UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

7596256075

BIOLOGY **0610/31**

Paper 3 Extended **May/June 2013**

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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, 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 document consists of **19** printed pages and **1** blank page.

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1 **(a)** Fig. 1.1 shows the human head, neck and thorax.

For Examiner's Use

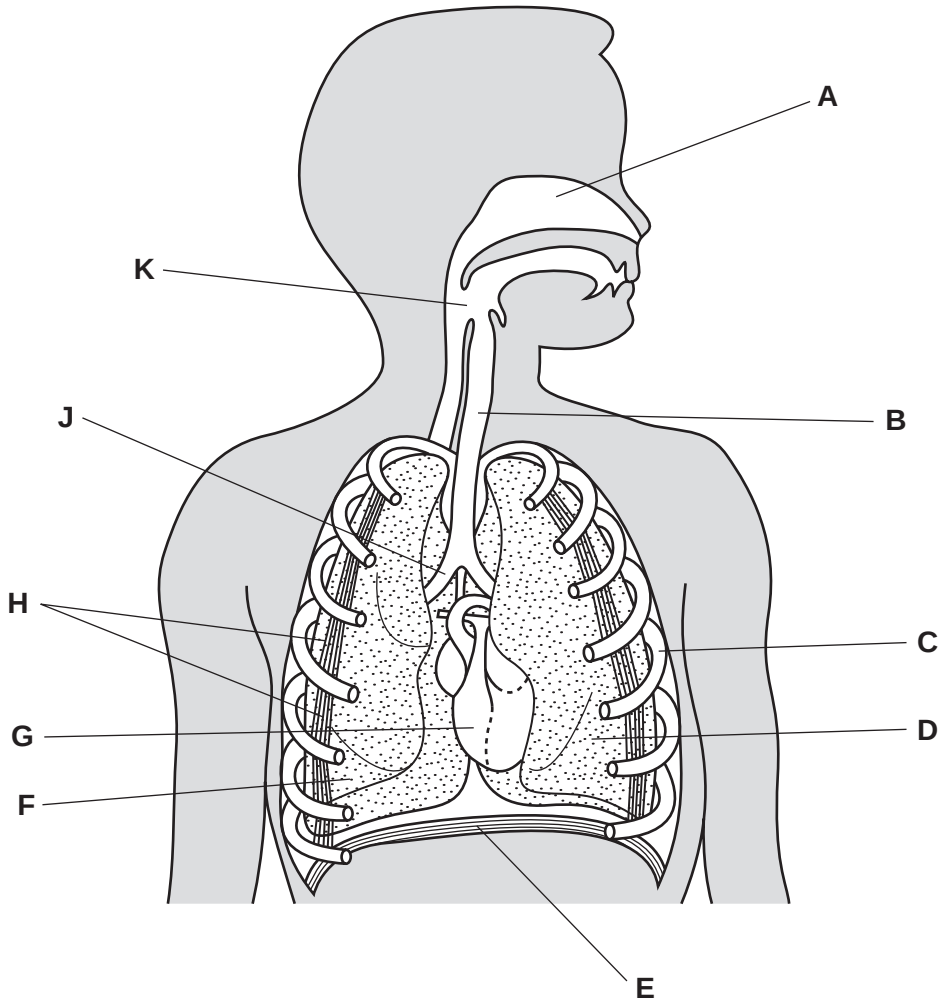


Fig. 1.1

Complete Table 1.1 by writing **one** letter from Fig. 1.1 to identify the named structures.

The first one has been done for you.

Table 1.1

structure	letter from Fig. 1.1
left lung	**D**
bronchus	
diaphragm	
intercostal muscle	
rib	
trachea	

[5]

For Examiner's Use

(b) In an investigation, a student breathed in and out of the apparatus shown in Fig. 1.2.

Valve **X** opens to allow atmospheric air in while valve **Y** is closed.

When the student breathes out, valve **X** is closed and valve **Y** opens to allow breathed out air into the bag.

