Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

BIOLOGY **0610/31**

Paper 3 Extended **May/June 2015**

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

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1 **(a)** Fig. 1.1 shows five species of mollusc.

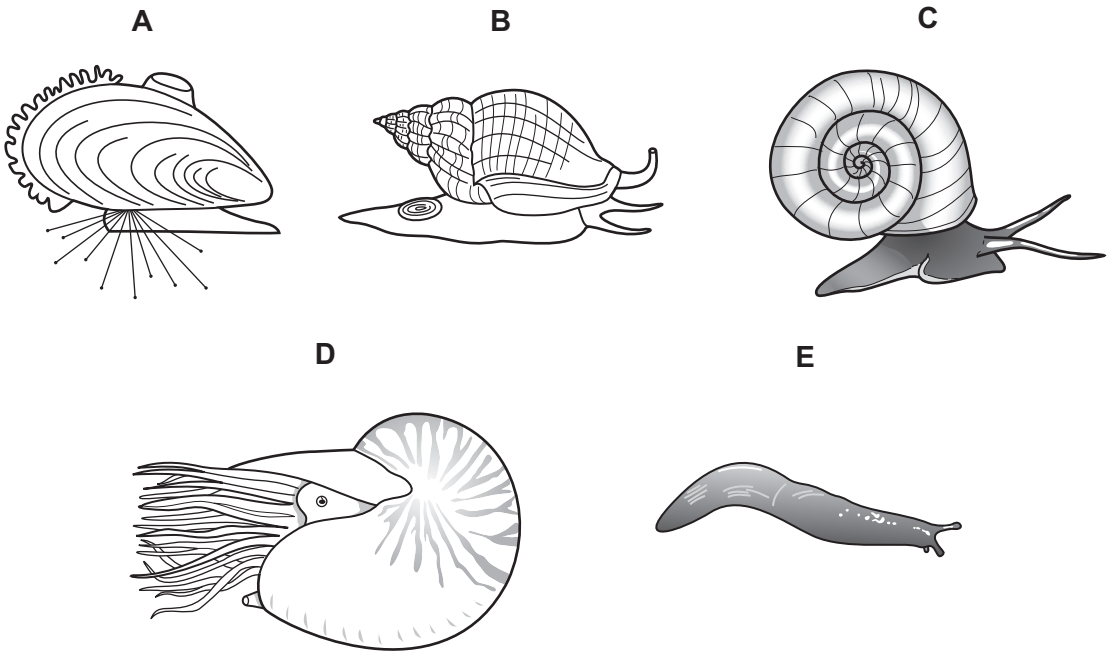

Fig. 1.1

Use the key to identify each species. Write the letter of each species (**A** to **E**) in the correct box beside the key.

Key

1 (a)	body is completely or partly covered in a shell	go to 2	
(b)	body is not completely covered or partly covered in a shell	*Limax flavus*	
2 (a)	shell is attached to rocks by thin threads	*Mytilus edulis*	
(b)	shell is not attached to rocks by thin threads	go to 3	
3 (a)	shell is a spire that comes to a point	*Buccinum undatum*	
(b)	shell is not a spire that comes to a point	go to 4	
4 (a)	animal has tentacles	*Nautilus pompilius*	
(b)	animal has 2 tentacles	*Planorbis planorbis*	

[3]

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(b) State **two** features that are shown by all molluscs.

1 .....

2 .....
[2]

[Total: 5]

2 A student carried out an investigation to find the effect of carbon dioxide concentration on the rate of photosynthesis of an aquatic plant.

The apparatus that the student used is shown in Fig. 2.1. The student was advised to use a light meter positioned at the same distance from the lamp as the pond plant. The student counted the number of bubbles produced by the cut end of the stem.

