Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2018**

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 or graphs.
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.

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

This document consists of **17** printed pages and **3** blank pages.

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CAMBRIDGE International Examinations

1 Two functions of the alimentary canal are mechanical digestion and chemical digestion.

(a) Outline where **and** how mechanical digestion occurs in the alimentary canal.

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.....[4]

(b) Enzymes catalyse the reactions of chemical digestion. Table 1.1 gives information about chemical digestion in three parts of the alimentary canal.

Complete Table 1.1.

Table 1.1

part of the alimentary canal	enzyme	substrate	product(s)
mouth		starch	
stomach			peptides
		fat	fatty acids and glycerol

[3]

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(c) Substances that are absorbed from the alimentary canal may enter cells and become part of the cells.

(i) State the storage carbohydrate made from glucose in liver cells.

.....[1]

(ii) State the type of protein used in the immune system that is produced from amino acids by lymphocytes.

.....[1]

(iii) Fat is produced from fatty acids and glycerol by cells in the fatty tissue beneath the skin.

State **one** function of this layer of fat.

.....[1]

[Total: 10]

2 Fig. 2.1 shows an Arctic wolf, *Canis lupus*. These wolves are one of the few mammals adapted to the extreme cold of the tundra in the Canadian Arctic and in Alaska.

Fig. 2.1

(a) **(i)** State **two** features, **visible** in Fig. 2.1, that identify Arctic wolves as mammals.

1 .....

2 .....
[2]

(ii) Arctic wolves show many adaptive features to a cold environment.

Explain what is meant by the term *adaptive feature*.

.....

.....

.....

.....

.....

.....[3]

(b) The food available to animals in the Arctic tundra is limited. There is a short growing season for plants and the environmental conditions do not favour high rates of photosynthesis and growth compared with temperate and tropical ecosystems.

State **three** conditions that limit plant growth rates.

1 .....

2 .....

3 .....
[3]

(c) Arctic wolves are the top carnivores in the food web in the tundra.

Explain why the number of Arctic wolves is so small in this ecosystem.

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.....[6]

[Total: 14]

3 Fig. 3.1 is a scanning electron micrograph of a vertical section through part of the leaf of a broad bean plant, *Vicia faba*.

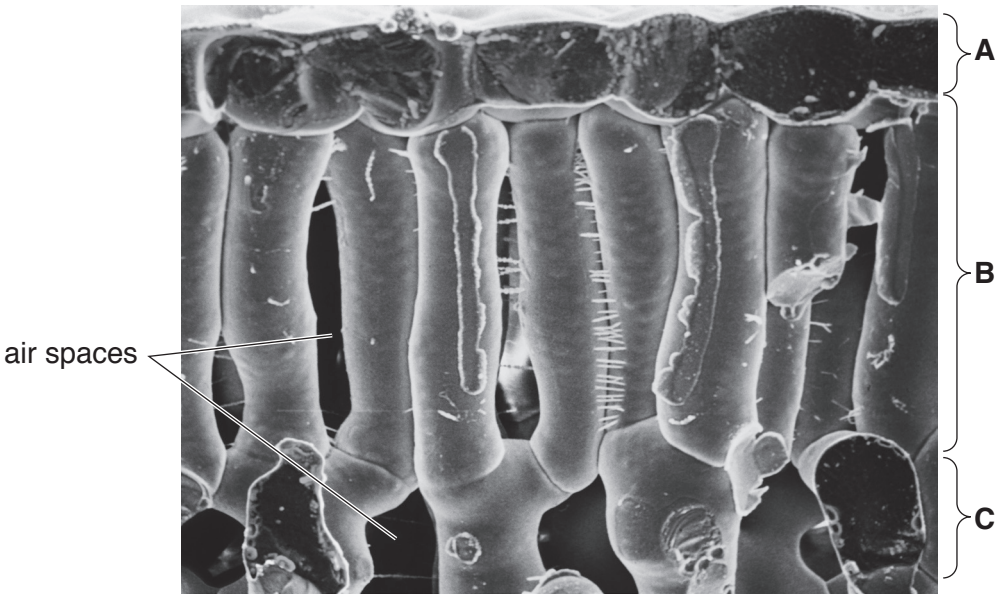

Fig. 3.1

(a) **(i)** State the names of the tissues labelled **A** and **B**.

A .....

B .....
[2]

(ii) The cells in regions **B** and **C** in Fig. 3.1 have a large surface area.

Explain why this is necessary for the functioning of the leaf cells.

.....

.....

.....

.....

.....

.....[3]

(iii) Explain why there are many interconnecting air spaces within the leaf.

.....

.....

.....

.....[2]

(b) When water is in short supply, plants can wilt as shown in Fig. 3.2.