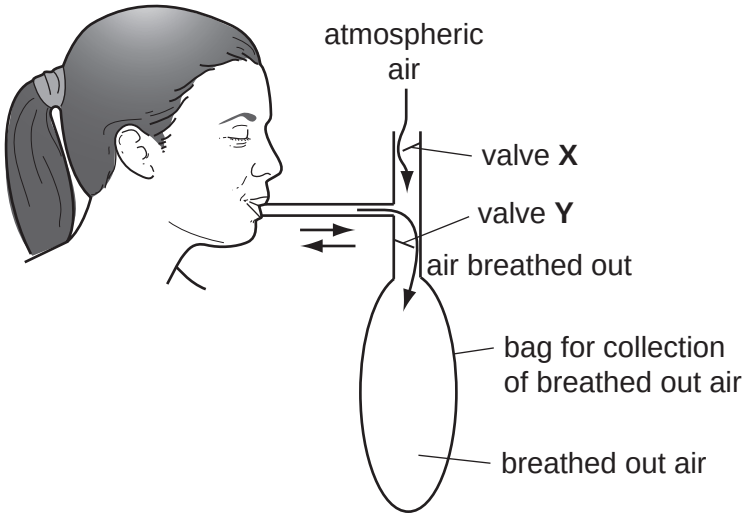


Fig. 1.2

The student breathed in and out **four times**. The bag was sealed and the volume of air inside the bag was measured.

A sample of air from the bag was analysed for the percentage composition of oxygen, carbon dioxide and nitrogen.

The student then did some vigorous exercise for five minutes. After the exercise, the student repeated the procedure.

The results of the investigation are shown in Table 1.2.

Table 1.2

	sample of breathed out air	
	before exercise	after exercise
total volume of air collected in bag / cm^3	2 000	15 000
mean volume of air per breath / cm^3	500	
percentage of oxygen / %	17.2	15.3
percentage of carbon dioxide / %	3.6	5.5
percentage of nitrogen / %	74.9	74.7

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For Examiner's Use

(i) Calculate the mean volume of air per breath after exercise.

Write your answer in Table 1.2.

Show your working.

[1]

(ii) Suggest **one** way, **not shown** in **Table 1.2**, in which the student's breathing changed after exercise.

.....

..... [1]

(iii) The figures in Table 1.2 for the percentage composition of air in each sample do not add up to 100 %.

Name **one** other gas that would be present in **both** samples of air.

..... [1]

(iv) The results for oxygen and carbon dioxide in the samples of breathed out air taken before and after exercise are different.

Describe **and** explain these differences.

.....

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.....

.....

..... [3]

[Total: 11]

2 Fig. 2.1 shows the flow of energy through a natural ecosystem that is **not** used by humans at any of the trophic levels.

For Examiner's Use

The unit of energy flow is kJ per m^2 per year.

