Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7668065725

BIOLOGY **0610/42**

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 **16** printed pages and **4** blank pages.

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1 **(a)** Red pandas, *Ailurus fulgens*, and humans have a similar arrangement of teeth.

Fig. 1.1 shows a section through one tooth of a red panda. Fig. 1.2 shows the side view of the lower jaw of a red panda.

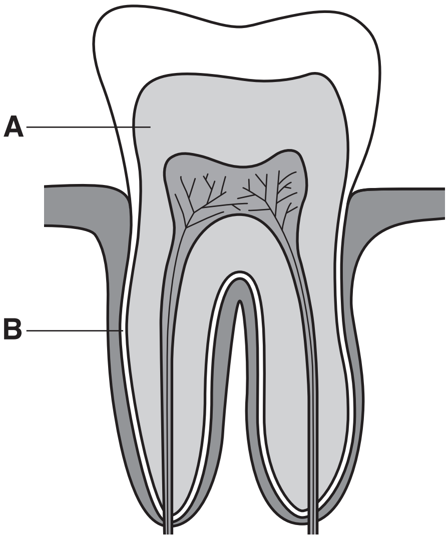

Fig. 1.1

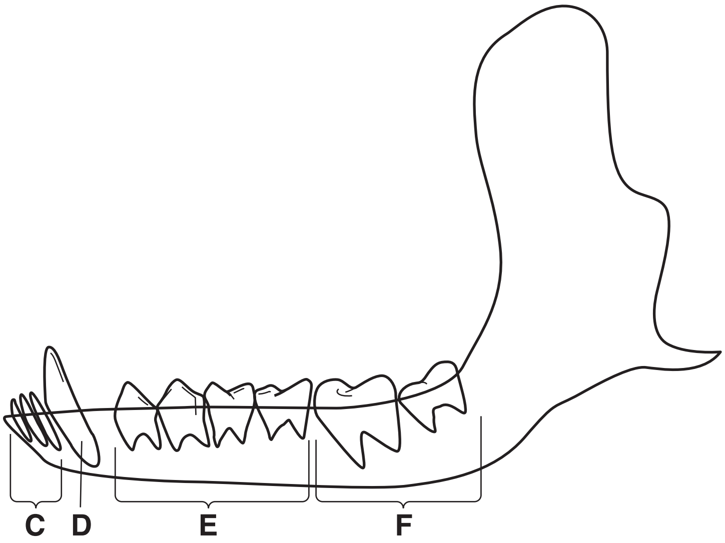

Fig. 1.2

(i) State the names of the structures labelled **A** to **F** in Fig. 1.1 and Fig. 1.2.

A ....

B ....

C ....

D ....

E ....

F ....

[3]

(ii) State the type of digestion that breaks down large pieces of food.

.... [1]

(b) Food that sticks to the teeth can be used by bacteria for anaerobic respiration.

This type of respiration releases a substance that can cause tooth decay.

(i) State the type of substance released by the bacteria, during respiration, that causes tooth decay.

.... [1]

(ii) State the names of the **two** parts of a tooth that are dissolved by the substance released by bacterial respiration.

1 ....

2 ....
[2]

(c) The teeth of red pandas do not decay as much as human teeth.

Suggest the component of a human diet that causes teeth to decay as a result of bacterial respiration.

.... [1]

[Total: 8]

2 Mangrove trees are hydrophytes because they grow in water.

Fig. 2.1 shows a young mangrove tree.