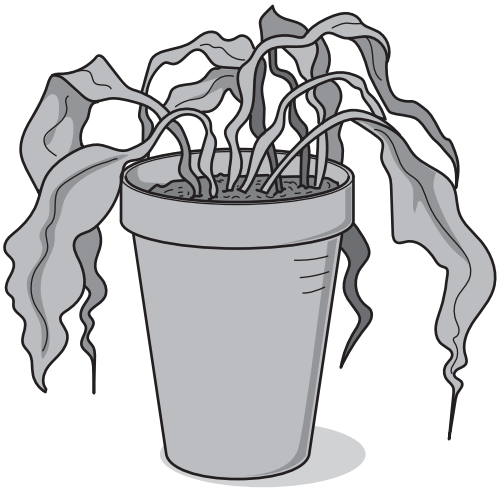

Fig. 3.2

(i) State **two** conditions that are likely to increase the chances of wilting.

1 .....

2 .....
[2]

(ii) Explain what happens to the cells of a leaf to cause wilting.

.....

.....

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.....

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.....

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.....

.....[4]

(iii) Wilting may look harmful, but it is often a strategy for survival.

Suggest the advantages to a plant of wilting.

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.....

.....

.....[2]

[Total: 15]

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4 **(a)** The endocrine system in mammals produces hormones.

Define the term *hormone*.

.....

.....

.....

.....

.....[2]

(b) The responses of the human body to danger are coordinated by the nervous and endocrine systems.

Fig. 4.1 shows the sequence of events that occurs in response to a dangerous situation that is detected by the eyes.

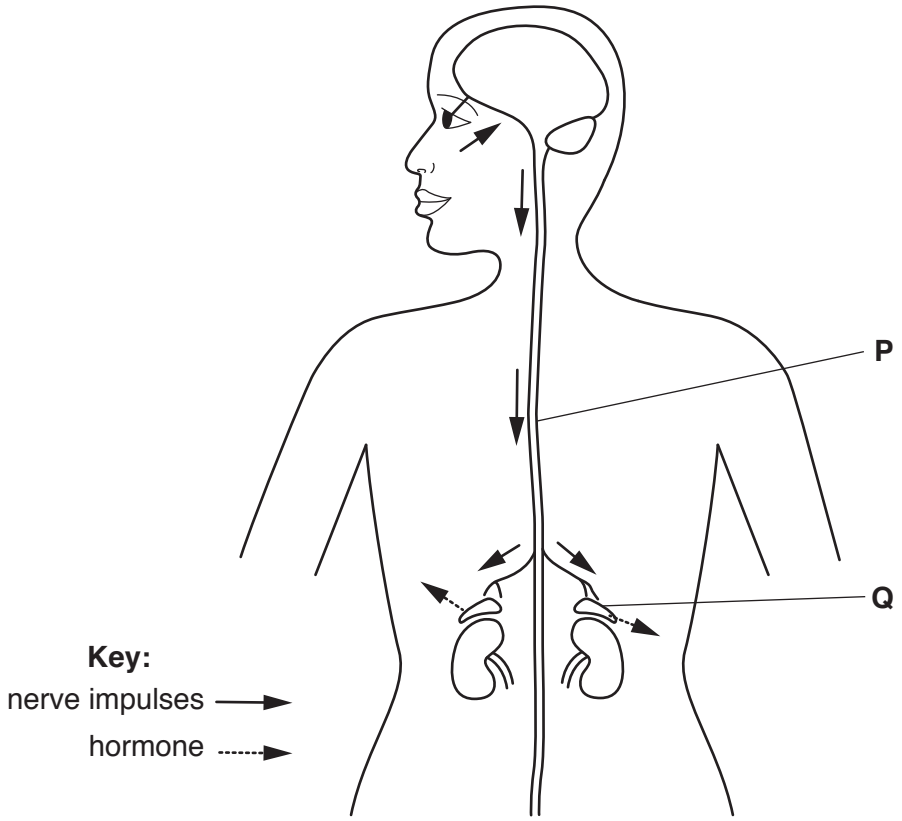

Fig. 4.1

(i) State the tissue in the eye that converts light energy into nerve impulses.

.....[1]

(ii) State the part of the eye that has the highest concentration of light-sensitive cells and gives the most detailed image.

.....[1]

(iii) State the type of neurone that conducts impulses from the eye to the brain.

.....[1]

(iv) State the nerve that contains these neurones that conduct impulses from the eye to the brain.

.....[1]

(v) Identify the organ labelled **P**.

.....[1]

(vi) Identify the gland labelled **Q**.

.....[1]

(c) Complete Table 4.1 to describe the effects of the hormone released when a person is in a dangerous situation.

