Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

BIOLOGY **0610/31**

Paper 3 Extended **October/November 2014**

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.

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CAMBRIDGE International Examinations

1 Fig. 1.1 shows some cells from the lining of the trachea.

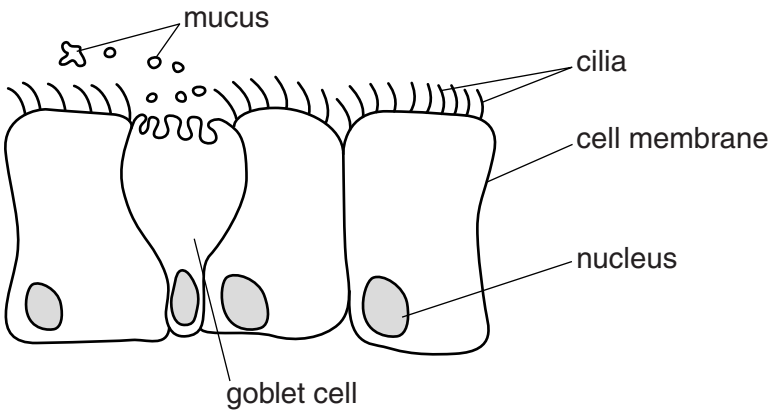

Fig. 1.1

(a) Describe the functions of the nucleus and cell membrane.

View solution

nucleus .....

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cell membrane .....

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..... [4]

(b) The cells in Fig. 1.1 form a tissue.

View solution

Define the term *tissue*.

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..... [1]

(c) The goblet cell secretes mucus.

View solution

Describe the role of mucus and cilia in the trachea.

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..... [3]

[Total: 8]

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2 In tulip plants, the petals can have markings called flecks.
There are two alleles for flecks in tulip plants: with flecks **F**; and without flecks **f**.

(a) Explain the meaning of the term *dominant* allele.

View solution

.....

..... [1]

(b) A tulip grower crosses two tulip plants.

He finds that 76 of the offspring have petals with flecks and 23 of the offspring have petals without flecks.

View solution

(i) Complete the genetic diagram to explain this result.

parental genotypes …… X ……

parental phenotypes …… X ……

gametes (....) (....) X (....) (....)

offspring genotypes …… ……

offspring phenotypes petals with flecks present petals without flecks

[5]

(ii) The tulip grower wants to produce a pure-breeding variety of tulips with petals without flecks.

State the genotypes of the parent plants he should use to produce tulip plants without flecks. Explain your answer.

View solution

parental genotypes …… X ……

explanation .....

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..... [2]

[Total: 8]

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3 The blood of a fetus does not mix with the blood of its mother, but substances are exchanged across the placenta.

(a) Table 3.1 shows five substances that cross the placenta, their direction of movement and the reason for the movement.

View solution

Complete Table 3.1. The second row has been completed for you.

Table 3.1

substance	direction of movement	reason
amino acids		
carbon dioxide	from fetus	waste gas from respiration
glucose		
oxygen		
urea		

[4]

(b) During pregnancy, women are often given dietary advice.

View solution

Explain why pregnant women require more iron and vitamin D in their diet.

iron .....

vitamin D ..... [2]

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(c) Mothers may be encouraged to breast-feed their newborn babies. The first milk that a mother secretes is called colostrum and contains antibodies.

View solution

(i) Name the cells that produce antibodies.

..... [1]

View solution

(ii) Explain why it is important for newborn babies to have antibodies.

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..... [3]

(iii) Some mothers bottle-feed their newborn babies with formula milk rather than breast-feed.

Describe **four advantages** of breast-feeding, **other than** providing antibodies.

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..... [4]

[Total: 14]

View solution

4 Ecologists study plants and animals in their natural environment.
Some ecologists inserted probes into the water-conducting tissue in trees, as shown in Fig. 4.1.
The ecologists measured the time taken for water to move up from probe 1 to probe 2.