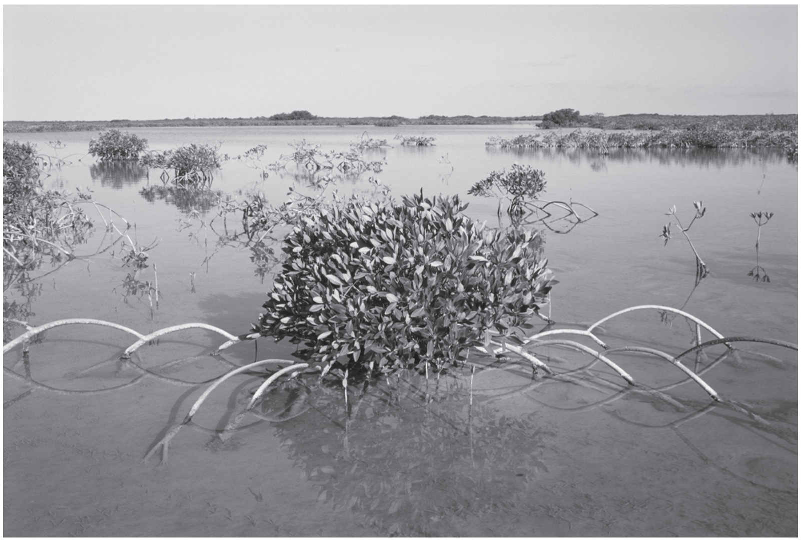

Fig. 2.1

(a) An adaptive feature is a feature that increases the fitness of an organism.

(i) Define the term *fitness*.

....

....

.... [1]

(ii) Mangrove trees have many aerial roots and floating seeds.

Suggest how these adaptive features allow mangrove trees to survive in water.

many aerial roots ....

....

....

floating seeds ....

....

....

[2]

(b) Fig. 2.2 shows a food chain in a mangrove forest.

mangrove tree → fiddler crab → seagull

Fig. 2.2

Table 2.1 gives the number of organisms and their biomass in a mangrove forest.

Table 2.1

organism	number of organisms	biomass of organisms / kg
mangrove trees	1 000	450 000
fiddler crabs	7 500 000	8 000
seagulls	150 000	1 200

(i) Estimate the biomass of one fiddler crab in grams.

Write your answer to two significant figures.

Show your working.

.... g
[2]

(ii) Sketch a **pyramid of numbers**, using the information in Table 2.1, for the food chain shown in Fig. 2.2.

Write the number of each trophic level on the appropriate part of your pyramid.

[3]

(iii) Explain why the shape of a pyramid of biomass, for the information given in Table 2.1, would be different from the shape of your pyramid of numbers.

....

....

....

....

....

....

....

....

.... [4]

[Total: 12]

3 Aphids are insects that feed on the phloem sap in plants.

Fig. 3.1 shows a diagram of an aphid with its mouth parts inserted into the stem of a plant.

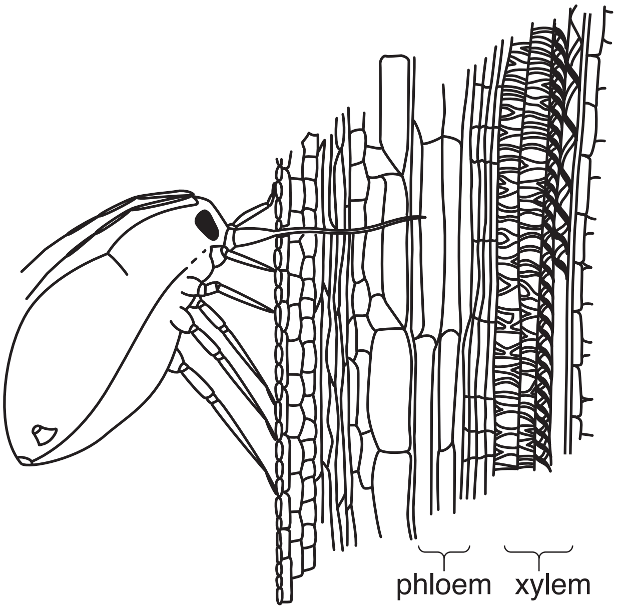

Fig. 3.1

(a) The mouth parts of the aphid reach the phloem tissue of the stem.

(i) State the name of the foods the aphid could suck out of the phloem tissue.

1 ....

2 ....

[2]

(ii) Explain the role of phloem in plant transport. Use the words **source** and **sink** in your answer.

....

....

....

....

....

....

....

....

.... [4]

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(b) Fig. 3.1 shows some of the features of xylem.

