Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

8378460959

BIOLOGY **0610/42**

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

The 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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1 Wheat is a crop plant grown to produce flour.

(a) Flour is used to make dough for bread.

(i) State the name of the organism used to make dough rise.

.....[1]

(ii) State the name of the process that this organism uses to produce the gas that makes dough rise.

.....[1]

(b) Farmers grow crop plants such as wheat to provide food.

(i) State **two** types of natural event that could cause widespread food shortages.

1 .....

2 .....
[2]

(ii) The increasing human population is another reason for food shortages.

Explain how the increasing human population contributes to food shortages.

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.....[3]

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(c) Many farmers grow crop plants as monocultures to improve yields.

Fig. 1.1 shows a monoculture of wheat.



Fig. 1.1

Describe the impact of large-scale monocultures on the environment.

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.....[4]

[Total: 11]

2 Many researchers are studying the structure and function of genes.

(a) Define the term *gene*.

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.....[2]

(b) Every living cell is able to make proteins.

The process begins in the nucleus.

Describe how proteins are made in a cell.

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.....[4]

(c) Fig. 2.1 is a diagram of a protein used to move ions across membranes in root hair cells.

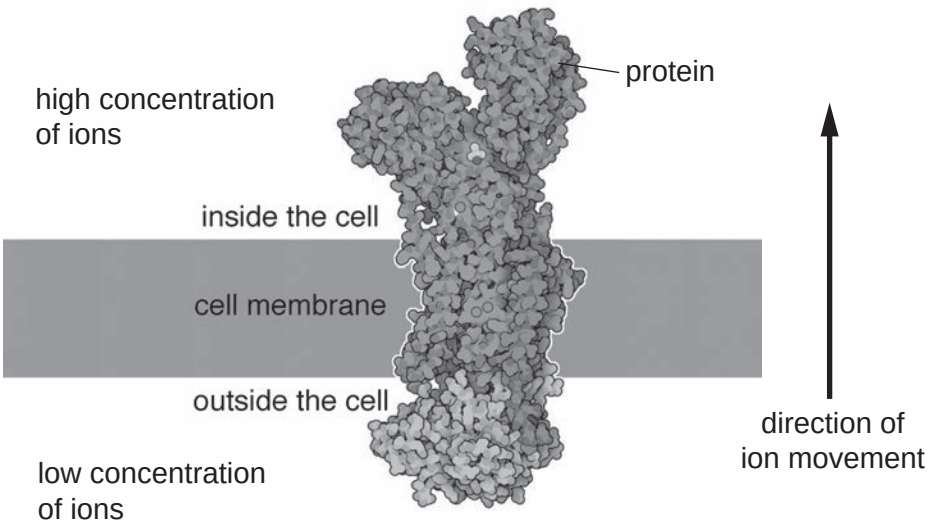


Fig. 2.1

(i) State the name of the process that moves mineral ions into root hair cells through cell membrane proteins.

.....[1]

(ii) Explain how protein molecules move ions across a membrane during this process.

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.....[3]

(d) Proteins are also found in the blood.

State the names of **two** proteins found in the blood.

1 .....

2 .....

[2]

[Total: 12]

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[Turn over

3 Heart rate is influenced by electrical impulses from the brain.

(a) State the name of the type of cell that conducts electrical impulses to the heart.

.....[1]

(b) The electrical activity of the heart can be recorded on an ECG.

Fig. 3.1 shows an ECG of one heartbeat.

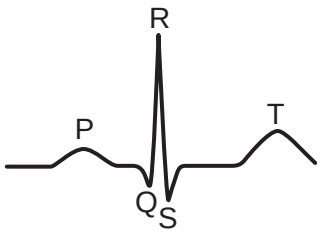


Fig. 3.1

(i) Table 3.1 shows how the electrical activity, during one heartbeat, corresponds to the opening and closing of the valves in the heart.

Complete Table 3.1 using the words 'open' and 'closed'.

