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**TOPICAL PRACTICE
QUESTIONS**

PAPER 4

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IGCSE BIOLOGY

VOL. 7

CHAPTER 21

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Chapter 21: Human Influences on Ecosystems

- 1 In South America, forests have been cut down to provide land for cattle grazing and for growing crops, such as soya beans.

Fig. 6.1 shows an area before deforestation and after the planting of soya. Occasionally small areas of forest are left if the land cannot support agriculture.



Fig. 6.1

- (a) Suggest the disadvantages of removing the forest from all but small areas of land.

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..... [3]

- (b) Much of the soya is used to feed farm animals rather than to make foods that humans can eat.

Explain the advantages of using soya as food for humans rather than for farm animals.

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..... [3]

- (c) Much of the cleared forest in South America is used as land for cattle grazing.

The clearing of forest and keeping large numbers of cattle have severe effects on the environment, especially the atmosphere.

Outline the effects of forest clearance and cattle farming on the atmosphere.

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..... [3]

- (d) Yields from crops grown on soils like those in Fig. 6.1 are likely to decrease over time.

State reasons for the likely decrease in yields.

1

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2

..... [2]

- (e) Forest products are used in the manufacture of paper.

Explain the environmental **advantages** of recycling paper.

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..... [2]

[Total: 13]

- 2 Nitrogen gas makes up about 80 % of the Earth's atmosphere. Only those organisms that are able to fix nitrogen can use it. All other organisms rely on the recycling of nitrogen from nitrogen-containing compounds, such as proteins and DNA. Fig. 6.1 shows the nitrogen cycle on a small farm in Ghana.

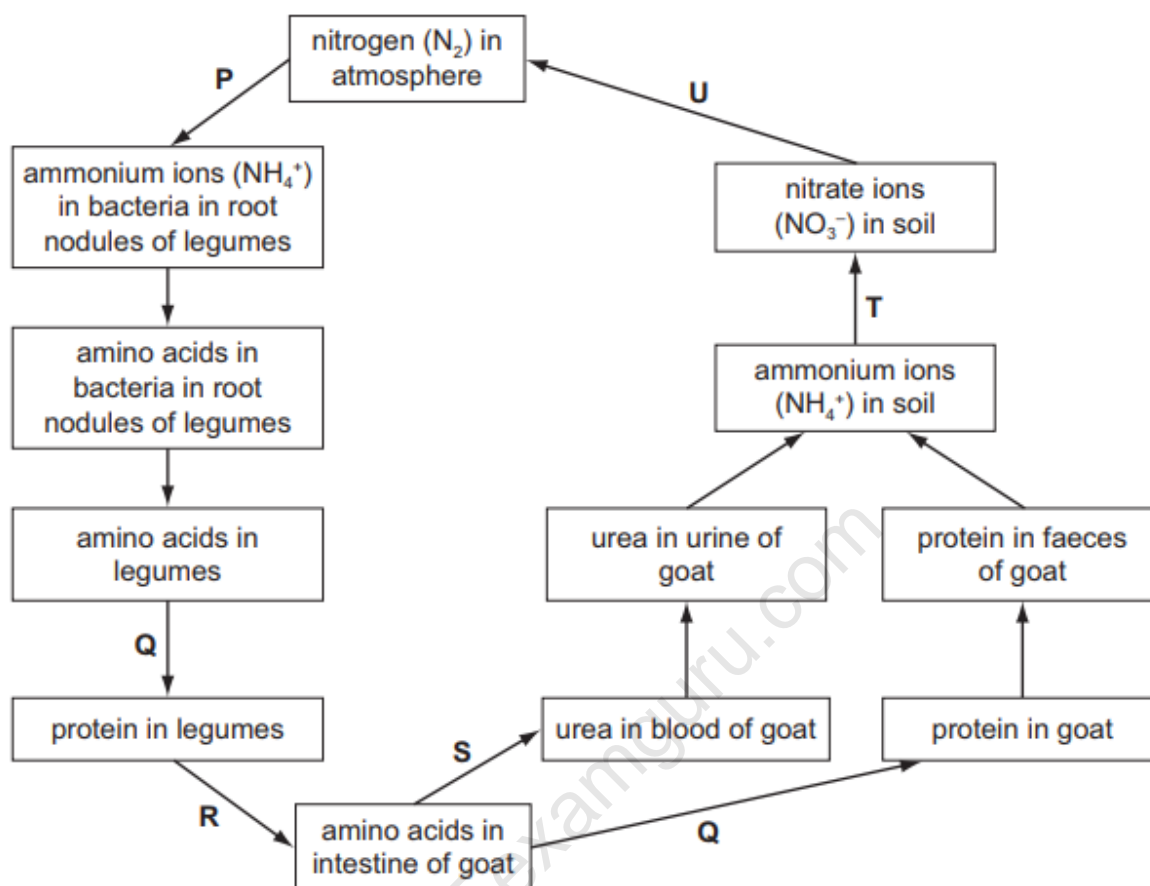


Fig. 6.1

- (a) Complete Table 6.1 by identifying the processes, **P** to **U**, in the nitrogen cycle shown in Fig. 6.1.

One process, **S**, has been completed for you.

Table 6.1

stage	process
P	
Q	
R	
S	deamination
T	
U	

[5]

It is difficult to improve legume crops by traditional plant breeding methods. Scientists in Ghana have used a different approach. They exposed seeds of two varieties of winged bean, *Psophocarpus tetragonolobus*, to ionising radiation.

Seeds that had been exposed to radiation (irradiated seeds) and seeds that had not been irradiated were grown under identical conditions.

After 45 days, the numbers of root nodules on the plants that grew from these seeds were recorded. The dry mass of the root nodules on each plant was also determined and recorded.

The results of the investigation are shown in Table 6.2.

Table 6.2

feature	variety 1		variety 2	
	non-irradiated	irradiated	non-irradiated	irradiated
mean number of nodules per plant at 45 days	12	21	7	21
mean dry mass of nodules per plant at 45 days / g	0.09	0.21	0.14	0.24

- (b) Use the results in Table 6.2 to describe the effect of radiation on the plants in both varieties.

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..... [3]

- (c) Suggest and explain what happens to the seeds when they are exposed to ionising radiation.

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..... [2]

- (d) Researchers use plants that show useful features in selective breeding to improve varieties of the winged bean. The improvement of winged beans by selective breeding is an example of artificial selection.

Suggest how selective breeding is carried out with plants.

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..... [4]

- (e) Scientists in Australia have put a gene from the bacterium *Bacillus thuringiensis* (Bt) into the cowpea, an important crop in Africa. This gene gives resistance against the cowpea pod borer, an insect pest that reduces the yield of cowpeas.

Explain how the method used by the Australian scientists differs from the technique used by the Ghanaian scientists.

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..... [2]

- (f) Legumes, such as cowpeas and winged beans, are grown in between maize plants in a method known as intercropping.

Suggest the advantages to farmers of growing legumes and maize together in the same field at the same time.

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.....

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..... [2]

[Total: 18]

3 Fig. 1.1 shows a goliath beetle, *Goliathus giganteus*.



Fig. 1.1

(a) State two features, visible in Fig. 1.1, that show that *Goliathus giganteus* is an arthropod.

- 1
- 2 [2]

Various arthropods are pests of date palms and cause much damage to this important crop throughout the Middle East.

Fig. 1.2 shows eight species of arthropod that are pests of date palms.

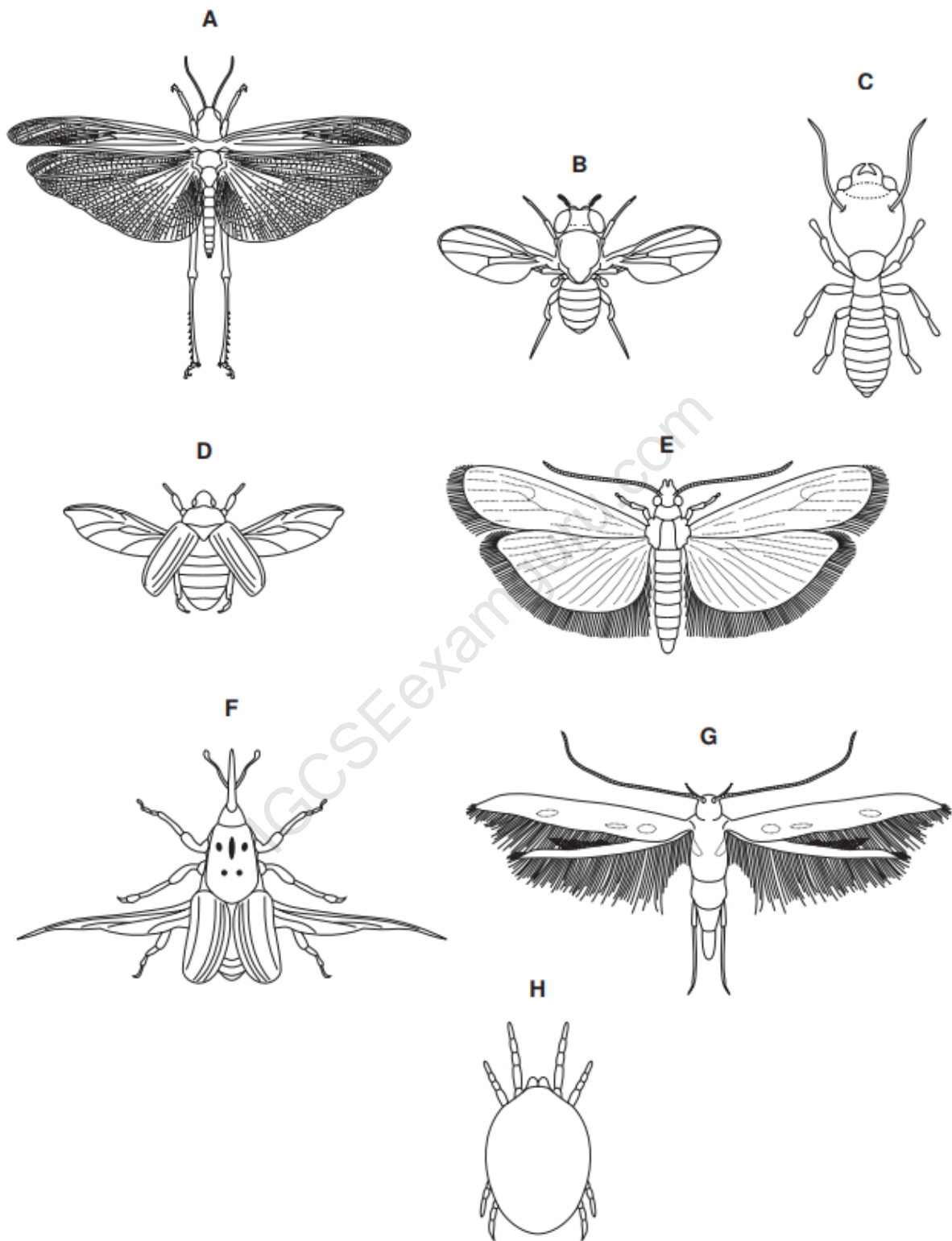


Fig. 1.2

- (b) Use the key to identify each species. Write the letter of each species, **B** to **H**, in the correct box in the key. One, **A**, has been done for you.