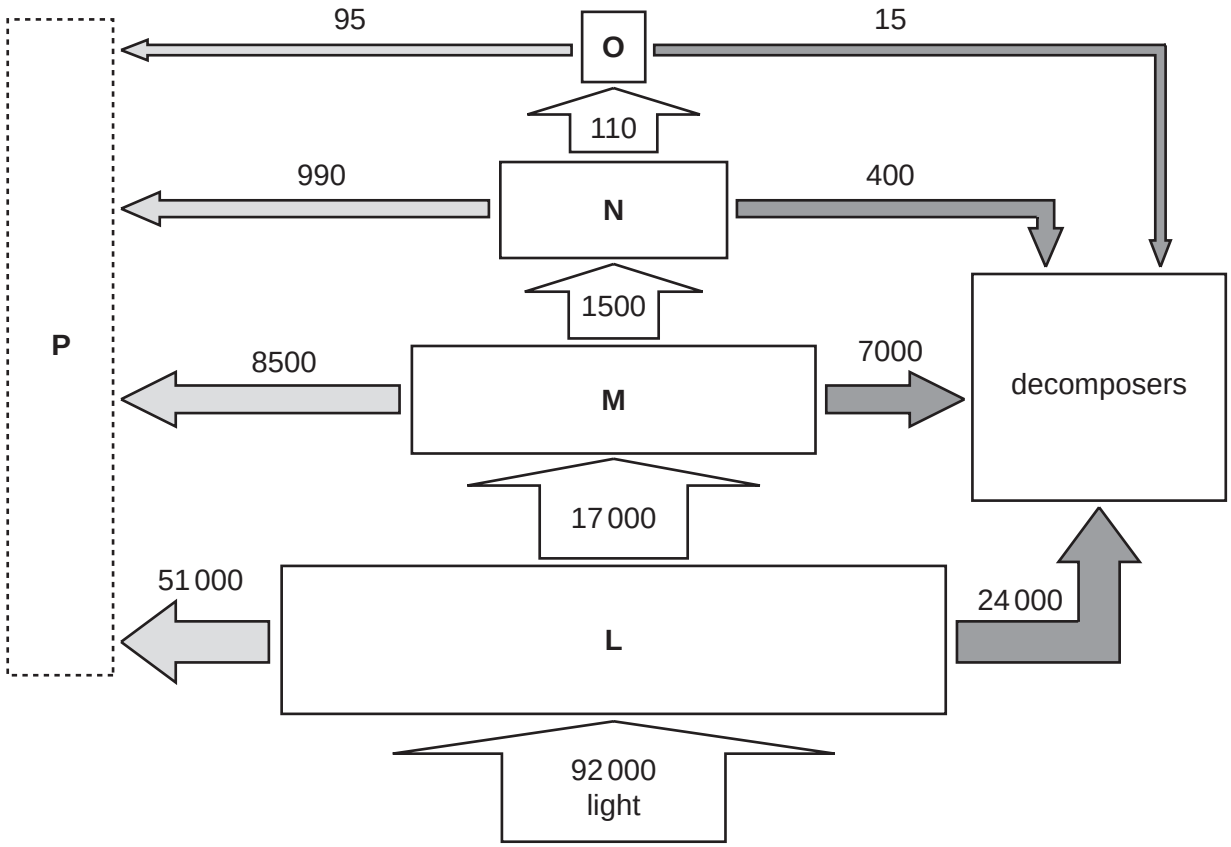


Fig. 2.1

(a) The letters **L** to **O** represent the different trophic levels in the ecosystem.

(i) Name the first and third trophic levels, **L** and **N**.

L .....

N ..... [2]

(ii) Suggest what is shown by the relative sizes of the boxes, **L** to **O**, in the energy flow diagram in Fig. 2.1.

..... [1]

For Examiner's Use

(iii) There are no predators in the ecosystem feeding on the animals in trophic level **O**.

Suggest **and** explain why there are no predators in the ecosystem feeding on the animals in trophic level **O**.

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..... [3]

(iv) **P** in Fig. 2.1 does **not** represent any organisms.

Explain what **P** represents in the energy flow diagram.

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..... [2]

(b) People who live near this ecosystem **would like** to use some of the organisms at trophic level **M** for food.

Suggest **and** explain what might happen to the ecosystem if the people took too many of the organisms at trophic level **M**.

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..... [3]

[Total: 11]

3 Fig. 3.1 shows the human female reproductive system.

For Examiner's Use

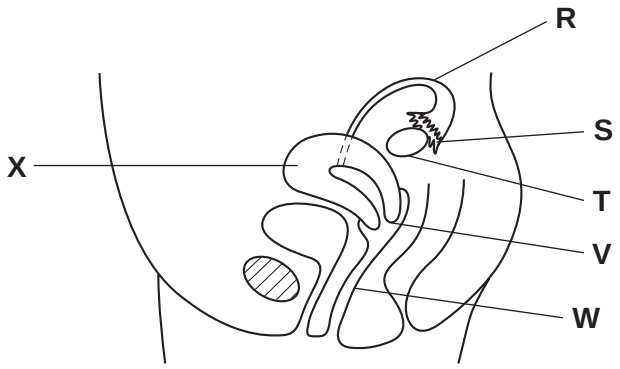


Fig. 3.1

(a) Table 3.1 shows four functions of the female reproductive system.

