Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0123456789

BIOLOGY **0610/04**

Paper 4 Theory (Extended) **For Examination from 2016**

SPECIMEN PAPER

1 hour 15 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, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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.

The syllabus is accredited for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages and **2** blank pages.

1 The dominant grass species in an African grassland ecosystem are star grass and red oat grass.

- Star grass is eaten by antelope species, such as topi and Thomson's gazelle.
- Smaller animals such as mice and grasshoppers feed on red oat grass.
- Topi and Thomson's gazelle are eaten by predators such as cheetahs, lions and serval cats.
- Grasshoppers and mice are eaten by serval cats and tawny eagles.
- Vultures feed on dead mammals.

Fig. 1.1 shows part of the food web for this ecosystem.

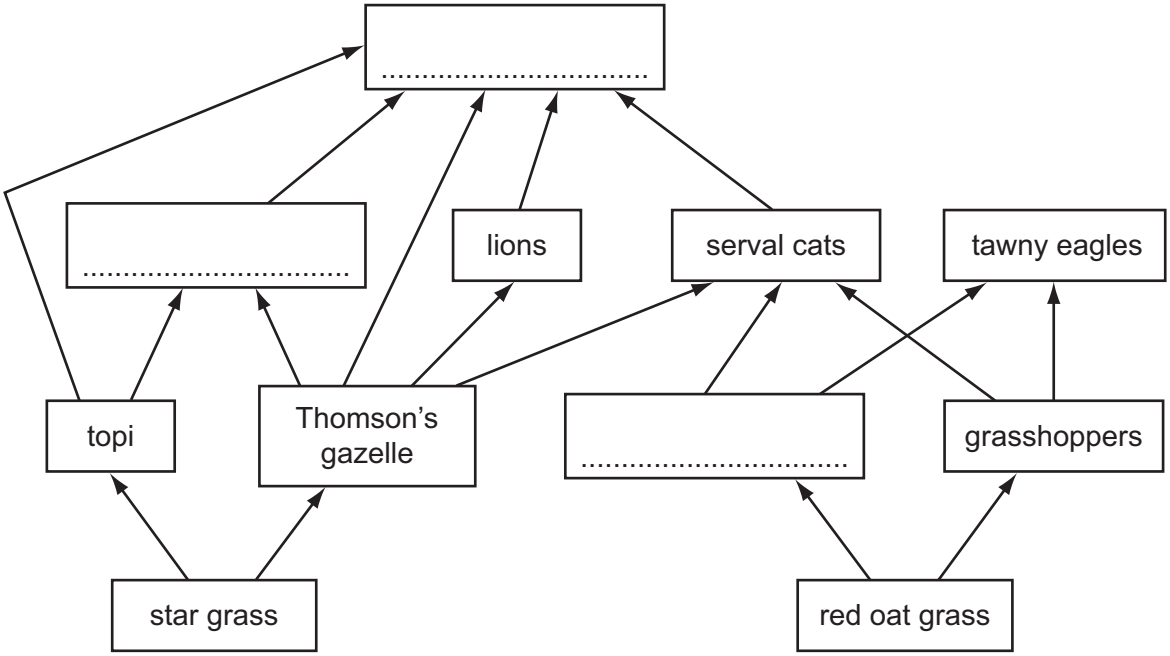

Fig. 1.1

(a) Complete the food web by writing the names of the correct organisms in the boxes in Fig. 1.1. [3]

(b) Name the trophic level of the following species.

star grass .....

topi ..... [2]

(c) **(i)** State the principal source of energy for the food web shown in Fig. 1.1.

..... [1]

(ii) State what happens to energy when it leaves a food web.

..... [1]

(d) Explain why there are no more than four trophic levels in the food web shown in Fig. 1.1.

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..... [3]

(e) Fish such as salmon can be reared intensively in fish farms. They are fed on high protein food made from animals. When eating this food, the fish are feeding as secondary consumers.

Describe the **disadvantages** of intensive farming, such as salmon farming, for producing human food.

