **and** explain the possible advantages of transferring this gene into the DNA of a plant used to produce crops that humans eat.

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

3 Syphilis is an infectious disease transmitted by sexual contact.

It is possible to test the blood of a person for the presence of antibodies produced after infection with the pathogen that causes syphilis.

(a) State each of the following:

(i) the type of pathogen that causes syphilis

..... [1]

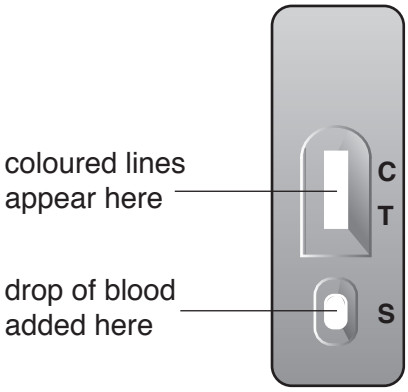
(ii) the component of an infected person's blood that produces antibodies

..... [1]

(iii) the component of an infected person's blood that transports these antibodies.

..... [1]

(b) The diagram shows part of a kit for testing a sample of blood for the presence of antibodies for syphilis.



If antibodies for syphilis are in the drop of blood added at **S**, a coloured line will form at the test region, **T**.

The presence of a coloured line at the control region, **C**, indicates that sufficient blood has been added and that the result at the test region, **T**, is valid.

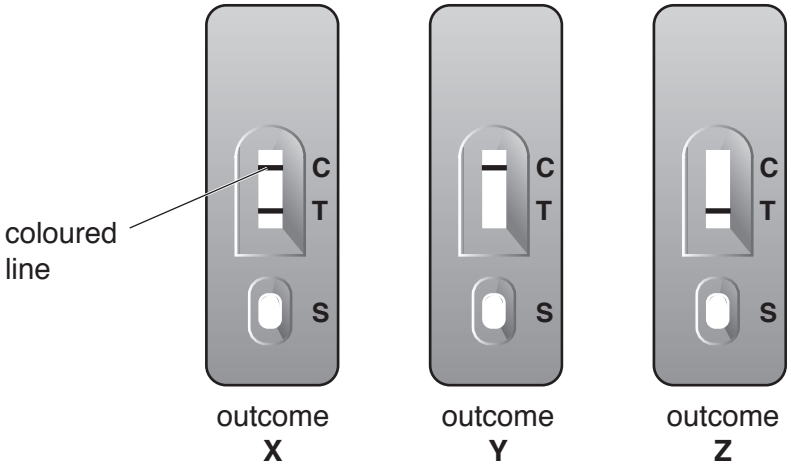
(i) If a person believes that they may have been infected with syphilis, a doctor may suggest that they have a blood test.

Suggest why it is advisable for a person to wait until some time after their last sexual contact has taken place before the test is carried out.

.....

..... [1]

(ii) Three possible outcomes of the test are shown below.



Complete the table below by entering **either** the word **yes** or the word **no** in each box to summarise the significance of each outcome.

outcome	is the result of the test valid?	can it be concluded that the person is infected with syphilis?
X		
Y		
Z		

[2]

(iii) State **one** first symptom shown by a person with primary stage syphilis.