Complete the table by:

- naming the part of the system that carries out each of the functions;
- using the letters from Fig. 3.1 to identify the part of the system named.

One row has been completed for you.

Table 3.1

function	name of organ	letter from Fig. 3.1
production of gametes		
site of implantation		
site of fertilisation		
dilates during birth	cervix	**V**

[3]

The hormone FSH is important in regulating the menstrual cycle.

(b) (i) State the target organ of FSH.

.....

[1]

(ii) State **one** effect of FSH.

.....

.....

[1]

For Examiner's Use

(c) The drug clomiphene is given to women who have difficulty in having children. The drug increases the secretion of FSH.

As part of treatment for infertility, a woman was given clomiphene for five days. The concentration of oestrogen in her blood was measured every day for 27 days.

The results are shown in Fig. 3.2.

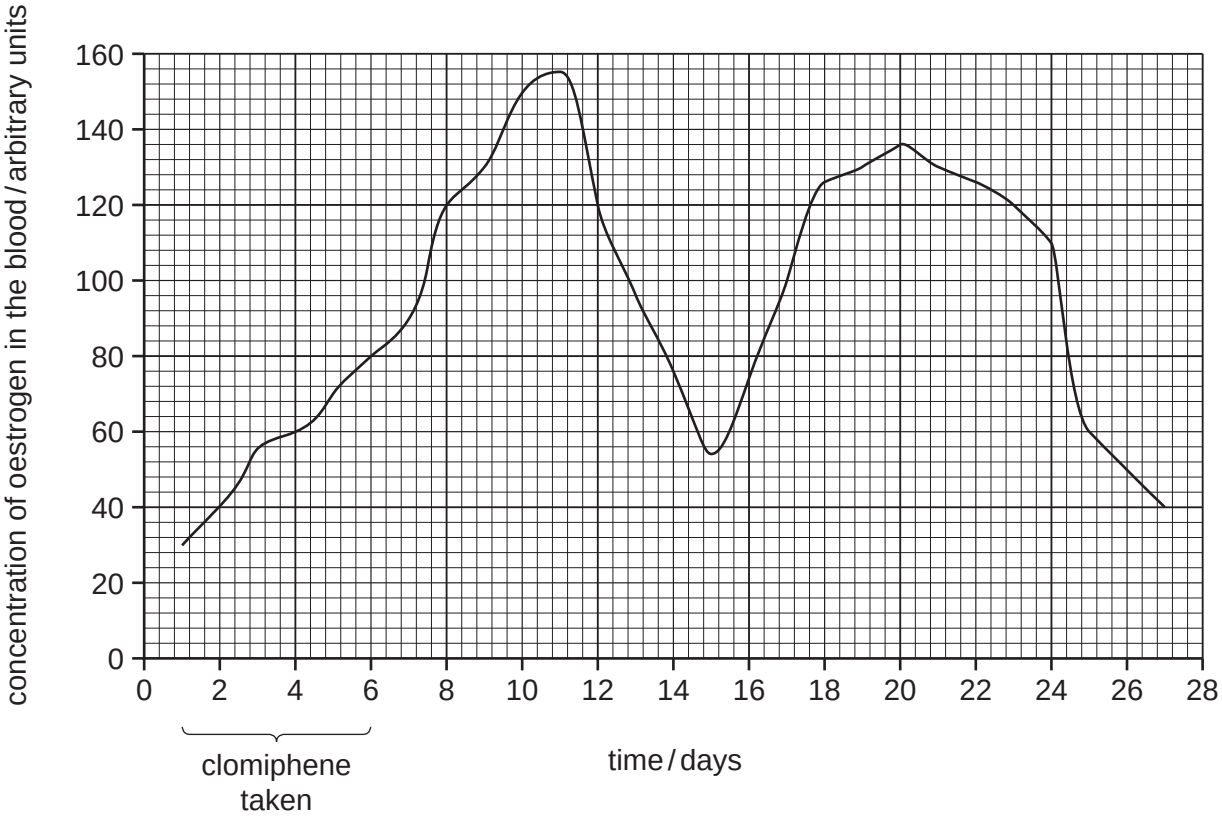


Fig. 3.2

(i) Describe the changes in oestrogen in the blood over the 27 days.

