Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

2203479952

BIOLOGY **0610/41**

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

DC (ST/JG) 152888/3
© UCLES 2018

CAMBRIDGE International Examinations

1 Fig. 1.1 shows a pyramid of biomass and part of the carbon cycle.

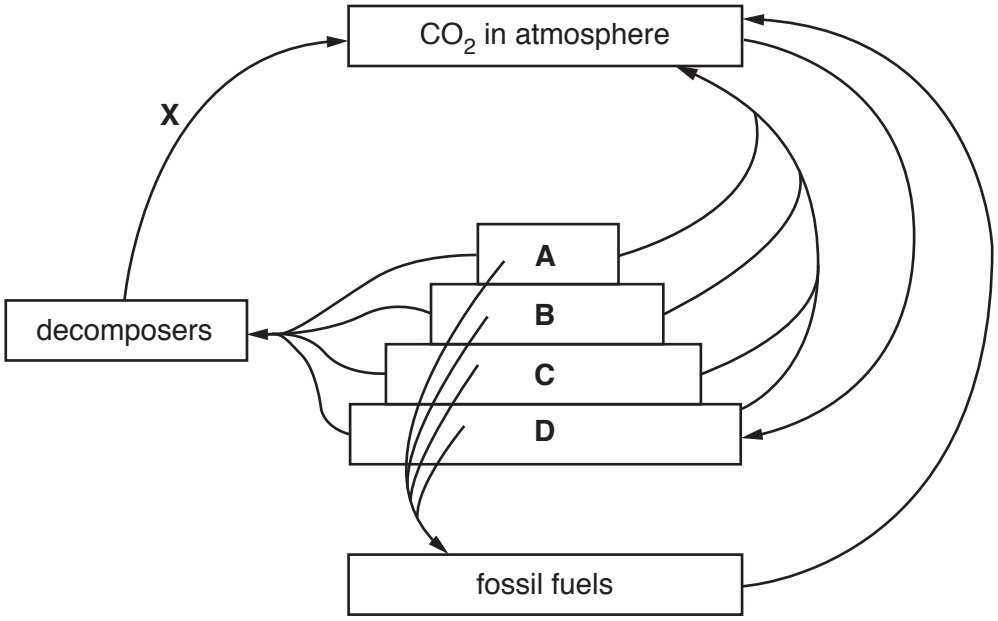

Fig. 1.1

(a) **(i)** State the principal source of energy required for trophic level **D** of the pyramid of biomass in Fig. 1.1.

.....[1]

(ii) State the letter that represents the primary consumers in Fig. 1.1.

..... [1]

(iii) State how carbon is transferred from producers to primary consumers.

.....[1]

(iv) Explain why trophic level **A** is smaller than trophic level **B** in the pyramid of biomass in Fig. 1.1.

.....

.....

.....

.....

.....

.....

.....[3]

© UCLES 2018

(b) Some fungi and bacteria are decomposers.

(i) Define the term *decomposer*.

.....

.....

.....[1]

(ii) Arrow **X** on Fig. 1.1 indicates the transfer of carbon from decomposers to the atmosphere.

State the name of process **X**.

.....[1]

(c) Describe how human activities are affecting the carbon cycle.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 13]

2 Microbiologists test strains of bacteria for antibiotic resistance.

They do this by soaking paper discs in antibiotics and placing them on bacteria growing in Petri dishes.

The paper discs in the centre of Petri dishes **E** and **F** in Fig. 2.1 have been soaked in penicillin.