Key

1 (a)	Wings present	go to 2	
(b)	Wings absent	go to 7	
2 (a)	Back legs adapted for jumping	<i>Schistocerca gregaria</i>	A
(b)	Back legs not adapted for jumping	go to 3	
3 (a)	Two pairs of wings	go to 4	
(b)	One pair of wings	<i>Drosophila melanogaster</i>
4 (a)	Wings with hairs	go to 5	
(b)	Wings with no hairs	go to 6	
5 (a)	Hairs on back wings longer than width of back wing	<i>Ephestia cautella</i>
(b)	Hairs on back wings shorter than width of back wing	<i>Batrachedra amydraula</i>
6 (a)	Thorax with spots	<i>Rhynchophorus ferrugineus</i>
(b)	Thorax with no spots	<i>Oryctes agamemnon</i>
7 (a)	Three pairs of legs	<i>Microcerotermes diversus</i>
(b)	Four pairs of legs	<i>Oligonychus afrasiaticus</i>

[4]

(c) Outline the damage to the environment that may be done by spraying pesticides.

[4]

The Senegalese grasshopper is a serious pest in West Africa. A fungal parasite of grasshoppers is used as a means of biological control. Spores of the fungus are sprayed onto populations of grasshoppers.

Three fields were treated as follows:

- sprayed with fungal spores
- sprayed with pesticide
- not sprayed

[1]

The population density of grasshoppers was recorded for 22 days after spraying. The results are shown in Fig. 1.3.

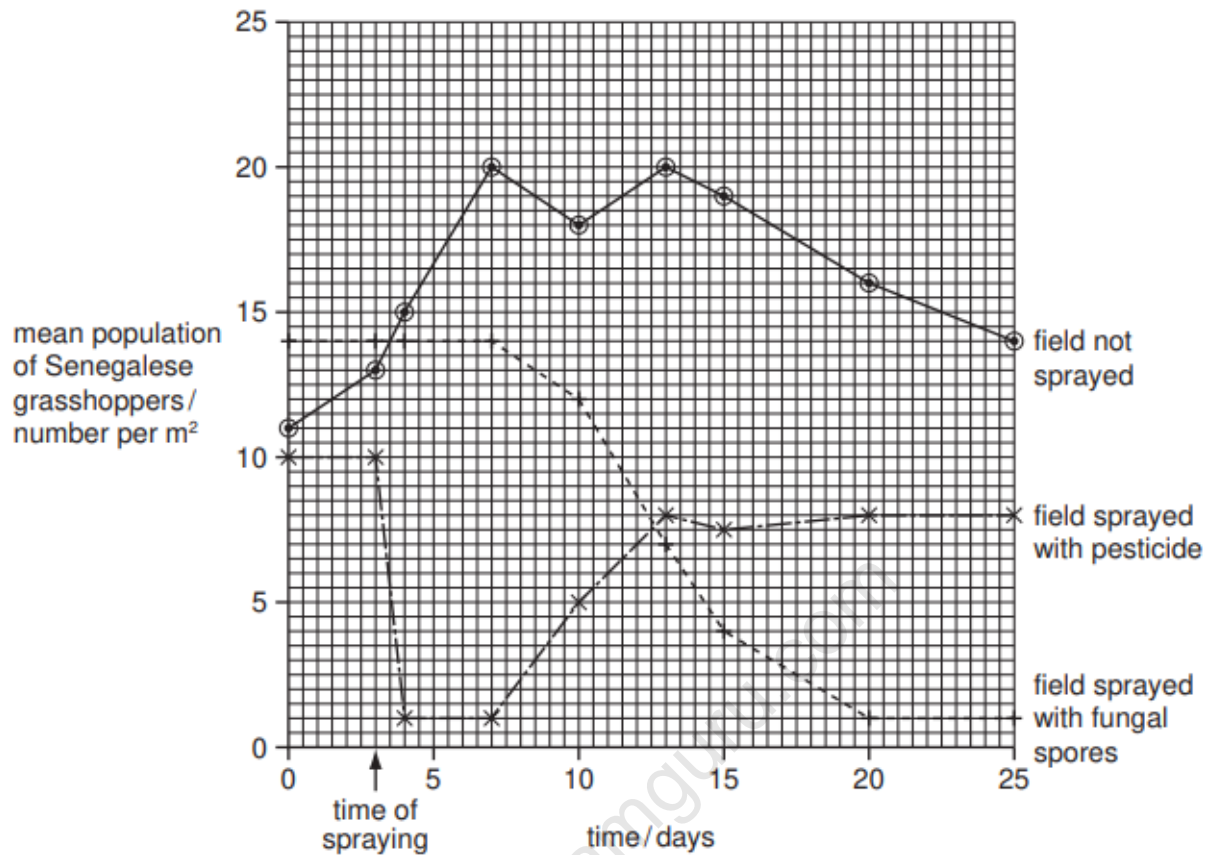


Fig. 1.3

- (e) (i) Describe the effects of the two sprays on the populations of grasshoppers. You will gain credit if you use data from Fig. 1.3 to support your answer.

pesticide

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fungal spores

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[5]

- com
- [4]

[Total: 20]

- (a) Explain the advantages of carbon dioxide enrichment of glasshouses.

.....[2]

- Glasshouses **D** and **E** received carbon dioxide enrichment and were ventilated by opening the windows.
- Glasshouse **F** did not receive any extra carbon dioxide and the windows were closed.

13

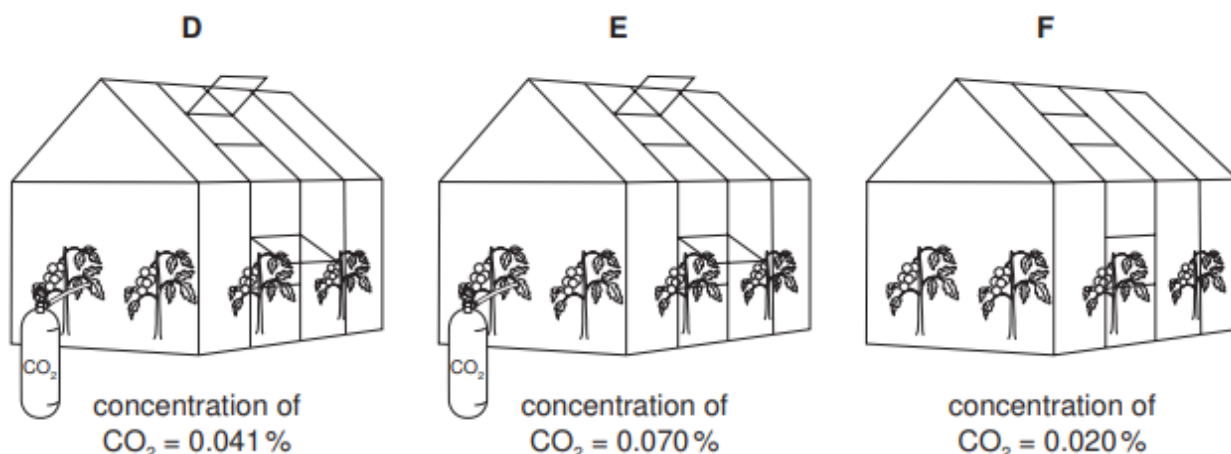


Fig. 3.1

The rate of uptake of carbon dioxide by the crop plants was measured in grams of carbon dioxide absorbed per square metre of glasshouse per hour. These results are shown in Table 3.1.

Table 3.1

glasshouse	rate of uptake of carbon dioxide by crop plants / g per m^2 per hour
D	2.5
E	5.7
F	1.0

- (b) Suggest why it may **not** be cost effective to maintain a high concentration of carbon dioxide in glasshouse **E** compared to the concentration of carbon dioxide in the atmosphere.

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[2]

- (c) (i) Concentrations of carbon dioxide in all three glasshouses in Fig. 3.1 increased at night. State why this happened.

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[1]

(ii) Explain why it is important to ventilate glasshouses by opening the windows.

[4]

[4]

[Total: 9]

5 (a) Explain why it is important to recycle paper rather than burn it.

[3]

[3]

When paper is recycled printing ink has to be removed.

Printing ink contains lipid-based compounds. The ink is removed by making the paper into a pulp and mixing it with lipase for several hours.

Scientists in India discovered that the marine bacterium, *Vibrio alginolyticus*, produces lipase. They carried out an investigation to find out whether using *V. alginolyticus* to remove ink from paper pulp was as effective as mixing it with a solution of lipase.

- (b) The bacteria were found to be more effective at removing the ink from the paper pulp than using the solution of lipase.

Suggest why.

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..... [3]

- (c) The scientists also investigated the effect of temperature on the ability of the bacteria to remove ink from paper pulp. They found that bacteria kept at high temperatures did not remove ink from the paper pulp.

Explain why.

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..... [2]

[Total: 8]

- 5 Table 5.1 shows some information about air pollution.

Table 5.1

pollutant	source of air pollutant	effect of pollutant on the environment
.....	combustion of fossil fuels	increased greenhouse effect and global warming
methane	increased greenhouse effect and global warming
sulfur dioxide	combustion of high sulfur fuels	acid rain
nitrogen oxides	fertilisers	acid rain

(a) Complete Table 5.1 by writing answers in the spaces indicated. [2]

(b) Explain how the increased greenhouse effect is thought to lead to global warming.

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..... [3]

(c) Fig. 5.1 shows changes in the emissions of sulfur dioxide in Europe between 1880 and 2004.