You will gain credit if you use results from Fig. 3.2 in your answer.

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..... [4]

For Examiner's Use

(ii) Doctors thought that ovulation occurred around day 15.

Explain what is meant by the term *ovulation*.

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..... [2]

(d) The treatment was not successful on the first occasion.

As an alternative to this treatment, women may be offered *in vitro* fertilisation (IVF) treatment.

In IVF treatment, an egg is fertilised outside the body and the resulting embryo is placed into the uterus.

Describe what happens when an egg is fertilised by a sperm.

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..... [3]

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(e) Some embryos produced by IVF do not develop because there are problems with their chromosomes, such as having the wrong number.

(i) Define the term *chromosome*.

.....

.....

.....

..... [2]

(ii) State the correct number of chromosomes that should be in a cell of a human embryo.

..... [1]

[Total: 17]

For Examiner's Use

4 Fig. 4.1 shows a cross section of part of a stem of buttercup, *Ranunculus*.

Fig. 4.2 is an outline drawing of one vascular bundle from the stem of *Ranunculus*.

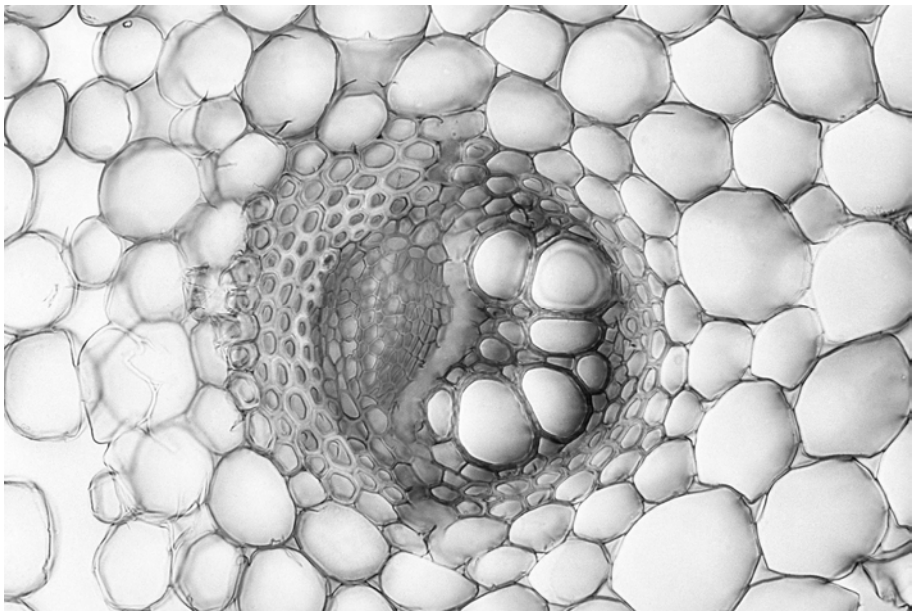


Fig. 4.1

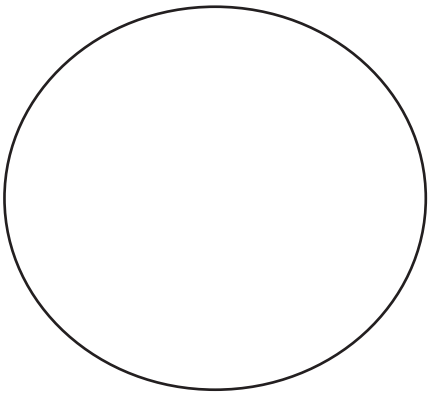


Fig. 4.2

(a) Draw **and** label the position of the xylem and the phloem in the outline of the vascular bundle in Fig. 4.2. [2]

(b) Name the carbohydrate that is transported in the phloem.

