Chapter 21

Human influences on ecosystems

01. 0610_w19_qp_42 Q: 5

Grass plants are wind-pollinated. Fig. 5.1 shows a flower from a species of grass plant.

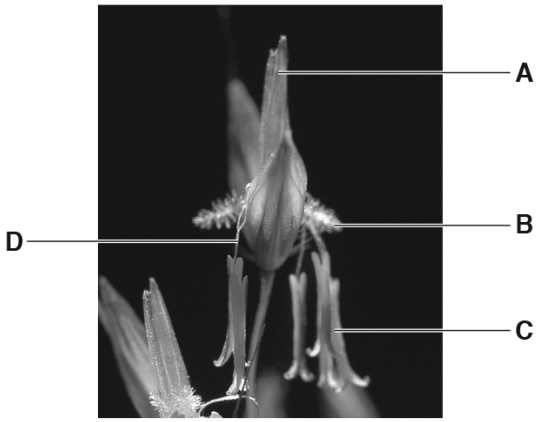

Fig. 5.1

(a) (i) Describe **and** explain how the features of the flower shown in Fig. 5.1 are adaptations for wind-pollination.

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..... [3]

(ii) State **one** letter in Fig. 5.1 that identifies a structure where meiosis occurs.

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(b) Wheat has flowers similar to those in Fig. 5.1, but reproduces by self-pollination.

Explain the consequences of self-pollination for a population of plants.

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..... [4]

(c) Wheat is an important crop plant in many countries. Wheat can be infected by diseases leading to total loss of the crop which results in famine.

Outline factors, **other than** plant diseases, that can cause famines.

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(d) Black stem rust is a disease of wheat that is caused by a fungus.

Plant breeders used two varieties of wheat to produce a variety of wheat that is both rust-resistant and has a high yield.

Fig. 5.2 shows the breeding programme that was used.

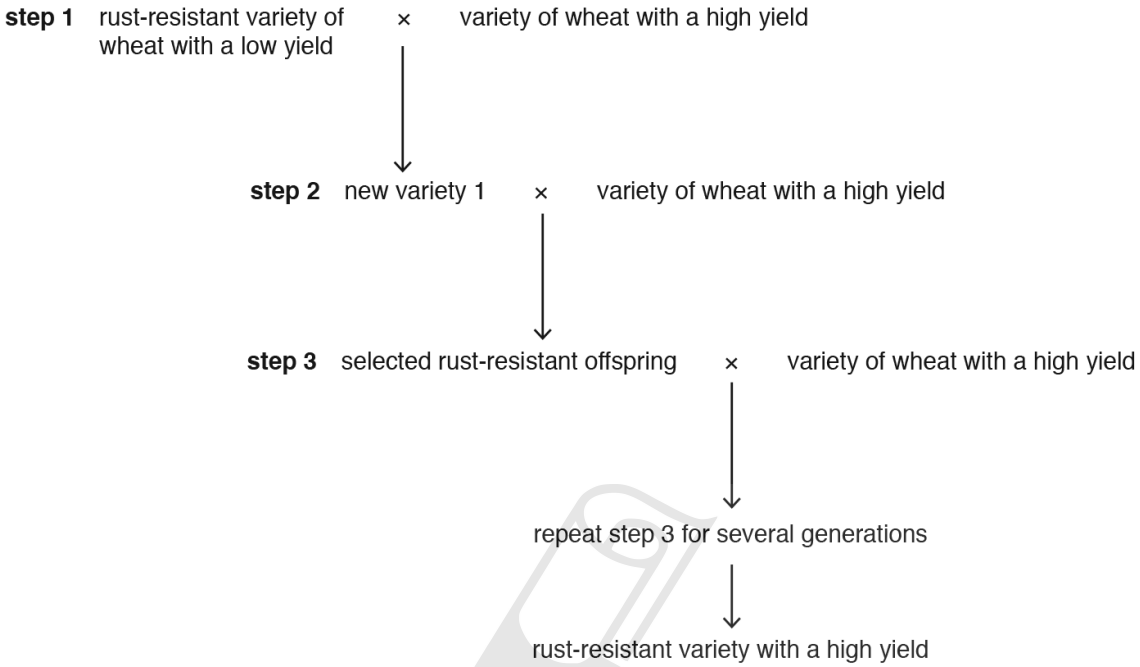

Fig. 5.2

(i) Suggest how plant breeders make sure that the plants that they use for step 3 are rust-resistant.

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..... [2]

(ii) Suggest why step 3 is repeated for many generations before the new rust-resistant variety is made available for farmers to grow.

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..... [1]

(e) Wheat plants are monocotyledons.

State **one** feature of monocotyledons that can be used to distinguish them from dicotyledons.

..... [1]

[Total: 15]

02. 0610_s18_qp_42 Q: 3

Aphids are insects that feed on the phloem sap in plants.

Fig. 3.1 shows a diagram of an aphid with its mouth parts inserted into the stem of a plant.

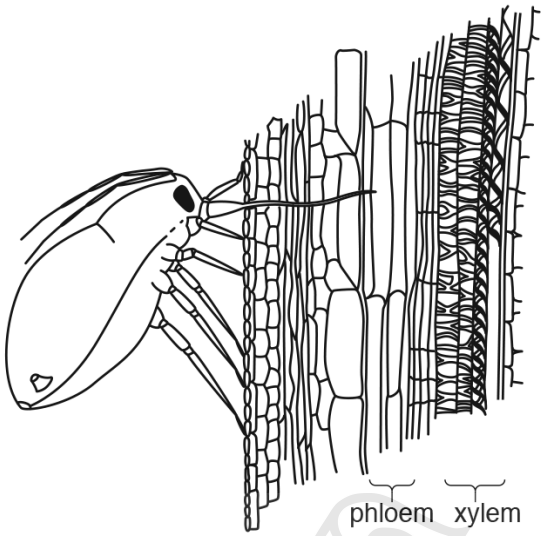

Fig. 3.1

(a) The mouth parts of the aphid reach the phloem tissue of the stem.

(i) State the name of the foods the aphid could suck out of the phloem tissue.

1 .....

2 .....

[2]

(ii) Explain the role of phloem in plant transport. Use the words **source** and **sink** in your answer.

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(b) Fig. 3.1 shows some of the features of xylem.

Describe how xylem is adapted for its functions.

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(c) Some farmers spray their crops with insecticides to kill pests such as aphids.

Explain the benefits of killing pests.

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[Total: 14]

03. 0610_s17_qp_42 Q: 1

Wheat is a crop plant grown to produce flour.

(a) Flour is used to make dough for bread.

(i) State the name of the organism used to make dough rise.

.....[1]

(ii) State the name of the process that this organism uses to produce the gas that makes dough rise.

.....[1]

(b) Farmers grow crop plants such as wheat to provide food.

(i) State **two** types of natural event that could cause widespread food shortages.

1 .....

2 .....
[2]

(ii) The increasing human population is another reason for food shortages.

Explain how the increasing human population contributes to food shortages.

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(c) Many farmers grow crop plants as monocultures to improve yields.

Fig. 1.1 shows a monoculture of wheat.

Fig. 1.1

Describe the impact of large-scale monocultures on the environment.

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[Total: 11]

04. 0610_s17_qp_43 Q: 5

An investigation studied the effect of fertilisers on grass yield and species diversity in a grassland ecosystem.

Some plots within the grassland were treated with fertilisers containing nitrogen, magnesium and phosphate.

The control plots did not have any added fertiliser.

The average yields were:

- plots with fertiliser 1733 g m^{-2} $year^{-1}$
- plots without fertiliser (control plots) 1009 g m^{-2} $year^{-1}$

(a) (i) Calculate the difference between the average yields of the two plots within the field as a percentage of the average yield of the control plots.

Show your working and give your answer to the nearest whole number.

..... %
[2]

(ii) Explain why the average yield increased as a result of adding the fertiliser.

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.....[3]

(iii) State the name of the process that occurs when fertiliser washes off land into rivers and causes an algal bloom.

.....[1]

The researchers counted the number of different plant species in each of the plots in the grassland to determine species diversity. Counting started at the beginning of the growing season and was repeated every three weeks.

The average number of plant species in each type of plot is shown in Fig. 5.1.

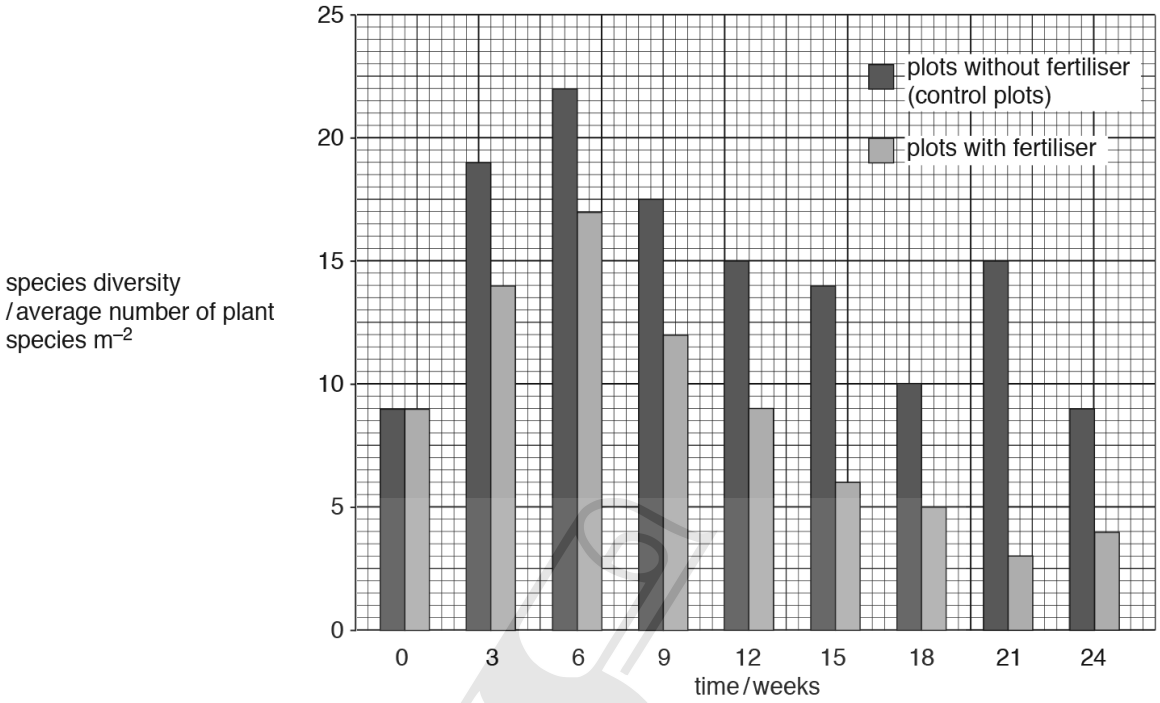

Fig. 5.1

(b) Describe the effect of fertiliser on the plant species diversity shown in Fig. 5.1.

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.....[3]

(c) Suggest why some species of plants survive in grassland and others do not.

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[Total: 11]

05. 0610_s19_qp_42 Q: 2

The concentration of atmospheric carbon dioxide has increased considerably in recent years.

(a) Describe the possible causes of increased atmospheric carbon dioxide.

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..... [3]

(b) Soybean plants, *Glycine max*, were grown in two separate plots.

Each plot used a carbon dioxide enrichment system to control the atmospheric carbon dioxide concentration.

The atmospheric carbon dioxide concentrations in the two plots were kept at:

- 370 ppm, which is similar to the current atmospheric carbon dioxide concentration
- 550 ppm, which is a possible future atmospheric carbon dioxide concentration.

When the soybean plants were fully grown, scientists calculated the average rates of photosynthesis at regular intervals from 04:00 to 22:00 for both plots.

The results are shown in Fig. 2.1.

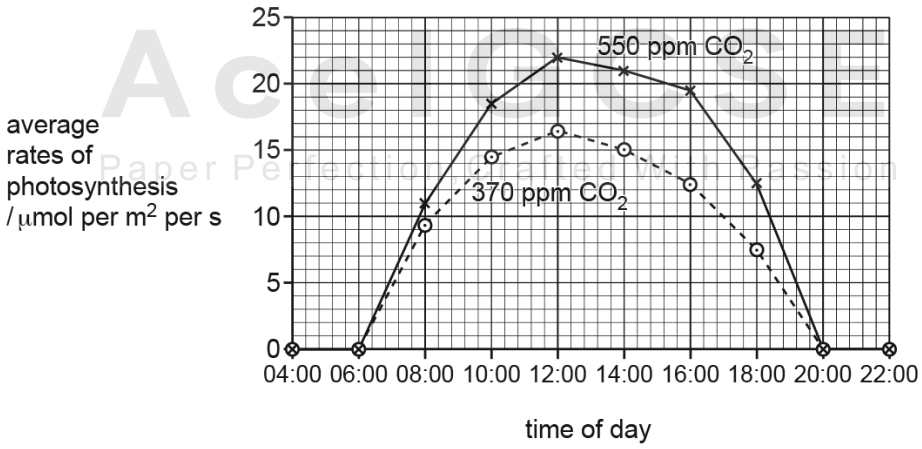

Fig. 2.1

Describe **and** explain the effect of carbon dioxide concentration on the average rates of photosynthesis of the soybean plants from 04:00 to 22:00.

Use the data from Fig. 2.1 in your answer.

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(c) The scientists also made observations of the leaf structure of the soybean plants.

Epidermis and mesophyll tissues are adapted for photosynthesis.

Complete Table 2.1 by stating **two** structural features of each of these tissues **and** explain how each feature is an adaptation for photosynthesis.

Table 2.1

tissue	feature	how the feature is an adaptation for photosynthesis
epidermis	1	.....
	.....	.....
	.....	.....
	2	.....
	.....	.....
	.....	.....
mesophyll	1	.....
	.....	.....
	.....	.....
	2	.....
	.....	.....
	.....	.....

[4]

(d) When the scientists were working in the plot with a carbon dioxide concentration of 550 ppm, their breathing rates were higher than when they worked in the other plot.

Suggest why their breathing rates were higher.

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..... [2]

[Total: 15]

06. 0610_m17_qp_42 Q: 4

(a) Water is one requirement for photosynthesis.

State **two** other requirements needed by plants to carry out photosynthesis.

1 ....

2 ....
[2]

Table 4.1 shows the number of hectares of forested area in some countries in Africa in the years 1990, 2000 and 2005.

Table 4.1

country	hectares of forest per 1000 hectares of land		
	1990	2000	2005
Cameroon	25	22	21
Tanzania	41	37	35
Nigeria	17	13	11
Zambia	49	45	43
Zimbabwe	22	19	18

(b) Calculate the percentage loss of forested area in Nigeria between **2000** and **2005**.

Show your working and give your answer to the nearest whole number.

.... %
[2]

(c) Some forested areas are cleared to provide land to grow crop plants. Deforestation reduces the local rainfall and the concentration of water vapour in the air.

(i) Describe **and** explain how a reduced concentration of water vapour in the air would increase the movement of water through crop plants.

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....[3]

(ii) Describe how water moves from the soil into the roots of crop plants.

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(d) Describe the consequences of deforestation on the animals that live in forests.

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[Total: 14]

07. 0610_s20_qp_42 Q: 4

Some crop farmers use herbicides on their fields.

Fig. 4.1 shows a farmer spraying a rice crop with herbicides.

Fig. 4.1

(a) Herbicides kill weeds.

Explain why farmers use herbicides.

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(b) Fields of crop plants were sprayed with two herbicides. A farmer measured the concentration of the two herbicides, **A** and **B**, in a lake near the fields.

The water in the lake was sampled at intervals for two weeks.

Fig. 4.2 shows the results.