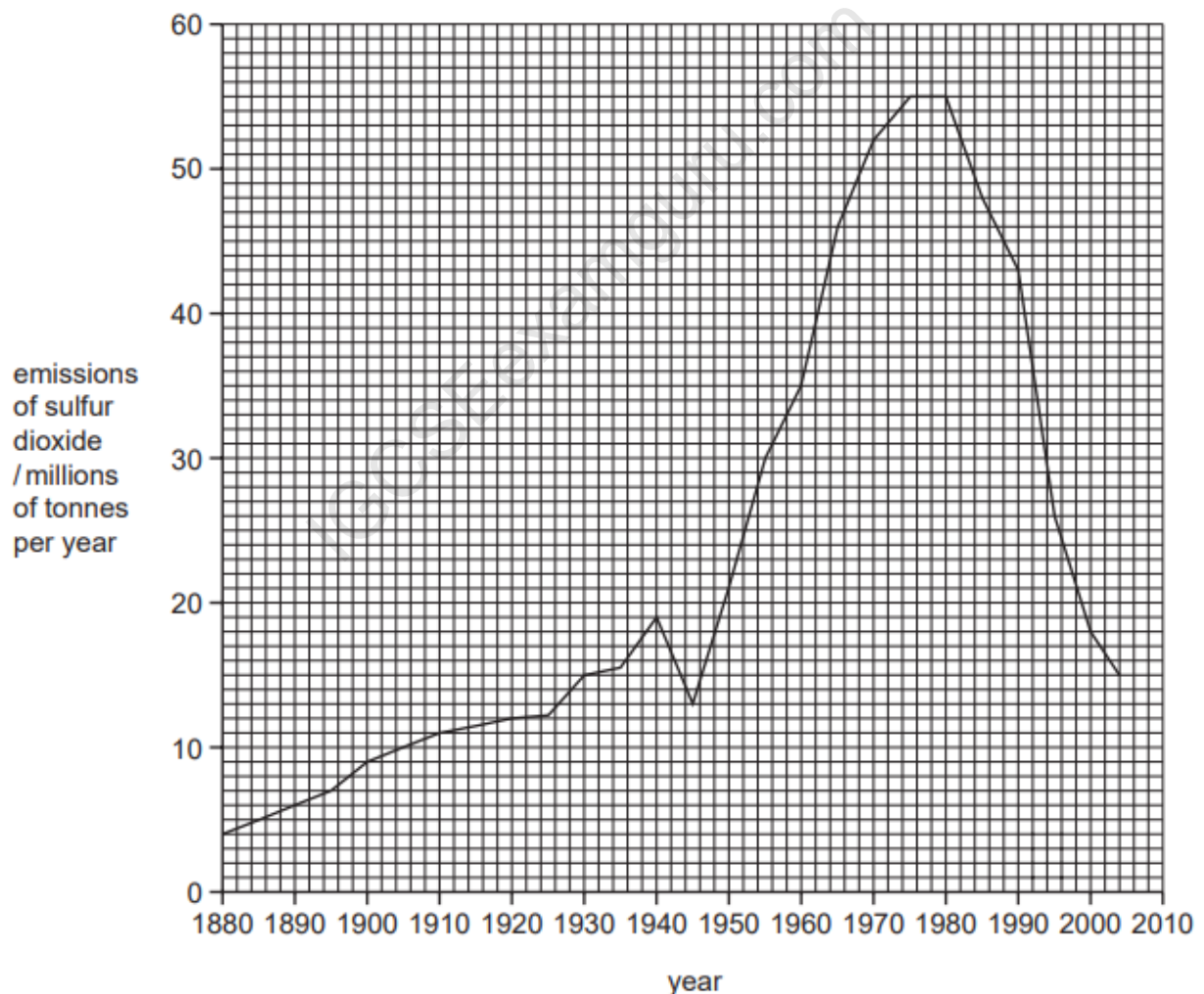


Fig. 5.1

- [4]

- [3]

- [3]

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- 7 Fig. 5.1 shows the changes in carbon emissions from the burning of three fossil fuels between 1800 and 2000.

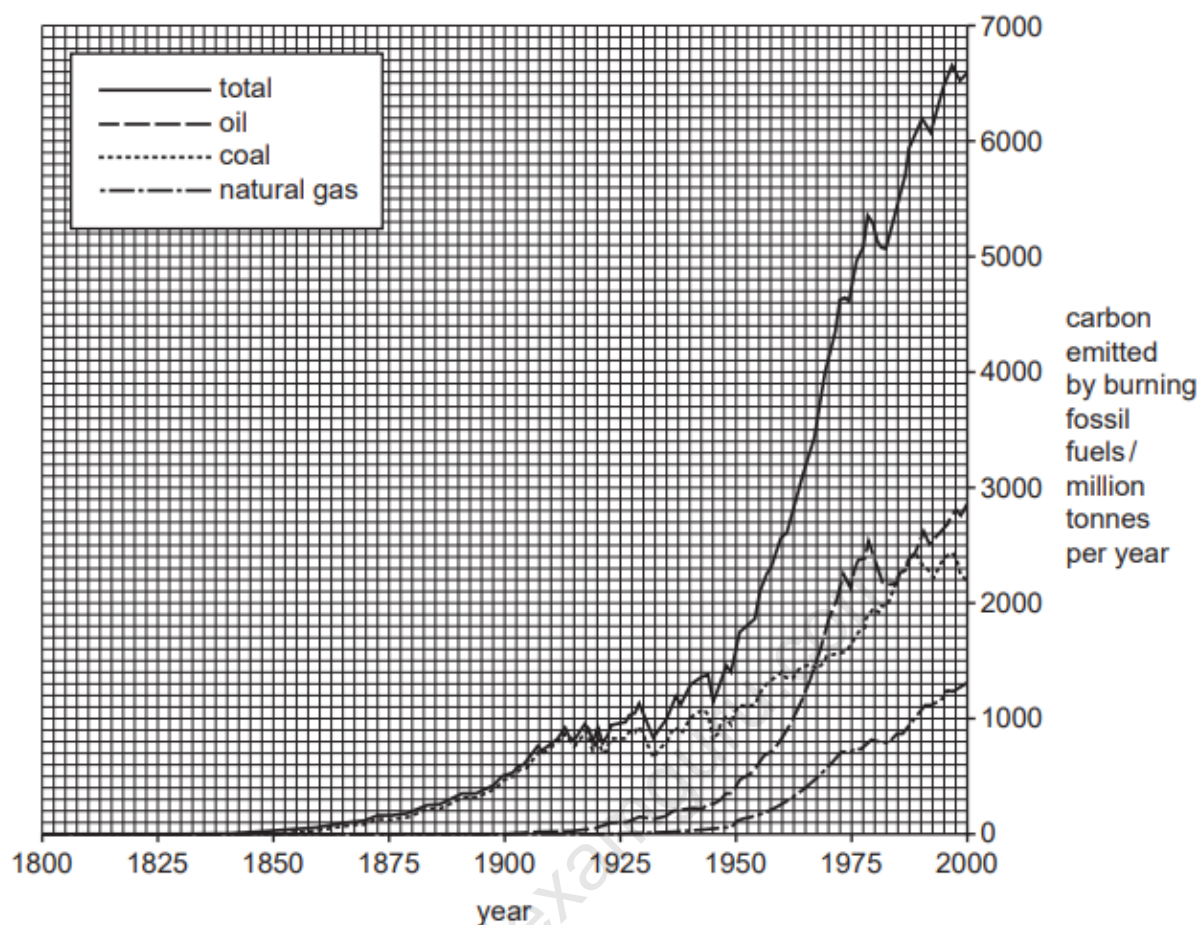


Fig. 5.1

- (a) Use the information in Fig. 5.1 to describe the changes in carbon emissions from the burning of fossil fuels between 1800 and 2000.

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[5]

All fossil fuels contain hydrocarbons and some also contain compounds of sulfur.

(b) Explain how the combustion of these compounds contributes to pollution.

hydrocarbons

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compounds of sulfur

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..... [4]

(c) Explain the need to conserve fossil fuels, such as coal, oil and natural gas.

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..... [2]

[Total: 11]

- 8 Fertilisers are used to increase crop yields. Many fertilisers contain compounds of nitrogen and are called 'nitrogen fertilisers'.

The development in the early twentieth century of the Haber-Bosch process for converting nitrogen from the air into ammonia made the production of these fertilisers possible.

(a) Fig. 5.1 shows the global use of nitrogen fertilisers between 1960 and 2003.

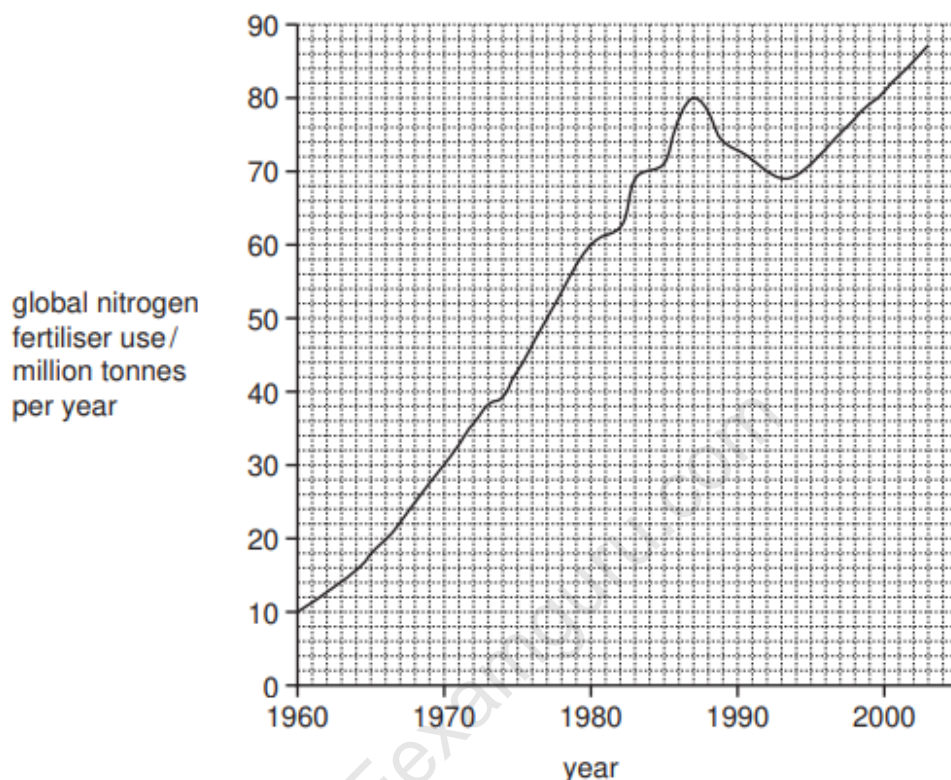


Fig. 5.1

- (i) Calculate the percentage increase in the global use of nitrogen fertilisers between 1970 and 1987. Show your working.

Answer% [2]

(ii) Explain why the use of nitrogen fertilisers has increased.

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..... [3]

(b) Some farmers increase the fertility of their soils by adding organic fertilisers, such as manure, and by using legume crops in a crop rotation. Manure contains protein, urea and ammonia in the waste from farm animals.

(i) Explain how nitrogen, in the form of nitrate ions, becomes available in a soil after the addition of manure.

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..... [4]

(ii) Explain why legume crops, such as peas, beans, alfalfa and clover are used in crop rotations.

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..... [3]

- (c) The overuse of fertilisers can lead to environmental problems. Soils, rivers, lakes, the sea and the atmosphere have all been affected by this pollution.

Outline the undesirable effects of the overuse of fertilisers.

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..... [5]

[Total: 17]

- 9 *Sorghum bicolor* is a cereal crop important in many dry areas of the world.

Fig. 4.1 shows some plants of *S. bicolor* growing in a field in China.



Fig. 4.1

- (a) *S. bicolor* is a monocotyledon.

State **two** features that are used to identify plants as monocotyledons.

- 1
- 2 [2]

- (b) Fig. 4.1 shows the flower heads of sorghum. Pollen is released from the individual flowers when they open.

Most sorghum flowers are self-pollinated and then self-fertilised.

- (i) State the meanings of the terms *pollination* and *fertilisation*.

pollination

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fertilisation

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..... [2]

- (ii) Describe **two** implications of self-pollination.

1

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2

..... [2]

- (c) Describe the events that occur in flowering plants after fertilisation to form a seed.

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..... [4]

- (d) In India, the cultivation of sorghum has decreased because now people prefer foods based on wheat and rice.

There are alternative uses of sorghum in the production of new foods, processed foods and as feed for animals.

Explain why it is less efficient to feed crops, such as sorghum, to animals rather than to use them for human foods.

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..... [3]

[Total: 13]

- 10 In some countries forests are cleared by burning. This produces carbon dioxide and ash.

