

- 1 Acid rain is a serious environmental problem in some areas of the world. Lakes in Canada, Norway and Scotland are highly acidic as a result of acid rain.

Fig. 4.1 shows a cause of acid rain.

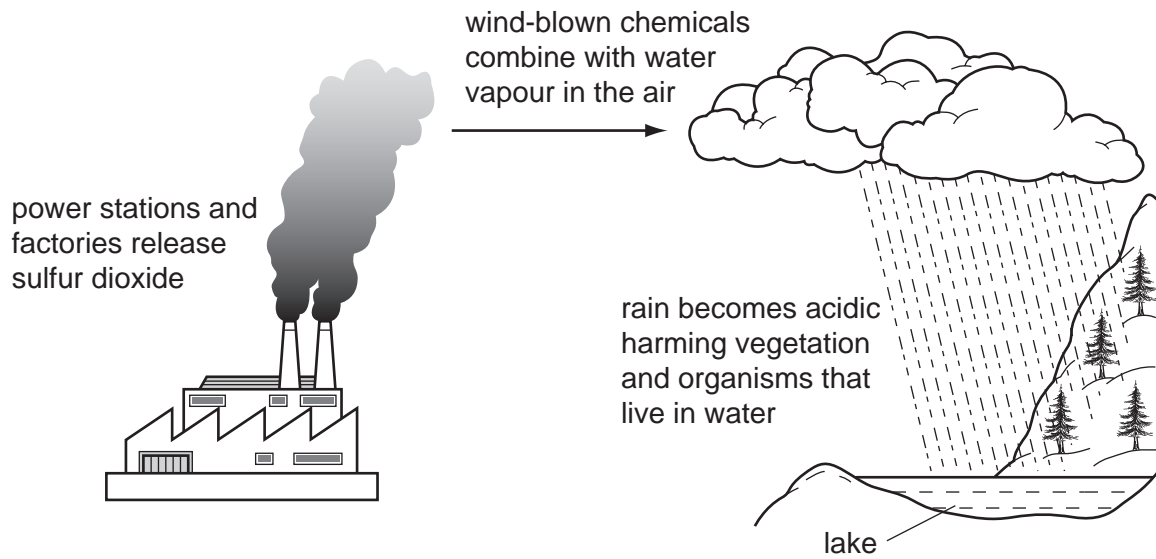


Fig. 4.1

- (a) State **one** cause of acid rain **other than that shown in Fig. 4.1**.

..... [1]

- (ii) Describe two effects of acid rain on forest ecosystems.

1.
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2.
..... [2]

- (b) Describe two different ways to reduce pollution so that there is less acid rain.

1.
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2.
..... [2]

Fig. 4.2 shows the pH ranges that some animals that live in lakes can tolerate.

| animals | | pH | | | | | | | |
|------------|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|
| group | examples | 7.0 | 6.5 | 6.0 | 5.5 | 5.0 | 4.5 | 4.0 | 3.5 |
| fish | trout | shaded | shaded | shaded | shaded | shaded | | | |
| | bass | | | | shaded | shaded | | | |
| | perch | | | | | shaded | shaded | shaded | |
| amphibians | frogs | shaded | shaded | shaded | shaded | shaded | shaded | shaded | |
| | salamanders | | | | shaded | shaded | shaded | | |
| molluscs | clams | shaded | shaded | shaded | | | | | |
| | snails | shaded | shaded | shaded | | | | | |
| crustacean | crayfish | shaded | shaded | shaded | shaded | | | | |
| insects | mayfly larvae | shaded | shaded | shaded | shaded | | | | |
| | blackfly larvae | shaded | shaded | shaded | shaded | shaded | shaded | shaded | shaded |

Fig. 4.2

(c) State **one** feature of molluscs that is **not** a feature of crustaceans.

..... [1]

(d) Using the information in Fig. 4.2,

(i) name an animal that could be found in a lake with a pH of 4.0;

..... [1]

(ii) name the animals that are most sensitive to a decrease in pH;

..... [1]

(iii) suggest why some animals cannot tolerate living in water of pH as low as 4.0.

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 [2]

[Total: 10]

- 2 The highest yields of potatoes are obtained in the USA. In Bangladesh they are very much lower. Scientists investigated the effects of improving soil fertility on the growth and yields of potatoes in Bangladesh.

They carried out an investigation by dividing a field into four plots, **E** to **H**. The potatoes in each plot received different treatments:

E – no fertiliser or manure

F – manure only

G – chemical fertiliser only

H – manure and chemical fertiliser

The scientists measured different aspects of growth and final yield of the potato plants. Their results are shown in Table 3.1.