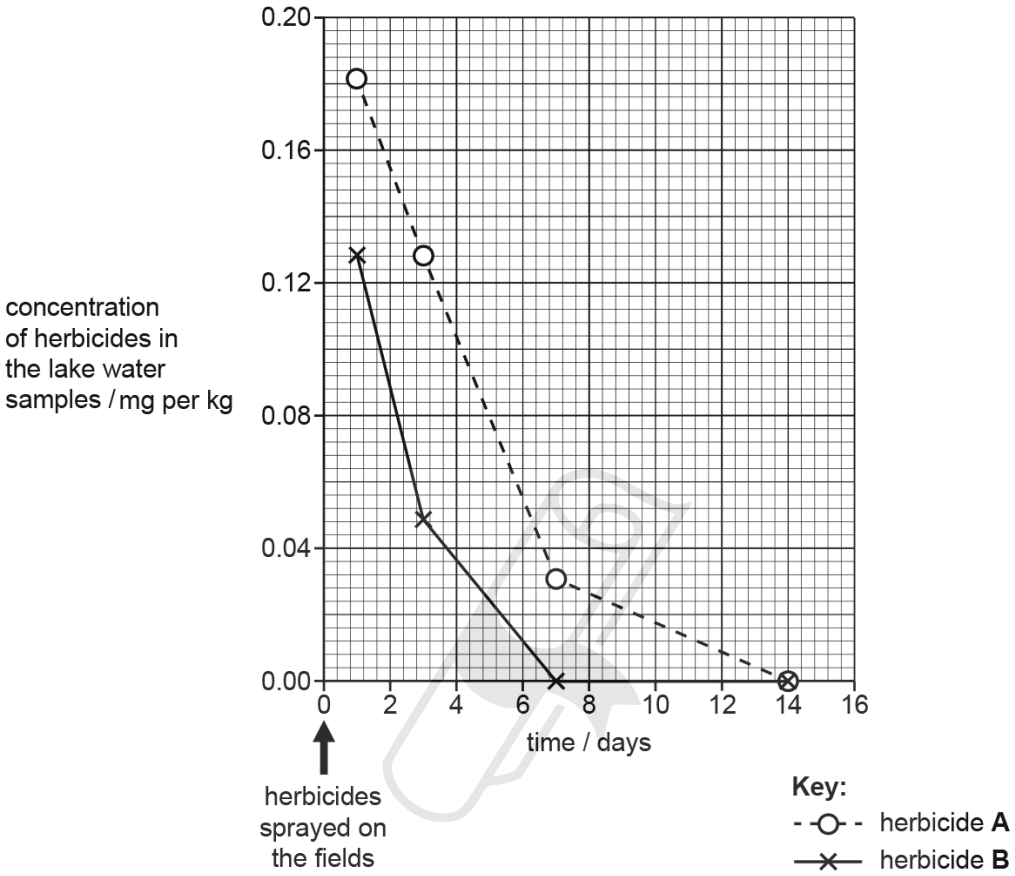

Fig. 4.2

(i) Compare the concentrations of herbicide **A** and herbicide **B** in the lake.

Use the information in Fig. 4.2 to support your answer.

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(ii) Suggest how herbicides damage ecosystems in a lake.

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(c) Herbicide **A** is a synthetic plant hormone called 2,4-D that selectively kills dicotyledonous plants only.

(i) State **two** features that distinguish leaves of dicotyledonous plants from leaves of monocotyledonous plants.

1 .....

2 .....

[2]

(ii) State the name of a natural plant hormone that stimulates cell elongation.

..... [1]

(iii) Herbicide **B** is a chemical that prevents the uptake of magnesium ions.

Suggest how herbicide **B** kills plants.

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[Total: 15]

08. 0610_s20_qp_43 Q: 6

In many parts of the world dairy cattle are kept in large barns and reared intensively, as shown in Fig. 6.1.

Fig. 6.1

(a) Food for cattle that are reared intensively includes cereals, such as maize and barley.

Ecologists have calculated that it is more energy efficient to grow crops for human consumption than for food for livestock.

Explain why intensive rearing of livestock is **not** an efficient use of crops.

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(b) The urine and faeces from cattle kept in barns is removed and treated in the same way as human sewage to avoid polluting the aquatic environment.

Outline the effects of **untreated waste** from cattle on the aquatic environment.

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(c) Intensive livestock production could be one way of preventing famine.

Describe the causes of famine.

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[Total: 10]

09. 0610_m19_qp_42 Q: 4

Pollution is the harm done to the environment by the release of substances from human activities.

Table 4.1 shows the names of some pollutants, their sources and their effects on the environment.

Table 4.1

pollutant	source	effect on environment
		acid rain
carbon dioxide		enhanced greenhouse effect
	cattle and rice farming	enhanced greenhouse effect
fertilisers	crop farming	eutrophication

(a) Complete Table 4.1. [4]

(b) When fertiliser is applied to fields, it can lead to eutrophication in lakes and rivers.

(i) Describe **and** explain what happens in lakes when eutrophication occurs.

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(ii) Suggest ways in which a farmer could reduce the chances of eutrophication occurring when applying fertiliser to crops.

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[Total: 12]

10. 0610_s19_qp_42 Q: 3

Very small pieces of plastic, called microplastics, are found in many products such as soaps and toothpaste.

Fig. 3.1 shows toothpaste that contains microplastics.

Fig. 3.1

(a) (i) It is estimated that microplastics make up 5% of the mass of some toothpastes.

Each person uses approximately 2 g of toothpaste a day.

There were estimated to be 1.2×10^9 people using toothpaste that contained microplastics in some countries in 2013.

Calculate the mass of microplastics contained in the toothpaste used on one day in 2013 for these countries.

Show your working and state appropriate units with your answer.

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[3]

(ii) State **one** recommendation, other than regular brushing, for the proper care of teeth.

..... [1]

(b) Lugworms live in sand on coastal beaches and are eaten by wading birds. Lugworms feed on diatoms. Diatoms are photosynthetic protoctists that require ammonium ions as a source of nitrogen. Beach sand contains ammonium ions.

(i) Construct a food chain for these marine organisms.

[2]

(ii) There is some evidence that microplastics affect ammonium ions. Affected ammonium ions cannot be used by diatoms. A group of researchers thought that this could affect lugworms living in sand polluted by microplastics.

The researchers collected 30 healthy lugworms, all with the same initial mass.

They divided them into three groups, **A**, **B** and **C**. Each group contained 10 lugworms.

Each group of lugworms was placed in a bucket containing the same mass of beach sand and ammonium ions and:

A biodegradable microplastics
B non-biodegradable microplastics
C no microplastics.

The measurements that were recorded at the **end** of the investigation are shown in Table 3.1.

Table 3.1

variable measured	group		
	A	**B**	**C**
ammonium ion concentration in the bucket / μmol per dm^3	19.3	47.0	27.4
average respiration rate of lugworms / mg oxygen per hour per g mass	5.2	9.6	5.1
volume of lugworm faeces / cm^3	60.0	25.0	40.0
average lugworm mass / g	9.1	7.0	9.1

Describe **and** explain why the researchers concluded that non-biodegradable microplastics are the most harmful to lugworms.

Use the information in Table 3.1 in your answer.

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..... [4]

(c) Ammonium ions are an important part of the nitrogen cycle. They can be converted into nitrate ions, which are used by plants and protoctists such as diatoms.

(i) State the name of the molecules that are converted into ammonium ions in the nitrogen cycle.

..... [1]

(ii) State the name of the process of converting ammonium ions into nitrate ions.

..... [1]

(iii) Explain the effects of nitrate ion deficiency on plant growth.

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..... [3]

(d) Non-biodegradable plastics are also harmful to terrestrial ecosystems.

Discuss the effects of non-biodegradable plastics on terrestrial ecosystems.

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..... [5]

[Total: 20]

11. 0610_w19_qp_42 Q: 6

Carbon dioxide forms approximately 0.04% of the atmosphere.

Fig. 6.1 shows part of the carbon cycle.

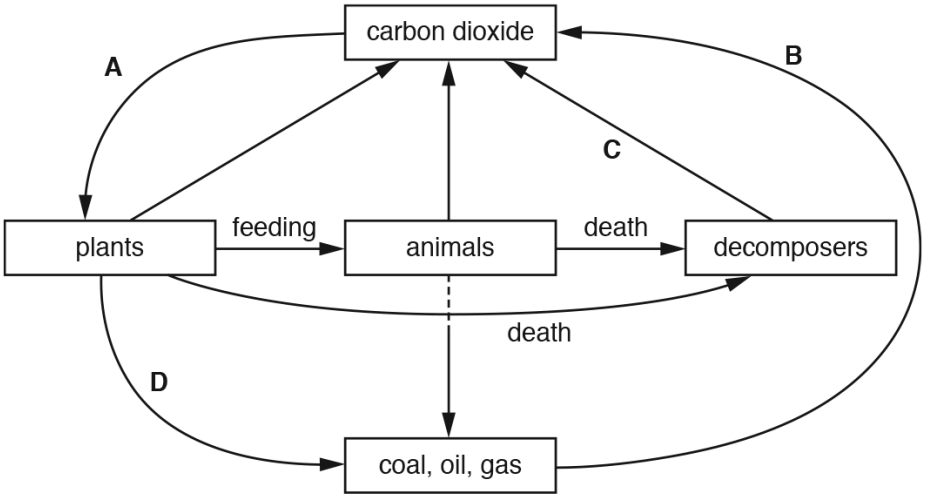

Fig. 6.1

(a) Complete Table 6.1 by naming the processes labelled **A** to **D** in Fig. 6.1.

Table 6.1

letter on Fig. 6.1	name of the process in the carbon cycle
A	
B	
C	
D	

[4]

(b) Complete the sentences by writing the missing words in the spaces.

Carbon dioxide is a greenhouse gas. Greenhouse gases trap ..... in the atmosphere. Water vapour is the most common greenhouse gas in the atmosphere. Another greenhouse gas is methane which is released from ..... and ..... . Carbon dioxide and methane released from human activities over the past 200 years have contributed to the ..... greenhouse effect.

Other atmospheric pollutants can cause acid rain. One of these is ..... which is a waste gas from some power stations.

One source of pollution in both aquatic and terrestrial ecosystems is ..... plastics. [6]

[Total: 10]

12. 0610_s17_qp_42 Q: 5

Acid rain has negative effects on many ecosystems.

(a) Describe the negative effects of acid rain on freshwater ecosystems, such as streams, rivers and lakes.

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.....[5]

(b) Two groups of students were asked to investigate the effects of acid rain on the germination of pine tree seeds.

(i) Both groups of students decided to use sulfuric acid rather than hydrochloric acid to represent acid rain in their investigation.

Suggest why.

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.....[1]

(ii) State how the students could have measured the pH of the sulfuric acid.

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.....[1]

(iii) The students provided the environmental conditions that seeds need to germinate.

State **two** of these environmental conditions.

1 .....

2 .....
[2]

(c) One group of students recorded the change in temperature as the seeds germinated in five insulated flasks, labelled **A** to **E**.

(i) Suggest why germinating seeds increase in temperature.

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.....[2]

(ii) The students sterilised the seeds before their investigation.

Their teacher told them to use a sterilising solution to wash the seeds because steam would kill the seeds and prevent the seeds from germinating.

Explain why steam sterilisation would prevent seed germination.

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.....[1]

The results from this group of students are shown in Table 5.1.

Table 5.1

flask	pH	group 1
		temperature of seeds after 72 hours / °C
A	2.0	20.6
B	3.5	20.3
C	4.0	21.2
D	5.5	34.1
E	7.0	46.2

(iii) Describe the results obtained by group 1.

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.....[2]

(d) The second group of students placed 100 seeds in each of five Petri dishes, labelled **1** to **5**.

Group 2 used the same range of pH values as group 1.

They recorded the percentage of seeds that had germinated after 72 hours.

Their results are shown in Table 5.2.

Table 5.2

Petri dish	pH	group 2
		percentage of seeds germinated after 72 hours
1	2.0	20
2	3.5	82
3	4.0	19
4	5.5	65
5	7.0	87

The teacher thought that group 2 had forgotten to add the sulfuric acid to one of their Petri dishes.

Suggest which Petri dish was not set up correctly.

.....[1]

[Total: 15]

13. 0610_m16_qp_42 Q: 4

(a) Increasing human population is linked to a change in carbon dioxide concentration in the atmosphere. Fig. 4.1 shows the carbon dioxide concentration between 1958 and 2010 measured at Mauna Loa, Hawaii.

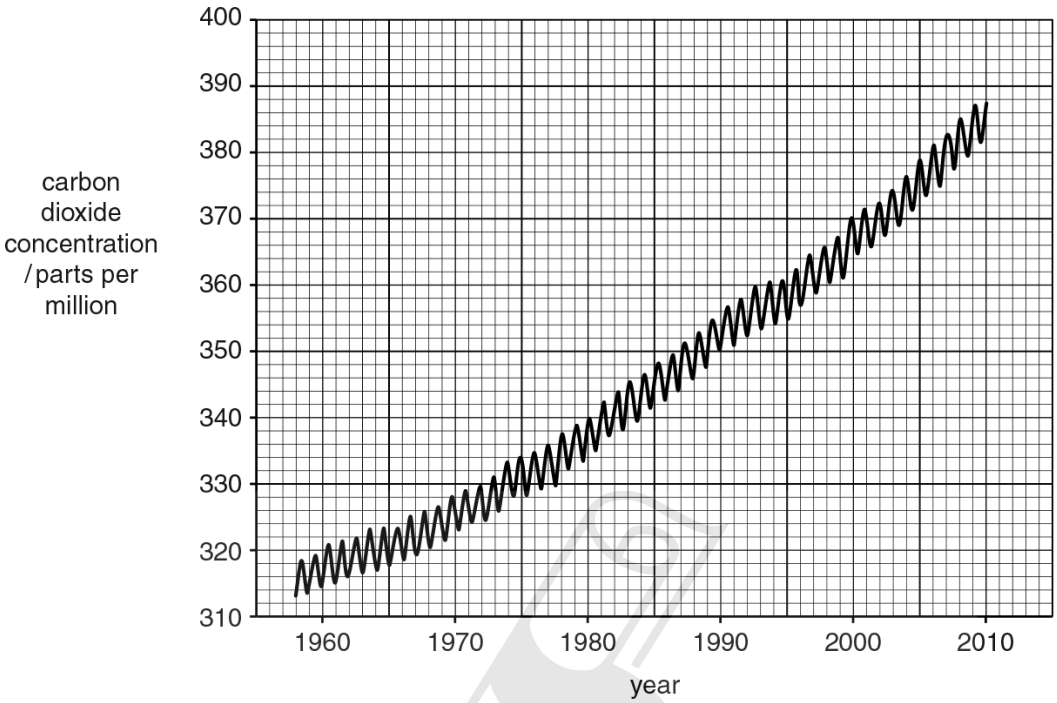

Fig. 4.1

Describe how the carbon dioxide concentration has changed between 1958 and 2010. You will gain credit for using data from Fig. 4.1.

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.....[3]

(b) **(i)** Carbon dioxide is a greenhouse gas.
Name **one other** greenhouse gas.

.....[1]

(ii) Explain how carbon dioxide enhances the greenhouse effect.

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.....[3]

(c) Mineral ions are needed for plant growth.

Complete Table 4.1 to show the function and effect of the lack of some mineral ions on plants.

One has been done for you.

Table 4.1

mineral ion	function in plants	effect of lack of mineral ion on plants
nitrate		
magnesium		
phosphate	used for making DNA	poor root growth

[4]

(d) Fertilisers can cause pollution to aquatic systems. Overuse of fertilisers may cause eutrophication. Lake Udai Sagar in India is an example of an aquatic system that shows high levels of eutrophication.

Explain what happens in aquatic environments, such as Lake Udai Sagar, when eutrophication occurs.

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.....[6]

[Total: 17]

14. 0610_s16_qp_42 Q: 5

Hormones are secreted by glands or made artificially by drug companies.

(a) **(i)** Name the gland that secretes testosterone.

..... [1]

(ii) State why testosterone can improve sporting performance.

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..... [1]

(iii) Describe the role of progesterone in the menstrual cycle.

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..... [1]

(iv) Synthetic progesterone is found in oral contraceptives.

Name **one** other hormone often found in oral contraceptives.

..... [1]

Water entering two sewage works, **A** and **B**, was tested for the presence of four hormones.

The testing was repeated on water that left the sewage works to flow into lake **A** and lake **B**.

The results of the tests on the water samples are shown in Table 5.1.

Table 5.1

hormone	concentration of hormones at sewage works / ng per dm^3			
	A		**B**	
	before sewage treatment	after sewage treatment including ozone and chlorine	before sewage treatment	after sewage treatment including chlorine alone
oestrogen	not measurable	not measurable	0.1	not measurable
synthetic progesterone	8.5	8.0	4.5	4.6
natural progesterone	2.5	2.8	2.4	2.7
testosterone	15.6	3.7	2.7	3.1

(b) Explain which water sample was most polluted with hormones **before** sewage treatment. Use data from Table 5.1 to support your answer.

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..... [3]

(c) One reason for treating sewage is to reduce the concentration of hormones in the environment.

(i) Chlorine was used in the sewage treatment of both lakes.

Describe the effect that chlorine had on the hormone concentrations in the water. Use data from Table 5.1 to support your answer.

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..... [2]

(ii) State the main purpose of chlorine in sewage treatment.

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(d) Describe the negative consequences of letting untreated sewage flow into lake ecosystems.

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..... [6]

[Total: 16]

15. 0610_s20_qp_41 Q: 5

Ciliates are classified in the kingdom Protoctist. Bacteria are classified in the kingdom Prokaryote.

(a) State **two structural** features that distinguish the cells of a protoctist from a prokaryote.

1 .....

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2 .....

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[2]

(b) Fig. 5.1 shows five species of ciliate that are found in sewage treatment works.