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..... [3]

[Total: 13]

[Turn over

2 Fig. 2.1 shows a person sitting in a room. A thermometer shows the temperature of the room.

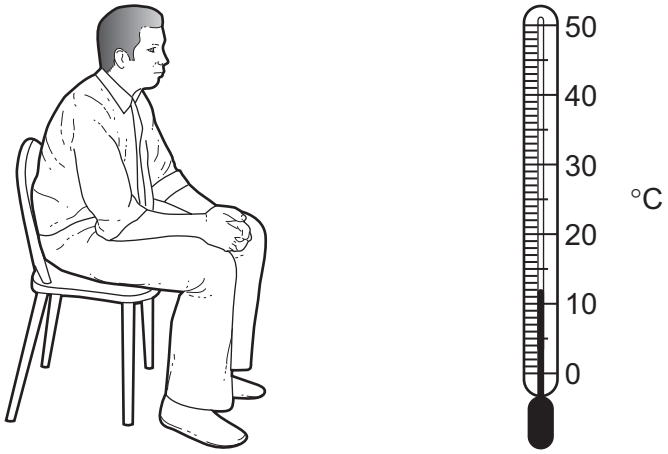

Fig. 2.1

(a) Give **three** uses of energy in the body of the person in Fig. 2.1.

1 .....

2 .....

3 ..... [3]

(b) **(i)** Name the process carried out by the person in Fig. 2.1 that releases energy.

..... [1]

(ii) State the balanced chemical equation that describes this process.

..... [1]

(c) The person leaves the room and runs very fast for 200 m. When the person stops running, his breathing rate and his heart rate remain high for several minutes.

Explain why the person's breathing rate and heart rate remain high.

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..... [4]

(d) The run results in changes in the skin involving the blood vessels and the sweat glands.
Describe what happens to the blood vessels and sweat glands during the run.
Explain why these changes happen.

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..... [5]

[Total: 14]

3 **(a)** Define the term *sensitivity*.

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..... [1]

Fig. 3.1 shows the reflex arc involved in a simple reflex action.

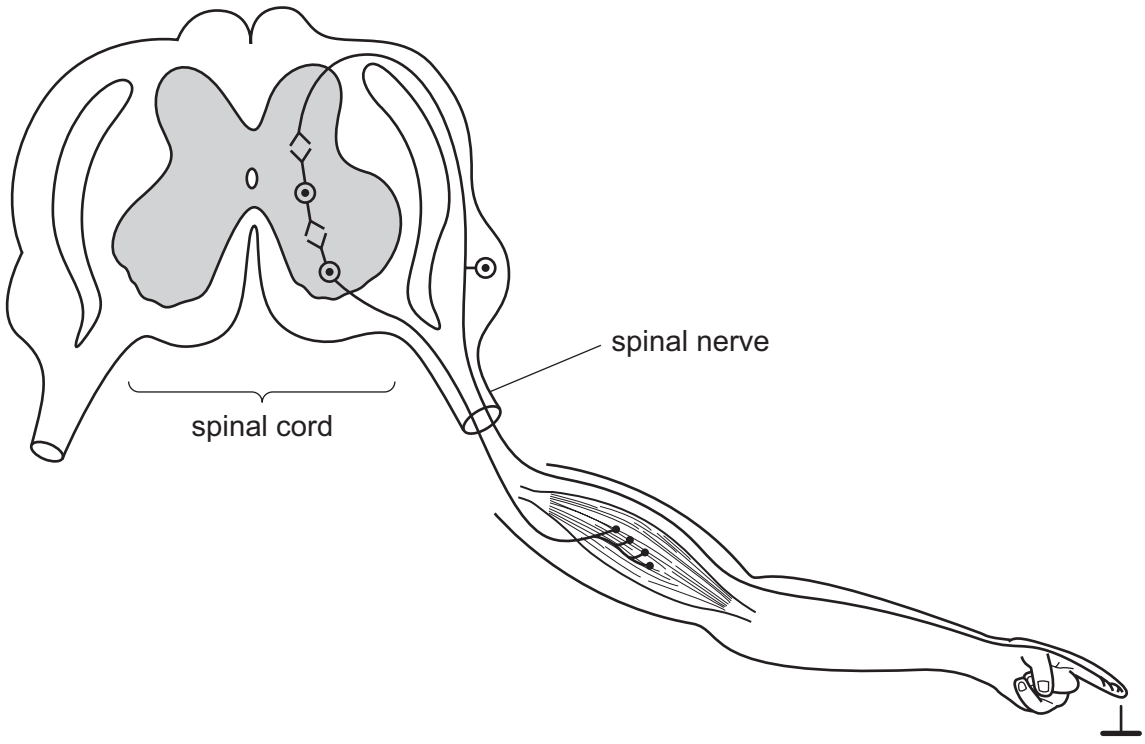

Fig 3.1

(b) On Fig. 3.1 use label lines to identify and name the three types of neurone shown. [3]

(c) A reflex is an involuntary action.