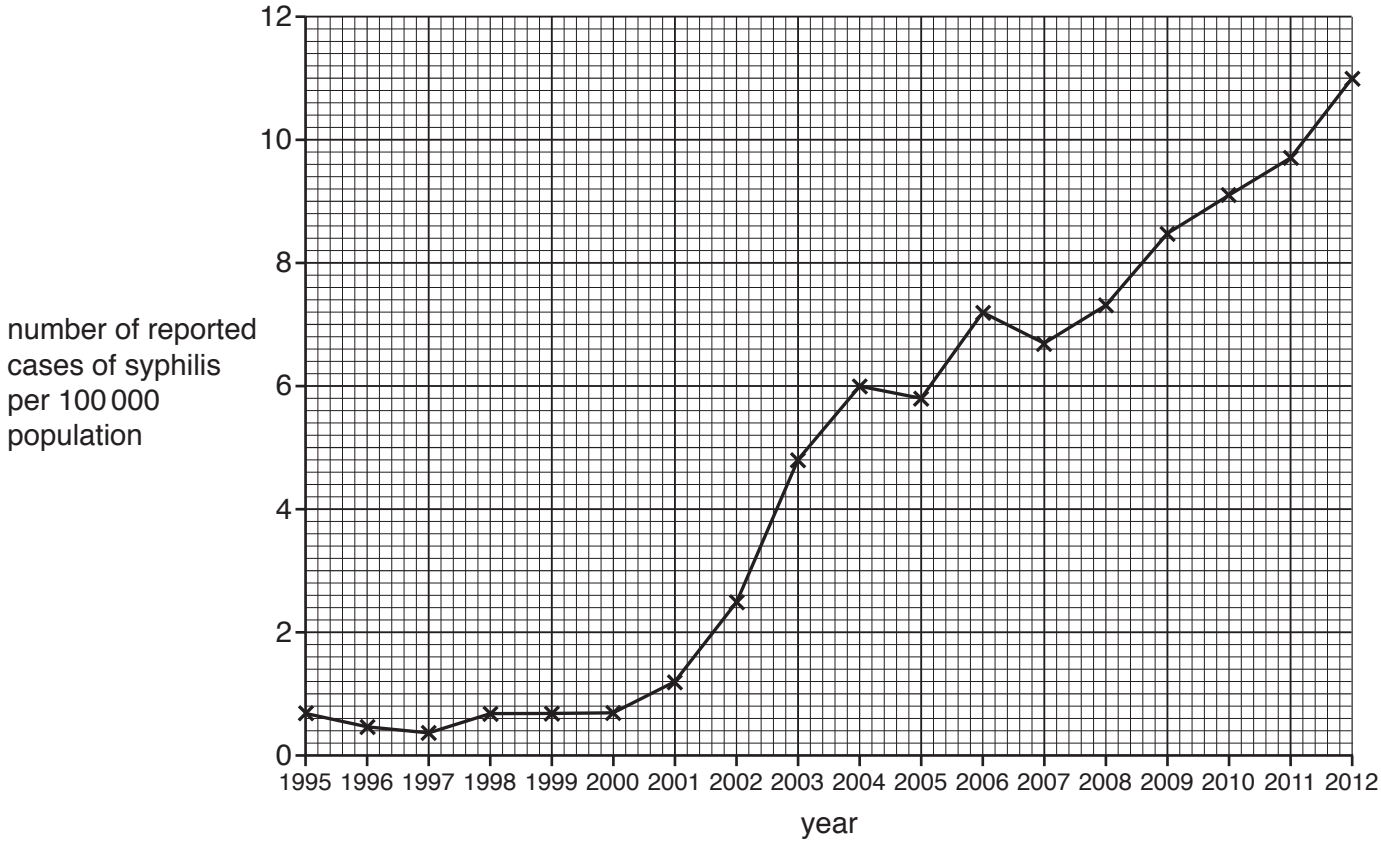
.....

State the type of drug that should be given to a person with primary stage syphilis to prevent the disease from progressing to the secondary stage.

.....

[2]

(c) The graph shows the number of reported cases of syphilis in men in a country between 1995 and 2012.



(i) Calculate the percentage increase in the number of reported cases of syphilis in men between 2004 and 2012.

Show your working.

.....% [2]

(ii) Suggest why the actual increase in the number of cases of syphilis in men may have been higher than shown in the graph.

.....

..... [1]

(iii) Suggest **two** recommendations that may be made to men in order to reduce the number of new cases of infection with syphilis.

1 .....

.....

2 .....

.....
[2]

[Total: 13]

4 Proteins are an important component of the human diet. Protein molecules are digested and the products of digestion are absorbed into the blood.

(a) **(i)** State **one** principal source of protein in the diet.

..... [1]

(ii) Describe the chemical digestion of proteins in **named** parts of the alimentary canal.

.....

.....

.....

.....