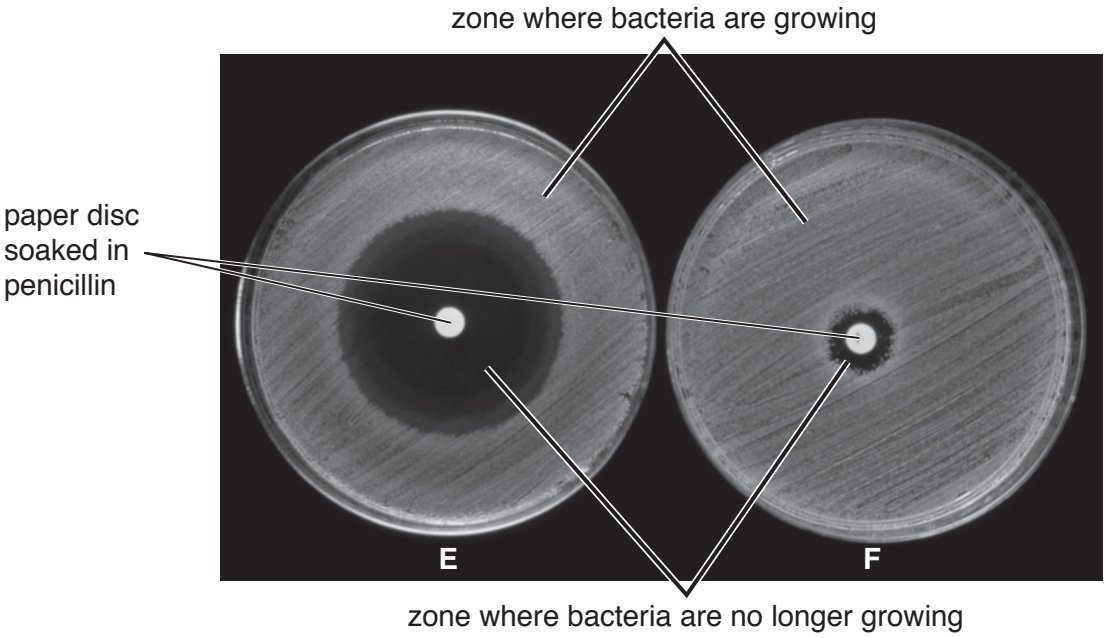

Fig. 2.1

(a) State the **type** of microorganism that produces penicillin.

.....[1]

(b) State **and** explain the evidence from Fig. 2.1 that suggests that the bacteria in dish **F** are resistant to penicillin.

.....

.....

.....

.....

.....[2]

(c) **(i)** Explain how bacteria become resistant to antibiotics **and** how humans can reduce the problem of antibiotic resistance.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

(ii) Explain why viral infections cannot be treated with antibiotics.

.....

.....[1]

(d) Some bacteria and viruses cause disease but many are useful to the biotechnology industry.

Explain why bacteria are useful in biotechnology.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 13]

3 Fig. 3.1 shows a photomicrograph of a section of a root.

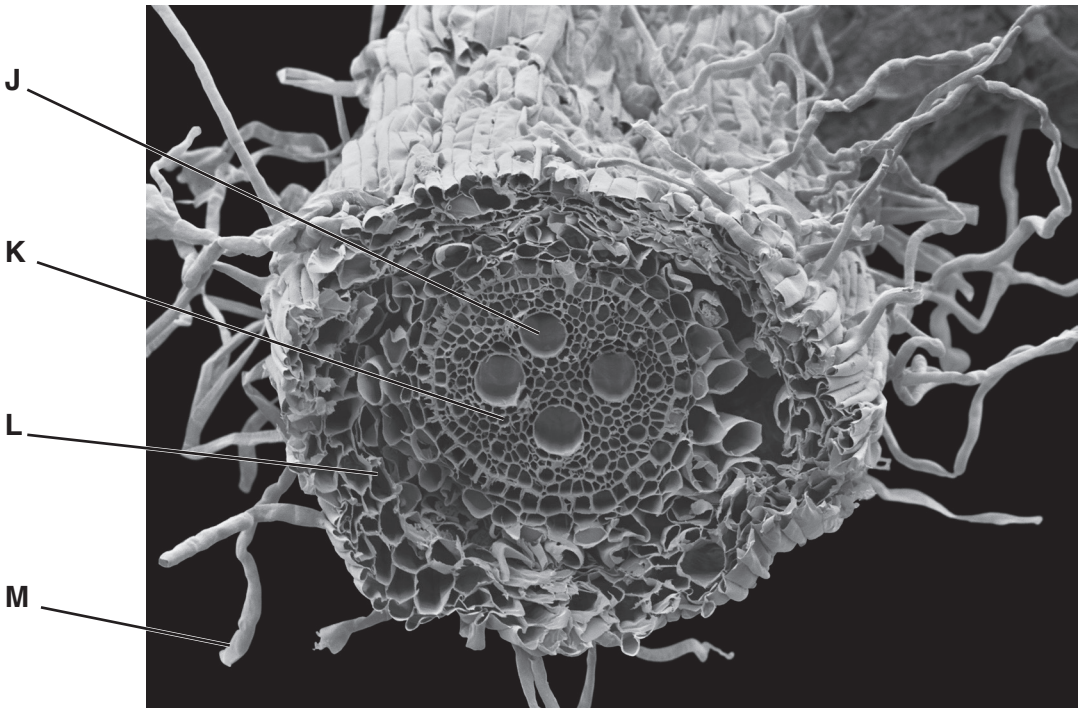

Fig. 3.1

(a) Structure **J** is a xylem vessel.

