Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

* 4 8 6 2 9 4 4 5 3 1 *

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **October/November 2017**

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 **18** printed pages and **2** blank pages.

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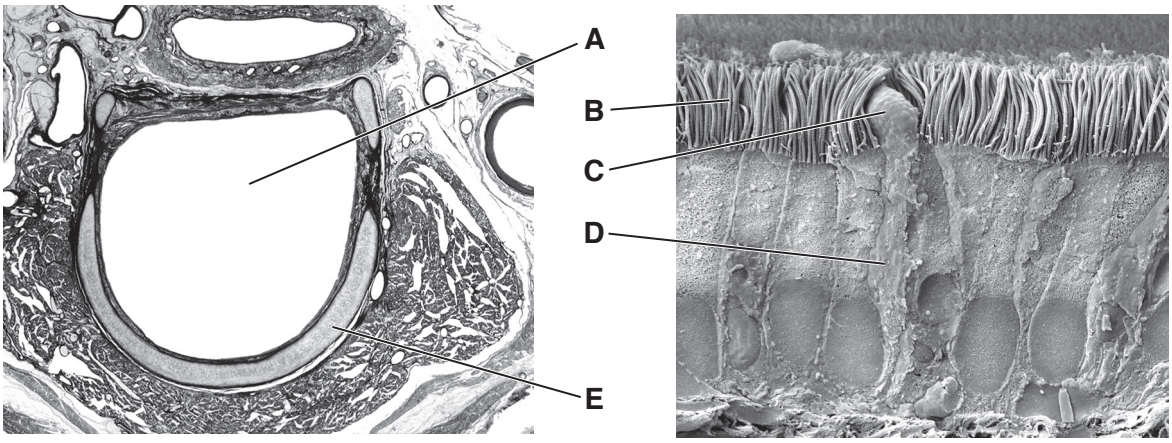
CAMBRIDGE International Examinations

1 Fig. 1.1 shows two photomicrographs of a cross-section of trachea.



low magnification high magnification

Fig. 1.1

(a) The open space at the centre of the trachea is labelled **A** in Fig. 1.1.

Air travels into and out of the trachea through this open space.

State a gas that is at a higher concentration in expired air than in inspired air.

.....[1]

(b) Describe **and** explain the functions of the structures or substances labelled **B** to **E** in Fig. 1.1.

Use the letters in Fig. 1.1 in your answer.

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.....[4]

(c) Fig. 1.2 shows some events during inspiration.

P	pressure in the thorax decreases
Q	air travels down the trachea
R	air enters the bronchi
S	air travels through the larynx
T	air enters the nose
U	the ribcage moves upwards and outwards
V	air enters the alveoli

Fig. 1.2

(i) Put the events shown in Fig. 1.2 into the correct sequence. Two have been done for you.

		T				**V**

[2]

(ii) Suggest why alveoli have thin walls.

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.....[2]

(d) Sickle-cell anaemia is a disease that reduces the delivery of oxygen to tissues.

Explain why.

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.....[3]

[Total: 12]

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2 A group of students investigated the effect of exercise on their heart rates.

They measured their heart rates:

- before exercise
- immediately after running 1 km
- one minute after running 1 km

Before doing the investigation they wrote a hypothesis.

(a) **(i)** Write a hypothesis for this investigation.

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.....[2]

(ii) The students measured their pulse as an indicator of heart rate.

Describe how the students could measure their pulse.

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.....[2]

(b) In another investigation, a doctor tested some of her patients to determine the effect of exercise on coronary heart disease.

Coronary heart disease is caused by a blockage in the coronary artery.

Describe the effect on the heart of a blockage in the coronary artery.

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.....[2]

(c) The doctor divided her coronary heart disease patients randomly into two equal groups.

Each group was given different instructions:

- group **A** – patients were given a daily exercise plan
- group **B** – patients were told to make their own exercise plan.

The doctor measured the heart rate (HR) of each patient immediately after doing exercise and again one minute later.