Table 3.1

| plot | treat | mean plant height at maturity / cm | mean fresh mass of potato tubers per plant / g | yield of potato tubers / tonnes per hectare |
|----------|--------------------------------|------------------------------------|--|---|
| E | no fertiliser or manure | 46.2 | 1 | 12.6 |
| F | manure only | 59.3 | 285.0 | 19.3 |
| G | chemical fertiliser only | 66.1 | 3 | 21.2 |
| H | manure and chemical fertiliser | 71.5 | 3 | 24.3 |

- (a) The yield of potato tubers was greater in plot **H** than in plot **E**.

Calculate the difference in yield as a percentage of the yield in plot **E**. Show your working.

Answer =% [2]

- (ii) Suggest **and** explain the importance of increased plant height in the production of tubers.

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 [2]

(iii) Describe the effect of adding manure and chemical fertilisers on the yield of potato tubers.

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..... [3]

(iv) Manure and chemical fertilisers provide plants with nitrate ions. Explain how extra nitrate ions in the soil may have increased the yield of the potatoes.

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..... [2]

(v) State why plot E was included in this investigation.

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..... [1]

(b) Discuss the advantages and disadvantages of adding chemical fertilisers to crops.

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..... [5]

[Total: 15]

- 3 Carbon dioxide and methane are two important greenhouse gases. The effect of human activities in increasing the concentration of greenhouse gases, such as carbon dioxide and methane, is known as the enhanced greenhouse effect.

Fig. 6.1 shows the concentrations of carbon dioxide and methane in the atmosphere over the past 1000 years.