- (a) Outline the environmental effects of an increase in carbon dioxide in the atmosphere as a result of burning forests.

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..... [4]

- (b) The ash helps crops to grow because it is rich in minerals, such as magnesium ions, but it is deficient in nitrate ions.

Explain why nitrate ions and magnesium ions are important for plants.

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..... [4]

- (c) When mineral ions from soils are washed into streams and rivers there is often a rapid growth of algae.

- (i) State the name of the effect that is caused by adding mineral ions to streams and rivers.

..... [1]

- (ii) These streams and rivers often have low concentrations of dissolved oxygen. Explain why.

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..... [2]

- (d)** Untreated domestic sewage contains organic waste as well as dissolved minerals.

Outline how sewage is treated so that the water may be recycled as drinking water.

[3]

[3]

[Total: 14]

- 11 (a)** Table 1.1 shows some features of the five groups of vertebrates.

Complete Table 1.1 to compare the five groups of vertebrates using a tick (✓) to indicate if the group shows the feature, or a cross (✗) if not.

The first row has been completed for you.

Table 1.1

group of vertebrates	scaly skin	external ear (pinna)	feathers	mammary glands
birds	✓	✗	✓	✗
bony fish				
amphibians				
reptiles				
mammals				

[4]

Fig. 1.1 shows a southern cassowary, *Casuarius casuarius*, which is a large bird that cannot fly. It lives in rainforests in northern Australia and southern New Guinea.

The cassowary feeds on fruits and helps to disperse seeds for many tree species, such as the cassowary plum.



Fig. 1.1

(b) Suggest why the cassowary can digest the **fruit** but not the **seeds** of rainforest trees.

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..... [2]

(c) Describe **one** method of seed dispersal that does **not** require animals.

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..... [2]

(d) State **two** environmental conditions that seeds require so that they can germinate.

1.

2. [2]

- (e) Cassowaries are an endangered species. Many are killed on the roads and development threatens their rainforest habitat.

Cassowaries, as with many other rainforest species, cannot survive in small nature reserves.

Suggest why species, such as cassowaries, cannot survive in small nature reserves.

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[3]

[Total: 13]

- 12 Nitrogen is one of the most important chemical elements in the biosphere. Nitrogen must be continually recycled if life is to continue on Earth.

Savanna grasslands are an important ecosystem in Africa.

Fig. 6.1 shows part of the nitrogen cycle in a grassland ecosystem in southern Africa.

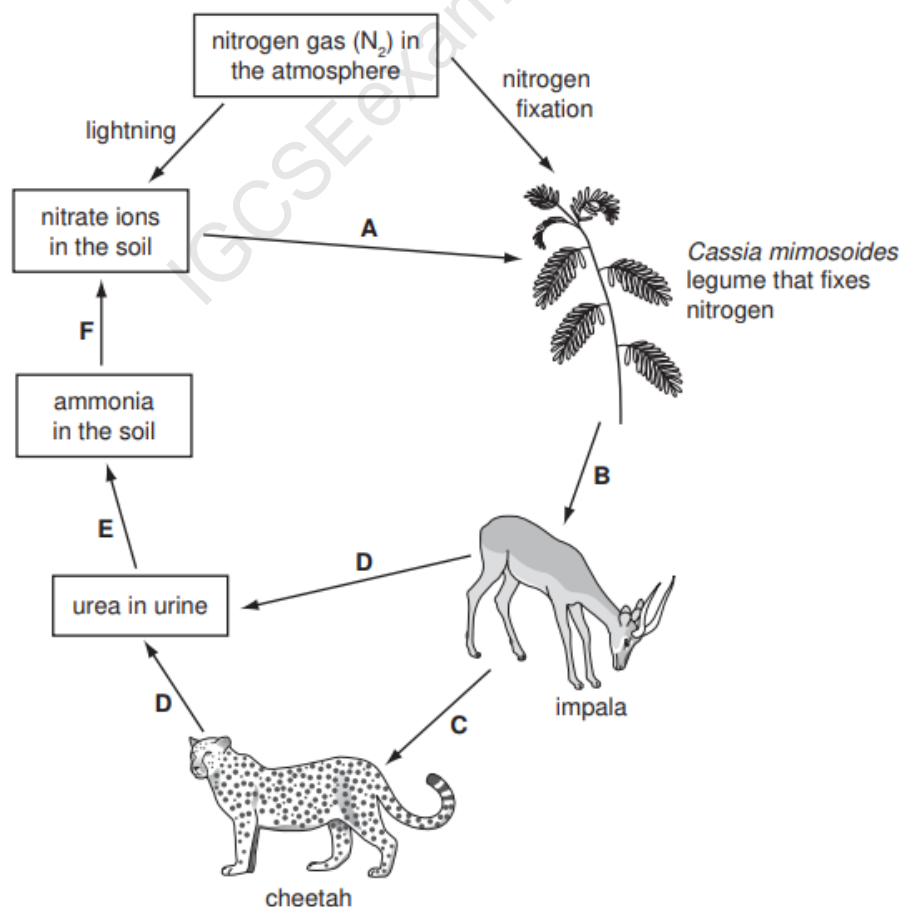


Fig. 6.1

(a) Name:

- (i) a type of nitrogen-containing compound that is made by *Cassia mimosoides*, eaten by the impala and by the cheetah;

..... [1]

- (ii) the type of consumer as represented by the cheetah;

..... [1]

- (iii) the process by which urea is removed from the body of the animals as shown by D;

..... [1]

- (iv) process F.

..... [1]

- (b) Explain the importance of recycling nitrogen in ecosystems, such as the African savanna.

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..... [3]

- (c) The most common plants that grow in the African savanna are grasses. There are very few legume plants, such as *C. mimosoides*.

Suggest reasons why *C. mimosoides* is a rare plant in the African savanna.

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..... [3]

(d) Explain why there are far fewer cheetah than impala.

[4]

(e) The cheetah is an endangered species.

It is important to conserve their food supply and all the species that inhabit their ecosystem.

Explain why.

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[3]

[Total: 17]

13 Molluscs are important animals in many aquatic and terrestrial ecosystems.

Fig. 1.1 shows four species of mollusc that live in the sea.

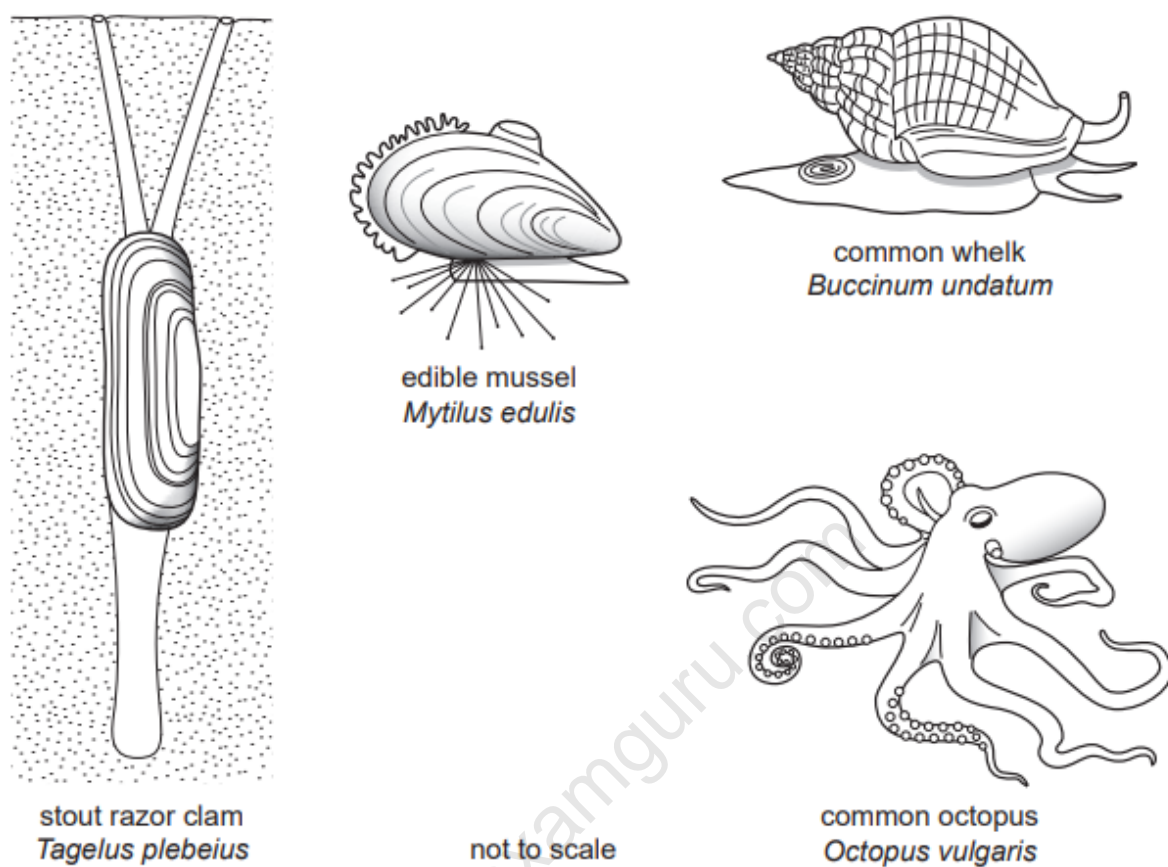


Fig. 1.1

(a) State **two** features shown by all mollusc species.

- 1
- 2 [2]

(b) State **two** features, **visible in Fig. 1.1**, in which the octopus differs from the other three molluscs.

- 1
- 2 [2]

- (c) The edible mussel, *Mytilus edulis*, is attached to rocks that are exposed to the air at low tide.

Use Fig. 1.1 to suggest how an edible mussel is adapted to attach to rocks and survive when exposed to the air.

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..... [2]

- (d) The zebra mussel, *Dreissena polymorpha*, is a freshwater mussel that originates from rivers in southern Russia.

The mussel was introduced into the Great Lakes of North America and has increased in huge numbers with serious effects on the food webs of the lakes.

Explain why an introduced species, such as the zebra mussel, can have serious effects on the populations of the species that are already living in the area.

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..... [3]

- (e) The freshwater mussel, *Pletholophus swinhoei*, was used in a project to monitor water pollution by chemical waste in northern Vietnam.

This was done by regularly counting the number of mussels in the river.

Suggest the advantages of using freshwater mussels to monitor the pollution of water instead of carrying out chemical analysis of the water.

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..... [2]

- (f) Non-biodegradable plastics are a serious problem in many aquatic ecosystems.

Explain the harm that non-biodegradable plastics may cause to organisms in aquatic ecosystems.

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..... [3]

[Total: 14]

- 14 Chemical fertilisers are used to improve crop productivity.

- (a) Outline how chemical fertilisers improve the productivity of crops.

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..... [3]

Some students investigated the effect of acid on the germination and growth of seedlings. Seeds were placed onto paper that had been soaked in different concentrations of sulfuric acid.

Ten seeds were placed into each dish.

The students measured the lengths of roots and shoots. Their results are shown in Fig. 6.1.