Table 3.1

part of the ECG shown in Fig. 3.1	result of electrical activity	atrioventricular valves	semilunar valves
P	atria contract		
QRS	ventricles contract		
T	atria and ventricles relax		

[3]

(ii) State the function of heart valves.

.....

.....[1]

(c) Fig. 3.2 shows the ECG of an athlete before and during exercise.

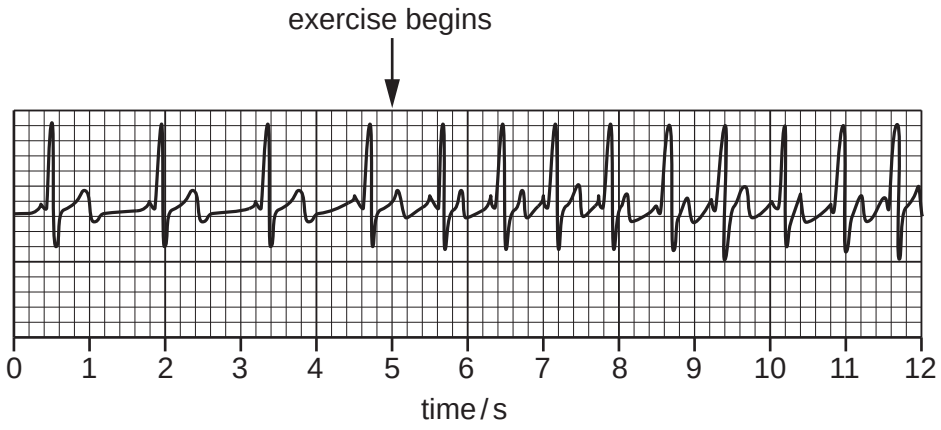


Fig. 3.2

(i) Calculate the heart rate, in beats per minute, **before** exercise begins.

Show your working and give your answer to the nearest whole number.

.....beats per minute
[2]

(ii) Using Fig. 3.2, describe how the electrical activity of the heart during exercise differs from the electrical activity before exercise begins.

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.....[3]

(iii) Describe how the ventilation of the lungs will change while the athlete exercises.

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.....[2]

[Total: 12]

4 A balanced diet is required to ensure healthy weight gain as children grow.

(a) Explain the term *balanced diet*.

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.....[3]

(b) A doctor diagnosed a young child with marasmus.

Describe the symptoms of marasmus.

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.....[3]

(c) The child with marasmus was put on a special diet.

He was given fortified milk, which is milk that has extra nutrients added to it.

The child was encouraged to drink as much fortified milk as he wanted over a period of seven months.

Table 4.1 shows the composition of the fortified milk given to the child and the composition of cow's milk for comparison.

Table 4.1

type of milk	milk composition			
	percentage of protein	percentage of carbohydrate	percentage of fat	energy / kJ dm^{-3}
fortified milk	16.5	57.0	17.0	5468
cow's milk	3.3	4.6	3.9	2845

The body mass of the child who had marasmus and the mean body mass of healthy children of the same age were recorded. The data is shown in Fig. 4.1.