The xylem vessels conduct water from the roots to the stems.

State the features of xylem vessels that enable them to conduct water.

.....

.....

.....

.....

.....

.....

.....[3]

(b) Describe the pathway of water from outside the root to the xylem vessels (**J**) at the centre of the root. Use the letters in Fig. 3.1 in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

(c) Scientists wanted to determine the flow-rate of water in roots.

They measured the flow-rate in three zones of onion roots as shown in Fig. 3.2.

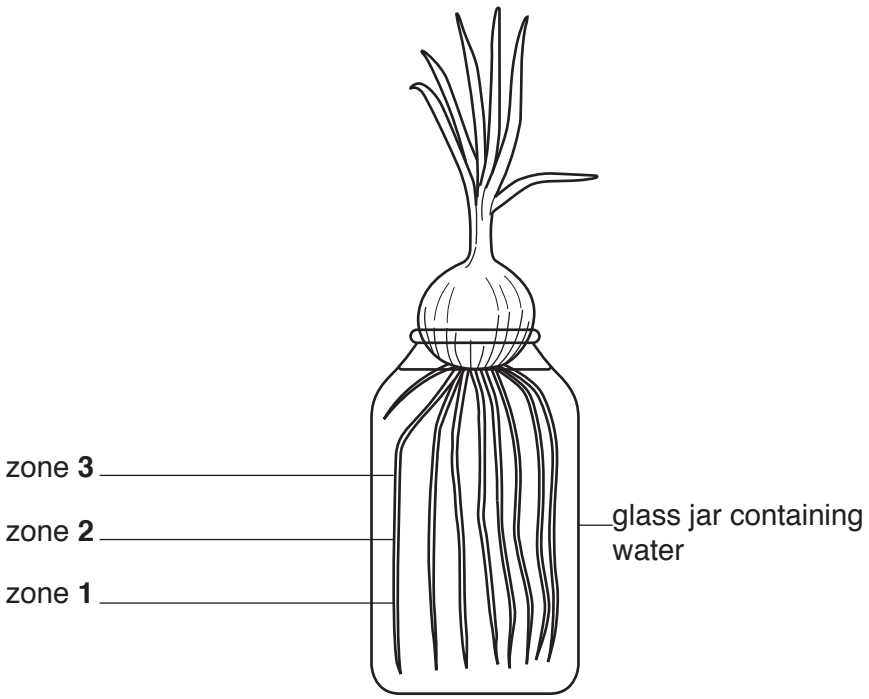

Fig. 3.2

They measured the flow-rate in healthy roots and roots that had been treated with a toxic solution.

Their results are shown in Table 3.1.

Table 3.1

zone in Fig. 3.2	average flow-rate of water / arbitrary units	
	healthy roots	treated roots
1	150	160
2	230	200
3	280	270

(i) Calculate the percentage increase in the average flow-rate between zone **1** and **3** for healthy roots.

Give your answer to **two** significant figures.

Show your working.

..... %
[2]

(ii) The scientists observed that the xylem vessels nearer the root tip were narrower than the xylem vessels higher up the root.

Describe how the width of xylem vessels in different zones of a root affects the average flow-rate of water. Use the information in Table 3.1 in your answer.

.....

.....

.....

.....

.....

.....

.....[3]

(iii) Suggest why there was little difference in the flow-rate in healthy roots and in roots treated with the toxic solution.

.....

.....

.....

.....

.....[2]

[Total: 15]

4 The eye is a sense organ that responds to light.

Fig. 4.1 is a diagram of a section through the human eye.

