Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

BIOLOGY **0610/32**

Paper 3 Extended **October/November 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 **21** printed pages and **3** blank pages.

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1 Fig. 1.1 shows a common emerald dove, *Chalcophaps indica*.

Fig. 1.1

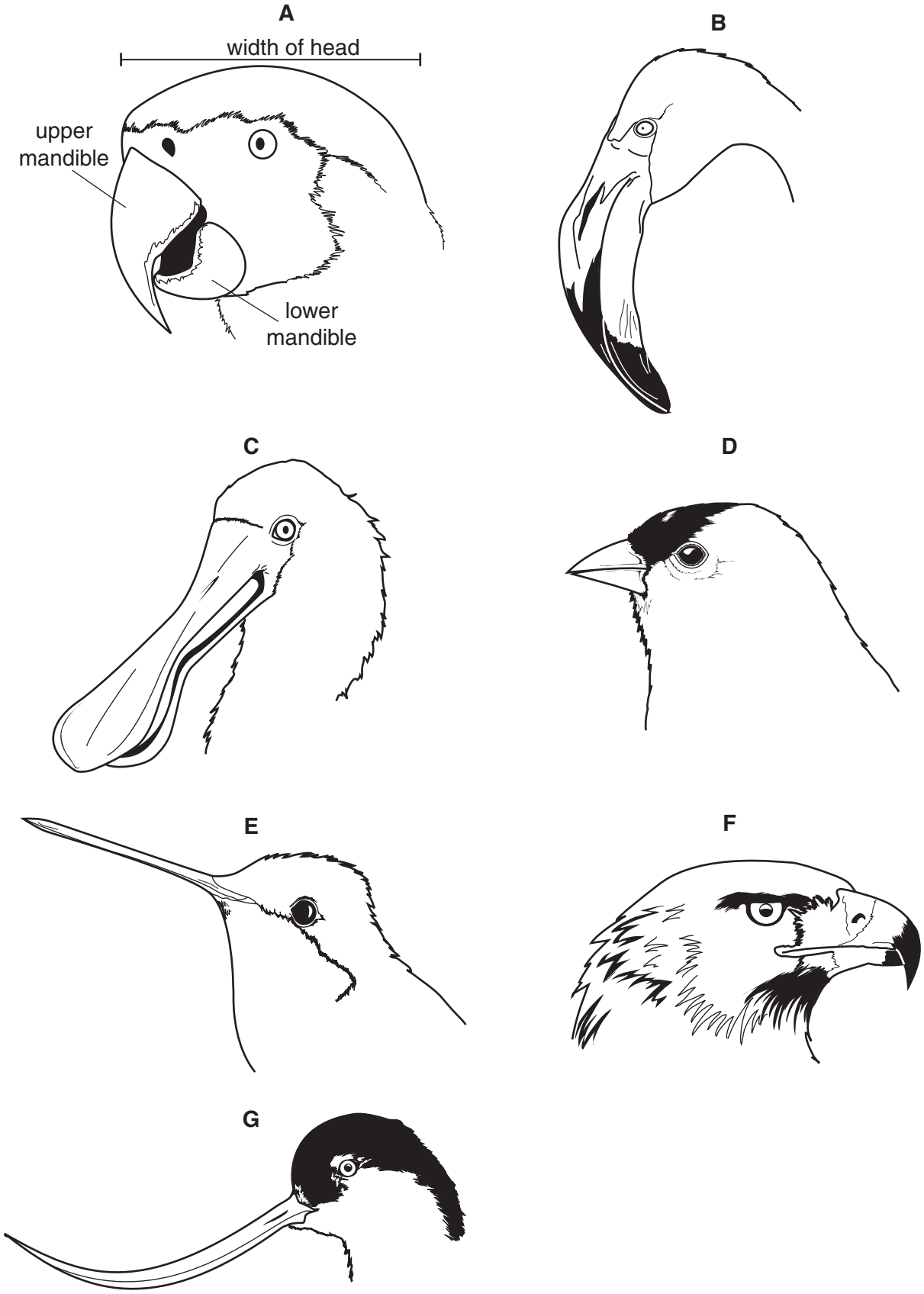
(a) Two distinguishing features of birds are beaks and wings.

