

- 1 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.

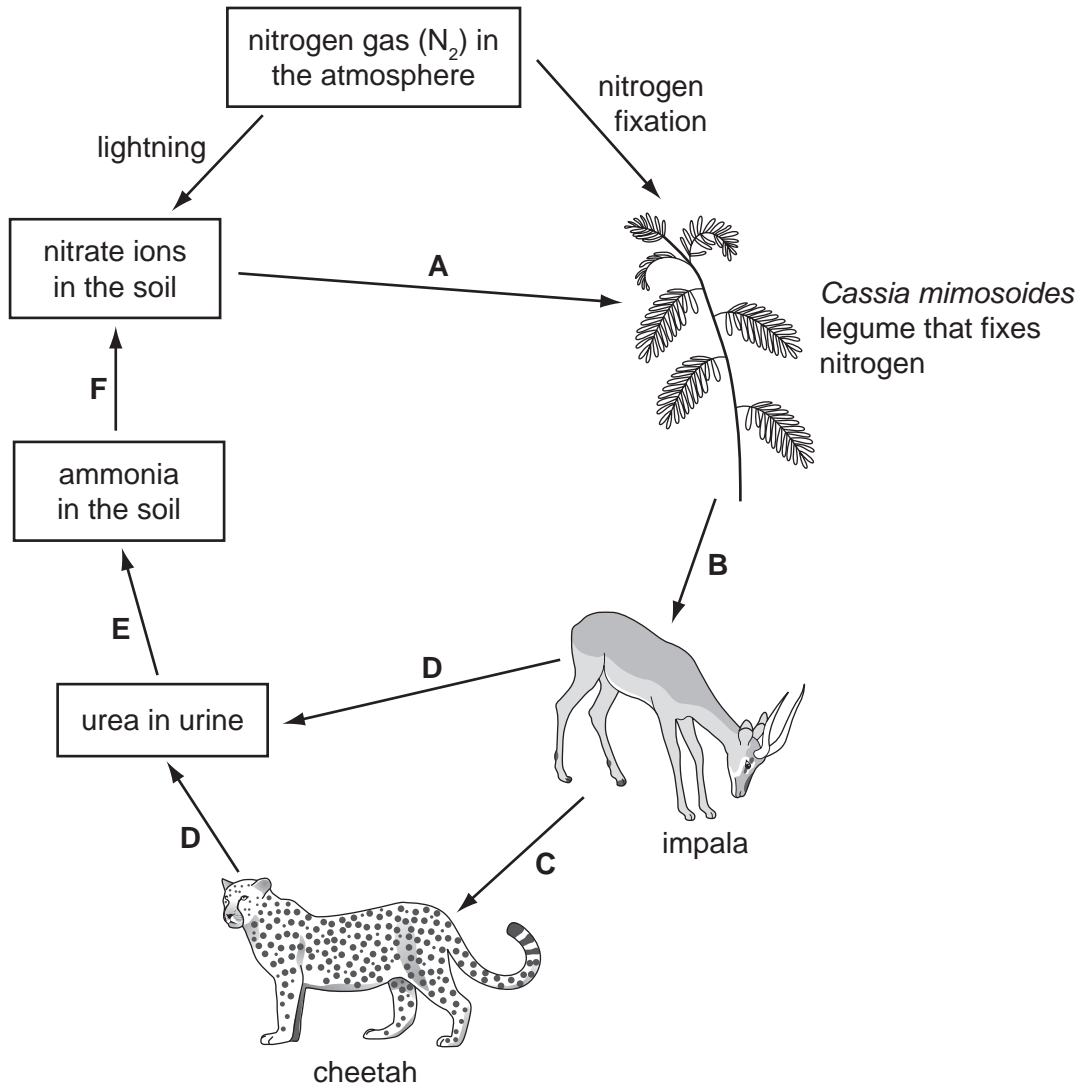


Fig. 6.1

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

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(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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[Total: 17]