..... [1]

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(c) Substances transported in the phloem are carried upwards in the stem at some times of the year and downwards at other times.

For Examiner's Use

Explain why substances are transported in the phloem upwards at one time of the year **and** downwards at another.

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..... [4]

(d) Define the term *transpiration*.

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..... [3]

For Examiner's Use

(e) The rattan palm is a plant that climbs on rainforest trees to heights of about 40 metres.

Explain how water is moved to the tops of tall plants, such as the rattan palm.

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..... [4]

[Total: 14]

For Examiner's Use

5 Enzymes are necessary for many biological processes, such as the digestion of fat.

$$\text{fat} + \text{water} \xrightarrow{\text{lipase}} \text{fatty acids} + \text{glycerol}$$

(a) (i) Explain why enzymes are necessary for biological processes.

.....

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..... [3]

(ii) Lipase, protease and amylase are enzymes secreted into the alimentary canal.

Name **one** organ that secretes each enzyme. Choose your answers from this list.

colon gall bladder liver oesophagus

pancreas rectum salivary glands stomach

You can use each organ **only once**.

lipase .....

protease .....

amylase ..... [3]

For Examiner's Use

(b) A group of students investigated the digestion of fat in milk.

- They added an alkaline solution to the milk.
- They divided the milk into four test-tubes.
- They added lipase and bile salts to some of the test-tubes, as shown in Table 5.1. They did this at the same time for each test-tube.
- They kept all test-tubes at 40 °C.
- After 5 minutes, they added Universal Indicator solution to each test-tube.

Table 5.1

test-tube	contents	colour of pH indicator after 5 minutes at 40 °C
A	milk, alkaline solution, lipase and bile salts	orange
B	milk, alkaline solution, bile salts and water	blue
C	milk, alkaline solution, lipase and water	yellow
D	milk, alkaline solution and water	blue

Fig. 5.1 shows the colour of the indicator at different pH values.

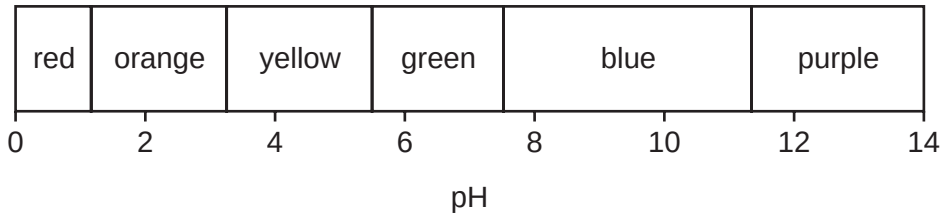


Fig. 5.1

(i) Explain why test-tube **D** was included in the investigation.

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..... [2]

For Examiner's Use

(ii) Explain why the colour in test-tube **A** was orange.

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..... [3]

(iii) Explain the results for test-tubes **B** and **C**.

test-tube **B** .....

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test-tube **C** .....

.....

..... [4]

[Total: 15]

For Examiner's Use

6 Bacteria and animals are found in many habitats on land and in the sea.

(a) State **two** ways in which the structure of a bacterial cell differs from the structure of an animal cell.

1 .....

2 ..... [2]

(b) Some bacteria were grown in the laboratory. Fig. 6.1 shows the change in numbers of bacteria when grown in a closed flask containing nutrients and oxygen.