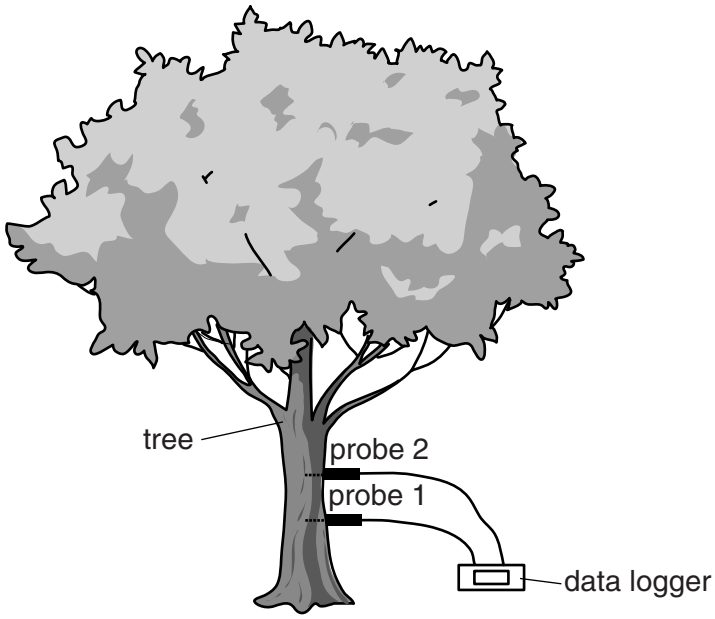

Fig. 4.1

(a) (i) Name the water-conducting tissue into which the two probes were inserted.

View solution

..... [1]

(ii) Describe how the structure of this water-conducting tissue is adapted to its function.

View solution

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..... [2]

(b) Explain the mechanism of water movement from the roots up the tree to the leaves.

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View solution

(c) Fig. 4.2 shows the rate of water conduction up three different trees in a forest over 24 hours.