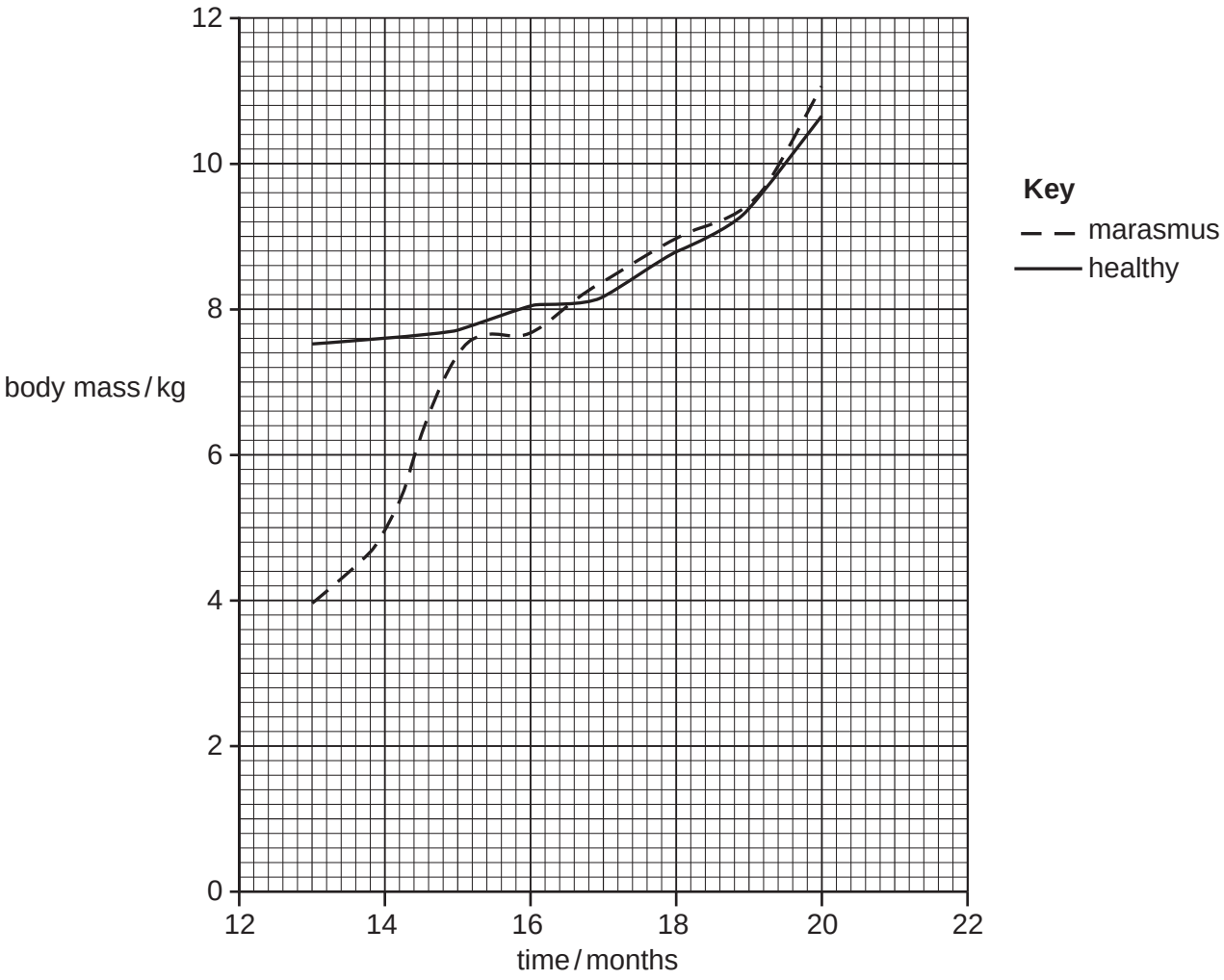


Fig. 4.1

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Using the information in Table 4.1 and Fig. 4.1, describe **and** explain the importance of diet when treating children affected by marasmus.

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.....[6]

(d) It is important that children with marasmus produce enough bile.

Describe the role of bile in the digestion of fats.

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.....[3]

[Total: 15]

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5 Acid rain has negative effects on many ecosystems.

(a) Describe the negative effects of acid rain on freshwater ecosystems, such as streams, rivers and lakes.

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.....[5]

(b) Two groups of students were asked to investigate the effects of acid rain on the germination of pine tree seeds.

(i) Both groups of students decided to use sulfuric acid rather than hydrochloric acid to represent acid rain in their investigation.

Suggest why.

.....

.....[1]

(ii) State how the students could have measured the pH of the sulfuric acid.

.....

.....[1]

(iii) The students provided the environmental conditions that seeds need to germinate.

State **two** of these environmental conditions.

1 .....

2 .....
[2]

(c) One group of students recorded the change in temperature as the seeds germinated in five insulated flasks, labelled **A** to **E**.

(i) Suggest why germinating seeds increase in temperature.