She calculated their heart rate recovery using this formula:

heart rate recovery = HR immediately after exercise – HR one minute after exercise.

She then calculated the average heart rate recovery for each of the two groups of patients.

The doctor repeated these measurements after three months and after six months.

The results are shown in Fig. 2.1.

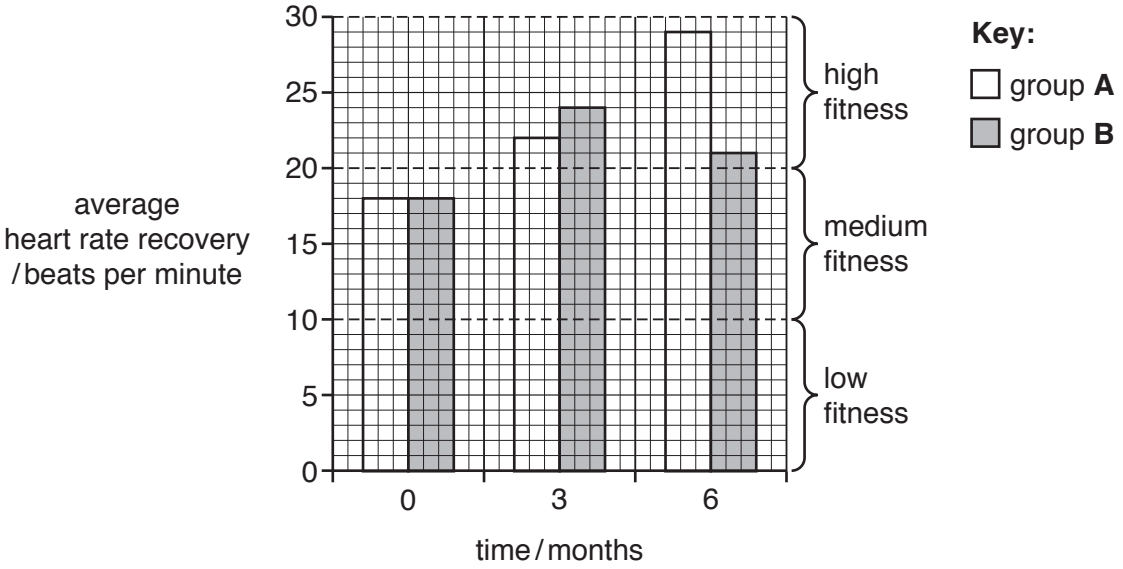

Fig. 2.1

Describe **and** explain the effect of exercise on the average heart rate recovery of the coronary heart disease patients in group **A** and group **B**.

Use data from Fig. 2.1 to support your answer.

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.....[6]

(d) Exercise may reduce the risk of coronary heart disease.

State **one other** possible way of reducing the risk of developing coronary heart disease.

.....[1]

[Total: 13]

3 Apple scab is a disease that infects apple trees.

Fig. 3.1 shows apples from uninfected and infected apple trees.

uninfected apple tree

infected apple tree

Fig. 3.1

There is a gene that determines whether or not apple trees are resistant to apple scab disease.

There are two alleles for this gene:

- disease-resistant, **R**
- not disease-resistant, **r**

(a) **(i)** Complete the sentence.

Genes and alleles are made of ..... . [1]

(ii) A farmer wanted to do a test cross to identify the genotype of disease-resistant apple trees. This would tell him whether his trees were either homozygous dominant or heterozygous.

Determine the phenotypes of the offspring if the unknown parent apple tree was heterozygous.

Complete the genetic diagram:

parental phenotypes	disease-resistant	×	not disease-resistant
parental genotypes	.....	×	.....
gametes	..... , ...	×	..... , ...

offspring genotype .....

offspring phenotype .....

[5]

(b) The farmer wanted to breed disease-resistant apple trees.

(i) He decided **not** to use heterozygous disease-resistant apple trees in his selective breeding programme.