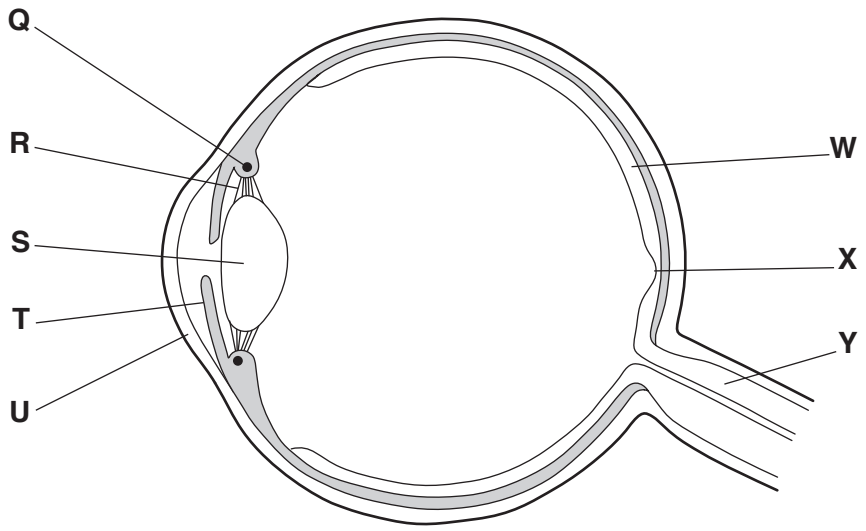

Fig. 4.1

(a) Table 4.1 describes some of the functions of the parts of the eye.

Complete the table by:

- naming the parts of the eye
- using the letters on Fig. 4.1 to identify the parts of the eye.

Table 4.1

function	name of part	letter on Fig. 4.1
carries impulses to the brain		
focuses light onto the back of the eye		
controls the tension of the suspensory ligaments		
tissue that detects light and colour		
location of most of the cone cells		

[5]

(b) **(i)** A pair of muscles in the eye work in opposition to each other to adjust the amount of light entering the pupil.

State the term that describes the action of a pair of muscles working in opposition to each other.

.....[1]

(ii) A different pair of muscles in the eye work in opposition to each other to view objects at different distances from the eye.

State the name of the process that allows the eye to view objects at different distances.

.....[1]

(c) Explain why the eye cannot easily identify different colours in **low** levels of light.

.....

.....

.....

.....

.....[2]

(d) Some people inherit colour blindness and cannot identify certain colours, even in bright light.

The gene responsible for colour vision is located on the X chromosome.

There are two alleles for this gene on the X chromosome:

- X^B – normal colour vision
- X^b – colour blindness.

(i) People that are heterozygous for colour blindness are called carriers.

State the genotype of a heterozygous female carrier.

.....[1]

(ii) There is no gene for colour vision on the male sex chromosome.

State the genotype of a colour-blind male.

.....[1]

Fig. 4.2 shows a pedigree diagram for colour blindness.

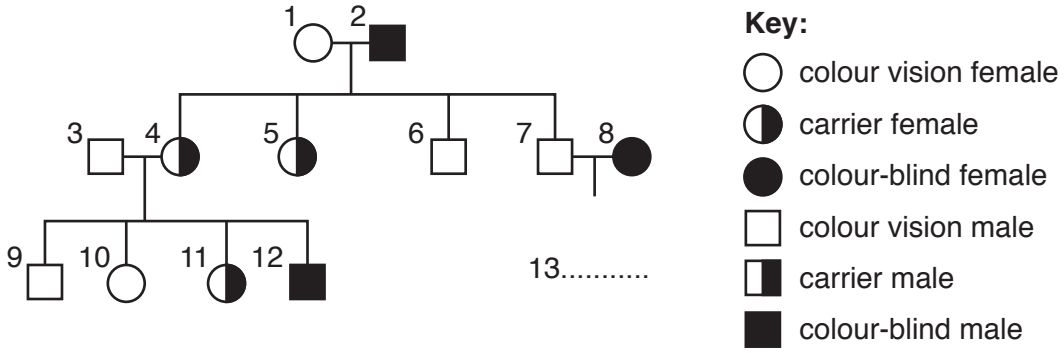

Fig. 4.2

(iii) Person **13** in Fig. 4.2 is male. His parents are person **7** and person **8**.