Explain what is meant by the term *involuntary action*.

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..... [2]

(d) **(i)** Define the term *synapse*.

.....

..... [1]

(ii) Describe how impulses are transmitted across a synapse.

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..... [3]

(e) When a body senses danger, more adrenaline is secreted from the adrenal glands.

Describe **two** ways in which the hormone adrenaline affects the body in preparation for action.

1 .....

.....

2 .....

..... [2]

(f) State **one** difference between nervous and hormonal control systems.

..... [1]

[Total: 13]

[Turn over

4 The four o'clock plant, *Mirabilis jalapa*, can have flowers of three different colours as shown in Fig. 4.1.

Fig. 4.1

(a) A student crossed some red-flowered plants with some yellow-flowered plants (**cross 1**).

She collected the seeds and grew them. All of the plants that grew from these seeds had orange flowers.

Complete the genetic diagram to explain the result of **cross 1**.

parental phenotypes	red flowers	×	yellow flowers
parental genotypes	**RR**	×	**YY**
gametes	.....	+	.....
offspring genotype	.....		
offspring phenotype	.....		

[3]

(b) The student then carried out three further crosses as shown in Table 4.1.

Table 4.1

		genotypes of offspring
cross 2	offspring of **cross 1** × offspring of **cross 1**	
cross 3	offspring of **cross 1** × red-flowered plant	
cross 4	offspring of **cross 1** × yellow-flowered plant	

Complete the table by writing in the genotypes of the offspring of **crosses 2**, **3** and **4**, using the same symbols as in the genetic diagram in **(a)**.

You may use the space below for any working.

[3]

(c) Flower colour in *M. jalapa* is **not** an example of the inheritance of dominant and recessive alleles.

Explain how the results of the crosses show that these alleles for flower colour are not dominant or recessive.

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..... [3]

[Turn over

(d) The flowers from *M. jalapa* were cross-pollinated.

Explain the difference between self-pollination and cross-pollination.

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..... [2]

(e) Some plant species are self-pollinated.

Discuss the long-term effects of self-pollination on the evolution of these plant species.

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..... [4]

[Total: 15]

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5 Penicillin is an antibiotic produced by the fungus *Penicillium chrysogenum*.

Fig. 5.1 shows the process used to produce penicillin.