State **one other** feature shown **only** by birds that is visible in Fig. 1.1.

.....[1]

(b) Birds show variation in the sizes and shapes of their beaks. A beak is composed of an upper mandible and a lower mandible.

Fig. 1.2 shows the heads of seven different species of bird.



not drawn to scale
Fig. 1.2

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Use the key to identify each species. Write the letter of each species (**A** to **G**) in the correct box beside the key. One has been done for you.

key

1	(a)	beak is shorter than the width of the head	go to 2	
	(b)	beak is longer than the width of the head	go to 4	
2	(a)	upper mandible is same length as the lower mandible	*Spinus tristis*	
	(b)	upper mandible is longer than the lower mandible	go to 3	
3	(a)	lower mandible is about half the length of the upper mandible	*Ara ararauna*	**A**
	(b)	lower mandible is more than half the length of the upper mandible	*Aquila chrysaetos*	
4	(a)	both mandibles widen at the end of the beak	*Platalea regia*	
	(b)	both mandibles are a similar width along their whole length	go to 5	
5	(a)	beak is straight	*Trochilus polytmus*	
	(b)	beak is curved	go to 6	
6	(a)	beak curves upwards	*Recurvirostra americana*	
	(b)	beak curves downwards	*Phoenicopterus minor*	

[3]

(c) Fig. 1.3 shows the events that occur during sexual reproduction in birds. The numbers in brackets indicate the number of chromosomes in the nuclei of the cells of the common emerald dove.

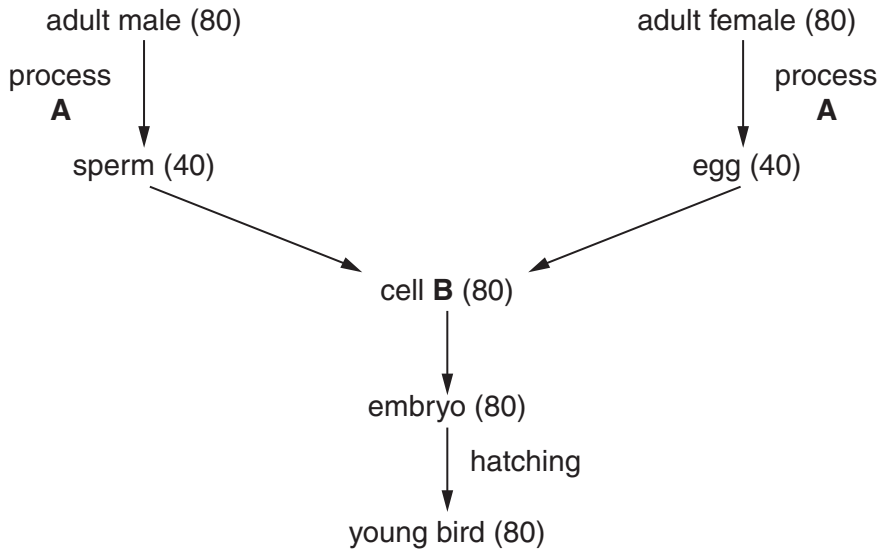

Fig. 1.3

(i) Name process **A** and cell **B**.

A .....

B .....
[2]

(ii) State why cell **B** is described as a diploid cell.

.....[1]

(iii) The embryo of the bird develops from cell **B**.

State what is meant by the term *development*.

.....

.....

.....[1]

(iv) Sexual reproduction usually leads to variation.

Explain why variation is an advantage for a species such as the common emerald dove.

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.....[2]

[Total: 10]

2 Sports physiologists study ways in which athletes can improve their performance by recording factors such as oxygen uptake and the concentration of lactic acid in the blood. They can also monitor how these two factors change during training.

Fig. 2.1 shows an athlete running on a treadmill in a physiology laboratory while aspects of his breathing are measured.

Fig. 2.1

The athlete ran on a treadmill at a slow speed for 11 minutes.