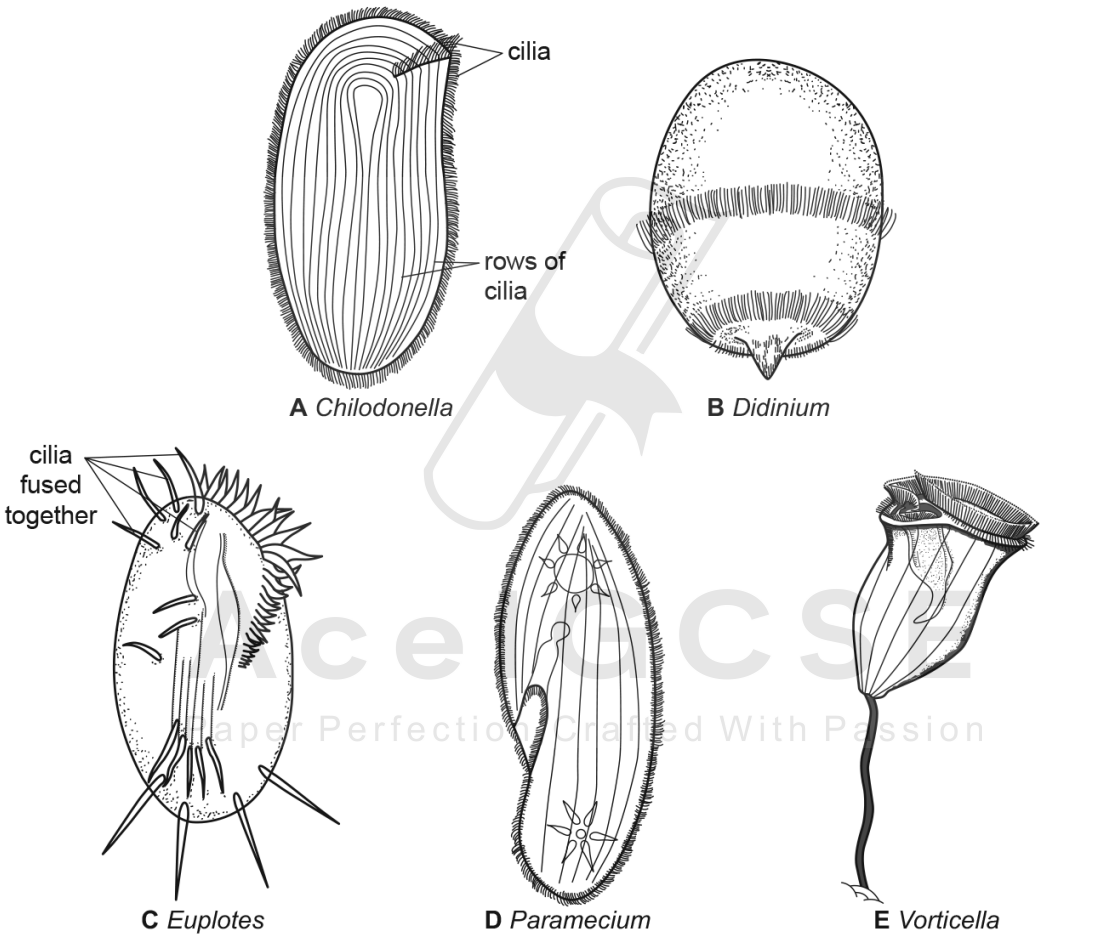

Fig. 5.1

Fig. 5.2 is a dichotomous key to identify the ciliates shown in Fig. 5.1.

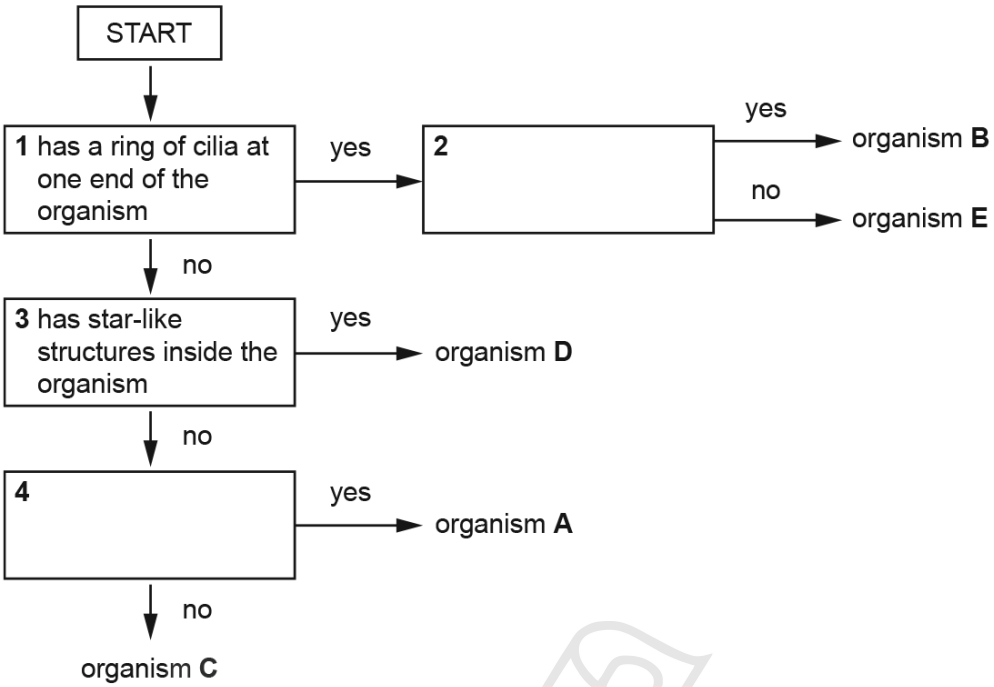

Fig. 5.2

Complete the key in Fig. 5.2 by writing suitable statements:

- for box 2 to distinguish species **B** and **E**
- for box 4 to distinguish species **A** and **C**.

text for box 2 .....

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.....

text for box 4 .....

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[2]

(c) *Didinium* is a predatory ciliate. A video recording was made of one *Didinium* feeding on a *Paramecium*. Fig. 5.3 shows a sequence of still photographs taken from the video.

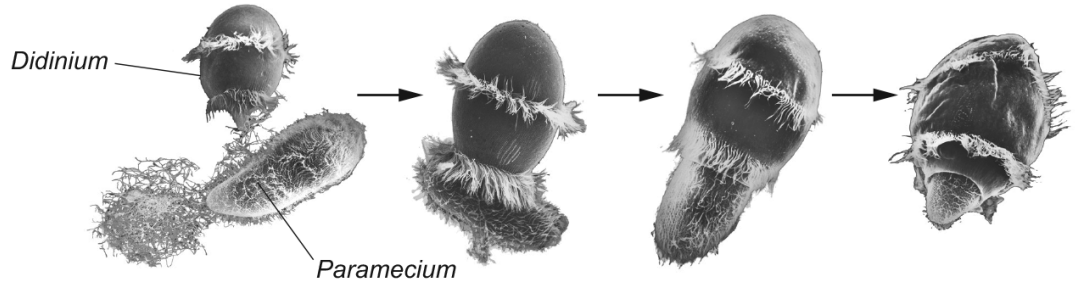

Fig. 5.3

Complete the table by putting a tick (✓) by each characteristic of life that can be seen in the still photographs from the video in Fig. 5.3.

excretion		nutrition	
growth		reproduction	
movement		respiration	

[1]

(d) Fig. 5.4 is a food web for some of the microorganisms in a sewage treatment works.

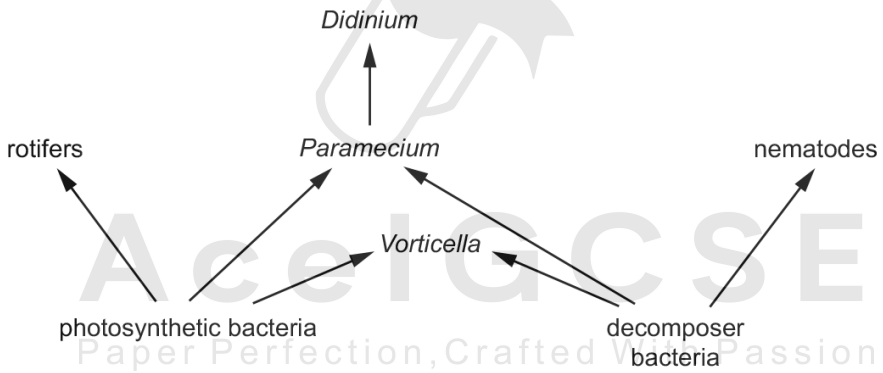

Fig. 5.4

(i) Construct **one** food chain with three trophic levels that use energy derived from the breakdown of sewage. Do **not** draw the organisms.

..... [1]

(ii) The water that passed out of the sewage works was often cloudy with suspended matter.

Scientists discovered that ciliates reduce the cloudiness of water during sewage treatment.

Suggest how the ciliates reduce the cloudiness of the water using the information in Fig. 5.4.

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..... [2]

(iii) Explain how sewage treatment reduces the spread of disease.

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..... [3]

(iv) Nitrifying bacteria are found in sewage works.

Explain the importance of nitrifying bacteria in the nitrogen cycle.

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..... [3]

[Total: 14]

16. 0610_s20_qp_42 Q: 3

Cheetahs, *Acinonyx jubatus*, are carnivores found in the dry grasslands and woodlands of southern Africa. Cheetahs hunt for food during the day. They eat deer and antelope.

The cheetah is the fastest mammal on land but can only run at high speed (sprint) over a short distance. Its hunting strategy is to creep up on prey and then sprint to catch them.

Fig. 3.1 is a photograph of a cheetah in its natural habitat.

Fig. 3.1

(a) Suggest how these adaptive features enable cheetahs to survive in their natural environment.

fur colouring .....

.....

.....

streamlined body shape .....

.....

.....

[2]

(b) The king cheetah is a rare variety of *A. jubatus* that has inherited striped fur markings.

Fig. 3.2 shows a cheetah with spots and a king cheetah.

cheetah with spots

king cheetah

Fig. 3.2

(i) Define the term *inheritance*.

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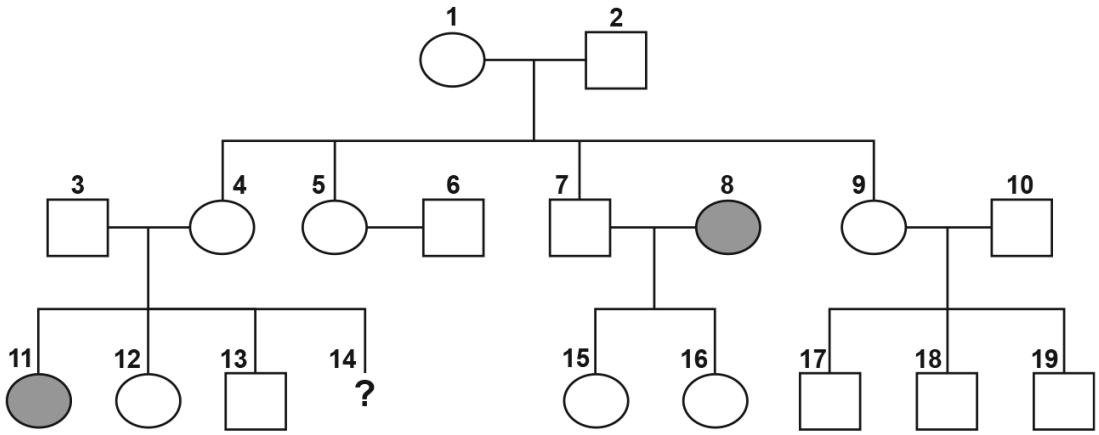
.....

..... [1]

Fig. 3.3 shows a pedigree diagram of a population of cheetahs.



Key:

female king cheetah

female cheetah with spots

male king cheetah

male cheetah with spots

Fig. 3.3

(ii) Deduce the genotype of cheetah **11**.

..... [1]

(iii) Predict the probability of cheetah **14** being a king cheetah.

..... [1]

(iv) Describe how a breeder could determine the genotype of cheetah **17**.

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..... [2]

(v) When the king cheetah was first discovered it was thought that it was a new species.

Pedigree diagrams of cheetahs proved it was not a new species.

Suggest **one** type of evidence, other than pedigree diagrams, that can be used to determine how closely related organisms are.

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..... [1]

(c) Cheetahs are at risk of becoming endangered.

(i) Suggest why the cheetah is at risk of becoming endangered.

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..... [3]

(ii) Describe how species like the cheetah can be conserved.

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..... [3]

[Total: 14]

17. 0610_s20_qp_43 Q: 4

Xerophytes grow in habitats with low rainfall and soils that often have high concentrations of salts.

Fig. 4.1 shows the xerophyte *Yucca treculeana* growing on salt flats.

Fig. 4.1

(a) (i) Explain how xerophytes, such as *Y. treculeana*, are adapted to absorb sufficient water in the conditions in which they live.

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..... [4]

(ii) Explain how xerophytes are adapted to reduce water loss to the atmosphere.

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..... [3]

(iii) Xerophytes often have many defence mechanisms that reduce or prevent herbivores eating them.

Suggest how xerophytes protect themselves against herbivores.

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..... [2]

(b) Forest ecosystems can be affected by acid rain.

Describe how the production of acid rain **and** its effects on forest ecosystems can be reduced.

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..... [4]

[Total: 13]

18. 0610_w19_qp_41 Q: 6

Fish are an important part of a balanced diet for many people.

(a) Fish are a good source of vitamin D.

State **one** effect of a diet that is deficient in vitamin D.

.....

.....

..... [1]

(b) Many fish stocks have declined.

Marine ecologists considered the three topics shown in Fig. 6.1 when they discussed the decline of fish stocks.

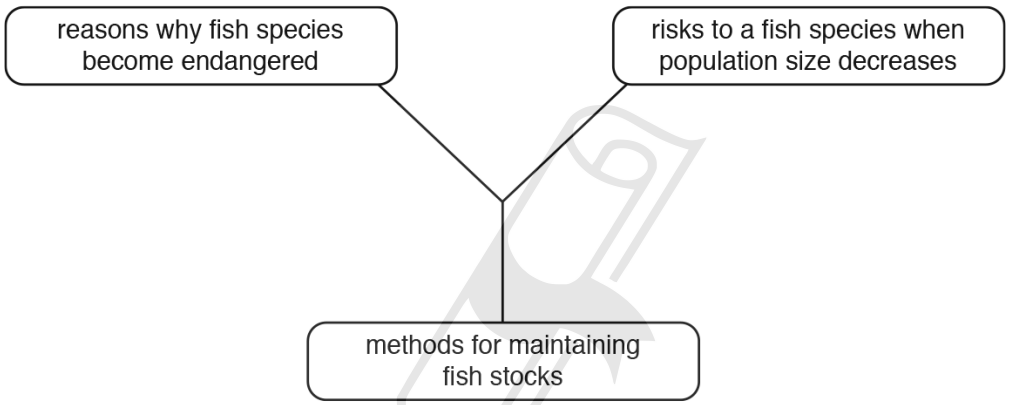

Fig. 6.1

Describe the key points for each of the three topics shown in Fig. 6.1.

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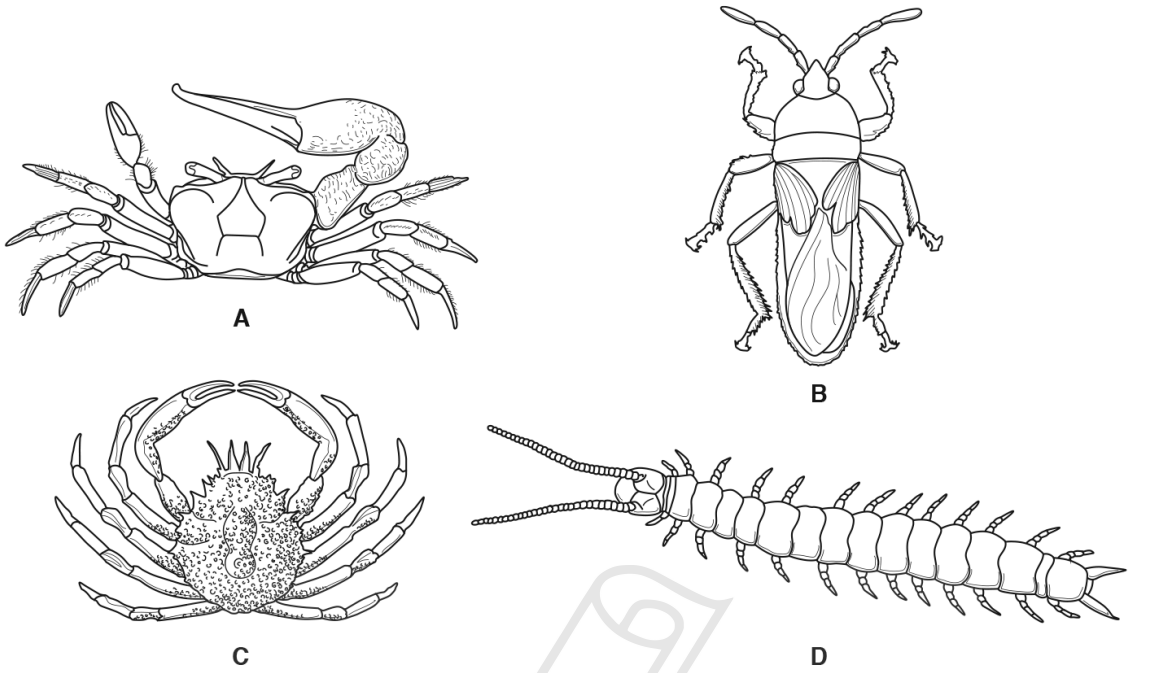
..... [6]

[Total: 7]

19. 0610_w19_qp_42 Q: 1

(a) Fig. 1.1 shows four arthropods.



not to scale

Fig. 1.1

(i) State **two** features, visible in Fig. 1.1, that are common to all arthropods.