Explain why.

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.....[2]

(ii) The farmer wanted to be sure that only the selected disease-resistant apple trees would reproduce.

Suggest what the farmer could do to ensure that only the selected apple trees were pollinated.

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.....[1]

(iii) Describe how artificial selection differs from natural selection.

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.....[2]

[Total: 11]

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4 The Canadian Government were concerned about overfishing at the Grand Banks in the Atlantic Ocean.

As a result, commercial fish stocks were monitored from 2002 until 2013.

The population data for four species of fish are shown in Fig. 4.1.

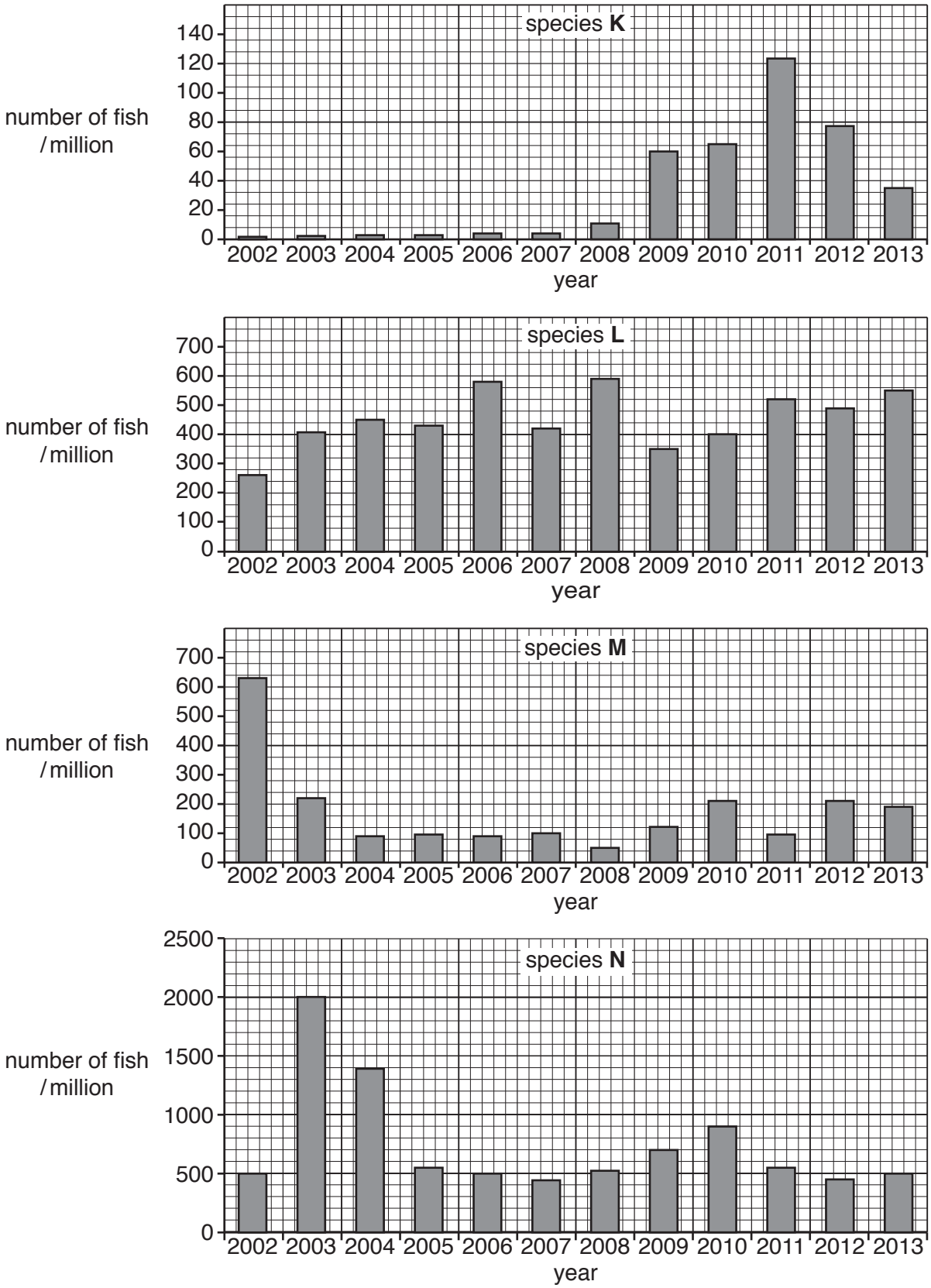


Fig. 4.1

(a) Use the information in Fig. 4.1 to:

(i) state the most abundant fish species in **2002**

.....[1]

(ii) suggest the fish species that had the most carefully controlled fishing quotas between **2002** and **2013**.

Give a reason for your choice.

.....

.....

.....[1]