His oxygen uptake was measured before, during and after the exercise.

The results are shown in Fig. 2.2.

The arrows indicate the start and end of the period of exercise.

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Fig. 2.2

(a) **(i)** State the oxygen uptake at rest, before the athlete started running.

.....$cm^3 kg^{-1} min^{-1}$ [1]

(ii) Use Fig. 2.2 to describe the changes in oxygen uptake during and after running on the treadmill (from 2 to 25 minutes).

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.....[4]

(iii) Explain the change in oxygen uptake during the run (between 2 and 13 minutes).

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.....[4]

(b) The lactic acid concentration in the blood of the athlete was measured at intervals.
At the end of the slow run the lactic acid concentration had increased by 30%.

After a rest, the athlete ran at a much faster speed on the treadmill. At the beginning of this exercise the lactic acid concentration in his blood was 100 mg dm^{-3}. After 11 minutes running at the faster speed, his lactic acid concentration was 270 mg dm^{-3}.

(i) Calculate the percentage increase in lactic acid concentration at the end of the faster run.

Show your working.

answer ..... %
[2]

(ii) Explain why the percentage increase in lactic acid is much greater when running at the faster speed.

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.....[3]

[Total: 14]

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3 Fig. 3.1 shows part of the thoracic and abdominal cavities of a human.

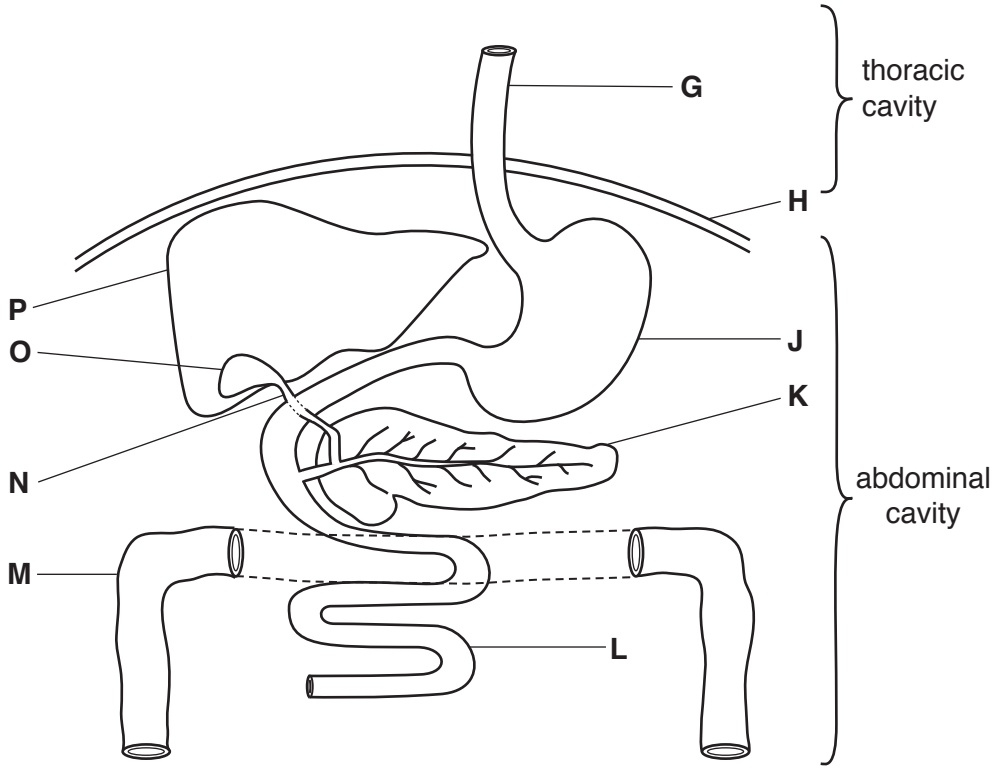

Fig. 3.1

(a) **(i)** Name the structures labelled **G**, **H** and **M**.

G .....

H .....

M .....