Describe how xylem is adapted for its functions.

....

....

....

....

....

....

....

....

....

....

....

....

.... [6]

(c) Some farmers spray their crops with insecticides to kill pests such as aphids.

Explain the benefits of killing pests.

....

....

....

....

.... [2]

[Total: 14]

4 One of the roles of the Centers for Disease Control and Prevention (CDC) in Atlanta, US, is to try to reduce the number of people who are infected with pathogens.

The CDC conducted a survey. They asked women which, if any, contraceptive methods they used.

(a) Suggest why the CDC collected data on contraceptive methods.

....

....

....

....

....

....

.... [3]

Fig. 4.1 shows the results of the survey.

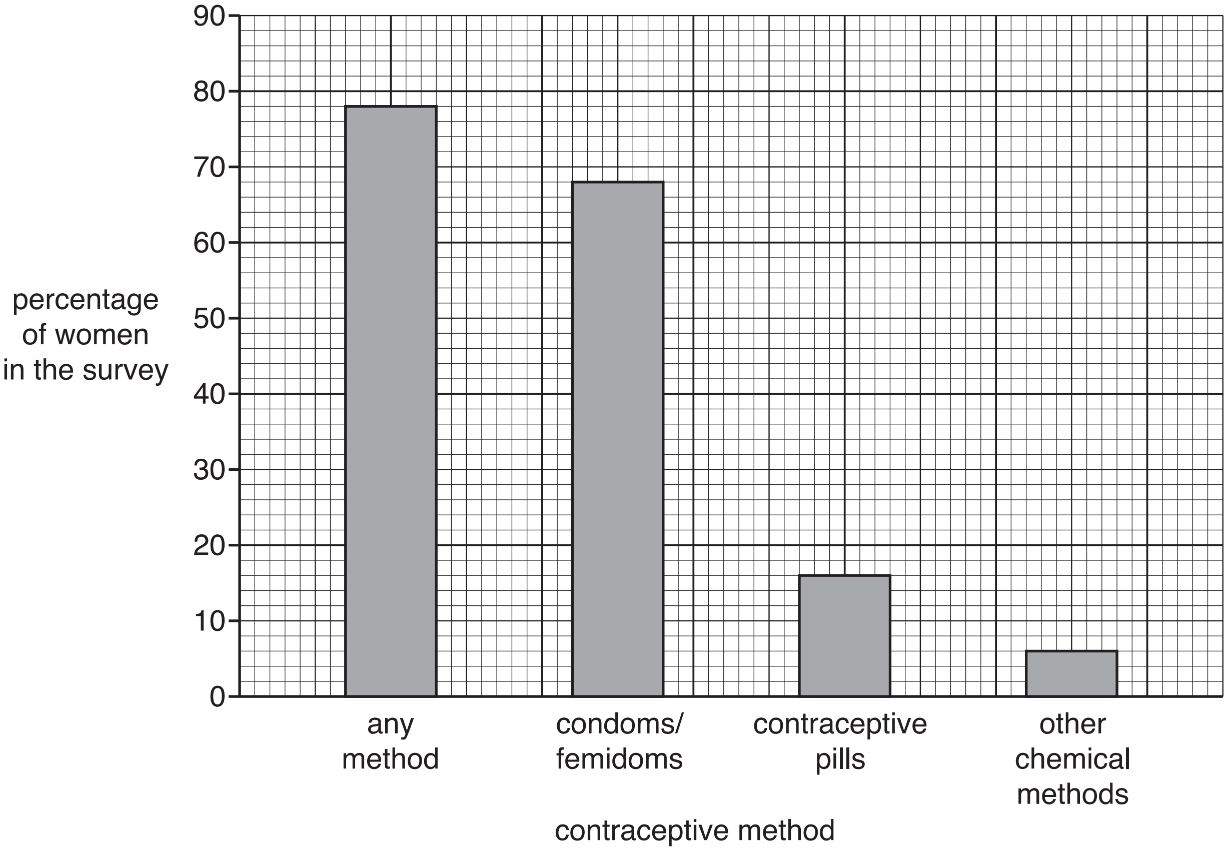

Fig. 4.1

(b) (i) State **two** hormones that are used in contraceptive pills.