.....

.....

.....[2]

(ii) The students sterilised the seeds before their investigation.

Their teacher told them to use a sterilising solution to wash the seeds because steam would kill the seeds and prevent the seeds from germinating.

Explain why steam sterilisation would prevent seed germination.

.....

.....[1]

The results from this group of students are shown in Table 5.1.

Table 5.1

flask	pH	group 1
		temperature of seeds after 72 hours / °C
A	2.0	20.6
B	3.5	20.3
C	4.0	21.2
D	5.5	34.1
E	7.0	46.2

(iii) Describe the results obtained by group 1.

.....

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.....[2]

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(d) The second group of students placed 100 seeds in each of five Petri dishes, labelled **1** to **5**.

Group 2 used the same range of pH values as group 1.

They recorded the percentage of seeds that had germinated after 72 hours.

Their results are shown in Table 5.2.

Table 5.2

Petri dish	pH	group 2
		percentage of seeds germinated after 72 hours
1	2.0	20
2	3.5	82
3	4.0	19
4	5.5	65
5	7.0	87

The teacher thought that group 2 had forgotten to add the sulfuric acid to one of their Petri dishes.

Suggest which Petri dish was not set up correctly.

.....[1]

[Total: 15]

6 Fig. 6.1 is a flow diagram that shows what happens at the start of a bacterial infection.

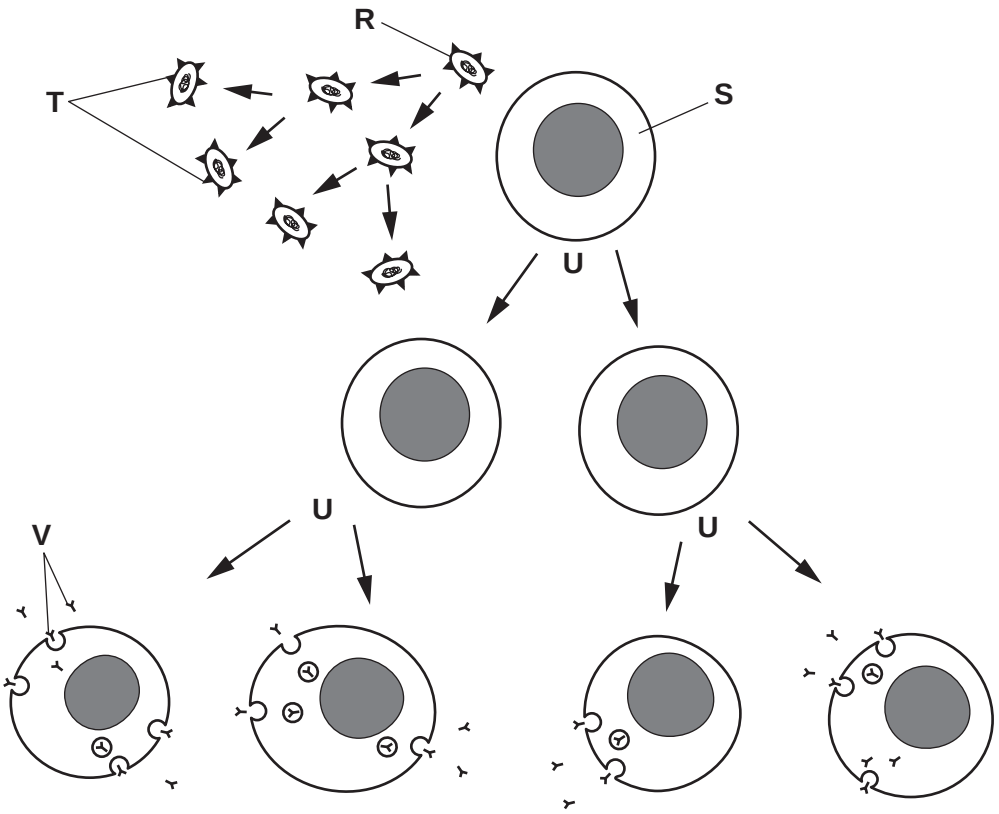


Fig. 6.1

(a) Cell **R** is a prokaryote and cell **S** is a lymphocyte.