[3]

(ii) Table 3.1 shows five functions of organs in the abdominal cavity.

Complete the table by:

- naming the organ that carries out each function
- using the letters from Fig. 3.1 to identify the organ named.

One row has been completed for you.

Table 3.1

function	name	letter from Fig. 3.1
conversion of glucose to glycogen		
secretion of insulin and glucagon	pancreas	**K**
absorption of products of digestion		
storage of bile		
chemical digestion of protein in an acidic pH		

[4]

(b) Fat is particularly difficult to digest as it is not water soluble and forms spherical globules in the alimentary canal.

Fig. 3.2 is a diagram showing what happens to fat globules when mixed with bile.

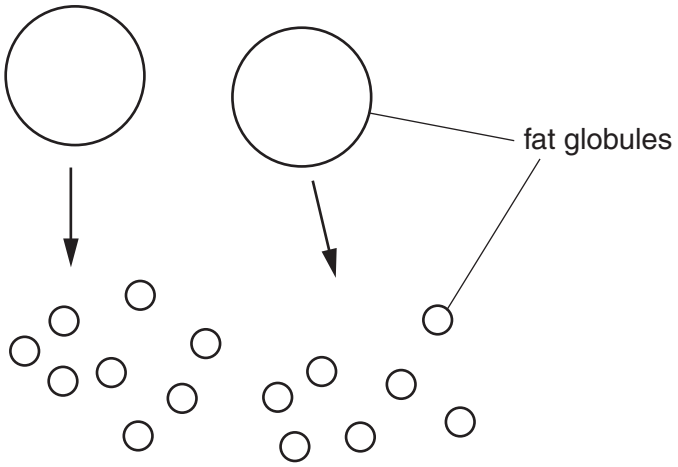

Fig. 3.2

(i) Name the process shown in Fig. 3.2.

.....[1]

(ii) Explain the advantage of the process shown in Fig. 3.2.

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.....[2]

(c) Insulin and glucagon are hormones secreted by the pancreas to control the concentration of glucose in the blood.

(i) Complete Table 3.2 to show how the uptake of glucose by cells and the concentration of glucose in the blood respond when the two hormones are secreted.

Use the words *increases*, *decreases* and *stays the same* to complete the table.

Table 3.2

hormone	uptake of glucose by cells	concentration of glucose in the blood
insulin		
glucagon		

[2]

(ii) State another hormone that influences the concentration of glucose in the blood.

.....[1]

(d) Explain why the control of the concentration of glucose in the blood is an example of negative feedback.

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.....[3]

[Total: 16]

4 Fig. 4.1 is an electron micrograph of part of the lower surface of a leaf. Three stomata are visible.

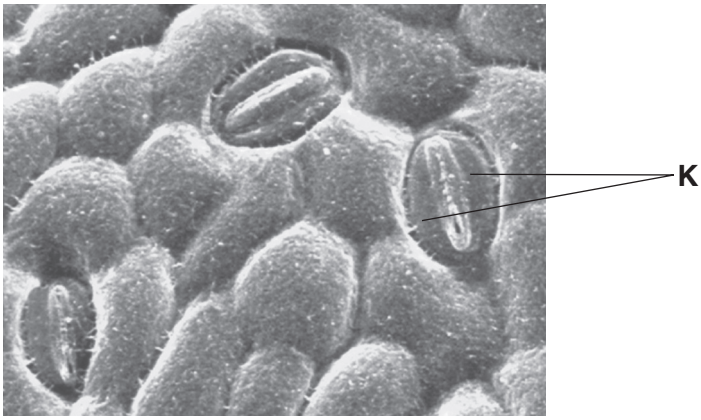

Fig. 4.1

(a) Name the cells labelled **K**.

.....[1]

(b) Stomata allow the movement of gases into and out of the leaf. During the daytime oxygen passes out and carbon dioxide passes in.

(i) Explain why oxygen passes out of the leaf during the daytime.

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.....[3]

(ii) Describe the path taken by a carbon dioxide molecule **after** it has passed through the stomata during the daytime until it becomes part of a glucose molecule.