1 ....

2 ....
[2]

(ii) Suggest why contraceptive pills do **not** contain FSH.

....

....

....

....

.... [3]

(iii) Give **one** example of 'other chemical methods' (fourth bar) that could be included in the bar in Fig. 4.1.

.... [1]

(iv) State **two** methods of birth control that were not listed in the survey.

1 ....

2 ....
[2]

(v) The percentage of the last three bars in Fig. 4.1 added together is 90%.

Suggest why the percentage of women who used any type of contraceptive method (first bar) is not equal to the sum of the last three bars.

....

....

.... [1]

[Total: 12]

5 Fig. 5.1 shows an adult fly, *Chrysomya megacephala*.

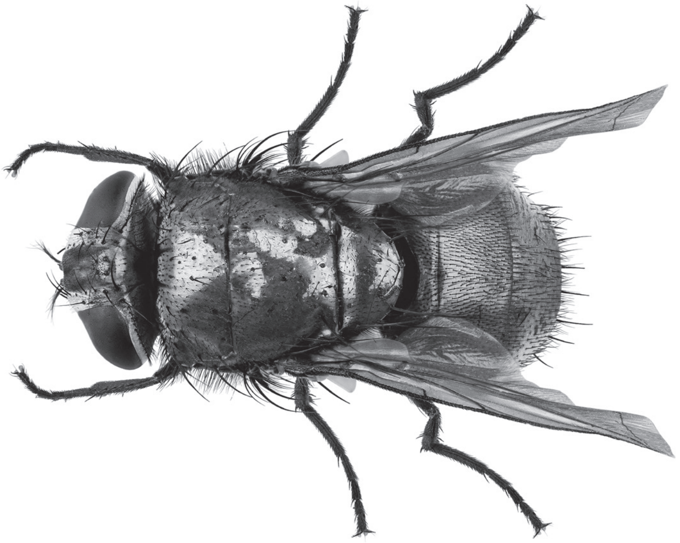

Fig. 5.1

(a) State **three** visible features from Fig. 5.1 that could be used to distinguish adult insects from other arthropods.

1 ....

2 ....

3 ....
[3]

(b) Fly larvae are immature insects that are often used in experiments on respiration.

Give the balanced chemical equation for aerobic respiration.

.... [2]

(c) A respirometer is shown in Fig. 5.2. It can be used to estimate an organism's rate of respiration.

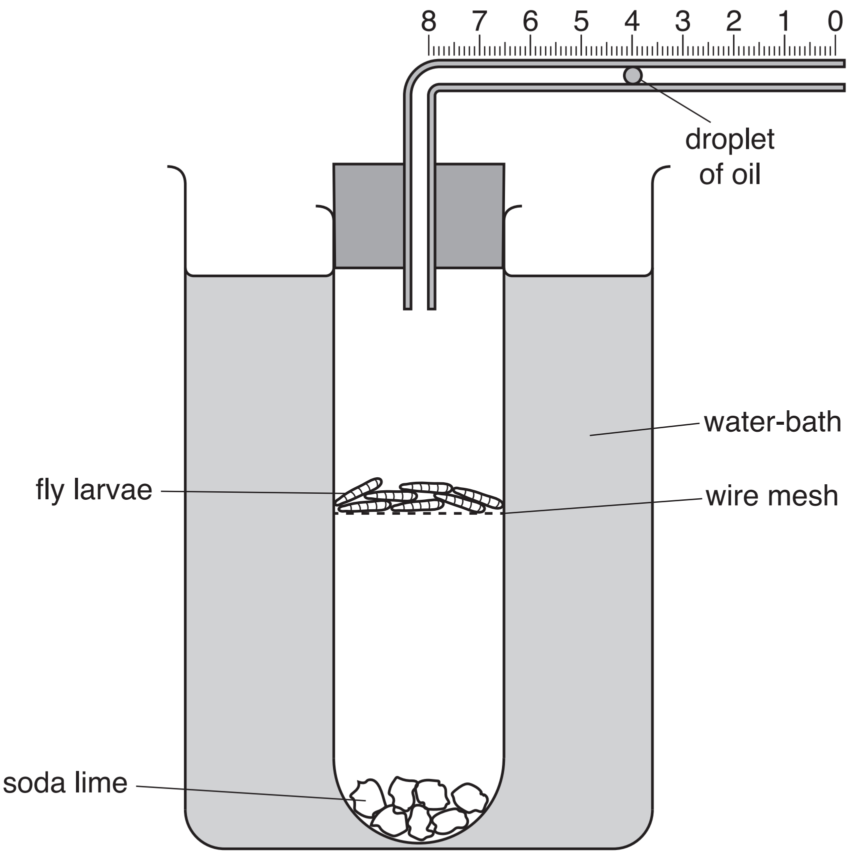
8 7 6 5 4 3 2 1 0
droplet of oil
water-bath
fly larvae
wire mesh
soda lime