1 .....

2 .....

[2]

(ii) Fig. 1.2 is a dichotomous key for the arthropods shown in Fig. 1.1.

Complete Fig. 1.2 by writing suitable statements in:

- box **2** to identify species **B**
- box **3** to separate species **C** and **A**.

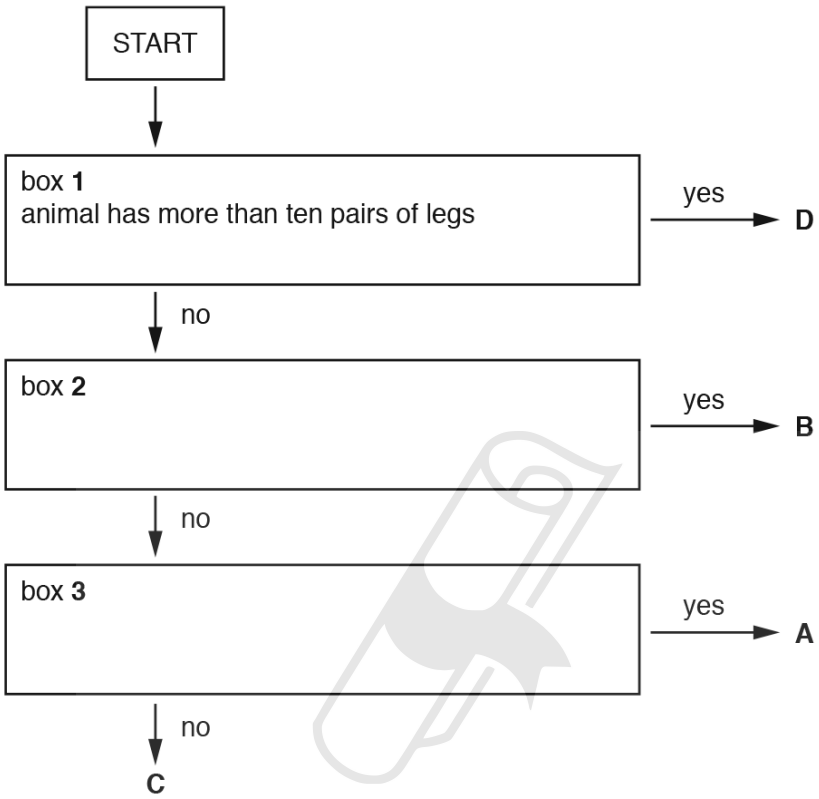


Fig. 1.2

[2]

(b) The Hawaiian happy-face spider, *Theridion grallator*, is found on several of the Hawaiian islands. Some of the spiders have a very distinctive pattern on their bodies as shown in Fig. 1.3.

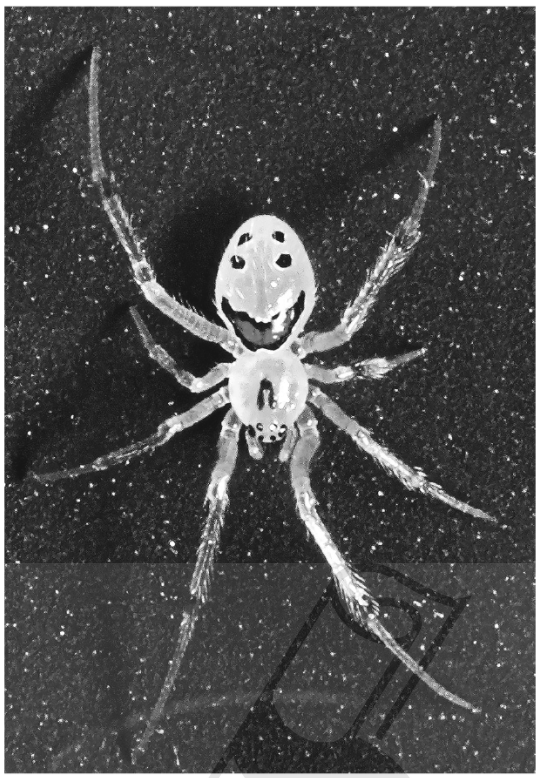


Fig. 1.3

(i) State **one** feature, visible in Fig. 1.3, that identifies *T. grallator* as an arachnid.

..... [1]

(ii) Scientists think that the pattern on the bodies of the spiders is an adaptive feature.

Explain the term *adaptive feature* with reference to this pattern.

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..... [3]

(c) DNA can be extracted from the webs of spiders. This DNA can be used to identify the species of spider that made the web, and the species of prey caught in the web.

Explain how DNA extracted from spider webs can be used to identify different species.

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..... [2]

(d) Many species of spider are thought to be endangered.

State **three** reasons why animal species such as spiders become endangered.

1 .....

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2 .....

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3 .....

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[3]

[Total: 13]

20. 0610_w19_qp_43 Q: 4

Forest ecosystems are threatened by many human activities.

(a) (i) Describe reasons why people cut down forests.

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..... [3]

(ii) Describe how forests can be conserved.

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..... [3]

(b) Ecologists in one country were concerned that some mammals had been affected by deforestation.

Fig. 4.1 is a diagram showing how deforestation affected one area of forest.

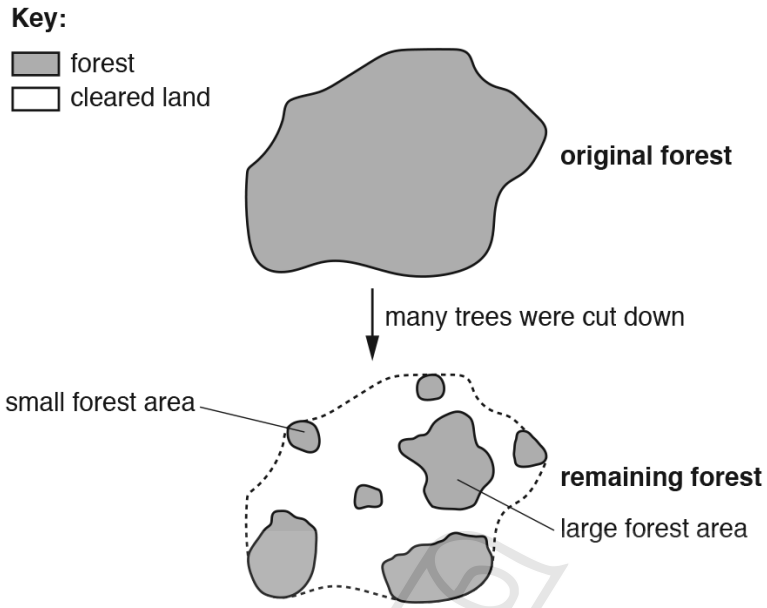

Fig. 4.1

The ecologists studied eight species of mammal. They recorded how many of the small and large areas of the remaining forest contained each of the eight species.

Two species, the black rat and the house mouse, are not usually found in this forest ecosystem. They were introduced to the area by humans many years ago before any trees were cut down.

The other six species are known to live in this forest ecosystem.

Table 4.1

species of mammal	average body mass / g	percentage of small forest areas containing the species	percentage of large forest areas containing the species
house mouse*	18	46	42
brown antechinus	40	62	83
swamp rat	130	15	25
bush rat	160	85	100
black rat*	200	15	0
southern brown bandicoot	850	31	92
long-nosed potoroo	1100	8	17
long-nosed bandicoot	1300	8	25

*introduced species

(i) State which mammal in Table 4.1 showed almost no preference between small and large areas of forest.

..... [1]

(ii) The ecologists made a hypothesis:

'Larger areas of forest are better for the conservation of mammals.'

Discuss the evidence from Table 4.1 to support or reject this hypothesis.

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..... [4]

[Total: 11]

21. 0610_m18_qp_42 Q: 3

(a) Ecologists studied an area of woodland and estimated the biomass of each trophic level for one of the food chains in the woodland.

Some students wanted to use the data to draw a pyramid of biomass for the food chain.

Table 3.1 shows the students' table.

The students added a column to calculate the width of the bars they would need to draw.

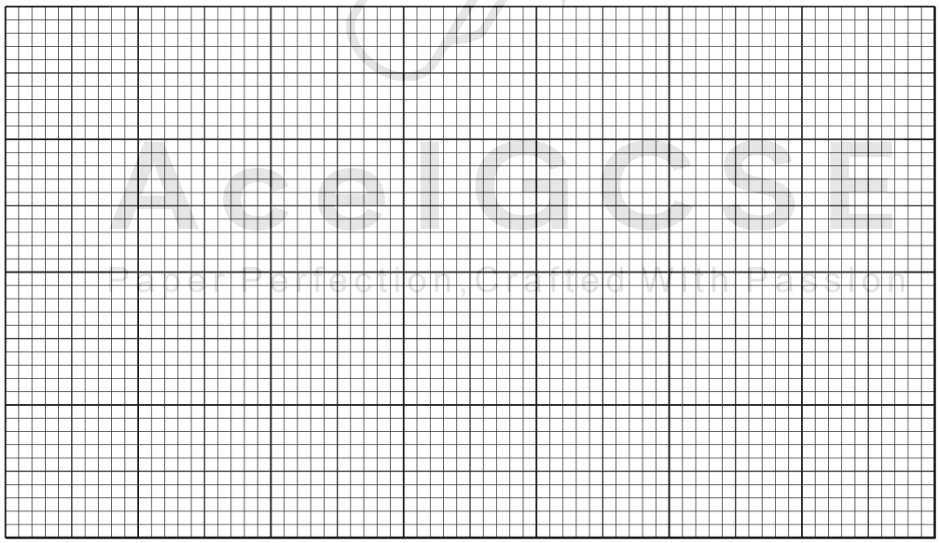
Table 3.1

trophic level		biomass / g m^{-2}	width of bar / cm
1	producer	120	12.0
2	primary consumer	48	4.8
3	secondary consumer	16	1.6
4	tertiary consumer	2	

(i) Complete Table 3.1 by calculating the missing value and writing it in the table. [1]

(ii) Using the information in Table 3.1, draw a pyramid of biomass.

Label each bar with the trophic level.



[3]

(b) A type of organism gains energy from waste organic material from all trophic levels.

State the name of this type of organism.

.....[1]

(c) **(i)** Outline how organisms in the first trophic level of the woodland food chain produce biomass using energy from the Sun.

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.....[3]

(ii) Explain why the fourth trophic level has the least biomass in this food chain.

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.....[3]

(d) The woodland is a conservation area.

Outline the possible benefits of conserving this specific area of woodland.

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.....[3]

[Total: 14]

22. 0610_w18_qp_42 Q: 6

Fig. 6.1 shows the Galapagos iguana, *Amblyrhynchus cristatus*.

Fig. 6.1

(a) **(i)** State **two** features that are used to classify animals, such as the Galapagos iguana, as reptiles.

1 .....

2 .....
[2]

(ii) State **two** features that are present in plant cells that are **not** present in the cells of reptiles.

1 .....

2 .....
[2]

(b) Galapagos iguanas feed on seaweed which contains starch and other carbohydrates.

(i) State the name of the enzyme that digests starch.

..... [1]

(ii) State the names of **two** parts of the alimentary canal where starch is digested.

1 .....

2 .....
[2]

(c) There are many threats to wildlife in the Galapagos.

Describe ways in which endangered species can be conserved.

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..... [5]

(d) One aim of conservation is to maintain resources in natural ecosystems.

State **three** resources that natural ecosystems provide for humans.

1 .....

2 .....

3 .....

[3]

[Total: 15]

23. 0610_w18_qp_43 Q: 1

Water is a very important molecule for all living organisms.

(a) **(i)** State the name of the organ in plants where most water is absorbed.

.....[1]

(ii) State the name of the organ in humans where most water is absorbed.

.....[1]

(iii) State **one** property of water that makes it useful to animals and plants.

.....[1]

(b) The flow diagram in Fig. 1.1 shows a town and part of the water cycle.

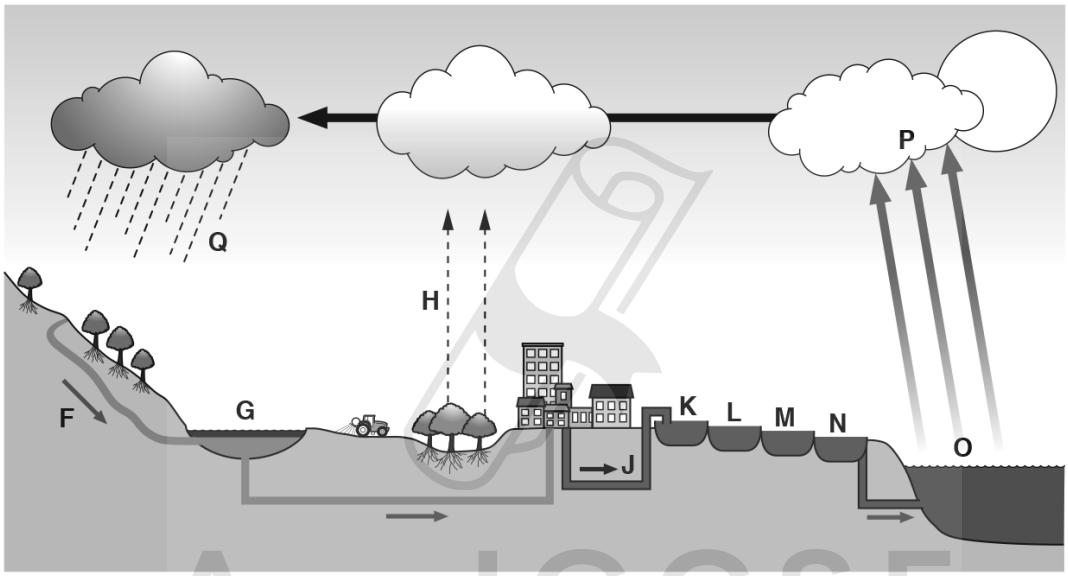

Fig. 1.1

Table 1.1 describes some of the processes in the water cycle.

Complete Table 1.1.

One row has been done for you.

Table 1.1

description	name of the process	letter in Fig. 1.1
nitrate ions are washed into rivers	leaching	**F**
an algal bloom in the water is caused by leaching of nitrate ions		
	evaporation	
conversion of water from a vapour to a liquid		
	transpiration	

[4]

(c) Polluted water can be purified at a sewage treatment works.

(i) State **one** reason why it is necessary to treat polluted water before it is used as drinking water.

.....

.....[1]

(ii) Outline the process of sewage treatment. You may use the letters in Fig. 1.1 in your answer.

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.....[4]

[Total: 12]

24. 0610_s17_qp_41 Q: 5

The giant quiver tree, *Aloe pillansii*, shown in Fig. 5.1, is an endangered species.

These long-lived trees grow in harsh environments. Some populations of *A. pillansii* are found within the Richtersveld National Park, but one population is found just outside on a mountain called Cornell's Kop in southern Africa.

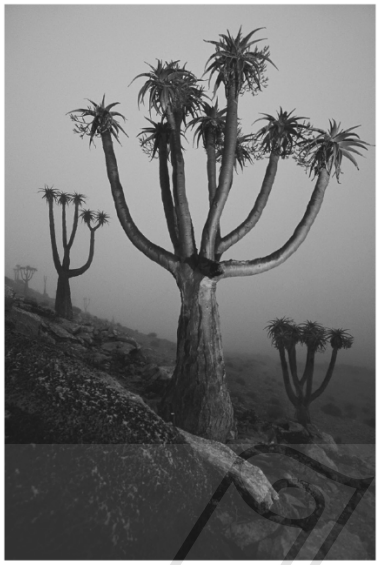

Fig. 5.1

(a) (i) State the genus of the giant quiver tree.

.....[1]

(ii) Explain why the *A. pillansii* trees on Cornell's Kop represent a population.

.....

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.....[3]

(b) Suggest **three** reasons why the giant quiver tree is an endangered species.

1.....

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2.....

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3.....

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[3]

(c) It was estimated in 2005 that the total number of giant quiver trees in the wild was less than 3000, which is considered to be very low compared with other tree species.

Explain the risks to a plant species of having very small numbers.

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.....[3]

(d) The population of *A. pillansii* trees on Cornell's Kop was surveyed and photographed at four sites, **A** to **D**, from 1937 onwards. Researchers took photographs at all four sites in 2004 and compared them with the original photographs.

The results are shown in Table 5.1.

Table 5.1

site	date of the original photograph	number of living trees in the original photograph	number of living trees in 2004	number of dead tree stumps	average annual mortality rate /percentage of deaths per year
A	1937	12	4	8	1.0
B	1953	9	5	4	0.9
C	1985	5	3	2	2.1
D	2001	6	5	1	5.6

(i) Calculate the percentage decrease in the number of living trees at site **B** from 1953 to 2004.

Show your working and give your answer to the nearest whole number.