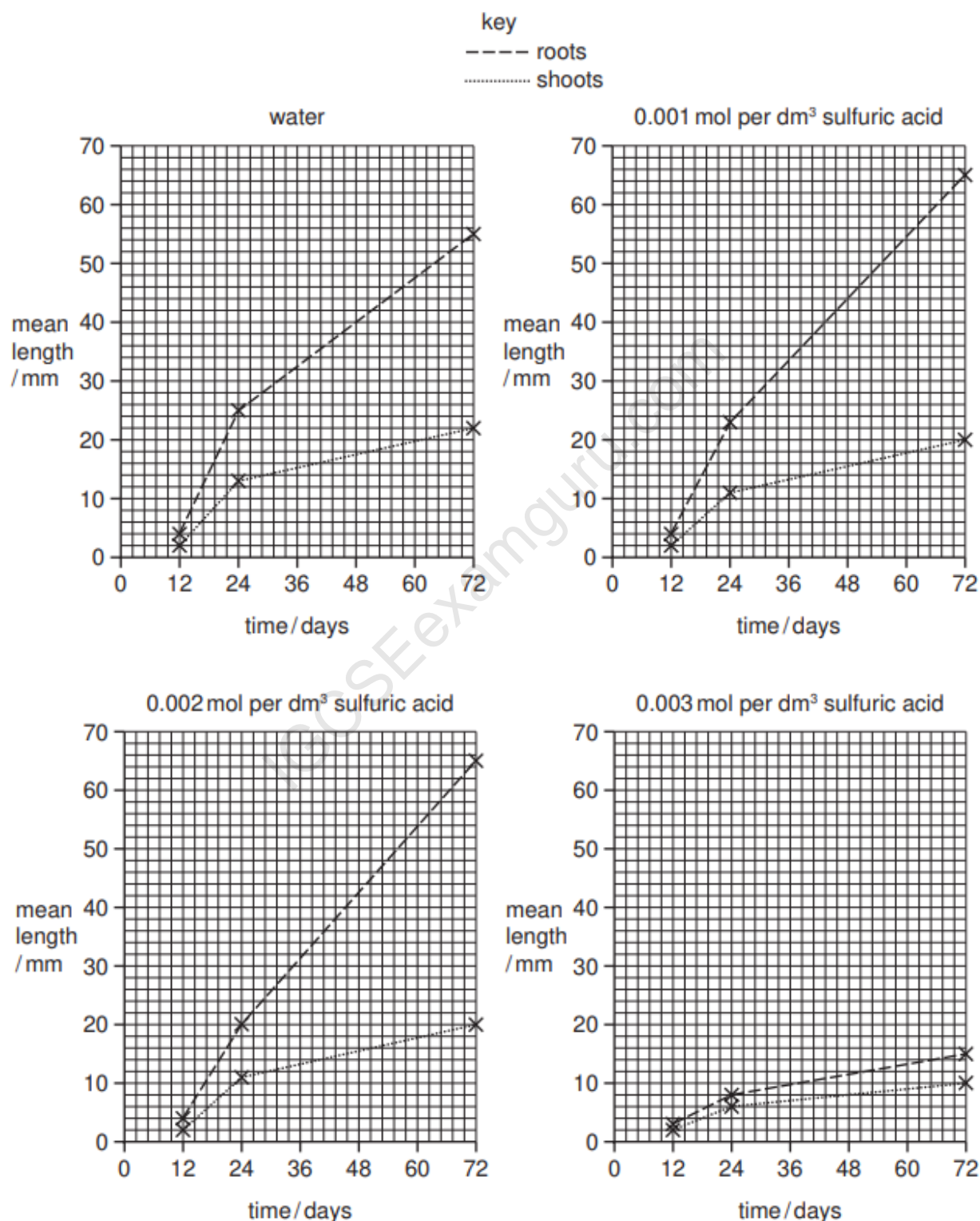


Fig. 6.1

- (b) State the conditions necessary for seeds to germinate.

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..... [3]

- (c) Describe the effects of increasing the concentration of sulfuric acid on the growth of roots and shoots of the seedlings.

You will gain credit if you use data from Fig. 6.1 in your answer.

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..... [4]

- (d) Acid rain is formed when sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) dissolve in rain water.

Explain why concentrations of sulfur dioxide in the atmosphere have increased over the last 150 years.

.....

.....

.....

..... [2]

(e) Describe **three** effects of acid rain on organisms and their environment.

1

.....

2

.....

3

..... [3]

[Total: 15]

- 15 Some information about pollutants, their sources and their effects on the environment are shown in Table 1.1.

Table 1.1

pollutant	source	effect on the environment
heavy metals in chemical waste		disrupts functioning of plants, causes brain damage
phosphate		eutrophication of streams, rivers and lakes
sulfur dioxide		damage to trees, e.g. death of leaves
ionising radiation		
DDT	pesticide sprays	accumulates in tissues of animals

(a) Complete Table 1.1.

[5]

(b) Explain what happens in streams, lakes and rivers when eutrophication occurs.

[illegible]

.....[5]

(c) Sulfur dioxide dissolves in rain water to form acid rain.

Describe **two** measures that can be taken to reduce the effects of acid rain.

1

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2

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[2]

[Total: 12]

16 Fig. 3.1 is a diagram of the water cycle.

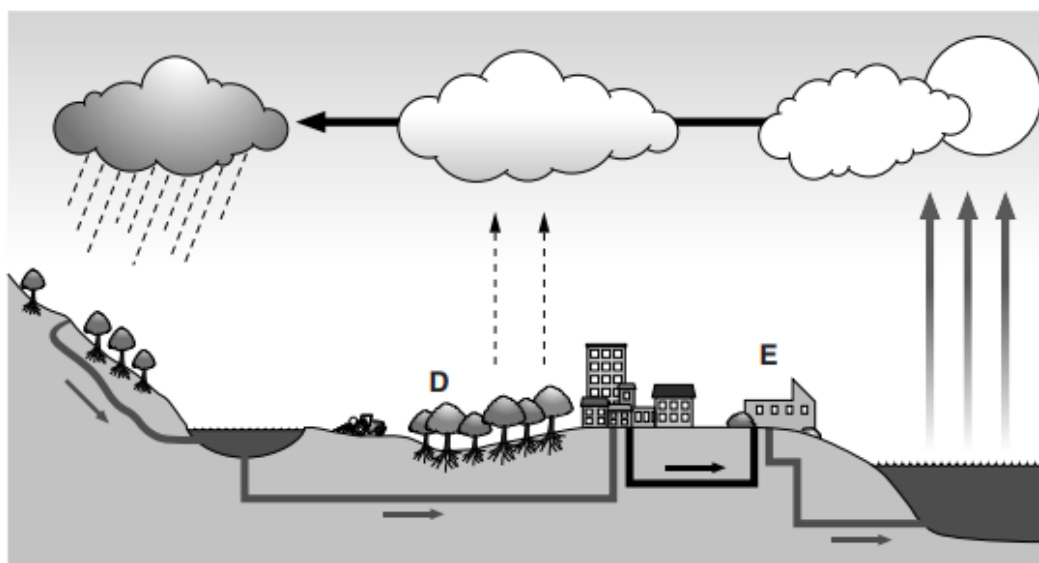


Fig. 3.1

- (a)** Water is a large component of the cells in the leaves of trees, as labelled **D** on Fig. 3.1.

Explain how water passes from a leaf cell to the atmosphere.

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..... [4]

- (b)** Explain how the loss of water from the leaves helps to move water from the roots to the leaves.

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..... [4]

- (c)** Explain how water enters the roots of the trees from the soil.

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..... [3]

(d) Fig. 3.1 shows a sewage treatment works, labelled E.

Describe **three** processes used in the treatment of sewage.

- 1
- 2
- 3 [3]

(e) Herbicides are used by farmers to control weeds.

Explain the environmental damage that may be caused by herbicides.

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-
-
-
-
-
- [3]

[Total: 17]

17 Sulfur dioxide (SO₂) can cause acid rain.

(a) Name **one** other pollutant that can cause acid rain.

..... [1]

(b) Describe the effects of acid rain on the environment.

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-
-
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-
-
- [3]

- 1
- 2
- 3

(d) Scientists in China measured the concentration of sulfur dioxide (SO_2) in the atmosphere and sulfur in plant tissues from 1990 until 2005. They did not record any measurements between 1990 and 1996.

Year	atmospheric SO ₂ / µg m ⁻³	plant tissue sulfur / %
1990	570	1.7
1996	300	1.1
1997	150	0.65
1998	145	0.62
1999	140	0.6
2000	130	0.58
2001	115	0.55
2002	110	0.52
2003	90	0.48
2004	70	0.45
2005	60	0.45

(i) Describe the trends in the concentrations of sulfur found in the atmosphere and in the plant tissues as shown in Fig. 2.1. You will gain credit for using the data in the graph to support your answer.

[3]

- (ii) Suggest why the concentration of sulfur in the plant tissues was calculated as a **percentage** of the **dry mass** of the plant tissue.

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.....[2]

[Total: 12]

- 18 Fig. 6.1 shows the carbon cycle. **P**, **Q**, **R**, **S** and **T** each represent a part of the carbon cycle.

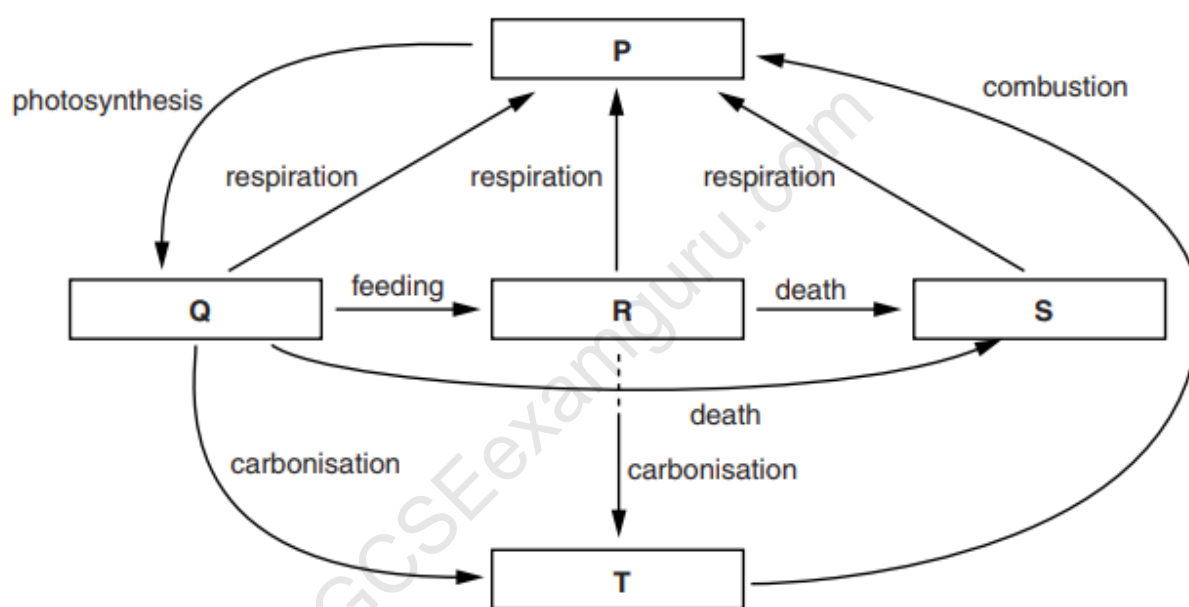


Fig. 6.1

- (a) Complete Table 6.1 by identifying **P**, **Q**, **R** and **S** and the name of **one** example of a carbon compound found in each. **T** has been completed for you.