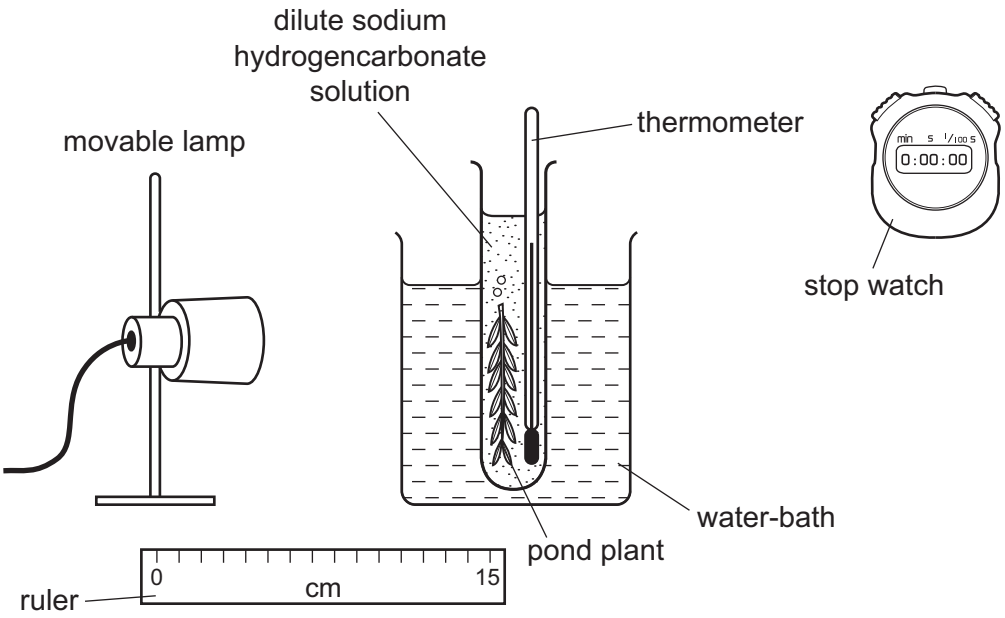

Fig. 2.1

(a) Explain why the student included the following in the apparatus.

(i) The beaker of water and the thermometer.

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.....[2]

(ii) The light meter and the ruler.

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.....[2]

(b) The results obtained by the student are shown in Fig. 2.2.

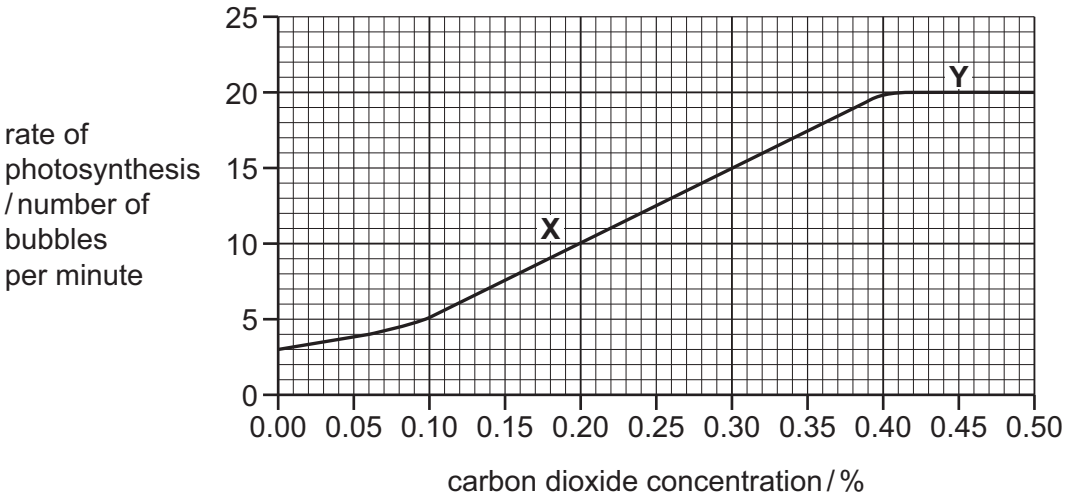

Fig. 2.2

(i) Describe the student's results.

You will gain credit if you use data from Fig. 2.2 in your answer.

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.....[3]

(ii) State the factor that is limiting the rate of photosynthesis in region **X** of the graph.

.....[1]

(iii) Suggest **and** explain the reasons for the shape of the graph in region **Y**.

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.....[4]

(c) Counting bubbles may not be the best way to measure the rate of photosynthesis. The volume of the bubbles is not always exactly the same.

Suggest and explain **one** alternative way of measuring the gas given off to solve this problem.

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.....[3]

(d) Fig. 2.3 shows the carbon dioxide concentration in the atmosphere as determined at Mauna Loa in Hawaii between 1959 and 2013.