.....%
[2]

(ii) Describe what the analysis of the photographs shows about the population of *A. pillansii* on Cornell's Kop.

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.....[3]

[Total: 15]

25. 0610_s17_qp_43 Q: 4

Fig. 4.1 is a photograph of a yellow-shouldered Amazon, *Amazona barbadensis*, a species of parrot found along the Venezuelan coast of the Caribbean.

Fig. 4.1

(a) State the vertebrate group that includes *A. barbadensis* and give **two** features that are used to classify animals into this group.

vertebrate group .....

feature 1 .....

feature 2 .....

[2]

(b) This species is subdivided into several populations on the mainland and on the islands of Margarita and Bonaire. Scientists believe that yellow-shouldered Amazons rarely travel between these places.

Explain what biologists mean when they refer to *populations* of animals, such as *A. barbadensis*.

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.....[3]

(c) The number of yellow-shouldered Amazons on Margarita Island had decreased to 700 parrots by 1989. The population then increased to 1600 parrots by 2009.

Part of this increase was due to the release of captive-bred parrots on the island. This is one of the few successful release programmes of parrots. A similar release programme in Arizona in the 1980s of a different species of parrot was not successful.

Suggest why release programmes for captive-bred parrots were **not** successful.

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.....[2]

(d) Some captive breeding programmes involve very small numbers of animals.

Outline the disadvantages of such programmes.

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.....[3]

(e) Many biologists think that it is better to conserve ecosystems rather than individual species, such as parrots.

Explain the advantages of conserving ecosystems.

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.....[3]

[Total: 13]

26. 0610_w17_qp_41 Q: 5

(a) Yeast can respire aerobically and anaerobically.

State the balanced chemical equation for aerobic respiration by yeast.

.....[2]

(b) When yeast respires anaerobically, ethanol is released.

Ethanol is a type of sustainable resource that can be produced from a wide range of crops. It can be used as a biofuel.

Table 5.1 summarises some information about crops that are used to make biofuel.

Table 5.1

crop	biofuel produced	energy yield / GJ per ha	optimum growth temperature / °C	optimum annual rainfall range / mm
wheat	ethanol	53–84	24	800–1200
corn	ethanol	63–76	18	360–1000
sugar beet	ethanol	110–122	18	360–1000
sugar cane	ethanol	110–140	28	800–1200
oil palm	oil	150–166	28	1100–2500

(i) Uruguay has an average temperature range of 12 °C to 24 °C and an average annual rainfall of 1000 mm.

Suggest **and** explain which crop would be the **most** suitable crop to grow for producing biofuel in Uruguay.

Use the information in Table 5.1 to justify your choice.

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.....[3]

(ii) Sugar cane requires soil with high concentrations of nitrogen and potassium.

Describe how the lack of nitrate ions would affect the production of sugar cane.

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.....[3]

(iii) Researchers in Brazil are considering using microscopic algae that live in water to produce biofuels. They have found that algae can produce a maximum amount of energy of 200 GJ per m^2.

1 m^2 = 0.0001 ha

Convert the production of biofuel from algae into GJ per ha.

Space for working.

..... GJ per ha [1]

(iv) Suggest why people who are concerned about the environment want countries to produce more biofuel from algae rather than the crops listed in Table 5.1.

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.....[3]

(c) Define the term *sustainable development*.

.....

.....

.....[2]

[Total: 14]

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27. 0610_w17_qp_42 Q: 3

Tasmania is an island off the south coast of Australia. Sheep were introduced to Tasmania in the nineteenth century.

Fig. 3.1 shows the population of sheep in Tasmania from 1820 to 1940. The dashed line shows the trend in the population growth.

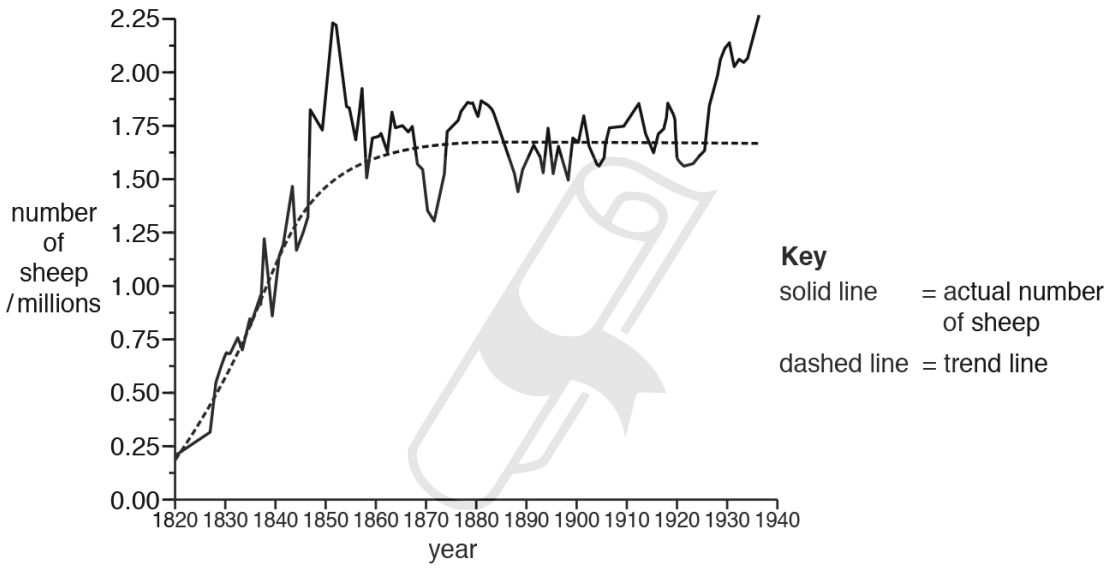

Fig. 3.1

(a) Describe the **trend** in the population of sheep in Tasmania between 1820 and 1940, using the information in Fig. 3.1.

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.....[3]

(b) Explain the change in the **trend** of the population that you described in **3(a)**.

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.....[3]

(c) The sheep that were first introduced to Tasmania were not well adapted to the environment.

Describe how farmers can use selective breeding to improve their sheep so that they are better adapted to the environment.

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.....[4]

(d) Maintaining very large populations of farm animals is unsustainable.

Define the term *sustainable development*.

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.....[2]

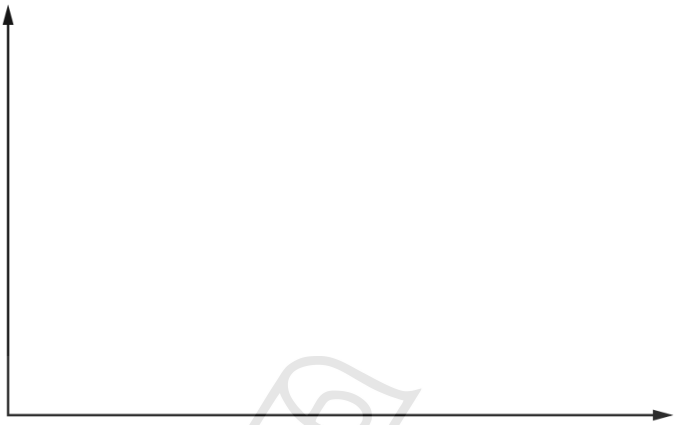
[Total: 12]

28. 0610_s16_qp_41 Q: 5

A researcher investigated the population growth of fish for fish farming. The researcher stocked a farmer's lake with a small number of these fish and recorded the number of fish over the next five years. The researcher's results showed that the population of fish had increased exponentially.

(a) **(i)** Use the axes to show the **exponential growth** in the population of fish.

Label the axes and draw a suitable curve.



[3]

(ii) Explain why the population of fish increased exponentially.

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..... [4]

Fig. 5.1 shows the total mass of wild fish caught worldwide between 1950 and 2012 and the mass of farmed fish produced worldwide over the same period.

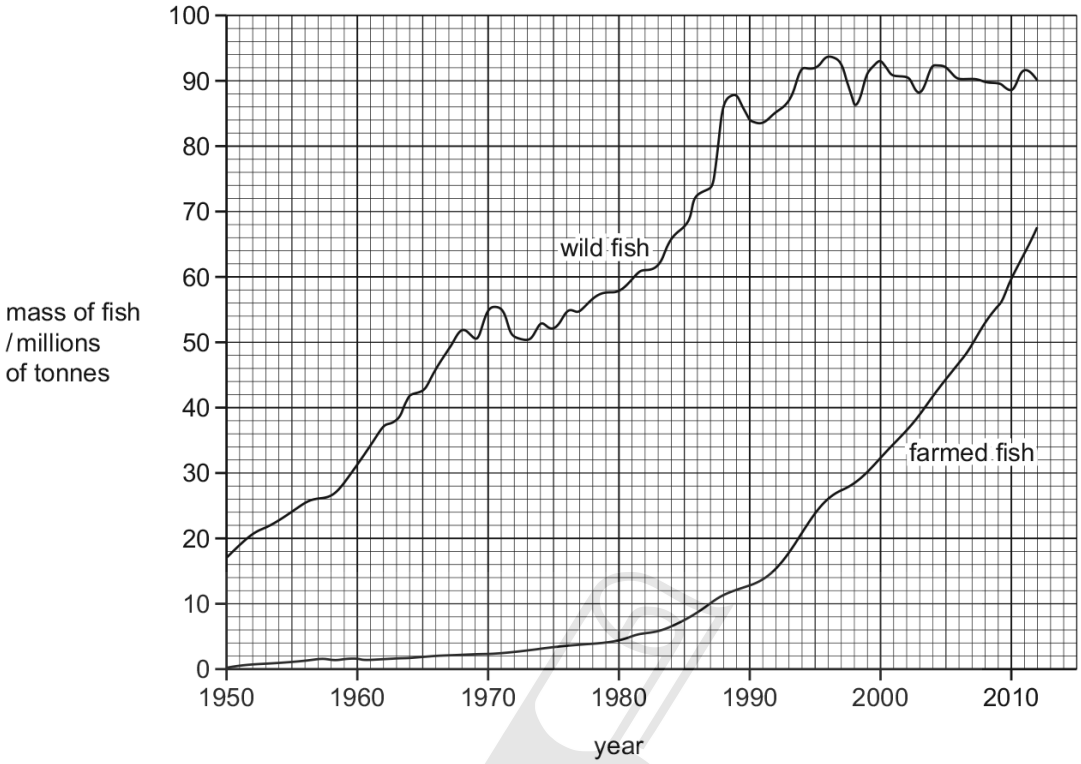

Fig. 5.1

(b) Describe the changes in the mass of **wild fish** caught between 1950 and 2012.

You will gain credit if you use data from Fig. 5.1.

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..... [3]

(c) It is predicted that wild fish stocks will decrease and become depleted because of overfishing.

Suggest ways in which governments can try to maintain the stocks of wild fish.

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..... [6]

(d) Like fish stocks, forests can be a sustainable resource.

Discuss what is meant by the term *sustainable resource*, using forests as an example.

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..... [3]

[Total: 19]

29. 0610_s16_qp_43 Q: 5

Fig. 5.1 shows an area of forest where some of the trees have been cut down.

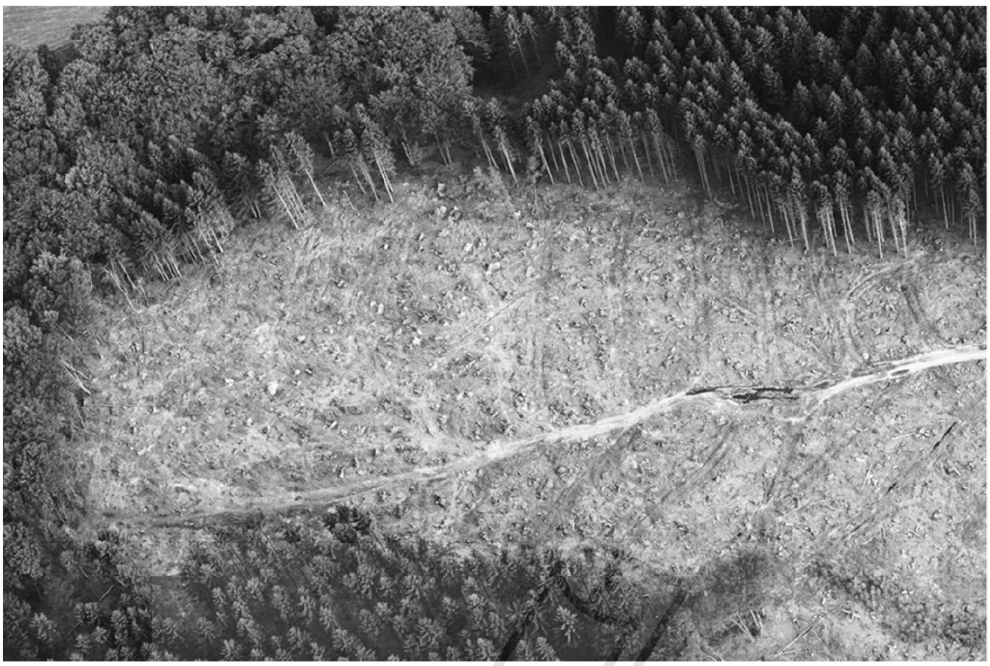

Fig. 5.1

(a) Explain the reasons why forests may be cut down as shown in Fig. 5.1.

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..... [3]

(b) The loss of forests from parts of the world is assessed by satellite imagery. Table 5.1 shows data on the forests in Indonesia and Malaysia, two countries in South-East Asia which have large areas of forest.

Table 5.1

country	type of forest	area / thousands of hectares			
		1990	**2000**	**2005**	**2010**
Indonesia	natural forest	118 545	95 737	94 158	90 883
Malaysia	natural forest	20 420	19 932	19 317	18 649

(i) Calculate the percentage loss of natural forest in Indonesia between 1990 and 2010. Show your working and express your answer to the nearest whole number.

..... % [3]

(ii) Use the data in Table 5.1 to compare the loss of natural forest in Indonesia with the loss of natural forest in Malaysia.

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..... [3]

(iii) Many hectares of natural forest have been cleared in countries such as Malaysia and Indonesia for oil palm plantations. Both countries have also replanted forests to grow timber and other forest products.

Suggest why replanted forests and plantations are **less** useful for conservation than natural forest.

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..... [3]

(c) Discuss the effects of deforestation on areas of land.

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..... [6]

[Total: 18]

30. 0610_w16_qp_41 Q: 2

Carp are a type of fish. Researchers in Brazil measured the body lengths of a population of carp in a river in **1998** and again in **2008**.

Histograms of their results are shown in Fig. 2.1.

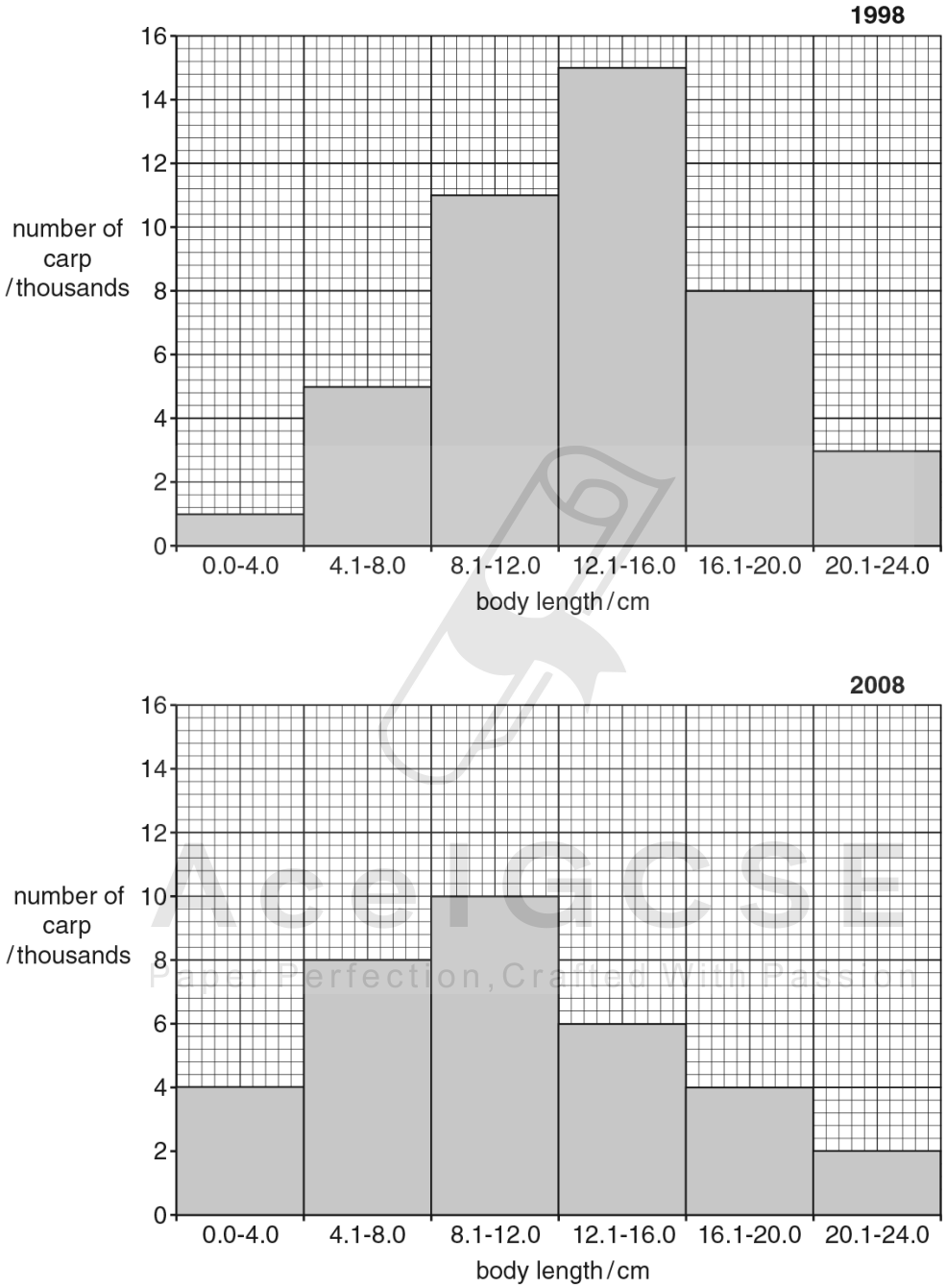

Fig. 2.1

(a) Define the term *population*.