Table 4.1

organ	effect of the hormone
heart	
liver	
lungs	
eyes	

[4]

(d) Explain the advantages of coordinating the response to a dangerous situation using both the nervous system and the endocrine system.

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.....

.....[4]

(e) **(i)** Plants also make hormones.

State the name of **one** hormone made by plants.

.....[1]

(ii) Some plant hormones are manufactured and applied to crops to alter aspects of plant growth.

Describe how the synthetic plant hormone 2,4-D is used in agriculture.

.....

.....

.....

.....

.....[2]

[Total: 19]

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5 **(a)** State the balanced chemical equation for aerobic respiration.

.....[2]

(b) Students investigated the rate of respiration of crickets (a type of insect) using a carbon dioxide sensor and laptop as shown in Fig. 5.1. The sensor was fitted inside an airtight glass jar. The apparatus was set up in a room with a constant temperature of 17 °C.

Fig. 5.1

The students found that the concentration of carbon dioxide inside the jar increased by 50 ppm in 120 seconds.

Calculate the rate of carbon dioxide production as ppm per second.

Show your working and express your answer to two significant figures.

..... ppm s^{-1} [1]

(c) After 10 minutes, the students opened the jar by removing the sensor. They left the jar open for 5 minutes but made sure that the crickets remained in the jar. They then replaced the sensor and took more readings for another 10 minutes.

State **and** explain one reason for opening the jar after 10 minutes.

.....

.....

.....

.....

.....[2]

(d) During the investigation the temperature inside the jar increased. The temperature outside the jar remained constant.

Explain why the temperature inside the jar increased.

.....

.....

.....

.....

.....[2]

(e) Researchers in Chile also investigated the rate of respiration in crickets.

They investigated the effect of temperature and body mass on the rate of respiration. They measured the rate of oxygen consumption in crickets with different body masses, at different temperatures.

The researchers' results are shown in Fig. 5.2.

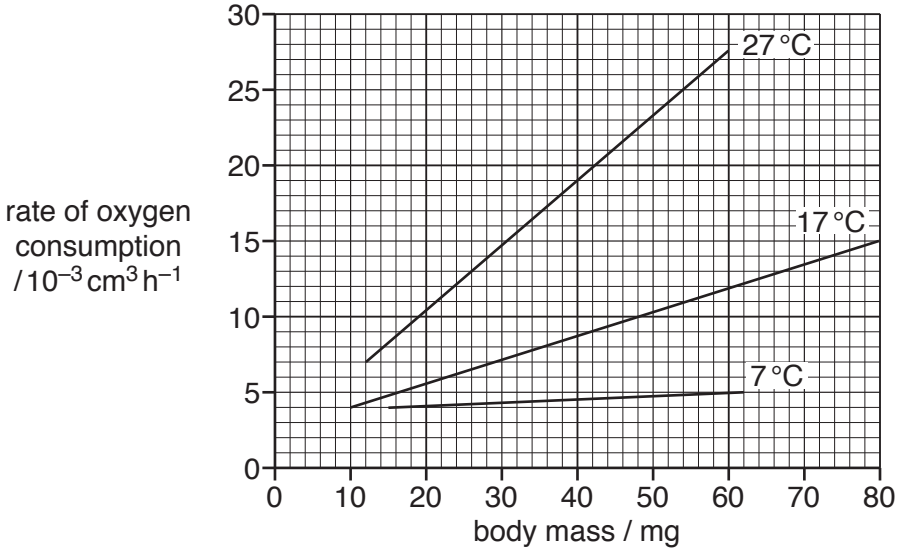

Fig. 5.2

State **two** conclusions that can be made from the data in Fig. 5.2 **and** support each conclusion with evidence from the graph.

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.....

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.....

.....

.....[4]

[Total:11]

6 **(a)** Fig. 6.1 is a half-flower drawing of pride of Barbados, *Caesalpinia pulcherrima*.