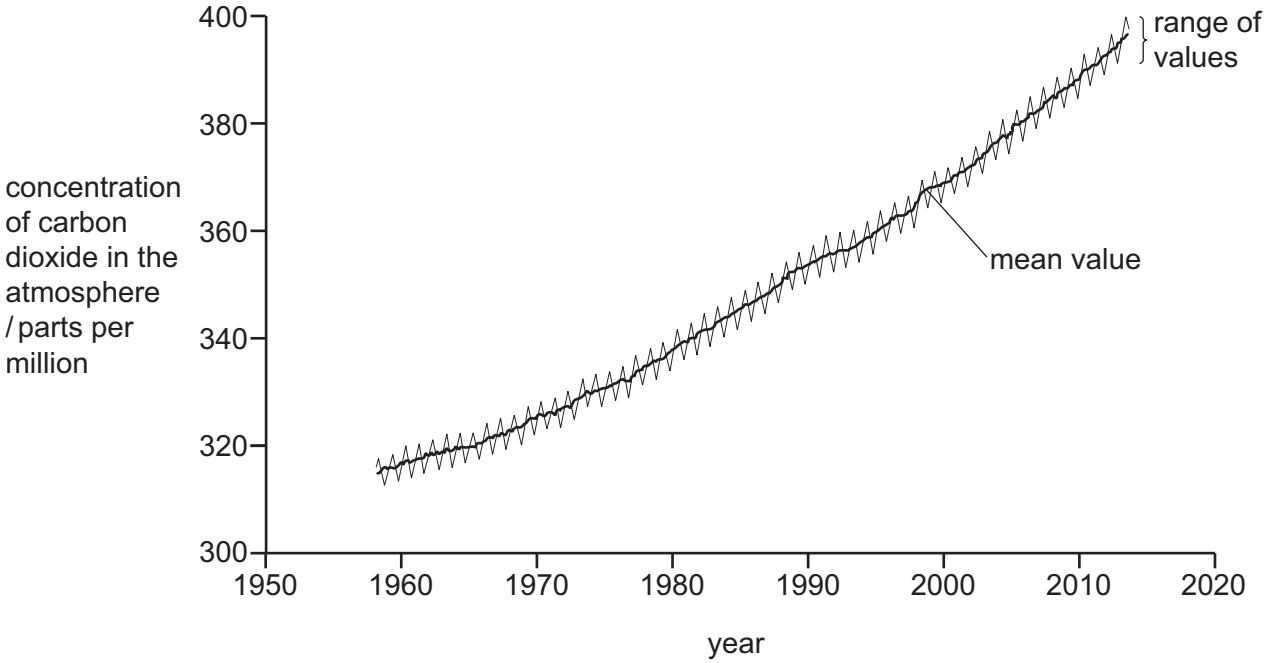

Fig. 2.3

(i) Explain why the concentration of carbon dioxide has increased between 1959 and 2013.

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.....[2]

(ii) Global warming is largely due to this increase in atmospheric carbon dioxide.

Explain how increases in atmospheric carbon dioxide concentrations contribute to global warming.

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.....[4]

[Total: 21]

3 The menstrual cycle is coordinated by hormones secreted by the pituitary gland and hormones secreted by the ovaries.

Fig. 3.1 shows some of the events that occur during the menstrual cycle.

H	FSH is secreted by the pituitary gland
J	oestrogen stimulates repair and growth of the lining of the uterus
K	one or more follicles start to develop in an ovary
L	ovulation occurs
M	oestrogen is secreted by follicle cells
N	LH is secreted by the pituitary gland
O	oestrogen inhibits secretion of FSH

Fig. 3.1

(a) Put the stages into the correct sequence. Two have been done for you.

H						**L**

[2]

(b) **(i)** Describe what happens at ovulation.

.....

.....

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.....

.....[2]

(ii) Name the cell produced at fertilisation by the fusion of two gametes.

.....[1]

(c) If an embryo implants in the uterus, the embryo secretes a hormone known as hCG that stimulates the reproductive organs of the woman to continue to secrete progesterone.

Describe what happens after fertilisation until the time that the embryo secretes hCG.