Fig. 5.2

(i) Complete the sentences:

A respirometer can be used to calculate the .... of oxygen used by the fly larvae by measuring the .... the droplet of oil moves in one minute. A water-bath is used to .... the temperature of the apparatus.

[3]

(ii) The soda lime in the respirometer absorbs carbon dioxide.

Explain why this is important in this investigation.

....

....

.... [1]

(iii) Fly larvae respire to release energy.

State **two** uses of energy in a fly larva.

1 ....

2 ....

[2]

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(d) A student used a respirometer to investigate the effect of temperature on the rate of respiration of germinating seeds.

Predict the results of this investigation and explain your prediction.

prediction ....

....

....

explanation ....

....

....

....

....

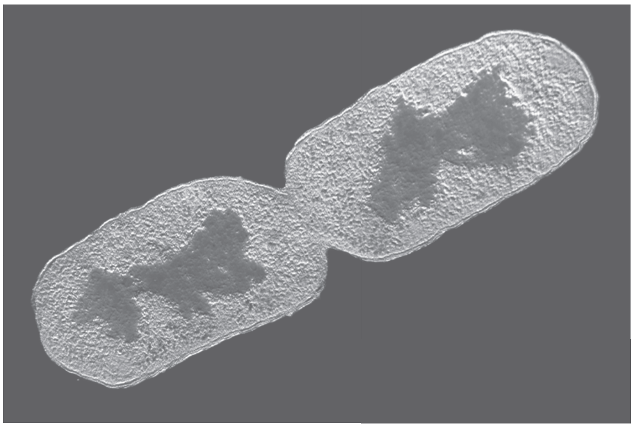
....

[4]

[Total: 15]

6 Bacteria are useful in biotechnology and genetic engineering.

Fig. 6.1 shows a photomicrograph of a bacterium.



magnification ×27 000

Fig. 6.1

(a) State the name of the process that is taking place in Fig. 6.1.

.... [1]

(b) **(i)** Write the formula that would be used to calculate the actual width of the bacterium.

[1]

(ii) The actual width of the bacterium is 0.0008 mm.

Convert this value to micrometres (μm).

Space for working.

.... μm [1]

(c) Genetically modified bacteria can produce human insulin.

(i) State the name of the disease that can be treated with insulin injections.

.... [1]

(ii) Insulin is a protein.

Describe the process of using bacteria in genetic engineering to produce human proteins.

....

....

....

....

....

....

....

....

....

....

.... [5]

(d) Genetically modified bacteria are often grown in fermenters.

(i) Suggest why steam is used to clean fermenters.

....

....

.... [2]

(ii) State **three** conditions inside a fermenter that are measured and controlled.

1 ....

2 ....

3 ....

[3]

(iii) State the name of **one** commercial product, **other than** insulin, that is made in fermenters.

.... [1]

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(e) Crop plants can also be genetically modified.

Describe the advantages of genetically modifying crops.

....

....

....

....

....

....

.... [4]

[Total: 19]

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