View solution

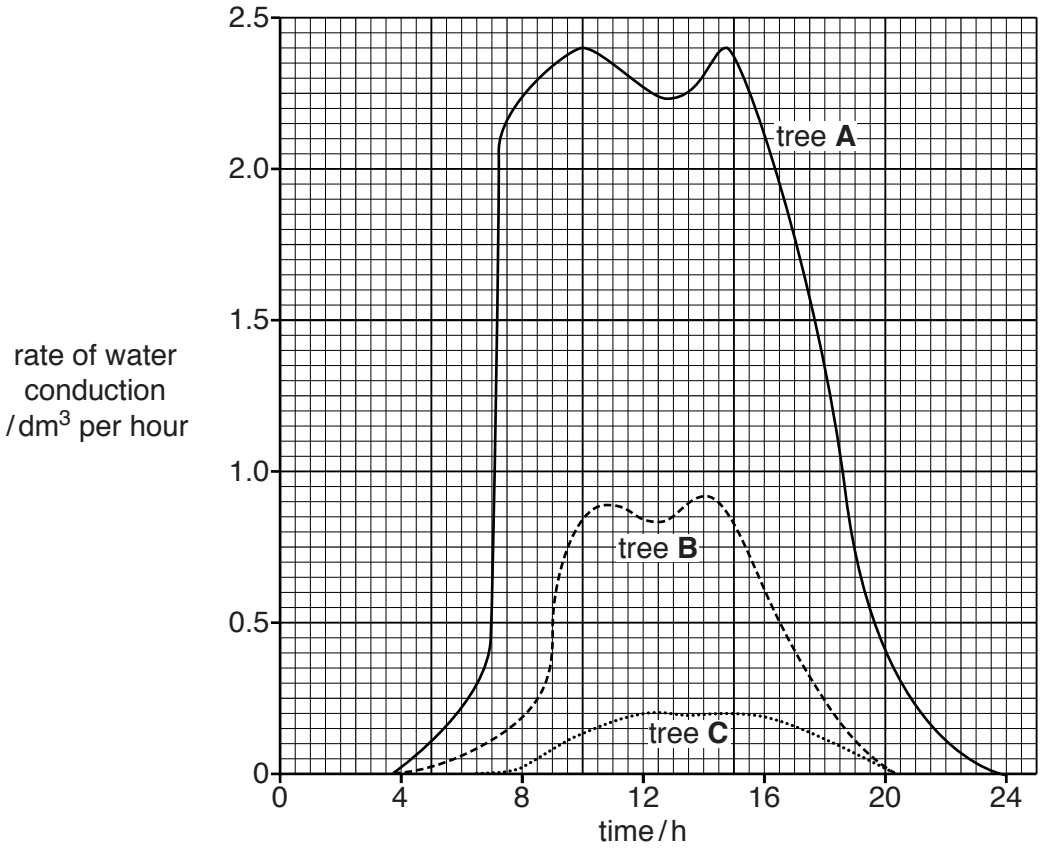

Fig. 4.2

(i) Describe the rate of water conduction in tree **A**, during this 24 hour period.

You will gain credit for using the data in Fig. 4.2 to support your answer.

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..... [3]

(ii) Suggest how the ecologists used the data in Fig. 4.2 to calculate the total volume of water used by a tree in 24 hours.

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..... [1]

(iii) In Fig. 4.2, tree **A** is a tall tree, tree **B** is a medium-height tree and tree **C** is a short tree.

Suggest reasons for the different rates of water conduction in the three trees.

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..... [3]

(d) Loggers often cut down the tall trees in a forest.

View solution

Describe the effects on the forest ecosystem of cutting down trees.

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..... [4]

[Total: 18]

5 Fig. 5.1 shows a species of bacterium, *Lactobacillus bulgaricus*.

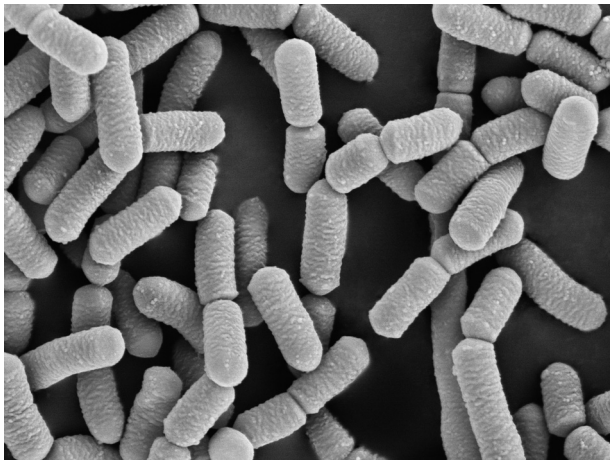

Fig. 5.1

(a) List **two** features that distinguish bacteria from other groups of organisms.

View solution

1 .....

2 ..... [2]

(b) *L. bulgaricus* are added to milk to make yoghurt.

Fig. 5.2 shows the changes in a population of *L. bulgaricus* during fermentation to make yoghurt.