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.....[2]

(b) Describe the variation in body length of the carp population in **1998**. Use the data in Fig. 2.1 to support your answer.

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.....[3]

(c) The total population of carp in 1998 was 43 000 fish.

(i) Calculate the total population of carp in **2008**.

Show your working.

.....[2]

(ii) The decrease in the carp population by 2008 was caused by overfishing.

Explain how fish stocks can be sustained.

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(d) Body length is an example of continuous variation.

(i) Suggest what causes the variation in body length in a population of fish.

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(ii) Continuous variation is shown with a histogram.

Name the type of graph that should be used to show **discontinuous** variation.

.....[1]

[Total: 14]

31. 0610_w16_qp_42 Q: 6

Wetlands are internationally important ecosystems. The spoon-billed sandpiper, *Calidris pygmaea*, is an endangered species.

Fig. 6.1 shows a spoon-billed sandpiper feeding in a wetland ecosystem. The wetland is a stopover on the bird's long migration from north-east Russia to south-east Asia.

The smaller photograph is a close-up of the bird's legs to show that it has been ringed.

Fig. 6.1

Spoon-billed sandpipers stop to feed at the Rudong mudflats near Shanghai, China.

Putting one or more rings on a bird's leg is a common way to identify individual birds. Spoon-billed sandpipers ringed in Russia have been seen at the Rudong mudflats.

(a) Suggest why scientists put leg rings on birds, such as the spoon-billed sandpiper.

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(b) Explain why it is important to conserve ecosystems, such as wetlands.

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[Total: 7]

01. 0610_w19_MS_42 Q: 5

	Answer	Mark	Partial Marks
(a)(i)	anthers / stamens / filaments / stigma, hang / AW, outside (the flower) ; large, anthers / **C**, produce large quantities of pollen ; *idea that* anthers / **C**, easily release pollen ; 'feathery' / AW, stigma / **B** ; stigma has, feathery surface / large surface area, to catch pollen ; bracts / **A**, are, small / inconspicuous ;	3	**A** petals
(a)(ii)	**C** ;	1	
(b)	*idea that* pollination / fertilisation, always going to happen / AW ; no agent of pollination needed ; little wastage of pollen ; reduced / little, variation / diversity ; increased competition between plants (as have the same adaptation) ; increase chance of, genetic / inherited, disease ; all plants adapted to same, conditions / environment ; little ability to adapt to changing conditions / little ability to evolve ; an infectious disease can kill all of the population / all plants more susceptible to the same disease ; risk of extinction ; AVP ;	4	
(c)	drought / lack of rain / lack of (irrigation) water ; flooding ; fire ; tsunamis / cyclones / hurricanes ; earthquakes / volcanic eruptions ; plagues of, animals / insect pests ; pests / diseases, of stored food / livestock ; conflict / war ; rising prices of food ; poverty ; unequal distribution of food ; growing, non-food crops / biomass for fuels / crops for export ; increase in population / migration of people ; soil degradation / soil erosion / desertification / salination of soils / loss of soil fertility / barren land / AW ;	3	
(d)(i)	expose the plants to (stem), rust / fungus ; find out if plants have DNA for rust resistance ; only use those plants that show no symptoms / AW ;	2	
(d)(ii)	to increase the, numbers of plants / population ; incorporate more genes from the high yield variety ; to maximise the yield of wheat from individual plants ; check that the plants keep their resistance to rust ; check the plants grow well in field conditions ; make sure the plants are, pure-breeding / homozygous ;	1	
(e)	*one from:* one, cotyledon / embryonic leaf / seed leaf oblong leaves / narrow leaves / straight leaves parallel-veined leaves / straight veins (named) flower parts in multiples of three fibrous roots / adventitious roots scattered vascular bundles in stem AVP ;	1	

02. 0610_s18_MS_42 Q: 3

	Answer	Mark	Partial Marks
(a)(i)	sucrose / sugar ; amino acids ;	2	
(a)(ii)	translocation ; (phloem) allows bidirectional movement / AW ; movement (of food / sap) from source to sink ; sucrose / amino acids / food, are produced / taken from storage, at a source ; region of respiration / storage / growth, is a sink ; named example of a, source / sink (in the correct context) ; some organs can be both a source or a sink at different times ;	4	
(b)	*functions* conduct / transport, water (and mineral ions) ; *ref to* transpiration ; reduced resistance to water flow / AW ; structural) support (for plant) ; prevents (inward) collapse (of xylem vessels) ; (spirals) allows (some) flexibility / bending, of stems (to prevent breaking) ; *adaptations* long / elongated (cells / vessels / tubes) ; *ref to* lignin (in walls) ; (cell walls) are water impermeable / waterproof / AW ; (secondary) thickening of cell walls ; hollow / no cytoplasm / no (named) organelles ; no, end / cross, walls (between cells) ; end plates to connect vessels (end to end) ; pits in walls (for water movement between vessels) ;	6	max 5 from one section **A** rings / spirals / AW
(c)	reduced / no, damage to crops ; **ora** increased, yield / quality (of the crop) ; **ora** more, income / profit ; **ora** because more, sugar / amino acids, available for growth ; **ora** reduced disease transmission / AW ; **ora**	2	**A** not / less, eaten by pests

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03. 0610_s17_MS_42 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	yeast ;	1	**A** fungus / *Saccharomyces (cerevisiae)*/ *S. cerevisiae*
(a)(ii)	respiration / fermentation ;	1	
(b)(i)	**1** drought ; **2** flooding / tsunami / monsoon / hurricane / cyclone ; **3** earthquake ; **4** volcanic eruption ; **5** (named) disease ; **6** AVP ;	2	**MP 1 I** desertification **I** tornado / landslide (too localised) / acid rain (not natural) / loss of soil fertility (usually not natural) **I** fire e.g. potato blight / foot and mouth disease e.g. (locust / rat) plagues
(b)(ii)	**1** increased demand for food ; **2** unequal (global) distribution of food ; **3** war / poverty ; **4** limited land for farming / increased urbanisation / AW ; **5** cash crops ; **6** poor farming practice ; **7** pollution (linked to crop failure) ; **8** AVP ;	3	 **A** (food) spoilage / wastage **A** government policies / sanctions **A** biofuels / tobacco (crops) e.g. loss soil fertility / erosion / eutrophication e.g. acid rain burning crops e.g. overfishing
(c)	**1** outbreaks / spreading, of diseases / pests / plagues ; **2** endangered / extinction, of species ; **3** disruption to food chains / described ; **4** loss in (variety) of, habitat / places where organisms live / described ; **5** loss of nutrients / disrupted nutrient cycling ; disrupted (soil) fertility **6** decreased in (soil) water / desertification ; **7** soil erosion / described ; **8** increased (described) pollution ; **9** deforestation ; **10** efficient food production so less land required ; **11** AVP ;	4	 **A** loss of (bio)diversity **A** landslides / reduced soil volume e.g. targeted use of pesticides / AW

	Answer	Mark	Partial Marks
(a)(i)	72 (%) ;;	2	difference = 724 g m^{-2} $year^{-1}$ = 724 / 1009 □ 100
(a)(ii)	1 (fertiliser provides) nutrients / salts / ions / minerals (required by plants) ; 2 (nitrogen / nitrate) needed for making, amino acids / proteins / RNA / DNA / AW ; 3 proteins are used in growth ; 4 (magnesium for) making chlorophyll ; 5 (chlorophyll for) photosynthesis ; 6 AVP ;	3	**A** original soil lacked minerals
(a)(iii)	eutrophication ;	1	
(b)	1 fertiliser decreases species diversity ; 2 at 21 weeks the difference is greater (than other weeks) ; 3 species diversity increases and decreases ; 4 peak at 6 weeks ; 5 week 24 with fertiliser not following the trend / AW ; 6 any data quote including data for both plots with units ;	3	**I** anomaly **A** increases
(c)	1 some species compete much better than others / better at obtaining (named) resource(s) ; 2 competition for, light / water / nutrients / space / AW ; 3 some species grow faster ; 4 example of grassland, adaptions / fast growth ; 5 better at using ions released by fertiliser ; 6 more 'robust' / less successful at combating disease *or* pests ; 7 some cannot survive grazing by grassland herbivores / AW ; 8 ref to adaptations ;	2	**MP 2 I** competition for mates **MP 4** examples: taller stems / larger leaves / longer roots

05. 0610_s19_MS_42 Q: 2

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>burning / use, (named) fuels ;
deforestation / AW ;
increased human population ;
example of named relevant human activity ;
AVP ;</td><td>3</td><td></td></tr>
<tr><td>(b)</td><td>description:
rate (of photosynthesis) peaks at, 12:00 / midday / noon ;
photosynthesis starts at, 06:00 / stops at, 20:00 / 8 pm ;
rate (of photosynthesis) at 550 (ppm) / AW, is greater than at, 370 (ppm) / AW ;
both plots / 550 and 370 ppm, follow same trend / pattern ;
comparative data quote between two plots with units at least once ;

explanation:
maximum light at 12:00 / dark until 6:00 / after, 20:00 / 8 pm ;
reference to light intensity as a limiting factor ;
because light is required for photosynthesis ;

reference to CO_2 as a limiting factor ;
(at high atmospheric CO_2) the concentration gradient (to air spaces) is steeper / diffusion is faster ;
effect of CO_2 concentration is most at high light intensities ; ora

reference to temperature as a limiting factor ;
higher temperature causes increased rate of photosynthesis ; ora
AVP ;</td><td>6</td><td></td></tr>
<tr><td>(c)</td><td>epidermis
<table><tr><th>feature</th><th>adaptation</th></tr><tr><td>transparent / clear / no chloroplasts</td><td>allows light to pass through ;</td></tr><tr><td>thin / flat</td><td>so less cytoplasm / more light, to pass through / AW ;</td></tr><tr><td>guard cells / stomata</td><td>allow gases to enter / leave the leaf / gas exchange ;</td></tr></table>
mesophyll
<table><tr><th>feature</th><th>adaptation</th></tr><tr><td>contains many chloroplasts (palisade)</td><td>trapping light energy ;</td></tr><tr><td>vertically / tightly, packed / column-shaped (palisade)</td><td>maximise light received (by cells) / reduce number of, cross / cell, walls ;</td></tr><tr><td>contain (air) spaces / loosely packed (spongy)</td><td>for diffusion / movement of gases (within leaf) ;</td></tr></table></td><td>4</td><td>one mark per row, max two from each tissue</td></tr>
<tr><td>(d)</td><td>more carbon dioxide in the blood ;
low pH / acid, in blood ;
(high) carbon dioxide detected by brain ;
increases impulses to (named) muscles used in breathing / AW ;
correct reference to negative feedback / homeostasis ;</td><td>2</td><td></td></tr>
</table>

06. 0610_m17_MS_42 Q: 4

	Answer	Mark	Partial Marks
(a)	carbon dioxide ; light energy ; chlorophyll ;	2	
(b)	(2 ÷ 13) × 100 ; 15(%) ;	2	
(c)(i)	increased rate of transpiration ; greater concentration of water vapour inside the leaf than outside ; more water vapour diffuses out of the leaf ; through stomata ; more water is drawn up through xylem / transpiration pull ;	3	
(c)(ii)	by osmosis ; the soil has a higher water potential than the root cells ; water moves from an area of higher water potential to lower water potential ; across a partially permeable membrane ; ref to root hair cell ;	3	**A** down a water potential gradient
(d)	**1** loss of habitat ; **2** population decrease / migration ; **3** extinction / endangerment, of species ; **4** loss of biodiversity ; **5** less food ; **6** disruption of, food chains / food webs ;	4	

07. 0610_s20_MS_42 Q: 4

(a)	to increase crop, yield / production ; to reduce competition with weeds ; AVP ;	2
(b)(i)	concentration of both herbicides decreased (with time) / described ; **A** higher concentration than **B** (throughout) ; **B** reached zero concentration before **A** ; comparative data quote with units stated ; **A** steeper than **B** initially ;	3
(b)(ii)	kills, water plants / algae ; lack of, producers / food for herbivores ; bioaccumulation / described ; reduced biodiversity ; (lack of roots causes) erosion / silting / flooding ; AVP ;;	4
(c)(i)	network / branched, veins ; broad (leaves) ; petiole ; AVP ;	2
(c)(ii)	auxin ;	1
(c)(iii)	*any three from:* no chlorophyll synthesis ; cannot trap sunlight ; cannot photosynthesise ; AVP ;	3

08. 0610_s20_MS_43 Q: 6

(a)	*any three from:* if crops are used as food for humans fewer trophic levels in the food chain ; energy lost at each trophic level in the food chain ; 90% energy lost / only 10% energy passed on ; energy is lost from the cattle ; any two examples of energy loss from cattle ;; therefore less energy available to humans ; AVP ;	**3**
(b)	*any four from:* smell / visual pollution ; increase risk of water-borne disease ; increase organic content of, rivers / lakes ; increase growth of, bacteria / decomposers ; bacteria / decomposers, use up dissolved oxygen ; death of (named) organisms that rely on dissolved oxygen ; eutrophication ; adds, urea / ammonia ; increases plant growth ; AVP ;;	**4**
(c)	*any three from:* lack of food supply / unequal distribution of food ; wars / sudden immigration, with inadequate resources for the population ; drought / floods, destroy crops / kill livestock ; disease in, food plants / animals ; poverty ; AVP ;;	**3**

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09. 0610_m19_MS_42 Q: 4

	Answer	Mark	Partial Marks
(a)	pollutant ; source ; effect on environment sulfur dioxide ; (burning) fossil fuels ; acid rain carbon dioxide ; (burning fossil) fuels ; enhanced greenhouse effect methane ; cattle and rice farming ; enhanced greenhouse effect fertilisers ; arable agriculture ; eutrophication	**4**	
(b)(i)	(named) fertiliser leached into, rivers / streams / lakes ; producer growth / algal bloom / algae growth / plant growth ; death of producers ; increased decomposition / increased decomposers ; increased respiration (aerobic) ; decomposers use up the oxygen in the water ; organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ; AVP ;	**6**	
(b)(ii)	use, less / correct amount, of fertiliser / calculate how much fertiliser is needed ; use slow-release fertilisers ; do not apply, during / after, rain / when rain is forecast / limit watering ; do not use near water / make channels between land and water body ; only apply when crops, will take-up fertiliser / are growing ; **ora**	**2**	

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10. 0610_s19_MS_42 Q: 3

	Answer	Mark	Partial Marks
(a)(i)	1.2 □ 10^8 (g) / 120 000 000 (g) / 1.2 □ 10^5 (kg) / 120 000 (kg) ;; kg or g (per day) ;	3	
(a)(ii)	avoid too much (named) sugar in diet ; flossing ; regular visits to, dentist / hygienist / AW ; AVP ;	1	
(b)(i)	diatom (→) lugwom (→) (wading) bird ; arrows in correct direction ;	2	
(b)(ii)	*description:* more ammonium ions remain in bucket / less ammonium, absorbed (by diatoms) ; less faeces ; higher respiration rates ; lower body mass ; *explanation:* less, diatoms / food / ammonium ions, for lugworms ; (high respiration of lugworms) to, release more energy / for finding food / stress etc. ; slower growth rate of (lugworms) ; (non-biodegradable) microplastics (negatively) affect digestion ;	4	
(c)(i)	protein / urea / amino acid ;	1	
(c)(ii)	nitrification ;	1	
(c)(iii)	plants absorb (nitrogen as) nitrate (ions) ; needed to make, amino acids / (named) proteins ; to make DNA / RNA / nucleotides / bases ; protein / DNA, is needed for, growth / cell division / mitosis ;	3	
(d)	visual pollution ; chokes / strangles / traps / blocks digestive systems / AW (of animals) ; *reference to*, chemical exposure / fumes / toxins ; (plastic) accumulates in an organism / is passed down a food chain ; (described) habitat destruction ; e.g. plastic covers the habitats (plastic) blocks (light / water for) photosynthesis (for land plants) ; (plastic) block roots / prevents root growth ; remain in the ecosystem (for a very long time) ; AVP ;	5	