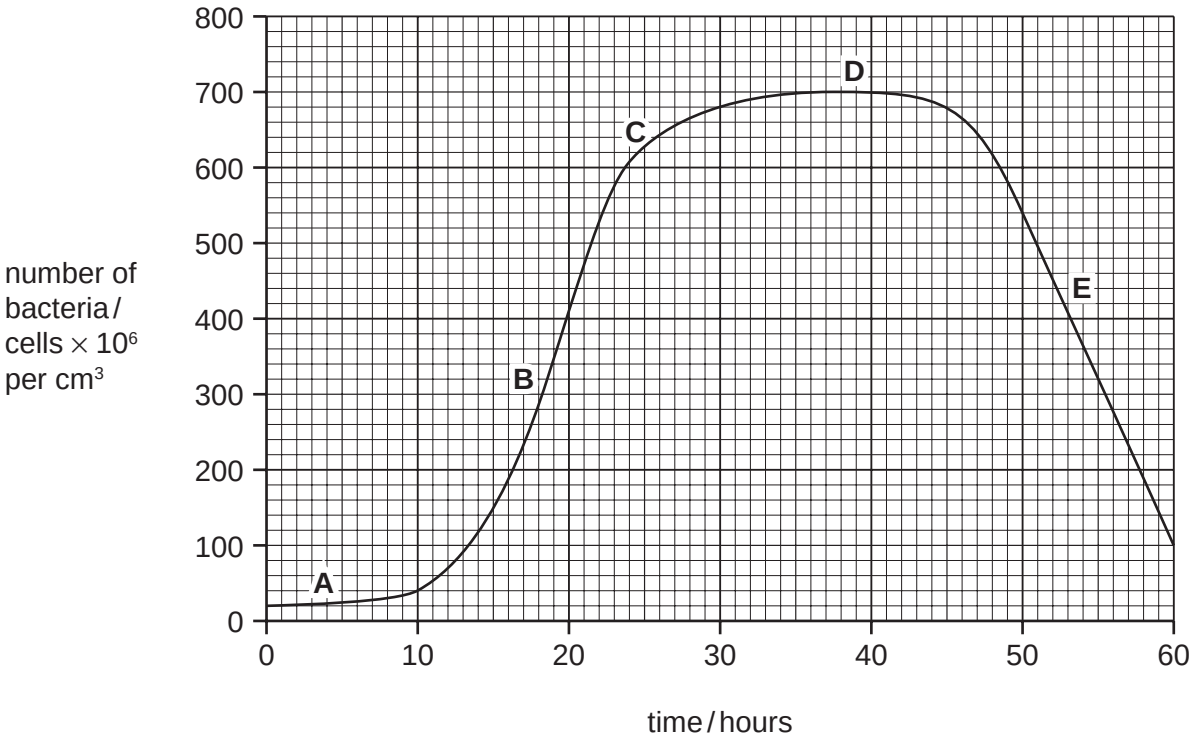


Fig. 6.1

(i) Name the phases of growth, **A** and **B**.

A .....

B ..... [2]

For Examiner's Use

(ii) Explain why the numbers of bacteria do not change in phase **D and** decrease in phase **E**.

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..... [3]

(c) Fig. 6.2 shows the vent crab, *Bythograea thermydron*, which lives at great depths in the sea where there is no light.

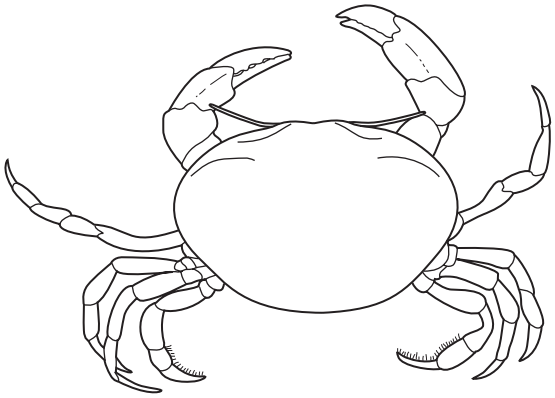


Fig. 6.2

(i) State **one** feature, **visible** in Fig. 6.2, that show that *B. thermydron* is an arthropod.

..... [1]

For Examiner's Use

(ii) Although most species of crabs are red, brown or green, *B. thermydron* is white.

Suggest **and** explain how white crabs evolved at great depths in the sea.

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..... [4]

[Total: 12]

Copyright Acknowledgements:

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Figure 4.1 © Ref: B725/0317; *Buttercup Stem* (*Ranunculus sp.);* Herve Conge; ISM Science Photo Library.

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