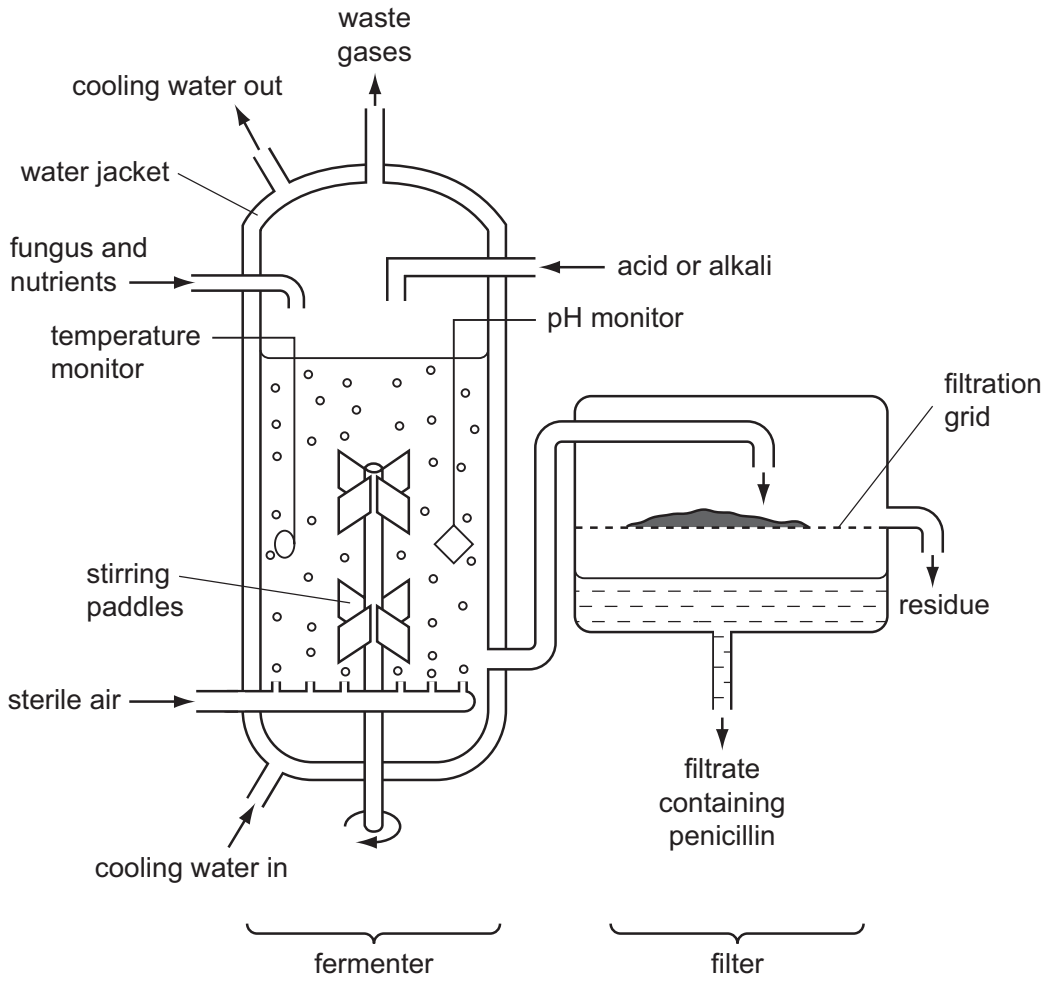

Fig. 5.1

(a) Explain why there is a water jacket around the fermenter **and** why acids or alkalis are added to the fermenter.

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..... [6]

(b) Fig. 5.2 shows the mass of fungus and the yield of penicillin during the fermentation process.

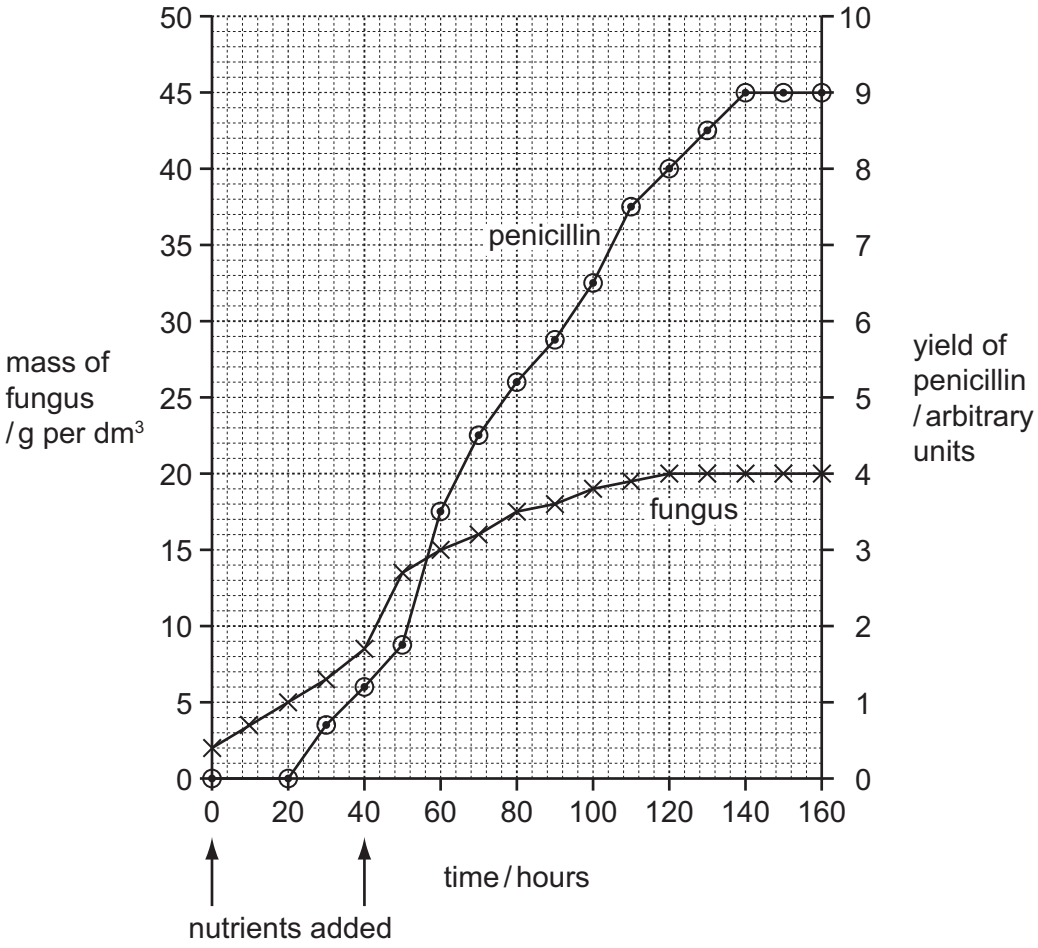

Fig. 5.2

(i) State the time interval over which the fungus grew at its maximum rate.