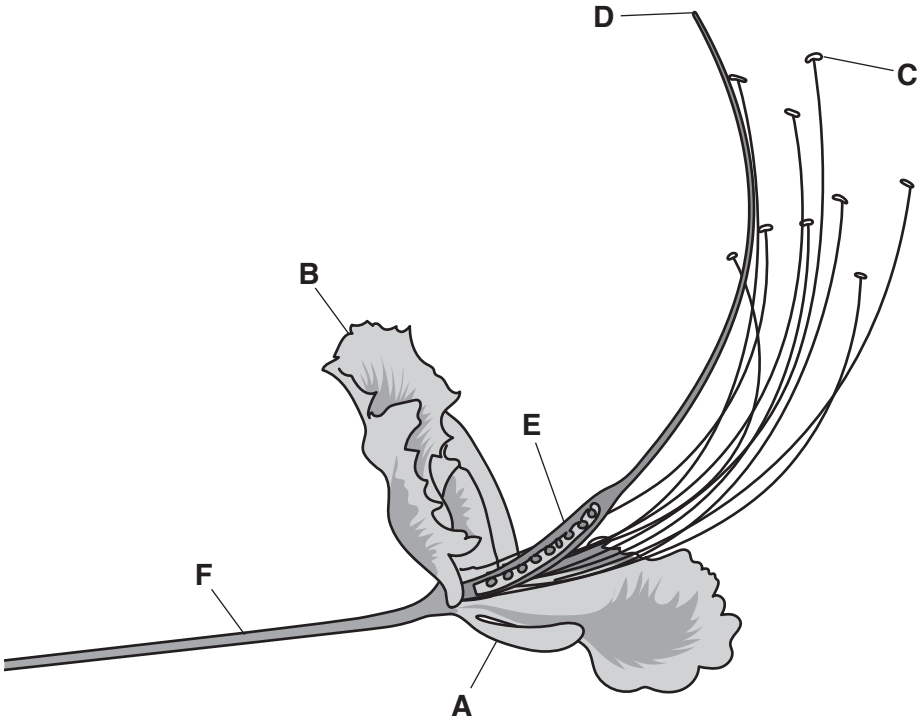


Fig. 6.1

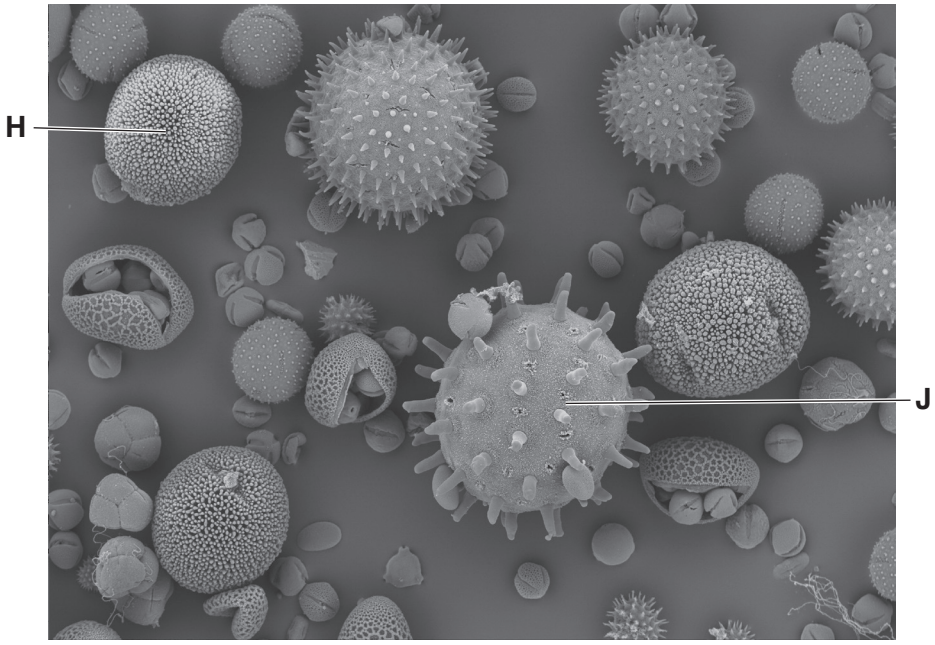
Complete Table 6.1 by stating the letter from Fig. 6.1 that indicates the organ where each function occurs and the name of the organ.

Table 6.1

function	letter from Fig. 6.1	name of the organ
meiosis to produce pollen grains		
pollination		
development of seeds		
protection of flower in the bud		

[4]

(b) Fig. 6.2 is a scanning electron micrograph of some pollen grains from wind-pollinated flowers and insect-pollinated flowers.



magnification ×220

Fig. 6.2

(i) Write the formula that would be used to calculate the actual diameter of pollen grain **H**.

[1]

(ii) The actual diameter of pollen grain **H** is 0.082 mm.

Convert this value to micrometres (µm).

Space for working.

..... µm [1]

(iii) Explain how the pollen grain labelled **J** is adapted for insect pollination.

.....

.....

.....

.....

.....[2]

(c) Pollen grains grow tubes, which contain haploid male gamete nuclei.

(i) One of these male gamete nuclei fuses with the female gamete.

State the part of the flower that contains the female gamete.

.....[1]

(ii) Define the term *haploid nucleus*.

.....

.....

.....[1]

(iii) Explain why it is important for gametes to be haploid.

.....

.....

.....[1]

[Total: 11]

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