View solution

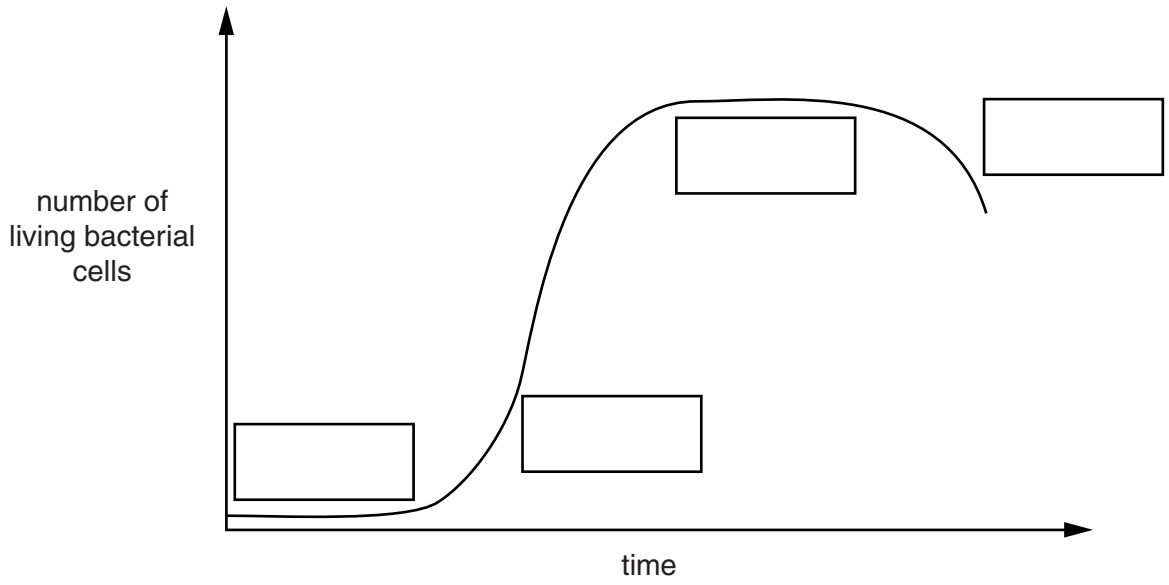

Fig. 5.2

(i) Name the stages shown on Fig. 5.2. Write your answers in the boxes on Fig. 5.2. [4]

(ii) Explain why the population of *L. bulgaricus* does not continue to increase during the fermentation to make yoghurt.

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..... [2]

(c) The curve shown in Fig. 5.2 is a sigmoid population growth curve.

View solution

Define the term *growth*.

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..... [2]

(d) Bacteria, such as *L. bulgaricus*, can reproduce rapidly.

View solution

Name the process of reproduction in bacteria.

..... [1]

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(e) Sometimes food additives are added to yoghurt. Some people suggest that it is healthier to eat yoghurt without additives.



Suggest the advantages and disadvantages of putting food additives into yoghurt.

advantages .....

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disadvantages .....

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..... [4]

[Total: 15]

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6 Microorganisms in the soil release enzymes to digest dead leaves.

(a) Explain how enzymes catalyse chemical reactions.

View solution

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..... [3]

(b) Protease and cellulase are two enzymes secreted by soil microorganisms. Protease digests protein.

Suggest what part of the dead leaf cells are digested by the enzyme cellulase.

View solution

..... [1]

(c) Table 6.1 shows the results of a study comparing the decomposition of dead leaves at two locations **A** and **B**.

View solution

Table 6.1

	location **A**	location **B**
protease activity / μmol min^{-1}	2750	2670
cellulase activity / μmol min^{-1}	4790	2500
soil pH	6.0	3.5
soil water content / %	10	77

(i) Compare the enzyme activity at location **A** with the enzyme activity at location **B**.

You will gain credit for using the data from Table 6.1 to support your answer.

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(ii) Suggest possible reasons for any differences in the enzyme activity at location **A** and location **B**.

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View solution

(d) Describe how nitrogen in proteins in dead leaves is recycled to be absorbed by plants.

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..... [4]

(e) Microorganisms also process and convert atmospheric nitrogen to form a nitrogen compound that can be absorbed by plants.

View solution

(i) Name this process of converting atmospheric nitrogen.

..... [1]

View solution

(ii) Explain how this process happens.

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..... [2]

[Total: 17]

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Copyright Acknowledgements:

Question 4 Figure 4.2 © adapted: Granier; *Tree Physiology 3*; Heron Publishing; 1987.
Question 5 Figure 5.1 © Ref: B220/1875RM; Dr Kari Lounatmaa/Science Photo Library; *Lactobacillus bacteria, SEM*; www.sciencephoto.com.
Question 6 Table 6.1 © adapted: Munch Dilly; *Soil Biology; Biochem 28, no.8*; Elsevier; 1996.

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