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.....[5]

(d) State **two** places where progesterone is produced during pregnancy.

1 .....

2 .....
[2]

(e) **(i)** Fertility drugs are taken to increase the chance that a woman may become pregnant.

Describe **and** explain how these drugs improve the chances of becoming pregnant.

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.....[3]

(ii) Outline **two** social implications of using fertility drugs.

1 .....

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2 .....

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[2]

[Total: 17]

4 A biologist made a slide of some epidermal cells from a scale leaf of an onion bulb.

Fig. 4.1 is a drawing that the biologist made of one of the cells.

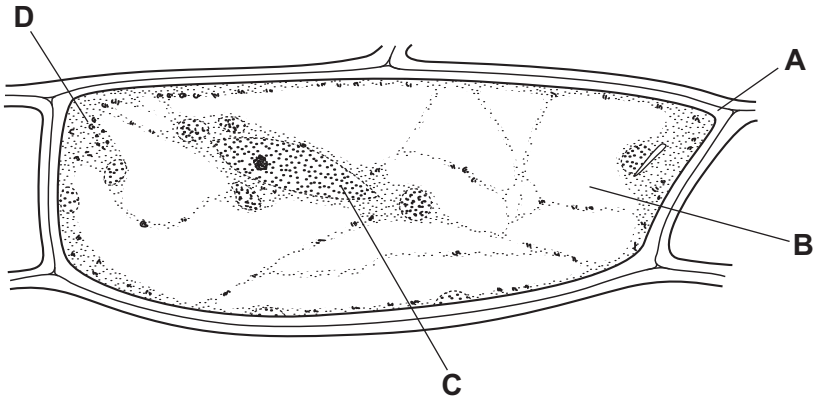

Fig. 4.1

(a) Table 4.1 shows the functions of the structures within a plant cell.

Complete the table by:

naming the part of the cell that carries out each function

using the letters from Fig. 4.1 to identify the part of the cell named.

Table 4.1

function	letter from Fig. 4.1	name
resists the turgor pressure of the cell		
controls the activities of the cell		
site of the chemical reactions of the cell including synthesis of proteins		

[3]

(b) The biologist added a few drops of concentrated salt solution to the cells on the slide and took a photograph of the cells, as shown in Fig. 4.2.

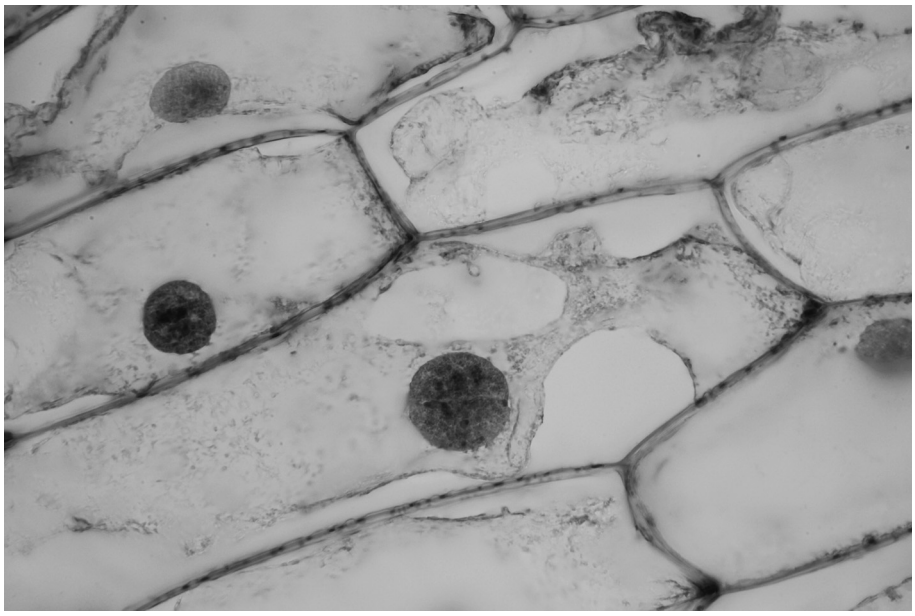

Fig. 4.2

(i) With reference to Fig. 4.2, describe the effect on the plant cells of adding a concentrated salt solution.

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.....[3]

(ii) Use the term **water potential** to explain the effect you have described.