Table 6.1

letter	part of cycle	carbon compound found in each part
P		
Q		
R		
S		
T	fossil fuels, e.g. natural gas	methane

[4]

- (b)** Photosynthesis is a very important process in the carbon cycle.

Explain how the process of photosynthesis converts carbon compounds from **P** to carbon compounds in **Q**.

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[5]

- (c)** The rate of photosynthesis varies as a result of changes in environmental factors.

State **one** environmental factor and explain how it can affect the rate of photosynthesis.

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[3]

- (d) Environmental factors can be controlled in glasshouses.

Describe how **three** environmental factors are controlled in a glasshouse to improve crop yield.

factor 1:

how is it controlled:

.....

factor 2:

how is it controlled:

.....

factor 3:

how is it controlled:

.....

[3]

[Total: 15]

- 19 Ecologists study plants and animals in their natural environment. Some ecologists inserted probes into the water-conducting tissue in trees, as shown in Fig. 4.1. The ecologists measured the time taken for water to move up from probe 1 to probe 2.

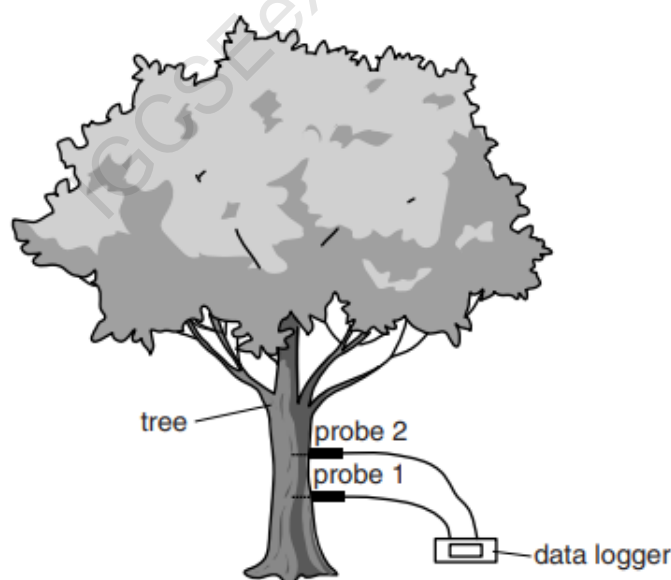


Fig. 4.1

- (a) (i) Name the water-conducting tissue into which the two probes were inserted.

..... [1]

- (ii) Describe how the structure of this water-conducting tissue is adapted to its function.

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- (b) Explain the mechanism of water movement from the roots up the tree to the leaves.

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- (c) Fig. 4.2 shows the rate of water conduction up three different trees in a forest over 24 hours.

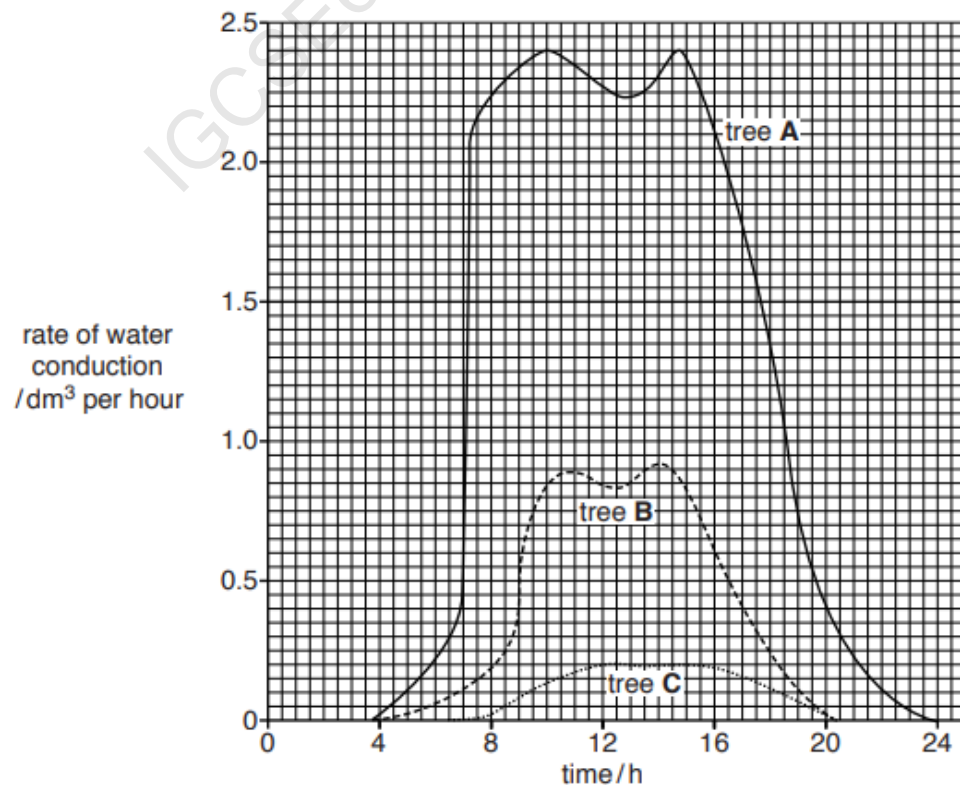


Fig. 4.2

- (i) Describe the rate of water conduction in tree **A**, during this 24 hour period.

You will gain credit for using the data in Fig. 4.2 to support your answer.

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- (ii) Suggest how the ecologists used the data in Fig. 4.2 to calculate the total volume of water used by a tree in 24 hours.

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- (iii) In Fig. 4.2, tree **A** is a tall tree, tree **B** is a medium-height tree and tree **C** is a short tree. Suggest reasons for the different rates of water conduction in the three trees.

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- (d) Loggers often cut down the tall trees in a forest.

Describe the effects on the forest ecosystem of cutting down trees.

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[Total: 18]

- 20** Sewage treatment works use bacteria to digest the waste matter. Waste matter contains complex organic compounds, such as starch, cellulose, protein and fat.

Fig. 3.1 shows a diagram of a sewage works with an aerobic digestion tank.

The sewage works discharges clean water into a river. Downstream from the sewage works, water is removed to be used as drinking water for a nearby village.

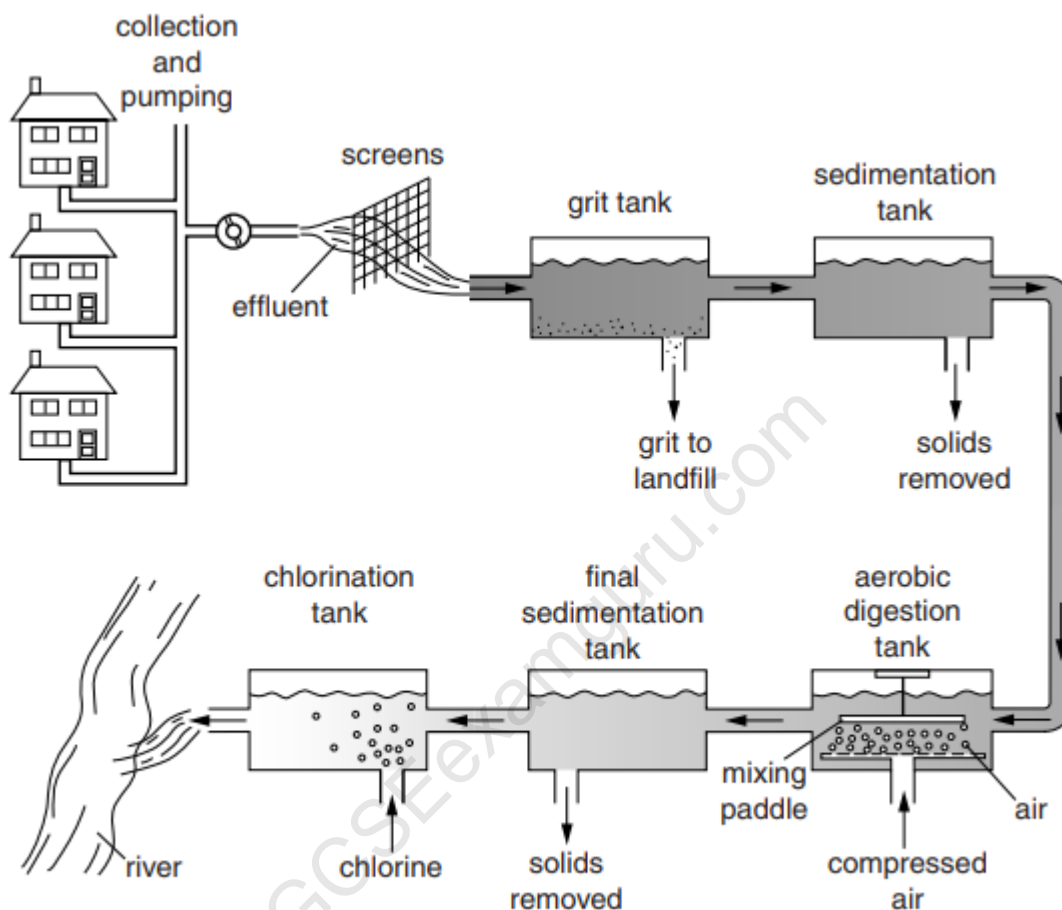


Fig. 3.1

(a) Explain the roles of bacteria in the aerobic digestion tank shown in Fig. 3.1.

[5]

(b) Fig. 3.1 shows that chlorine is added to water before it leaves the sewage treatment works.

Explain why chlorine is added to the water.

ICCS Eext

[2]

[Total: 7]

- 21** Some pollutants are not broken down easily and remain in the environment for a long time. These are described as persistent pollutants.

PCBs are a waste material from the manufacturing of electrical insulation. PCBs are one of the most persistent pollutants in the environment.

Between 1947 and 1976, factories dumped large quantities of PCBs into the Hudson River in the USA. Studies measured the concentrations of PCBs in the tissues of organisms in a food chain in the sea near the Hudson River, as shown in Fig. 6.1.