(i) State the names of **two** cellular structures that would be found in **both** prokaryotes and white blood cells.

1 .....

2 .....
[2]

(ii) Describe how the cellular structure of white blood cells differs from the cellular structure of prokaryotes.

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.....[3]

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(b) Cell **R** is a pathogen that has structures **T** on its surface. These structures are recognised by cell **S**. Cell **S** is a lymphocyte and it produces structures **V**. Cell **R** reproduces by binary fission and cell **S** divides by process **U**.

Identify **T** to **V** from the passage and Fig. 6.1.

T .....

U .....

V .....

[3]

(c) Cell **W** in Fig. 6.2 also responds to pathogens.

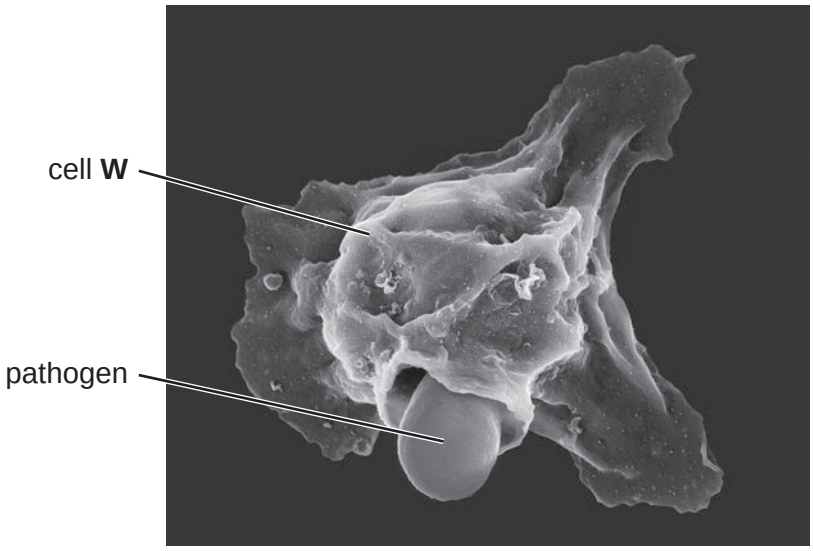


Fig. 6.2

(i) State the name of the process shown in Fig. 6.2.

.....[1]

(ii) Describe what happens to the pathogen during the process shown in Fig. 6.2.

.....

.....

.....[1]

Fig. 6.3 shows some human teeth that require dental treatment.

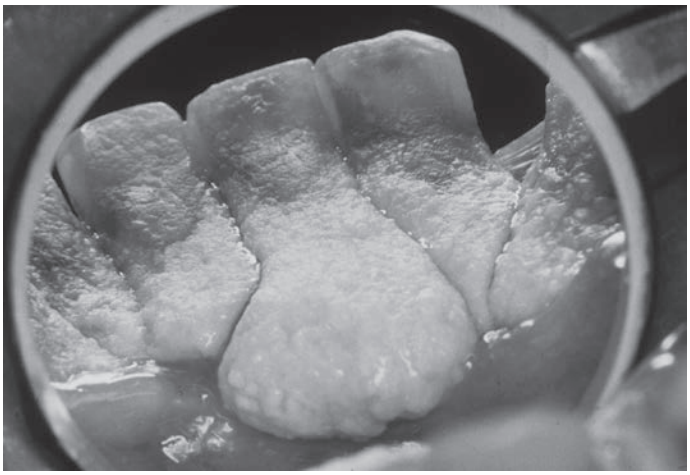


Fig. 6.3

(d) **(i)** Identify the type of teeth in Fig. 6.3.

.....[1]

(ii) Explain how bacteria dissolve enamel to cause tooth decay.

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.....[2]

(e) Describe **two** ways of preventing tooth decay.

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.....[2]

[Total: 15]

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