11. 0610_w19_MS_42 Q: 6

	Answer	Mark	Partial Marks
(a)	<table><tr><th>letter on Fig. 6.1</th><th>name of the process in the carbon cycle</th></tr><tr><td>A</td><td>photosynthesis ;</td></tr><tr><td>B</td><td>combustion ;</td></tr><tr><td>C</td><td>respiration ;</td></tr><tr><td>D</td><td>fossilisation ;</td></tr></table>	4	
(b)	*gap 1:* heat OR long-wave / infra-red, radiation ; *gaps 2 and 3, any two from:* ;; paddy fields / rice farming (named) animals / livestock decay / decomposition (by bacteria) rubbish tips / landfill sewage / dung / faeces (natural) gas extraction / fracking melting tundra waterlogged soil / swamp / marsh biomass burning / forest fires / peat fires *gap 4:* enhanced ; *gap 5:* sulfur dioxide / sulfur trioxide / nitrogen oxide(s) ; *gap 6:* non-biodegradable / micro- / non-recyclable / single-use ;	6	

12. 0610_s17_MS_42 Q: 5

	Answer	Mark	Partial Marks
(a)	**1** lake / river, pH decreases / acidification ; AW **2** aluminium ions become mobile ; **3** nutrients / named example(s), leached ; **4** shells damaged ; **5** fish / frogs, fail to reproduce ; **6** (aquatic) plants, die / become damaged / AW (from acid) ; **7** disrupts food chains / described ; **8** loss of (bio)diversity / endangered / extinct, species ; **9** acid / low pH / aluminium ions, toxic to / kills / AW, aquatic animals ; **10** fish produce mucus which blocks gills ; **11** AVP ;	5	**ecf** on 'higher pH' **MP 3** e.g. potassium / calcium / unqualified ions **MP 6 / 9 A** kills aquatic organisms = 1 mark **MP 6 I** plant death via eutrophication **MP 9 I** low oxygen causes fish death e.g. denatured enzymes / described loss of habitat in context
(b)(i)	(acid rain often caused by) sulfur dioxide / sulfuric / sulfurous acid ; chlorine / hydrochloric acid, does not cause acid rain ;	1	**I** sulfur unqualified
(b)(ii)	pH, meter / paper / probe / sensor / AW ; (pH) indicator ;	1	**I** data logger unqualified **A** named indicator
(b)(iii)	warmth ; oxygen ; water / moisture ; AVP ;	2	**A** heat / temperature **A** humidity e.g. conditions that break dormancy of pine seeds: low pH, cold, light qualified, stratification described
(c)(i)	(aerobic) respiration / fermentation / metabolic reactions ; heat / energy, is released ;	2	**MP 1 A** (named metabolic reaction) e.g. hydrolysis / enzyme activity **A** exothermic reaction / heat produced **I** produce energy unqualified
(c)(ii)	denatures enzymes ;	1	
(c)(iii)	germination / temperature, increased as, pH increased / acidity decreased ; **ora** no / little, effect / AW, at less than pH 4 ; **ora** comparative data quote between pH and temperature with units stated at least once ;	2	**I** ref to pH 7.0 as optimum
(d)	(Petri dish) **2** / pH 3.5 ;	1	

13. 0610_m16_MS_42 Q: 4

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>1 overall carbon dioxide concentration increases ;
2 at a steady rate ;
3 there are minor fluctuations in carbon dioxide concentration ;
4 the fluctuations occur, regularly / yearly / seasonally ;
5 use of comparative figures with year and concentration with units ;</td><td>[max 3]</td><td>A gradual I constant</td></tr>
<tr><td>(b) (i)</td><td>methane ;</td><td>[1]</td><td>I carbon dioxide / carbon monoxide / water unqualified.
A other correct greenhouse gases</td></tr>
<tr><td>(ii)</td><td>1 radiation / light from the Sun hits, Earth / atmosphere ;
2 (named) short-wave radiation passes through carbon dioxide layer ;
3 re-radiated / reflected, from the ground as long-wave radiation / infrared / heat energy ;
4 long-wave radiation / infrared / heat energy, trapped / prevented from escaping from atmosphere by carbon dioxide ;</td><td>[max 3]</td><td>I climate change

mpt 3 A re-emitted</td></tr>
<tr><td>(c)</td><td><table><tr><th>mineral ion</th><th>function in plants</th><th>effect of ion deficiency on plants</th></tr><tr><td>nitrate</td><td>make amino acids / proteins / DNA / RNA / enzymes / chlorophyll ;</td><td>poor growth / lower leaves die early ;</td></tr><tr><td>magnesium</td><td>used to make chlorophyll / pigments ;</td><td>yellow leaves / chlorosis ;</td></tr><tr><td>phosphate</td><td>used for making DNA</td><td>poor root growth</td></tr></table></td><td>[4]</td><td>I reference to yields

I chloroplasts</td></tr>
<tr><td>(d)</td><td>1 fertiliser / nutrients, leached into / enter, rivers / streams / lakes ;
2 causing algal bloom / algae growth ;
3 algae block sunlight from entering water ;
4 so rooted plants unable to photosynthesise ;
5 so plants die ;
6 bacteria, decompose / feed, on dead plants ;
7 so bacterial population increase ;
8 bacteria respire aerobically ;
9 bacteria use up the oxygen in the water ;
10 organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ;</td><td>[max 6]</td><td>A decomposers for bacteria
R if incorrect reason
I bacteria breed unqualified</td></tr>
<tr><td></td><td></td><td>[Total: 17]</td><td></td></tr>
</table>

14. 0610_s16_MS_42 Q: 5

	Answer	Mark	Partial Marks
(a) (i)	testes ;	[1]	**A** adrenal gland / ovaries
(ii)	increases, muscle mass / strength / power ; improved recovery of muscle damage / promotes protein synthesis ; increase, competitive drive / aggression / AW ; increases bone, density / mass ;	[max 1]	
(iii)	maintains, uterine lining / endometrium ; inhibits, FSH / LH (release) ;	[max 1]	**R** uterus wall. **I** thickens lining
(iv)	oestrogen ;	[1]	
(b)	***A** is most polluted because:* greater (overall) concentration of hormones ; all hormones at higher concentration except oestrogen ; comparative data quote with units ; (but) similar levels of oestrogen / (natural) progesterone (to **B**) ; ***B** is most polluted because* more oestrogen (than **A**) ; more types of hormones ;	[max 3]	
(c) (i)	*Lake **B*** oestrogen decreases (slightly) ; progesterone / testosterone, increases (slightly) ; *Lake **A** or Lake **B*** no / little, effect on oestrogen / progesterone / testosterone without ozone; *Lake **A*** chlorine with ozone caused, decrease in testosterone / synthetic progesterone / increase in natural progesterone ;	[max 2]	**A** mp 1, 2, 4 as data quotes **R** little effect on testosterone with ozone
(ii)	make the water safe, to return to the environment / for human use ; kill, pathogens / (harmful) microorganisms / bacteria ;	[1]	**I** germs **A** disinfectant / sterilisation
(d)	 eutrophication ; (aquatic) plants, die / cannot photosynthesise (due to blocked light) algae / (aquatic) plants / organic material, decayed by bacteria ; (aerobic) respiration (by bacteria / decomposers) ; decreased pH / increased acidity (due to low oxygen) ; oxygen concentration decreases (due to bacteria / decomposers) ; (aquatic) animals / fish, migrate / die, due to lack of oxygen ; disrupted / altered, (aquatic) food chains / habitats ; more, flies / mosquitoes ; (more) waterborne (named) disease ; e.g. cholera / typhoid smelly / visual pollution ; toxicity / mutations caused, by heavy metals / sewage ; (female contraceptive) hormones cause feminisation of (aquatic) organisms ; (female contraceptive) hormones cause reduced sperm count (in aquatic animals) ;	[max 6]	**I** marine and other non-lake ecosystems **I** unqualified death / extinction throughout **A** growth of, floating aquatic plants / algae / algal bloom **A** nutrients in sewage as organic material **A** microorganisms / decomposers for bacteria **I** all oxygen used up **A** diseases / pathogen in humans or aquatic organisms **A** biomagnification / bioaccumulation / death of (aquatic) organisms by, heavy metals / toxins / poisons, in sewage **A** hormone may cause gender change in fish
		[Total : 16]	

(a)	*any two from:* *assume features are of protoctists unless told otherwise* nucleus / nuclear membrane / nuclear envelope ; (named) organelle(s) / internal membranes ; cell walls (if present) have different composition ; linear chromosomes ; AVP ;	**2**
(b)	*box 2:* (organism) has two rings of cilia / (organism) stalk absent / AVP ; *box 4:* (organism) has a covering of cilia / (organism) fused cilia absent / AVP ;	**2**
(c)	movement AND nutrition ticked ;	**1**
(d)(i)	bacteria ⟶ *Paramecium* ⟶ *Didinium* ;	**1**
(d)(ii)	*any two from:* ciliates eat (many) bacteria ; *Didinium* / predatory ciliates, eat other (named) ciliates ; ciliates may eat, dead / decomposing, material ;	**2**
(d)(iii)	*any three from:* removal of, harmful bacteria /pathogens, from sewage ; e.g. cholera bacteria *or* any other water born disease / parasites ; stop spread of pathogens via water ; use of chlorination / chemical treatment ;	**3**
(d)(iv)	*any three from:* conversion of ammonia / ammonium (ions), to nitrate (ions) ; convert ammonium ions to nitrite ions ; make nitrate ions available to plants ; nitrate ions are absorbed by plants ; nitrate ions are used to make, amino acids / proteins ;	**3**

16. 0610_s20_MS_42 Q: 3

(a)	*fur colouring* camouflaged so that not seen by prey (when stalking) / reflecting heat / AW ; *streamlined body shape* improved ability to run fast / reduced air resistance / AW / AVP ;	**2**
(b)(i)	transmission of genetic information from generation to generation ;	**1**
(b)(ii)	two of the same letter both lower case ;	**1**
(b)(iii)	0.25 / 25% / $\frac{1}{4}$;	**1**
(b)(iv)	*any two from:* perform a test cross ; by breeding with, homozygous recessive / king cheetah ; if any of the offspring of the test cross are king cheetahs it confirms 17 is heterozygous ; DNA testing ;	**2**
(b)(v)	*any one from:* compare, morphology / anatomy ; compare, DNA / amino acid, sequences ;	**1**
(c)(i)	*any three from:* hunting / poaching ; disease ; lack of, food / prey ; loss of (natural) habitat / urbanization ; pollution / poisoned carcasses ; inbreeding / AW ; climate change ; AVP ;	**3**
(c)(ii)	*any three from:* captive breeding programmes ; local cooperation / education (of farmer / land users) ; national parks / conservation areas / protect habitats ; legislation / public pressure, against hunting ; monitor numbers ; AVP ;	**3**

(a)(i)	*any four from:* deep roots / AW ; to absorb water from the water table / AW ; long and spread out below the surface ; to absorb water when it rains ; root cells have low water potential ; to absorb water by osmosis ; from (very) salty soils / AW ; roots branch many times ; have many roots hairs ; to give a large surface area (for absorption of water) ;	**4**
(a)(ii)	*any three from:* few stomata / low stomatal density ; sunken stomata ; stomata close during the day and open at night ; rolled leaves ; thick epidermis / thick cuticle ; few / no / small, leaves ; hairs on leaves ; low rates of transpiration ; AVP ;;	**3**
(a)(iii)	*any two from:* make / store, toxins ; make / store, foul-tasting substances / AW ; spines / prickles / needles ; resins (that trap insects) ; thick (inedible) leaves ; AVP ;;	**2**
(b)	*any three from:* reduce air pollution ; reduce emissions of, sulfur dioxide ; use filters / 'scrubbers' on chimneys ; catalytic converters ; reduce use of (named) fossil fuel(s) ; example of way to reduce demand for energy ; use low-sulfur (fossil) fuels ; use alternative sources of power ; add lime to soils ; to reduce mobilisation of aluminium in soils / AW ; to raise pH of soils ; AVP ;	**4**

18. 0610_w19_MS_41 Q: 6

	Answer	Mark	Partial Marks
(a)	poor absorption of calcium / weak bones / weak teeth / depression / fatigue / muscle pain / joint pain / rickets / osteomalacia / AVP ;	1	
(b)	*reasons why endangered:* (described) overfishing / hunting ; food chain disrupted (described); overconsumption (by humans) ; (named) pollution ; introduced diseases / species ; habitat destruction ; climate change ; *risks if populations drop:* reduced variation ; reproduction rate is lower / harder to find a mate ; extinction ; AVP ; *how to maintain fish stocks:* education ; quotas ; no-catch zones / nursery zones / seasonal fishing / protected areas / MPAs / Marine Protected Areas ; fines ; restocking ; fish farms ; method of fishing (described) ; AVP ;	6	

19. 0610_w19_MS_42 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	exoskeleton / AW ; jointed / segmented, limbs / legs / appendages / AW ; pairs of, limbs / legs / appendages / AW ; segmented (body) / AW ; bilateral body symmetry ;	2	
(a)(ii)	**Box 2**: *any one from:* animal has, 3 pairs of legs / 6 legs / less 4 pairs of legs / less than 8 legs ; wings ; head, thorax, abdomen / body in three sections ; no, pincers / claws / carapace ; **Box 3**: *any one from:* (animal has) claws / pincers, of different sizes / AW ; eyes on stalks ; smooth, carapace / body / 'shell' ; body, has five sides / is angular ; hairs / bristles / AW, on, legs / claws ;	2	
(b)(i)	4 pairs of legs / 8 legs ; fused head and thorax / cephalothorax / two sections *or* parts of the body ; (pedi)palps / described ; AVP ;	1	
(b)(ii)	inherited feature / controlled by gene(s) / allele(s) / DNA ; functional / AW, feature ; increase, fitness / chances of survival ; increases chance of reproducing (to leave offspring) ; any suitable example visible in *T. grallator* ; e.g. camouflage / warning signal / scares predators / lure for prey / sexual attractant	3	
(c)	*identification can be done using:* base, sequences / order / pattern, in DNA / genes ; each species, has unique / AW, DNA / genes ; *idea that* compare with, reference DNA / base sequences / genes, of known species ; *idea that* if a match with DNA from known species then DNA is from that species OR closely related species have fewer differences in their, base sequences / DNA / genes ; AVP ; e.g. any technique involved in DNA analysis	2	
(d)	hunting / collecting / AW ; pollution ; pesticide(s) / insecticide / (chemical) spray(s) that kill animals / poisons ; loss of habitat / any example ; disease ; increased competition / described ; increase in predator(s) ; climate change / any example ; lack of food / loss of prey species ; AVP ;	3	

20. 0610_w19_MS_43 Q: 4

	Answer	Mark	Partial Marks
(a)(i)	*use of trees* paper ; (as building materials) for furniture / construction / poles / boats / AW ; firewood / fuel ; to sell ; *clearance of trees for* agriculture ; urbanisation / roads / housing / factories / industry / developments ; extraction of, minerals / natural resources ;	3	
(a)(ii)	education ; replanting / reforestation / afforestation ; government policies / legal quota / penalties / controls / bans / rules / AW ; management of conflicting demands ; co-operation with local communities ; protected area / national parks / wardens ; AVP ; e.g. selective felling	3	
(b)(i)	house mouse ;	1	
(b)(ii)	*for hypothesis* all native / nearly all / more / most, species prefer large areas of forest ; **ora** comparative data quote for one mammal, between both areas as a percentage or last column ; heavier / larger, mammals are more (negatively) affected by the breakup of large areas (than smaller mammals) ; **ora** *against hypothesis* not true for, introduced species / black rat / house mouse ; comparative data quote for black rat / mouse, between both areas as a percentage ; cannot make (broad) conclusion on, only study / one area ; AVP ;	4	

21. 0610_m18_MS_42 Q: 3

	Answer	Mark	Partial Marks
(a)(i)	0.2 ;	1	
(a)(ii)	pyramid shape with four trophic levels widest at the bottom ; bars drawn at correct width (□ half a small square) ; each bar labelled with trophic level ;	3	**A** ecf from part **(i)**
(b)	decomposer ;	1	
(c)(i)	photosynthesis ; ref. to chlorophyll ; light energy is transferred to chemical energy ; (named) glucose formed (from carbon dioxide and water) ; named example of carbohydrate molecule used to make biomass ;	3	e.g. cellulose, sucrose, starch, protein, DNA, tissues
(c)(ii)	energy is lost between the trophic levels / energy decreases up the trophic levels ; not all of the organism is, eaten / digested / absorbed ; energy is lost, as heat / in respiration / in metabolic processes / named metabolic process / movement ; energy lost in, excretion / faeces / urine ; (so) less energy to support the next trophic level ;	3	
(d)	**1** prevents extinction / protection of endangered species ; **2** maintains genetic diversity / biodiversity / AW ; **3** maintaining habitat / ecosystem / breeding grounds ; **4** maintain, nutrient recycling ; **5** maintain, resource provision / food / drugs ; **6** maintain, food chains / food webs / trophic levels / description of ; **7** prevent soil erosion / flooding ; **8** AVP ; as a leisure facility / tourism / education	3	