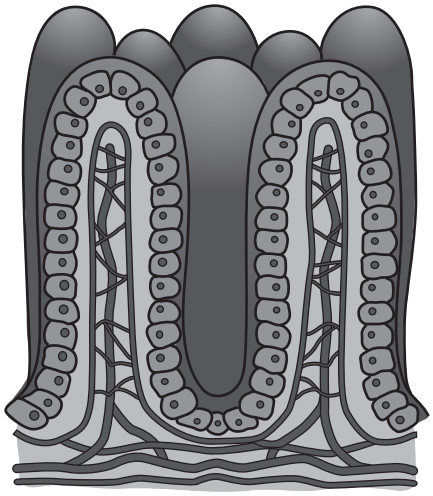
.....

..... [4]

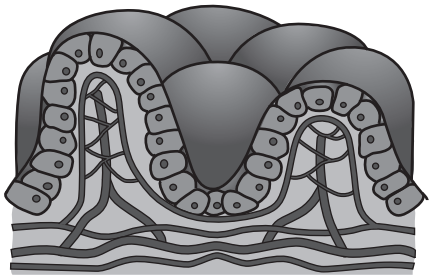
(iii) State where in the alimentary canal the products of digestion are absorbed into the blood.

..... [1]

(b) In a disease that affects a small number of people, the surface through which the products of digestion are absorbed into the blood changes. This change is shown in the diagrams below. Both diagrams are drawn to the same scale.



absorption surface in a person **not affected** by the disease



absorption surface in a person **affected** by the disease

Describe the change in the absorption surface in a person affected by the disease **and** suggest ways in which the person may be affected by this change.

change in absorption surface

.....

.....

.....

.....

ways in which person may be affected

.....

.....

.....

.....

[4]

[Total: 10]

5 The statements **E** to **L** relate to the process of cell division.

E is used in the repair of damaged tissues

F results in the production of diploid cells

G results in the production of gametes

H results in the chromosome number being halved

J gives rise to genetically identical cells

K takes place in both animals and plants

L is used in the process of asexual reproduction

Complete the table by writing each statement letter in the correct box to show whether the statement relates to mitosis only, meiosis only, or to both.

The first letter has been written in the correct box for you. [6]

mitosis only	meiosis only	both mitosis and meiosis
E		

Section B

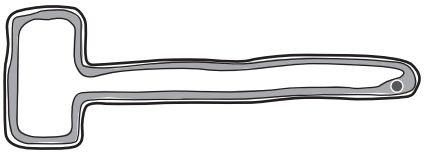
Answer **both** questions in this section.

Write your answers in the spaces provided.

6 The diagrams show two types of cell specialised to carry out particular functions.

Name each type of cell shown and state the relationship between cell structure and cell function.

(a) cell from a plant



name of cell type .....

relationship between structure and function

.....

.....

.....

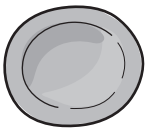
.....

.....

.....

[4]

(b) cell from human blood



name of cell type .....

relationship between structure and function

.....

.....

.....

.....

.....

.....

[6]

[Total: 10]

7 Respiration in the muscle cells of a human may take place when oxygen is available and when oxygen is not available.

(a) Name the type of respiration that takes place when oxygen **is** available.

..... [1]

(b) A person is running in a race. Outline the advantages to the person of the type of respiration in **(a)** compared with the type of respiration that takes place when oxygen is **not** available.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) The oxygen required for the type of respiration in **(a)** is provided to the muscle cells from the air.

Describe the events that must take place in a person's body so that a muscle cell can be provided with molecules of oxygen from the air.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 10]

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Section C

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

Write your answers in the spaces provided.

8 **(a)** Describe the possible harmful effects of human activity on the ecosystem of a tropical rainforest.

.....

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.....

.....

.....

.....

..... [7]

(b) The Sun is the principal source of energy in an ecosystem such as a tropical rainforest.

Outline the flow of energy through an ecosystem such as a tropical rainforest. In your answer you should make reference to **named** levels in food webs.

.....

.....

.....

.....

.....

..... [3]

[Total: 10]

9 Following sexual intercourse in humans, fertilisation may take place.

(a) Describe the process of fertilisation and the early development of a ball of cells.

.....

.....

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.....

.....

.....

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..... [4]

(b) The ball of cells may then become implanted in the wall of the uterus and form a developing fetus.

Describe how a developing fetus obtains and uses the **named** substances it needs and removes its **named** waste products.

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.....

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..... [6]

[Total: 10]

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