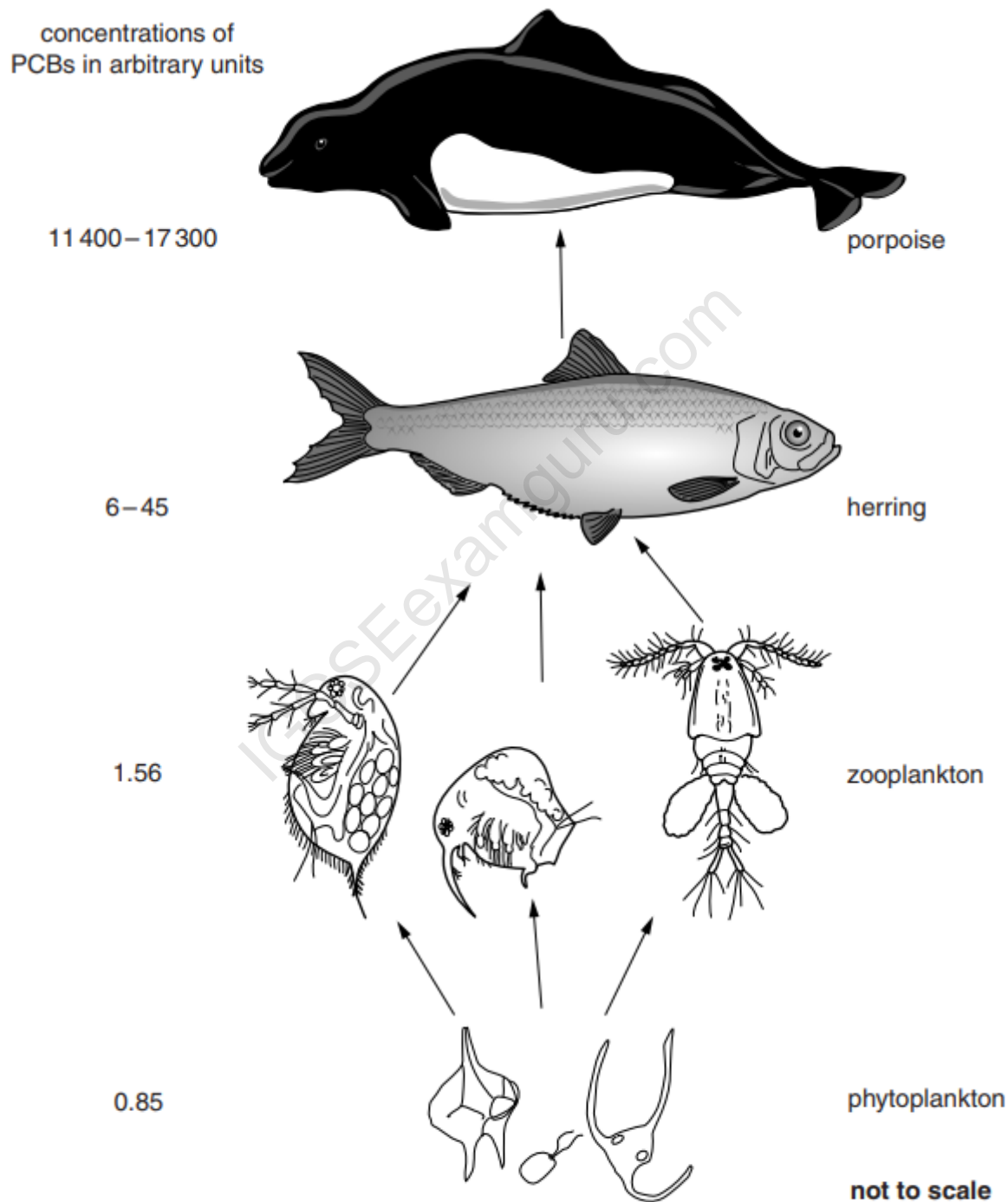


Fig. 6.1

(a) (i) Describe the results shown in Fig. 6.1.

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(ii) Suggest an explanation for the different concentrations of PCBs in the organisms of the food chain.

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- The Atlantic tomcod, *Microgadus tomcod*, is a fish that lives in the Hudson River and other rivers nearby.

(i) Suggest how this resistance came about.

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[5]

- Suggest reasons why the proportion of fish with the altered AHR protein might decrease.

[2]

(c) Describe the problems caused by non-biodegradable plastics in the environment.

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[Total: 16]

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

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

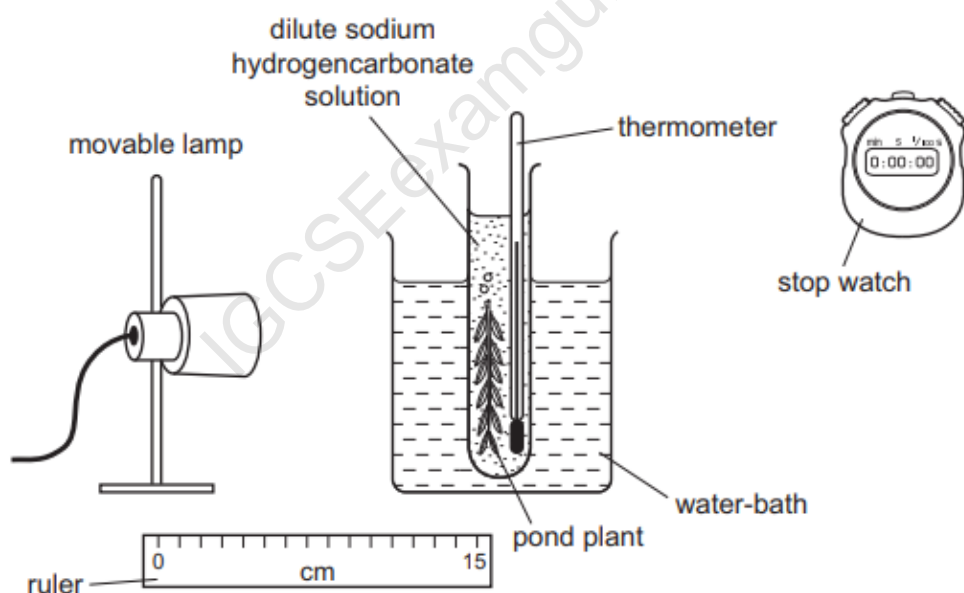


Fig. 2.1

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

(i) The beaker of water and the thermometer.

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.....[2]

(ii) The light meter and the ruler.

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

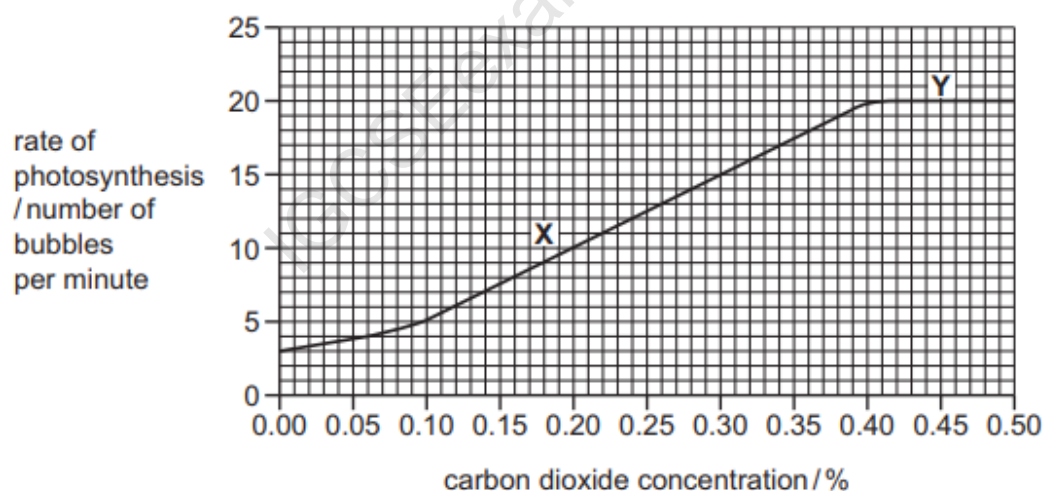


Fig. 2.2

- (i) Describe the student's results.

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

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.....[3]

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

.....[1]