22. 0610_w18_MS_42 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	dry scaly skin ; leathery / soft-shelled, eggs ;	2	
(a)(ii)	cellulose / cell wall ; chloroplast / chlorophyll ; starch grains ; (large / permanent / central) vacuole ;	2	
(b)(i)	amylase ;	1	
(b)(ii)	mouth ; small intestine ;	2	
(c)	monitoring / AW, population(s) / individual(s) ; habitat, protection / restoration ; reducing / prevention, of pollution ; removal / AW, of alien species ; preventing colonisation by alien species ; hunting ban / prevent poaching ; government / legislation, to protect species ; create, exclusion zones / reserves (so not disturbed by people) ; specific, times when / areas where, hunting / AW, not allowed ; international agreements to limit trade ; removal to, zoos / botanical gardens / wildlife parks ; captive breeding / breeding programme (*in situ* or *ex situ*) ; seed banks / frozen zoos / cryopreservation / AW ; artificial insemination / IVF / use of surrogates / AW ; reintroduction programmes ; education / awareness ;	5	
(d)	food ; drugs / medicines ; (named) fuel / biomass for energy ; timber / building materials / AW ; water ; ***ignore*** rain oxygen ; (named) mineral ; gene(s) ; clothing / fur ; AVP ;;;	3	

23. 0610_w18_MS_43 Q: 1

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)(i)</td><td>root(s) ;</td><td>1</td><td></td></tr>
<tr><td>(a)(ii)</td><td>small intestine ;</td><td>1</td><td></td></tr>
<tr><td>(a)(iii)</td><td>it is a solvent ;
AVP ;</td><td>1</td><td></td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>description</th><th>name of process</th><th>letter on Fig. 1.1</th></tr>
<tr><td>dissolved nitrate ions draining into rivers from farmland</td><td>leaching</td><td>F</td></tr>
<tr><td>algae blooms in water caused by leaching of nitrate ions</td><td>eutrophication</td><td>G / O ;</td></tr>
<tr><td>conversion of liquid / water, to, vapour / gas</td><td>evaporation</td><td>O ;</td></tr>
<tr><td>conversion of water vapour into liquid water molecules</td><td>condensation</td><td>P ;</td></tr>
<tr><td>loss of water from plants by evaporation / vapour / $H_2O(g)$ from plant</td><td>transpiration</td><td>H ;</td></tr>
</table>
</td><td>4</td><td>one mark per row</td></tr>
<tr><td>(c)(i)</td><td>prevent (spread of named waterborne) diseases / infections ;
remove / kill, (named) pathogens ;</td><td>1</td><td></td></tr>
<tr><td>(c)(ii)</td><td>1 (polluted) water piped, to sewage treatment works / through J / to K, L,M,N ;
2 screening / removal of, large pieces of waste ;
3 flocculation / coagulation, to separate suspended particles ;
4 settling of, particles / grit / gravel ;
5 digestion by, bacteria / fungi / decomposers / microorganisms ;
6 with aeration (tank) / trickle filter / activated sludge ;
7 sludge treated with anaerobic decomposers / anaerobic digestion ;
8 (water) treated with, chlorine / ozone / UV (light) ;
9 distillation / collection of water from evaporator ;</td><td>4</td><td>A settlement tank / sedimentation
A digestion in reed beds
A charcoal beds / reverse osmosis</td></tr>
</table>

24. 0610_s17_MS_41 Q: 5

	Answer	Mark	Partial Marks
(a)(i)	Aloe ;	1	**R** *Aloe pillansii*
(a)(ii)	**1** (isolated) group of individual plants / AW ; **2** of, one / the same, species ; **3** living in the same area ; **4** at the same time ;	3	
(b)	**1** deforestation ; **2** climate change / global warming ; **3** change in land use / described ; **4** desertification ; **5** pollution ; **6** plant hunters ; **7** increase in (new / invasive), grazers / predators ; **8** competition with, introduced species / alien species ; **9** (new) disease / pests ; **10** lack of pollinators ; **11** AVP ;	3	**A** habitat loss **A** acid rain e.g. quiver trees are (very) slow growing damage to plants by, people / tourists
(c)	**1** high risk of extinction ; **2** less chance of, reproduction / pollination AW ; **3** high risk of genetic diseases ; **4** less / little / no, (genetic) variation ; **5** (small population so) more vulnerable to, pests / disease / catastrophe ; **6** reduced number of alleles ; **7** less likely to, adapt to / evolve to / cope with, (named) change in environment ; **8** AVP ;	3	**A** small gene pool **R** number of genes **MP7** – e.g. new, disease / pest e.g. ref inbreeding ; **R** interbreeding
(d)(i)	44 (%) ;;	2	4 / 9 □ 100 (= 44.4)
(d)(ii)	**1** decrease in population (at all sites) ; **2** **D** has highest mortality / **B** has the lowest mortality ; **3** site **A** has lost the most number of trees / site **D** has lost the lowest number of trees ; **4** use of data from last column to illustrate - minimum of two *or* loss of trees from at least two sites or one site between two years ; comparative data quote **A** 12 to 4 / **B** 9 to 5 / **C** 5 to 3 / **D** 6 to 5 **5** (in whole population) there is no (net) increase in number of trees ; **6** difficult to compare changes over time as numbers are for different sites ; **7** site **A** has most trees in original photograph / site **C** has the least trees in the original photo ; **8** in 2004, **B** and **D** had the most trees / site **C** had the least trees ; **A** more dead tree stumps in site **A** / least dead tree stumps in **D**	3	**A** increase in mortality

25. 0610_s17_MS_43 Q: 4

	Answer	Mark	Partial Marks
(a)	birds / *Aves* ; *Any two features for max 1* ; • feathers • beak / bill • hard-shelled eggs • scaly legs • no teeth • air sacs • light-weight skeletons • AVP	2	**I** wings / four-chambered heart
(b)	1 (isolated) group of individual animals / AW ; 2 of, one / the same, species ; 3 living in the same, habitat / ecosystem / environment / area / place / location ; 4 at the same time ;	3	
(c)	1 killed by predators / not able to evade predators / new predators ; 2 not able to find food ; 3 more prone to disease / AW ; 4 poaching ; 5 ref to, low genetic variation ; 6 competition with new species ; 7 idea of no survival instinct /AW ; 8 AVP ; e.g. techniques not as advanced in 1980	2	**MP 7 A** captive animals unable to 'cope' in wild / too docile / ref to artificial selection / not integrated with wild population of parrots
(d)	1 inbreeding / described ; 2 less / little, (genetic) variation ; 3 reduced number of alleles ; 4 increased risk of genetic disease ; 5 cannot reproduce / sterile ; 6 not enough animals to breed ; 7 less likely to, adapt / to evolve to / cope with, (named) change in environment ; 8 cost ; 9 AVP ;;	3	
(e)	1 to prevent extinction (of many species) / maintain (bio)diversity ; 2 ref to preventing disruption of food, chains / web ; 3 provide, habitats (for shelter / breeding grounds / AW) for many species ; 4 and 5 ecosystems provide, 'service', for humans ; ; 6 idea of areas for, recreation / (eco)tourism / education ; 7 ethical reasons / aesthetic reasons / AW ;	3	**MP 1 A** saves many species **MP 4** examples • ref to flooding / natural disasters • ref to nutrients cycle • ref to maintenance of water cycle • ref to greenhouse gas / carbon storage / carbon sink waste disposal • provide, resources / food / fuel / drugs / raw materials / building materials • provide genes (for selective breeding / genetic engineering)

26. 0610_w17_MS_41 Q: 5

	Answer	Mark	Partial Marks
(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow$; $6H_2O + 6CO_2$;	2	max one mark if not balanced
(b)(i)	sugar beet ; (one of three crops that) falls with appropriate temperature range / **ora** ; sugar beet / corn requirement for rainfall, is in the range ; wheat requires more rainfall ; corn / wheat, has a lower productivity / energy yield ; appropriate use of data ;	3	wheat and corn also grow in suitable temp.(ecf) **A** sugar beet has a higher energy yield than wheat (or corn).
(b)(ii)	stunted / reduced / no, growth / yield ; used to make amino acids / proteins ; amino acids converted to proteins ; named molecule containing nitrogen ;	3	e.g. DNA, enzymes, chlorophyll
(b)(iii)	200 ÷ 0.0001 2 000 000 ÷ 2 □ 10^6 ;	1	
(b)(iv)	less land required ; crops can be used as food (rather than fuel) ; less habitat destruction / less deforestation ; less disruption to food chains / greater diversity maintained ; comparison of algae yield with any crop from Table 5.1, with units ; AVP ;	3	
(c)	development that provides for the needs of an (increasing) human (population) ; without harming the natural environment / ecosystems / habitat ;	2	

27. 0610_w17_MS_42 Q: 3

	Answer	Mark	Partial Marks
(b)	*population increases* 1 more births than deaths ; 2 more sheep are imported ; 3 more food needed for increasing human population ; *4 idea that* more sheep needed for, export / economy of Tasmania ; *population remains constant* *5 idea that* population reaches, carrying capacity / described ; 6 number of births = number of deaths / culling for meat / AW ; 7 any ref to limiting factor(s) in correct context in either increase or plateau ; 8 any example of a limiting factor ; resources food supply water supply space / area of land for grazing / AW disease predators competitors	3	e.g. maximum that the land can support **I** drought / floods / any other natural disaster
(c)	1 *idea that* farmer, chooses / selects (animals that are best adapted to conditions) ; 2 appropriate named feature(s) ; 3 selected animals bred together / (cross) breed them ; 4 select the offspring that show the features required ; 5 repeat, the selection and breeding / the process ; 6 *idea that* imports (male) sheep with desired features to mate with flock ; 7 uses artificial insemination ;	4	
(d)	providing for the needs of (the increasing) humans (population) ; without harm to the (natural) environment / ecosystem(s) / habitat / biodiversity ;	2	**A** examples of development, e.g. roads / houses / cities / urbanisation / AW

28. 0610_s16_MS_41 Q: 5

	Answer	Mark	Partial Marks
(a) (i)	vertical axis – numbers / population ; horizontal axis – time / years ; curve showing exponential increase / log phase ;	[3]	**I** lag phase / curve starting at origin
(ii)	*idea that* 'birth' / reproduction / breeding, rate is greater than death rate ; no limiting factors ; no/little, competition ; plenty, of food / nutrients / space / mates / oxygen / resources ; no / few, predators ; no / few, parasites / pathogens / disease ; AVP ; e.g. no / little, pollution / waste products / toxins	[max 4]	**I** definitions of exponential growth
(b)	*between 1950 and 2012* mass of fish caught increased and levels off ; 17 to 90 million tonnes / increase = 73 million tonnes ; fluctuations / increases and decreases / described ; e.g. around 1970 / any time after 1990 ; maximum catch, 94 million tonnes / in 1996 ; steep increase between, 1950–1970 / 1973–1989 ;	[max 3]	*units must be used at least once* **A** 16 to 18 / increase of 72 to 74 mp4 cannot be awarded without mp3
(c)	*answers can refer to seas, lakes and / or rivers* international, agreements / treaties ; quotas / permits / licenses ; fines / sanctions, for, overfishing / illegal / unauthorised, fishing ; fishery protection vessels / wardens / patrols / AW ; restrictions on times when fishing can occur ; exclusion zones / nursery zones / 'no take' zones / reserves ; total ban for some species ; regulations on method of fishing ; e.g. mesh size of nets / ban nets / use of lines instead / size of fishing vessel / 'fishing effort' education / raise awareness / any example ; monitoring fish stocks ; captive breeding (of wild fish) ; re-stocking (of wild stocks) ; encourage farmed fish ; e.g. provide subsidies AVP ; e.g. tax on wild fish / increase the cost of wild fish	[max 6]	**A** set maximum mass / number / amount / quantity **A** 'ban unauthorised fishing' **A** consequences other than fines **A** not in breeding season **A** descriptions or examples **A** named examples **I** ban on all wild fish
(d)	*definition of sustainable resource* renewable / self-renewing / regenerates / described ; e.g. produced as rapidly as it is removed resource, does not / will not, run out / become exhausted ; replanting / reseeding / regrowing ; AVP ; e.g. pollarding / coppicing / leaving mature trees	[max 3]	**I** reused / recycled
		[Total: 19]	

29. 0610_s16_MS_43 Q: 5

	Answer	Mark	Partial Marks
(a)	timber / paper, manufacture / AW; firewood; *clearance for* agriculture ; urbanisation / roads / housing / factories / industry / leisure developments ; extraction of minerals / for other natural resources ;	[max 3]	**A** wood unqualified **A** fuel
(b) (i)	118 545 – 90 883 = 27 662 $\frac{27\,662}{118\,545} \times 100$; 23.3(3459) ; 23 (%) ;	[3]	
(ii)	Indonesia has lost the most forest **ora** ; 9% (8.7%) compared with 23% in Indonesia ; Indonesian forest has continued to be lost, whereas loss in Malaysia has slowed between 2005 and 2010 ; comparative use of figures with units ;	[max 3]	**A** 14% more in Indonesia ecf from **(b)(i)**
(iii)	planted forest, has one (dominant) species / is a monoculture ; loss of <u>biodiversity</u> ; qualification of biodiversity loss ; (plantation) susceptible to pest / disease ; nutrients removed / soils become infertile ; *ref to* alien / foreign / invasive / non-indigenous species ; AVP ; e.g. vegetation is removed / lower canopy / all immature	[max 3]	e.g. habitats / example / extinction of a species **I** homes / organisms die **A** use of chemicals
(c)	<u>roots</u> die so do not bind the soil ; loss of soil / soil erosion ; silting of rivers ; reduced (soil) fertility ; no trees to absorb the water ; increased risk of flooding ; increased rate of evaporation / land is exposed to drying ; desertification / decreased soil water ; loss of, habitat / places where organisms live / described ; disruption to food chain / described ; endangered / extinction, of species or loss of biodiversity ; AVP ; named example of affected 'land' organism in context / removed trees cause nutrient cycling disruption / lack of decomposition	[max 6]	**A** landslides **A** loss of, minerals / ions / nutrients **A** mudslides **A** drought / decreased rainfall **I** home **I** organisms die
		[Total: 18]	

30. 0610_w16_MS_41 Q: 2

	Answer	Mark	Partial Marks
(a)	group / number, of organisms / AW, from one species; living in same, area / place / environment / time, together;	2	
(b)	1 mode is / majority / most fish are, between 12.1 and 16.0 cm long; 2 range / body length, varies up to 24 cm / varies 0 to 24 cm; 3 very few fish are less than 4 cm; 4 no fish longer than 24 cm; 5 normal distribution / bell-shaped curve / similar number of fish longer and shorter than the mean; AW 6 Data quote of range with units and thousands of fish; 7 AVP ref to actual range may be shorter than 0–24 cm;	3	**A** mean
(c)(i)	4 + 8 + 10 + 6 + 4 + 2 (thousand); = 34 thousand (fish);	2	
(c)(ii)	quotas / licences / permits / limits; fines for overfishing / taxes; only adult fish caught / young fish returned; (laws to) restrict net size; no fishing, zones / seasons; encourage, fish farms / nurseries / hatcheries / captive breeding; international fishing agreements / treaties; reduce, pollution / silting (of rivers) / avoidance of environmental factors detrimental to fish; education; restocking / add more, fish than removed / AW;	4	**A** 'regulation of fishing' **A** 'eutrophication' if linked to the death of fish.
(d)(i)	genetics / inherited (genes); environmental factors ; any two named environmental factors; (natural) selection;	2	examples of named environmental factors: nutrition / pollution / temperature / predation / disease / fishing
(d)(ii)	bar chart;	1	
		Total: 14	

	Answer	Mark	Partial Marks
(a)	1 ringing allows monitoring of, species / population; 2 to check on (population) numbers; 3 find out about life span; 4 to find out where they go (during migration) / to track their position; 5 find out how far birds travel; 6 to find out when they migrate; 7 allows checks on, health of birds / survival rates; 8 breeding success; 9 do not harm the birds / do not make them obvious to predators; 10 AVP; e.g. information from ringing is used in conservation	2	I 'to track them' unqualified
(b)	1. to prevent extinction; 2. maintain biodiversity; 3. provide feeding grounds for animals / ref. to disruption of food, chains / web; 4. provide, breeding grounds / places for breeding; 5. provide, habitats / shelter; 6. vulnerable to the effects of, development / drainage / AW; 7. ref to flooding / natural disasters; 8. ref to nitrogen cycle; 9. ref to maintenance of water cycle; 10. ref to carbon cycle; e.g. greenhouse gas / carbon storage / carbon sink 11. waste disposal; 12. provide, resources / food / fuel / drugs / raw materials; 13. idea of areas for, recreation / (eco)tourism / education; 14. ethical reasons / aesthetic reasons / AW; 15. AVP; e.g. soil erosion	5	I food chain (singular)
		Total: 7	