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.....[3]

(c) Plants that live in different types of habitat have leaves that show adaptations for survival.

Table 4.1 shows some features of the leaves of three species of plant from different types of habitat.

Table 4.1

species	habitat	orientation of the leaves	individual leaf area / cm^2	mean stomatal density / number of stomata per mm^2	
				upper epidermis	lower epidermis
annual meadow grass, *Poa annua*	grassland	vertical	1 – 10	125	135
white water lily, *Nymphaea alba*	the surface of ponds and lakes	horizontal	more than 1000	460	none
common myrtle, *Myrtus communis*	dry scrubland	horizontal	2 – 4	none	508

(i) State how the stomatal density of annual meadow grass differs from the stomatal densities of the other two species in Table 4.1.

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.....[2]

(ii) Suggest explanations for the distribution and density of stomata in white water lily and common myrtle as shown in Table 4.1.

white water lily .....

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common myrtle .....

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[5]

[Total: 14]

5 Bacteria can be grown on nutrient agar in Petri dishes. The main nutrients in the agar are glucose and amino acids. The bacteria reproduce asexually to form colonies. Each colony is formed from one bacterium.

(a) **(i)** Explain why glucose and amino acids are included in the agar medium.

glucose .....

.....

amino acids .....

.....
[2]

(ii) Describe how bacteria reproduce asexually.

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.....[2]

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A microbiologist collected bacteria from a kitchen which was suspected to be responsible for an outbreak of food poisoning.

The microbiologist spread the bacteria on nutrient agar and let them reproduce to form colonies. The bacterial colonies were transferred onto new nutrient agar that contained high concentrations of antibiotics **S** or **T**, as shown in the flow diagram in Fig. 5.1.