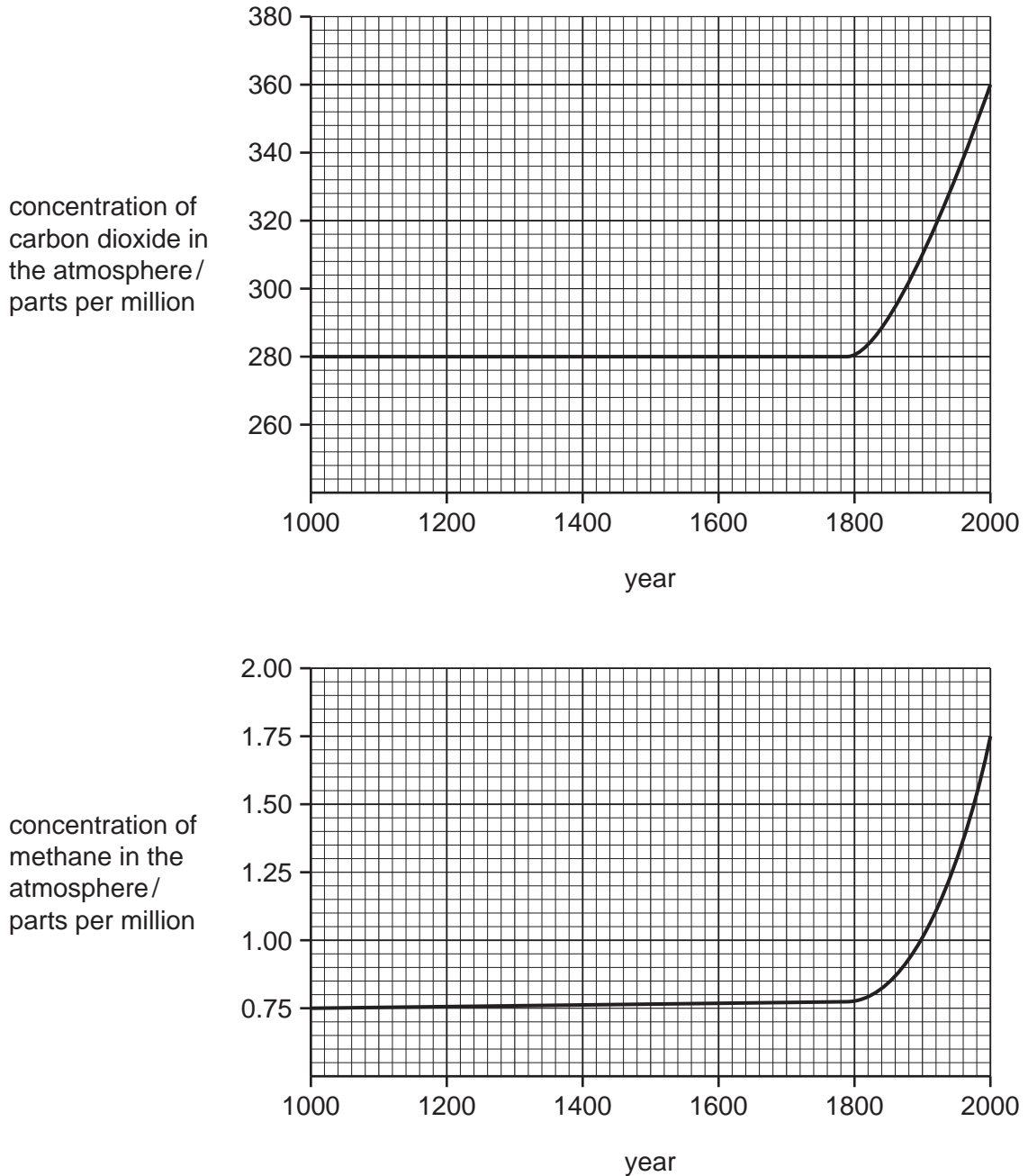


Fig. 6.1

(a) Using information in Fig. 6.1, describe the trend in the concentrations of carbon dioxide and methane over the past 1000 years.

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..... [3]

(b) Suggest **and** explain reasons for the trend in the concentrations of carbon dioxide and methane that you described in (a).

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(c) Explain how gases, such as those shown in Fig. 6.1, contribute to the greenhouse effect.

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..... [3]

(d) People are encouraged to recycle materials, such as paper and plastics.

Discuss the advantages of recycling materials, such as paper and plastics.

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..... [3]

[Total: 13]

- 4 In many parts of the world, raw sewage drains into rivers. Raw sewage contains organic matter which acts as food for bacteria. The breakdown of organic matter by bacteria has an effect on the oxygen concentration and species of invertebrate animals in rivers.

Fig. 5.1 shows the changes in oxygen concentration along a river.

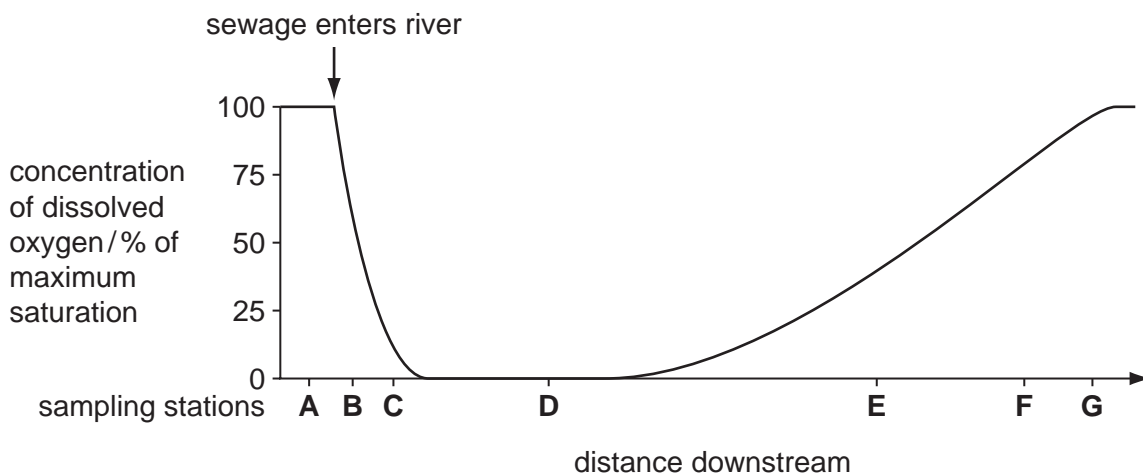


Fig. 5.1

Table 5.1 shows the invertebrate animals at seven sampling stations, **A** to **G**, along the river.

Table 5.1

key

✓ invertebrate animal present

| invertebrate animals | sampling stations | | | | | | |
|----------------------|-------------------|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| stonefly nymph | ✓ | | | | | | ✓ |
| freshwater shrimp | ✓ | | | | | ✓ | ✓ |
| caddis fly larva | ✓ | | | | | ✓ | ✓ |
| mayfly nymph | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| midge larva | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| rat-tailed maggot | | ✓ | ✓ | ✓ | | | |
| water louse | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| wandering snail | | | | | ✓ | ✓ | ✓ |
| tubifex worm | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

(a) (i) Describe the changes that occur to the oxygen concentration in the river as shown in Fig. 5.1. You will gain credit for using the data in Fig. 5.1 in your answer.

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..... [4]

(ii) Name the invertebrate animal that is only found in water with the highest oxygen concentration.

..... [1]

(iii) Name the **two** invertebrate animals that tolerate the lowest oxygen concentrations.

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..... [1]

(iv) Suggest **and** explain the changes in the number of different species of invertebrate animals along the river, as shown in Table 5.1.

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..... [3]

(c) Explain **two** ways in which the concentration of nitrate ions may be reduced as the water flows through the reed beds.

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..... [3]

(d) Some bacteria that live in reed beds release methane. Other sources of methane are cattle and flooded rice fields.

Explain the environmental consequences of an increase in the methane concentration in the atmosphere.

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..... [3]

[Total: 19]