Use the key to complete Fig. 4.2 by drawing the correct symbol for person **13**. [1]

(iv) Colour blindness is a sex-linked characteristic.

Explain why females **4** and **5** are carriers even though their mother is not a carrier.

.....

.....

.....

.....

.....[2]

[Total: 14]

5 The liver is an important organ in many processes.

(a) The liver responds to changes in insulin concentration.

Insulin is a hormone.

(i) Define the term *hormone*.

.....

.....

.....

.....

.....

.....

.....[3]

(ii) Describe how the liver responds to an increase in insulin concentration.

.....

.....

.....

.....

.....[2]

(b) The liver is also involved in the processing of amino acids.

(i) Describe how excess amino acids are broken down.

.....

.....

.....[2]

(ii) State the name of the process that assembles amino acids to form proteins.

.....[1]

(c) The liver is also involved in the processing of toxins.

(i) Lactic acid is an example of a toxin that is produced during vigorous exercise and processed in the liver.

Describe how lactic acid is processed.

.....

.....

.....[2]

(ii) Alcohol is another toxin that is processed in the liver.

The effect of alcohol consumption on the risk of dying from liver disease was investigated in men and women.

The results are shown in Fig. 5.1.

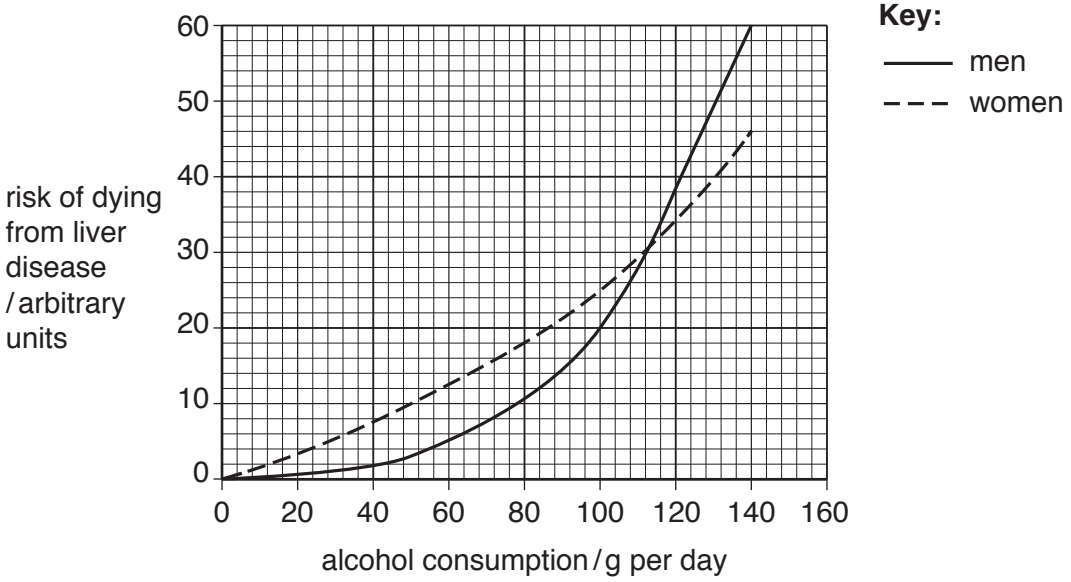

Fig. 5.1

Describe the results shown in Fig. 5.1.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 14]

6 Young mammals that are orphaned can be bottle-fed.

Fig. 6.1 shows a newborn tiger cub sucking on a bottle.

Fig. 6.1

(a) **(i)** Sucking is an example of an involuntary action observed in newborn mammals.

State the name given to involuntary actions.

.....[1]

(ii) Describe the advantages of breast-feeding compared with bottle-feeding.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

(b) The digestive systems of young mammals are not fully developed.

Enzymes such as amylase, maltase and protease are often added to baby food to aid chemical digestion.

(i) Complete Table 6.1 by stating the substrate and product(s) for each enzyme reaction.

Table 6.1

enzyme	substrate	product(s)
amylase		
maltase		
protease		

[3]

(ii) Suggest why the temperature of baby food must be controlled when the enzymes are added.

.....

.....

.....[2]

(iii) State **one** other condition that must also be controlled to optimise enzyme activity.

.....[1]

[Total: 11]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2018