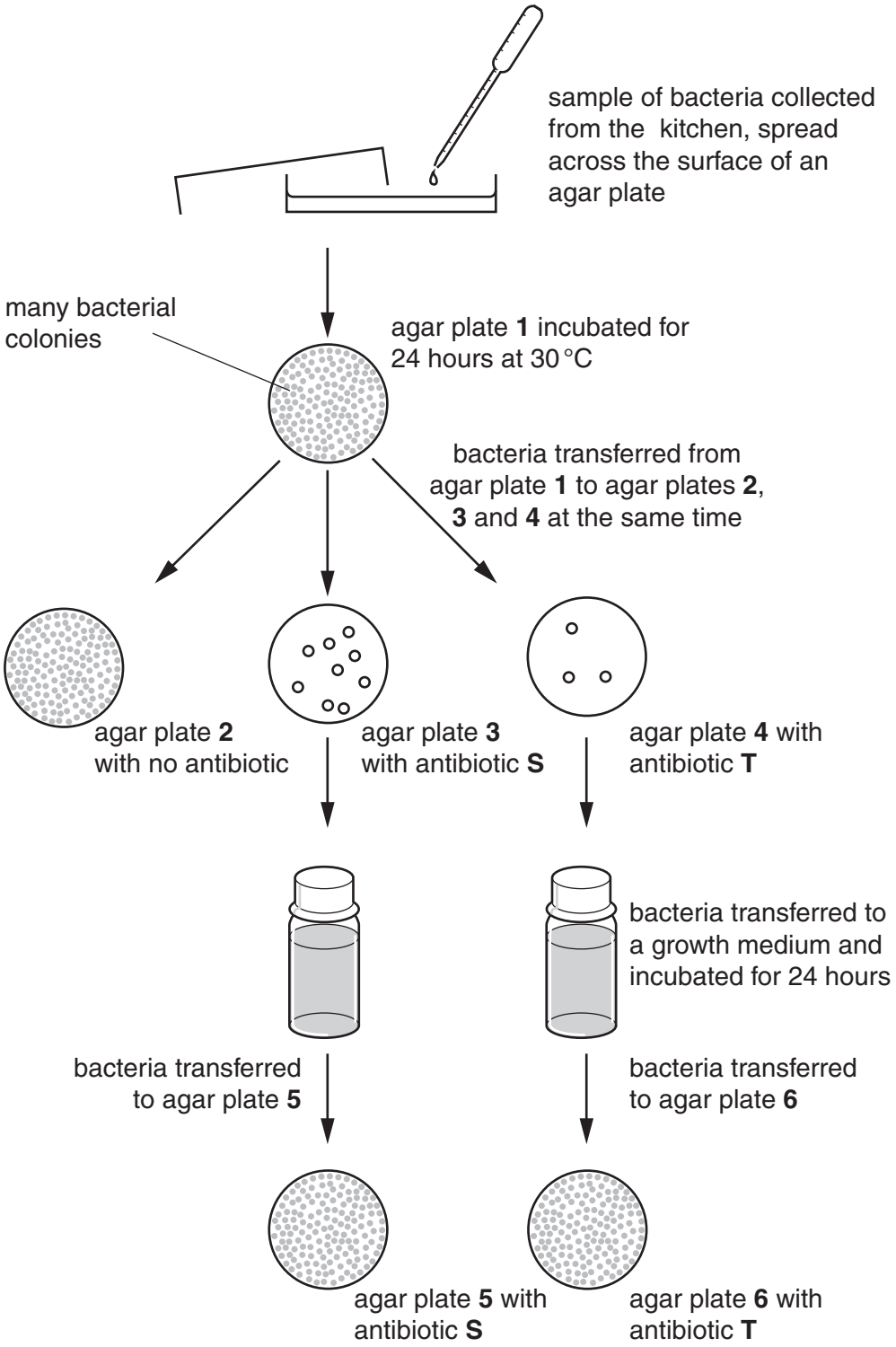

Fig. 5.1

(b) Explain the appearance of agar plates **3** and **4**.

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.....[2]

(c) Explain why many bacterial colonies were found on agar plates **5** and **6**.

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.....[2]

(d) Gonorrhoea is a sexually transmitted disease. It is caused by the bacterium, *Neisseria gonorrhoeae*. Many strains of this bacterium cannot be treated by common antibiotics.

Explain how strains of antibiotic-resistant bacteria are formed **and** then spread.

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.....[5]

[Total: 13]

6 Some students studied water pollution in a stream near their school.

They took samples of water at six sampling points along the stream and carried out a chemical analysis on the water samples. They also counted the numbers of five different invertebrates at the same sampling points. The students used a four point scale to record the numbers they found in each sample.

Their results are shown in Table 6.1.

Table 6.1

sampling points	chemical analysis		types of invertebrates				
	nitrate concentration	oxygen concentration	rat-tailed maggot	mayfly nymph	stonefly nymph	tubifex worm	water louse
1	low	high	+	+++	+	+	+
2	high	very low	++	–	–	+++	++
3	high	very low	++	–	–	+++	++
4	very high	very low	++	+	–	+++	++
5	very high	low	+	++	–	++	++
6	low	high	+	+++	+	+	+

key
– none
+ 1 to 10
++ 11 to 100
+++ too many to count

(a) Using **only** the information from Table 6.1,

(i) state the invertebrates that survive in polluted water

.....

.....[1]

(ii) state the invertebrate that is most sensitive to a decrease in the oxygen concentration of the water.

.....[1]

(b) The students noticed there were many algae and aquatic plants growing in the stream at sampling points **4** and **5**.

Use the results in Table 6.1 to explain why there are many algae and aquatic plants growing in these parts of the stream.

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.....[2]

(c) The students decided there were advantages in sampling invertebrates to assess the level of pollution in the stream, compared with carrying out a chemical analysis of the water.

Suggest the advantages of carrying out a survey of invertebrates when studying the pollution of freshwater ecosystems, such as streams and rivers.

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.....[2]

(d) The students found that the stream was polluted by sewage from a nearby house.

Outline how sewage should be treated before entering a stream.

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.....[4]

(e) The stream contained many plastic items that had been thrown away. Most of the plastic was non-biodegradable.

Describe the likely environmental problems caused by non-biodegradable plastics in streams and rivers.

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.....[3]

[Total: 13]

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