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

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

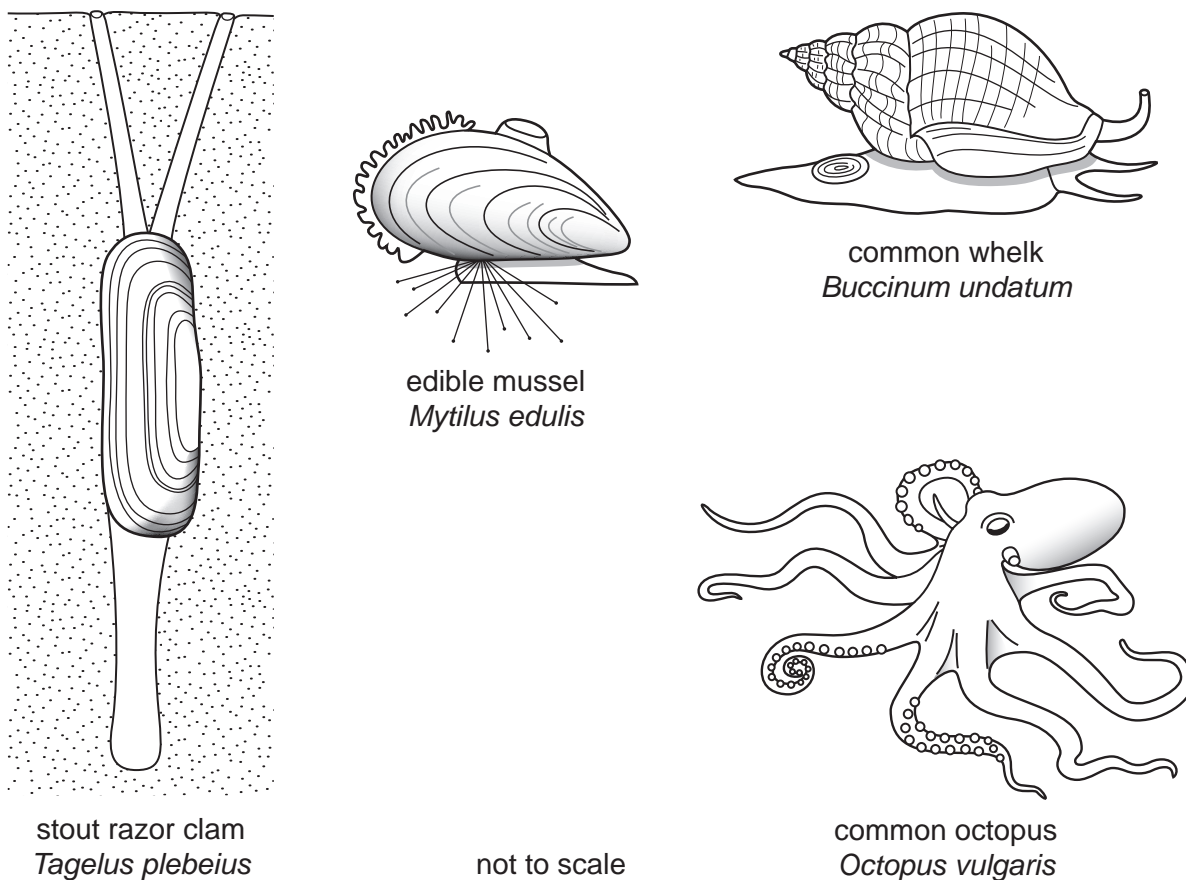


Fig. 1.1

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

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- 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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- (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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- (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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- (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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[Total: 14]

3 Chemical fertilisers are used to improve crop productivity.

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

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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.

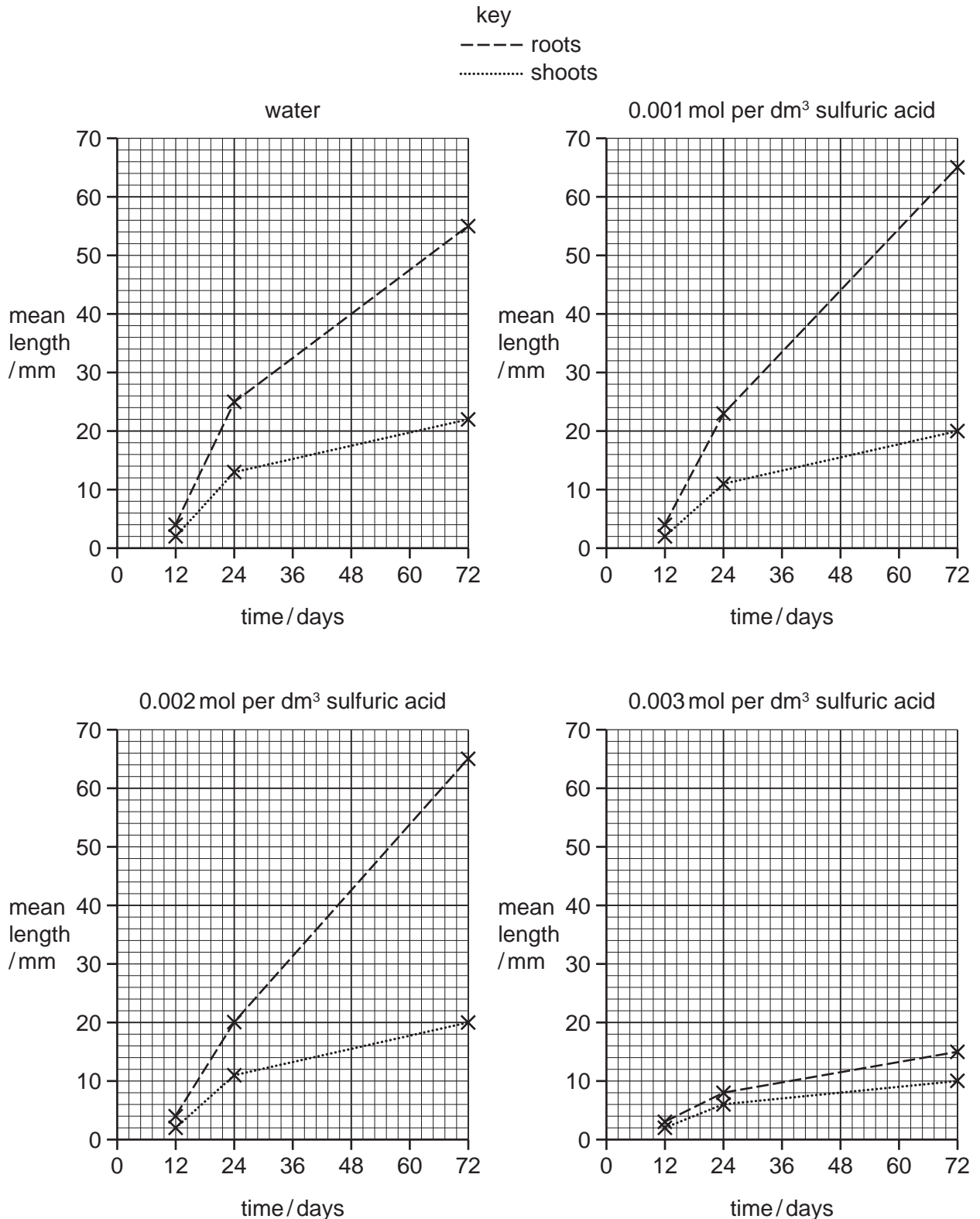


Fig. 6.1

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

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(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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(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.

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

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[Total: 15]