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

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

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

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

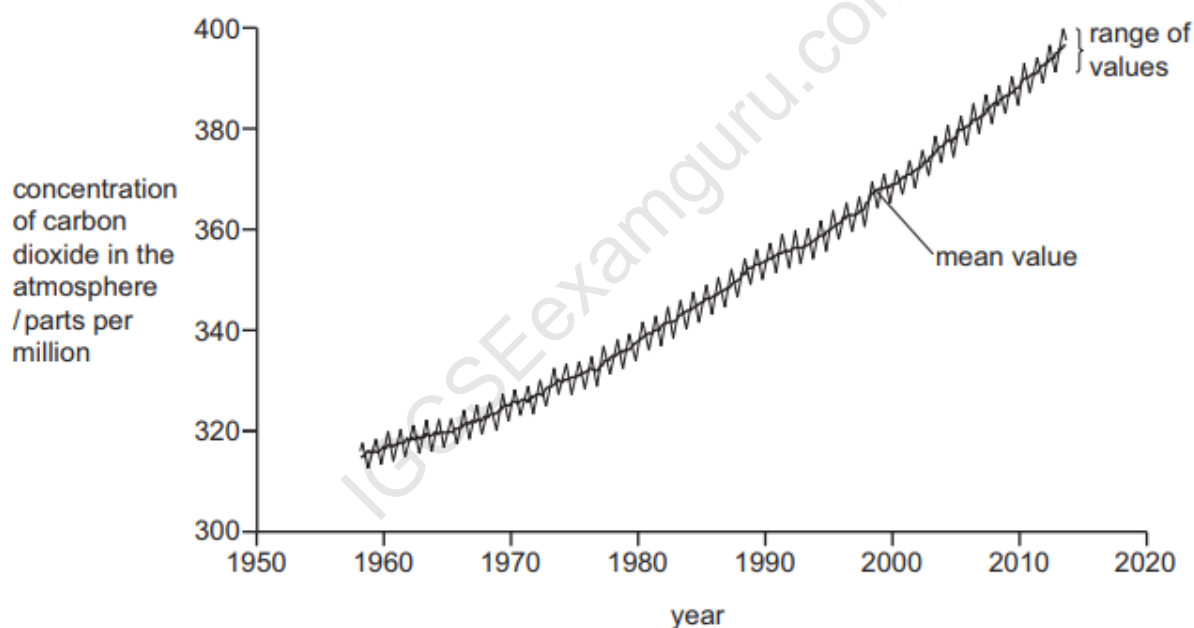


Fig. 2.3

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

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

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

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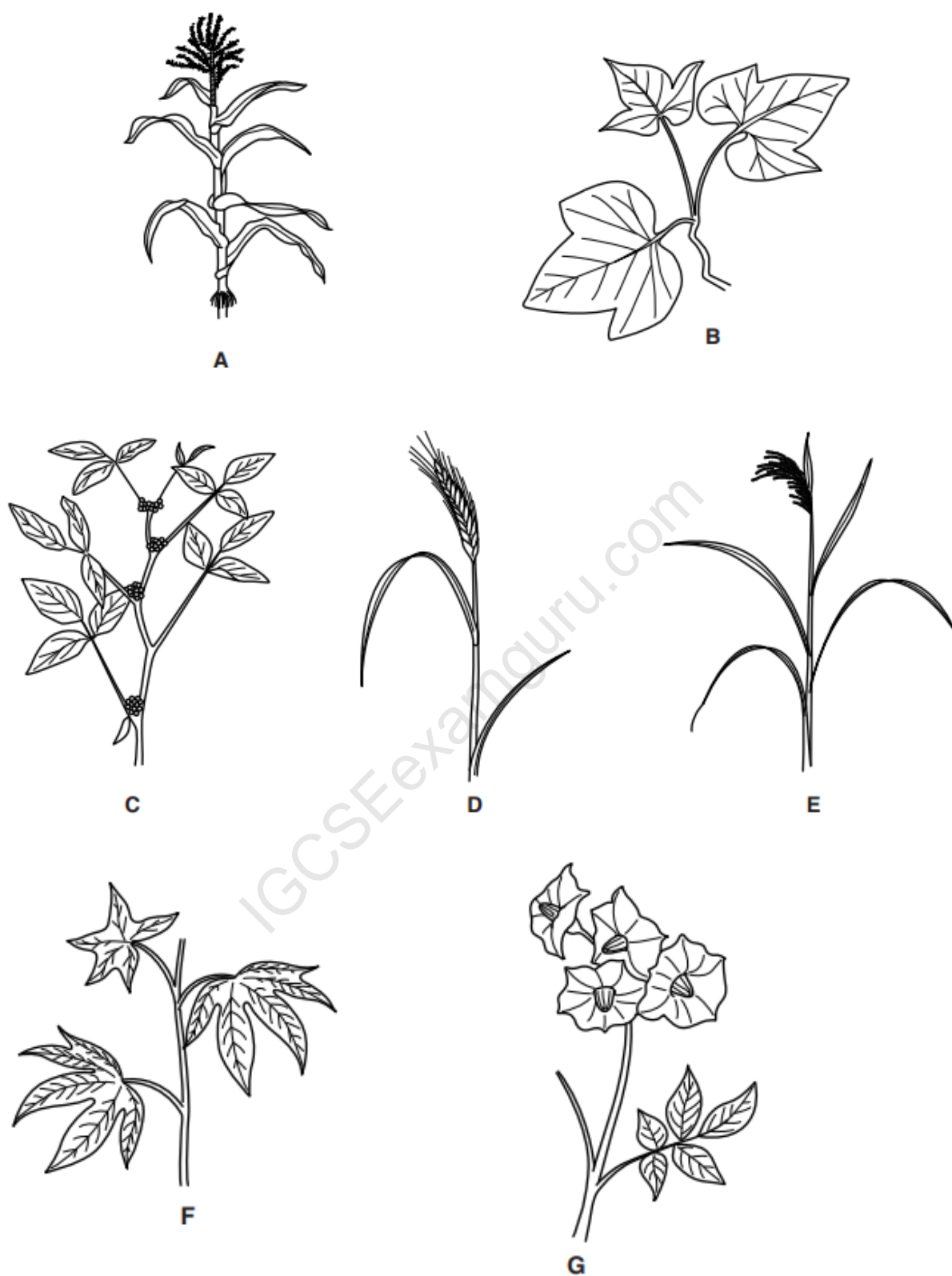
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[Total: 21]

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23 (a) Fig. 1.1 shows seven plant species that are important crops.



not drawn to scale

Fig. 1.1

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

Key

1 (a)	branched veins on leaves	go to 2	
(b)	parallel veins (not branched) on leaves	go to 3	
2 (a)	leaves divided into leaflets (look like small individual leaves)	go to 4	
(b)	leaves not divided into leaflets	go to 5	
3 (a)	flowers grouped tightly together at the top of the stalk	<i>Triticum aestivum</i>	
(b)	flowers grouped loosely together at the top of the stalk	go to 6	
4 (a)	large flowers located at top of stem	<i>Solanum tuberosum</i>	
(b)	small flowers located along the stem	<i>Glycine max</i>	
5 (a)	leaves have five lobes	<i>Manihot esculenta</i>	F
(b)	leaves have three lobes	<i>Ipomoea batatas</i>	
6 (a)	flowers above youngest leaf	<i>Zea mays</i>	
(b)	flowers bend down below youngest leaf	<i>Oryza sativa</i>	

[3]

- (b) The pattern of the veins on the leaves was used in the key to separate the monocotyledonous crop plants and eudicotyledonous (dicotyledonous) crop plants shown in Fig. 1.1.

State **one** other feature that could be used to identify monocotyledonous plants from eudicotyledonous plants.

..... [1]

- (c) The leaves of some crop plants are not eaten but are used to make paper. This reduces deforestation because fewer trees are cut down for making paper. Deforestation has negative effects on soil ecosystems.

- (i) Describe the negative effects of deforestation on **soil** ecosystems.

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- (ii) Paper recycling can reduce deforestation.

Outline how paper can be recycled.

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[Total: 11]

- 24 The human population is growing rapidly. This is increasing the pressure on the world food supply.

(a) Name the rapid growth phase of any population of organisms.

..... [1]

In Canada farmers are breeding fish in large nets because the wild stocks of fish are decreasing. Fig. 6.1 is a diagram of a salmon fish farm in the ocean. The salmon only eat the food provided by the worker.

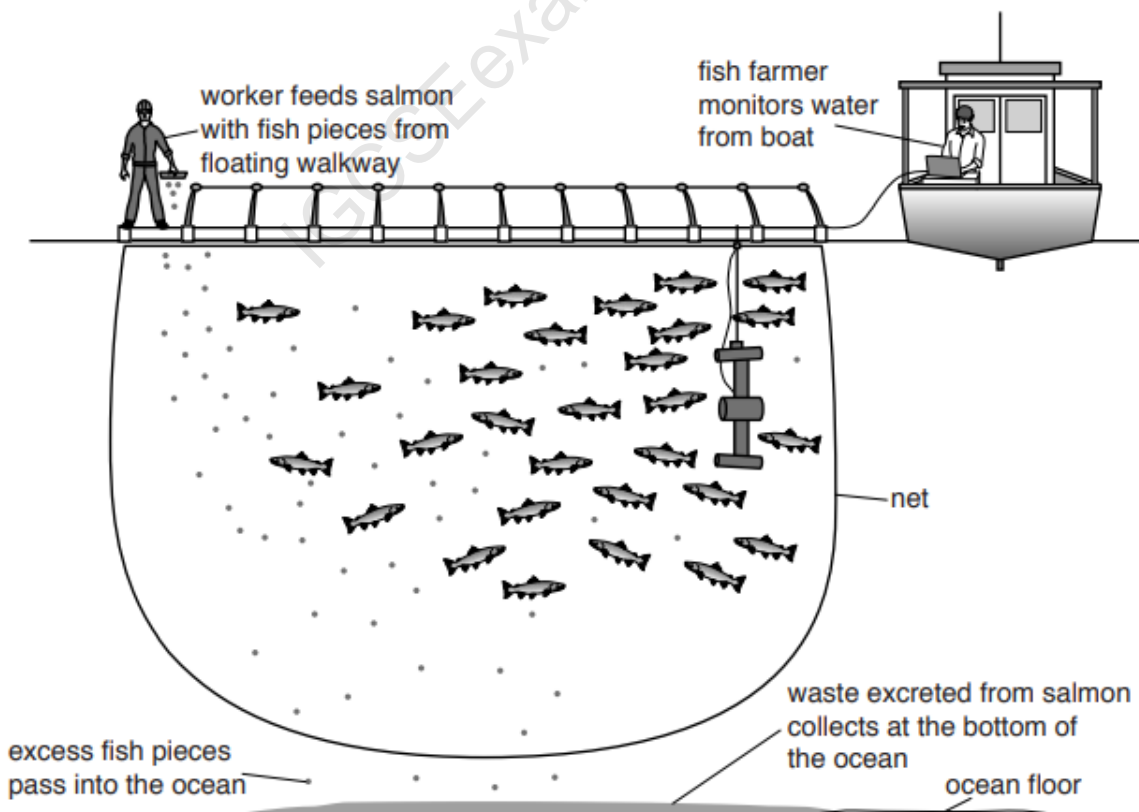


Fig. 6.1

- (b) Explain the effects of the excess fish pieces and waste excreted from the salmon on the environment.

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- (c) State the lowest possible trophic level of the salmon shown in Fig. 6.1.

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- (d) Other farmers grow seaweed. Salmon farming is a less energy efficient way of producing food for humans than seaweed farming.

Explain why.

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[Total: 8]

- 25** Some integrated farming systems involve making best use of all available resources without the use of large inputs of energy in the form of fossil fuels.

A study looked at what happened to the light energy that was the major energy input to farms in the Zhujiang delta in China. The farms are based on a dyke-pond system as shown in Fig. 6.1.

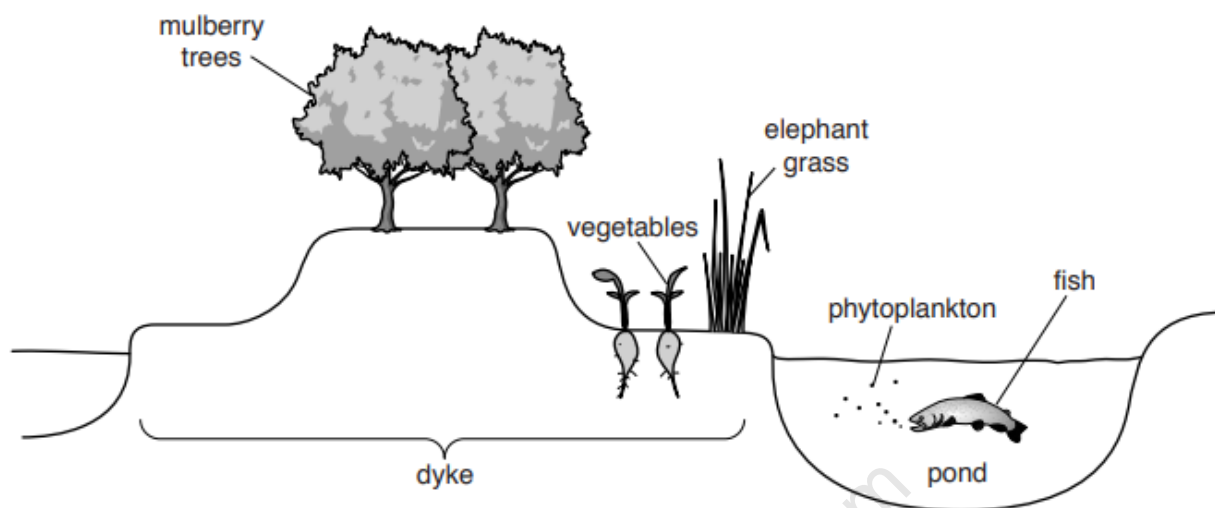


Fig. 6.1

Elephant grass, vegetables and mulberry trees are grown on the dykes in between the ponds. The elephant grass is grown and then cut to feed the fish. Vegetables and fish are used for human consumption. Silkworms feed on the mulberry trees. Phytoplankton are the main producers in the pond and are eaten by the fish.

- (a) (i)** Explain the meaning of the term *producer*.

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.....[2]

- (ii) Use the information provided in the passage on page 18 and in Fig. 6.1 to **complete** a food web for the farm. Some of the producers have been drawn for you.



[5]

- (b) In the study the researchers discovered that the vegetables absorbed 1560 MJ m^{-2} per year of light energy. The energy which was transferred from the vegetables to humans was 3 MJ m^{-2} per year.

Explain what happens to the energy that is absorbed by the vegetables but is not transferred to humans.

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- (c) Suggest the advantages to a farmer of including ponds stocked with fish in an integrated farming system.

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[Total: 13]

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