(iii) calculate the percentage increase in species **N** between **2002** and **2003**.

Show your working.

.....
[2]

(b) Overfishing is a possible reason for the decrease of the population of species **M** between 2002 and 2003.

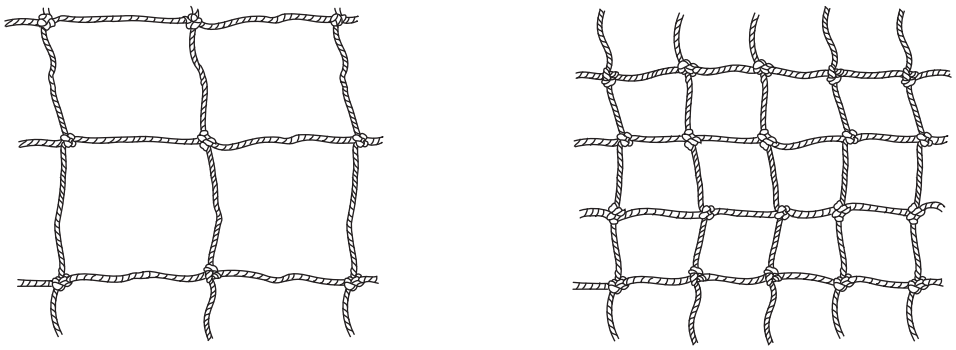
State **two other** reasons that could have caused this decrease.

1 .....

2 .....
[2]

(c) Overfishing can be reduced by having large holes in fishing nets.

Fig. 4.2 shows sections of two fishing nets, the drawings are both at the same scale.



fishing net with large holes

fishing net with small holes

Fig. 4.2

(i) Suggest how controlling the size of the holes in fishing nets helps to reduce overfishing.

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.....[1]

(ii) Describe and explain how methods **other** than fishing net hole size, could help to prevent overfishing.

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(d) Fig. 4.3 shows part of a food web at the Grand Banks.

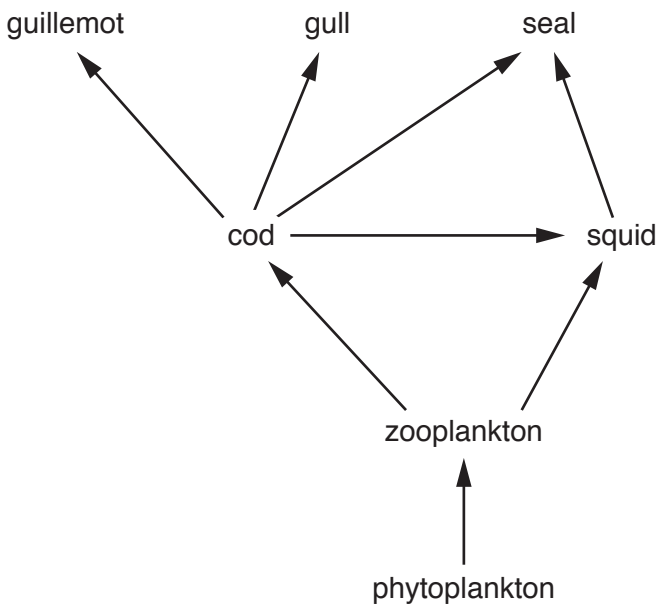

Fig. 4.3

Cod is a species of fish that almost became extinct in the Grand Banks due to overfishing.