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.....[3]

[Total: 9]

5 Mammals have a double circulation system.

(a) Explain what is meant by a double circulation system.

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.....[1]

(b) Table 5.1 shows some of the main organs in a mammal and the vessels that deliver blood and take it away.

Complete the table.

Table 5.1

organ	blood vessel	
	delivers blood	takes blood away
heart	1 ..... 2 ..... vein	1 aorta 2 ..... artery
lungs	pulmonary artery	.....
liver	1 hepatic artery 2	hepatic vein
kidney	..... artery	..... vein

[5]

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(c) Table 5.2 shows the blood pressure in the different blood vessels that supply and drain a muscle in the leg.

Table 5.2

blood vessel	mean blood pressure / kPa
aorta	13
femoral artery	12
distributing / muscular artery	9
arteriole in muscle	6
capillary in muscle	4–1.3
venule in muscle	1.1
femoral vein	< 1.0

(i) The table shows that the mean blood pressure decreases from 13 kPa in the aorta to 6 kPa in the arterioles.

Explain why blood pressure must decrease in the arterioles before entering the capillaries.

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.....[2]

(ii) Explain how blood returns to the heart in the femoral vein against the pull of gravity.

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.....[3]

(d) Fig. 5.1 shows a section across part of an artery.

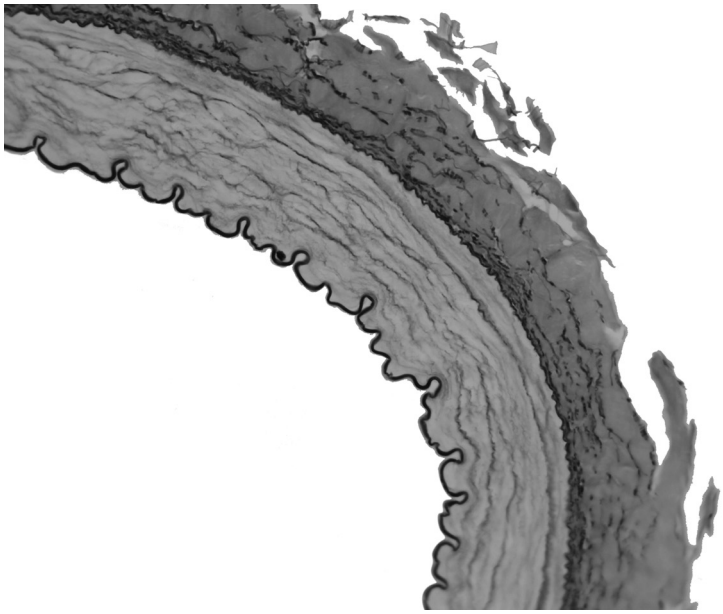

Fig. 5.1

With reference to Fig. 5.1, explain how the structure of an artery is related to its function.

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.....[3]

[Total: 14]

6 Moose, *Alces americanus*, shown in Fig. 6.1, are large herbivores that primarily live in northern parts of North America. They have a varied diet that includes young shoots of willow trees and aquatic plants.

Fig. 6.1

Isle Royale is a large island in Lake Superior in the United States where there is a population of moose that has been studied by ecologists for a long time. The animals' only predator is the wolf. The island has a population of wolves that has changed in numbers over the years.

(a) **(i)** Draw a food chain for the organisms in the passages above.

[2]

(ii) Complete Table 6.1 by stating the name and identifying the trophic level of each organism in the food chain.

Table 6.1

name of organism	trophic level

[3]

(iii) State **two** factors that influence the numbers of a top predator, such as wolves.

1 .....

2 .....

[2]

(b) In the 1970s, the American ecologist Paul Colinvaux investigated the energy flow between moose and wolves.

His results are summarised in Table 6.2.

Table 6.2

energy input or output or energy flow	energy / MJ
consumed by moose	4 320 000
respiration of moose	380 000
consumed by wolves	56 000
respiration of wolves	53 000

(i) Calculate the percentage of the energy obtained by the moose that is consumed by the wolves. Show your working.

..... % [2]

(ii) Explain why the number of wolves on Isle Royale has never risen above 50 while the highest number of moose recorded is 2450.

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.....[5]

[Total: 14]

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