..... hours [1]

(ii) As the fungus grows in the fermenter, the nuclei in the fungal hyphae divide.

State the type of nuclear division that occurs during the growth of the fungus in the fermenter.

..... [1]

(iii) Explain why the growth of the fungus slows down and stops.

.....

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..... [3]

(c) Penicillin is not needed for the growth of *P. chrysogenum*.

(i) State the evidence from Fig. 5.2 that shows that penicillin is not needed for this growth.

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..... [2]

(ii) The people in charge of the penicillin production emptied the fermenter after 160 hours.

Use the information in Fig. 5.2 to suggest why they did not allow the fermentation to continue for longer.

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..... [1]

[Turn over

(d) *Downstream processing* refers to all the processes that occur to the contents of the fermenter after it is emptied. This involves making penicillin into a form that can be used as a medicine.

Suggest why downstream processing is necessary.

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..... [3]

(e) Explain why antibiotics, such as penicillin, affect bacteria but not viruses.

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..... [2]

[Total: 19]

6 Fig. 6.1 shows a villus from the small intestine of a mammal and an enlarged view of a cell from region **A**.

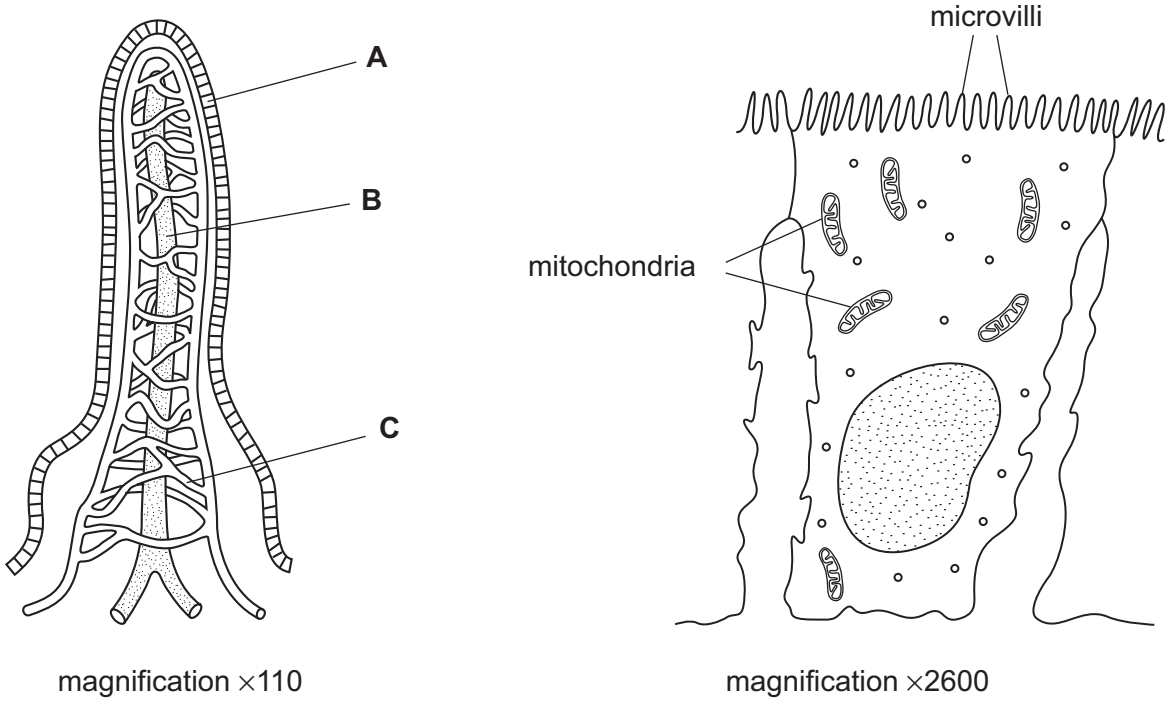

Fig. 6.1

(a) Name regions **A**, **B** and **C**.

A .....

B .....

C ..... [3]

(b) Explain why the cells from region **A** have many microvilli and many mitochondria.

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..... [3]

[Total: 6]

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