Suggest how the extinction of cod could affect the food web in Fig. 4.3.

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.....[4]

(e) Sustainable development is required to manage fish stocks.

Define the term *sustainable development*.

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.....[2]

[Total: 17]

5 The kingdom Fungi contains a great diversity of organisms including yeasts, moulds and mushrooms.

Like plants, fungi contain nuclei and mitochondria.

(a) **(i)** State the function of mitochondria.

.....

.....[2]

(ii) State **two** characteristics of fungi that are used to distinguish them from plants.

1 .....

2 .....
[2]

(b) Yeast is a single-celled fungus that is used in bread-making.

Explain why yeast is used in bread-making.

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.....[3]

(c) *Penicillium* is a mould fungus that is used to make antibiotics.

(i) Describe how *Penicillium* is used to make the antibiotic penicillin.

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.....[3]

(ii) Explain why antibiotics can be used to treat bacterial infections but not viral infections.

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.....[1]

(d) Some fungi are human pathogens.

Describe how the human body prevents pathogens from entering.

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.....[3]

[Total: 14]

6 Fig. 6.1 is a flow chart of some of the events that occur to maintain a constant body temperature.

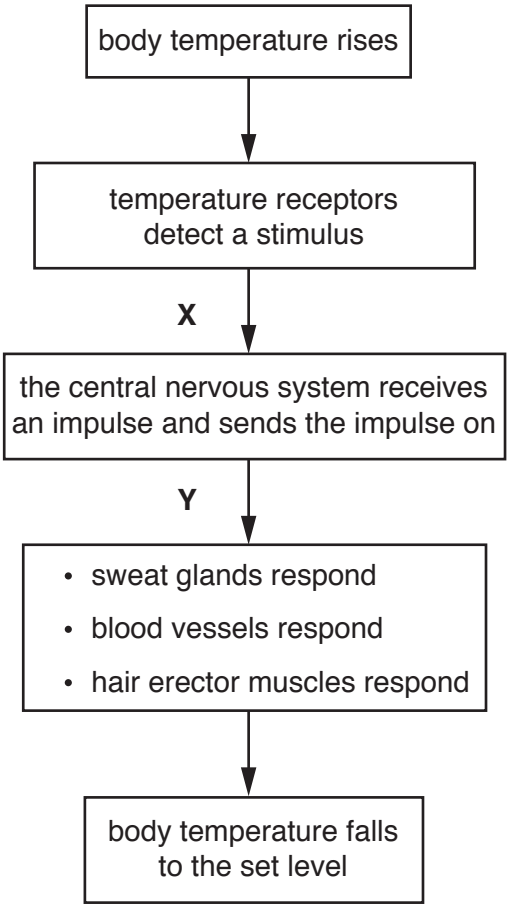

Fig. 6.1

(a) **(i)** State the names of the types of neurones at **X** and **Y** in Fig. 6.1.

X .....

Y .....
[2]

(ii) State the name of **one** effector shown in Fig. 6.1.

.....[1]

(iii) State the name of the mechanism that controls homeostasis which is represented by the flowchart in Fig. 6.1.

.....[1]

(b) **(i)** Describe how shunt vessels in the skin function to help cool the body when the body temperature is high.

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.....[3]

(ii) Describe how the sweat glands and the hair erector muscles function in mammals when the external environment is hot.

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.....[3]

(c) **(i)** Suggest an advantage of using neurones rather than hormones to regulate body temperature.

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.....[1]

(ii) List **two** hormones that are involved in homeostasis.

1 .....

2 .....
[2]

[Total: 13]

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