

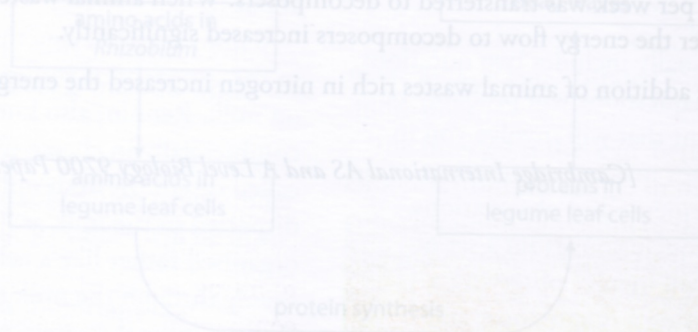
End-of-chapter questions

- Nitrogenase is an enzyme found in nitrogen-fixing bacteria. What reaction is catalysed by nitrogenase?
 - the conversion of nitrate ions to nitrite ions
 - the conversion of nitrite ions to nitrate ions
 - the conversion of nitrogen gas to ammonium ions
 - the conversion of nitrogen gas to nitrate ions
- Which is **not** a way in which energy is lost between a producer and a primary consumer?
 - as chemical energy in the faeces of the primary consumer
 - as chemical energy in roots that are not eaten by the primary consumer
 - as heat from respiration in the cells of the primary consumer
 - as heat from respiration in the cells of the producer
- Draw a flow diagram to show how an atom of nitrogen in a nitrogen molecule in the air could become part of a protein molecule in a muscle in a person's arm.

Your diagram should:

- name the molecules or ions in which the nitrogen atom is present, at each stage
- name the processes involved in the conversion of one substance to another, or in the passing of a substance from one organism to another

You will need to use knowledge of the nitrogen cycle in your answer. You may also use knowledge of digestion, absorption, transport in mammals and protein synthesis in cells.



a Name the processes that occur at H, J and K. [3]

b Suggest the advantages gained by legumes of having *Rhizobium* living in their roots. [2]

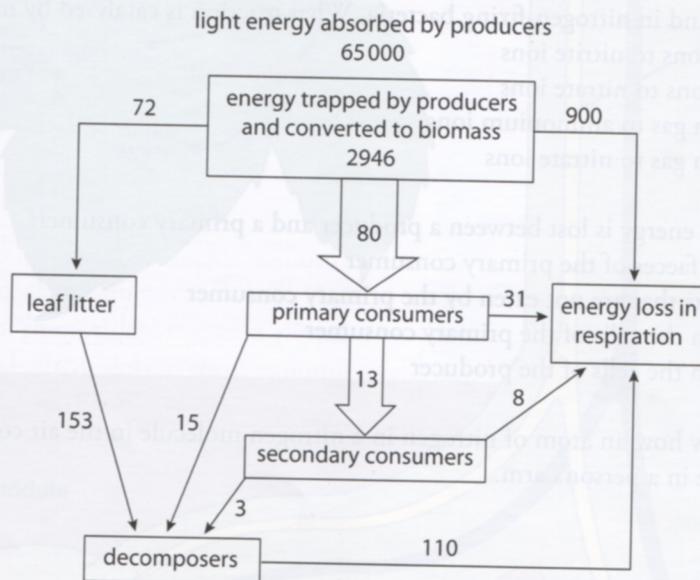
[Total: 5]

[Cambridge International AS and A Level Biology 9700 Paper 21, Question 6, June 2010]

4 a Explain what is meant by the term **community**.

b The figure shows the flow of energy through a woodland. All figures are in kJ m^{-2} per week.

[2]



- i Calculate the energy trapped by the producers and converted to biomass, as a percentage of the light energy absorbed. Express your answer to the nearest 0.1%. Show your working. [2]
- ii Suggest, in terms of energy flow, why there are no tertiary consumers in the woodland. [2]
- iii Leaf litter is composed of dead leaves and twigs. The total energy in the leaf litter was $15\ 899 \text{ kJ m}^{-2}$ but only 153 kJ m^{-2} per week was transferred to decomposers. When animal wastes rich in nitrogen were mixed with the leaf litter the energy flow to decomposers increased significantly.

Suggest why the addition of animal wastes rich in nitrogen increased the energy flow to decomposers. [3]

[Total: 9]

[Cambridge International AS and A Level Biology 9700 Paper 22, Question 6, November 2009]

Denitrifying bacteria provide themselves with energy by reversing nitrogen fixation and converting nitrate to nitrogen gas, which is returned to the air. They are common in places such as sewage treatment plants, compost heaps and wet soils. This brings the nitrogen cycle full circle.

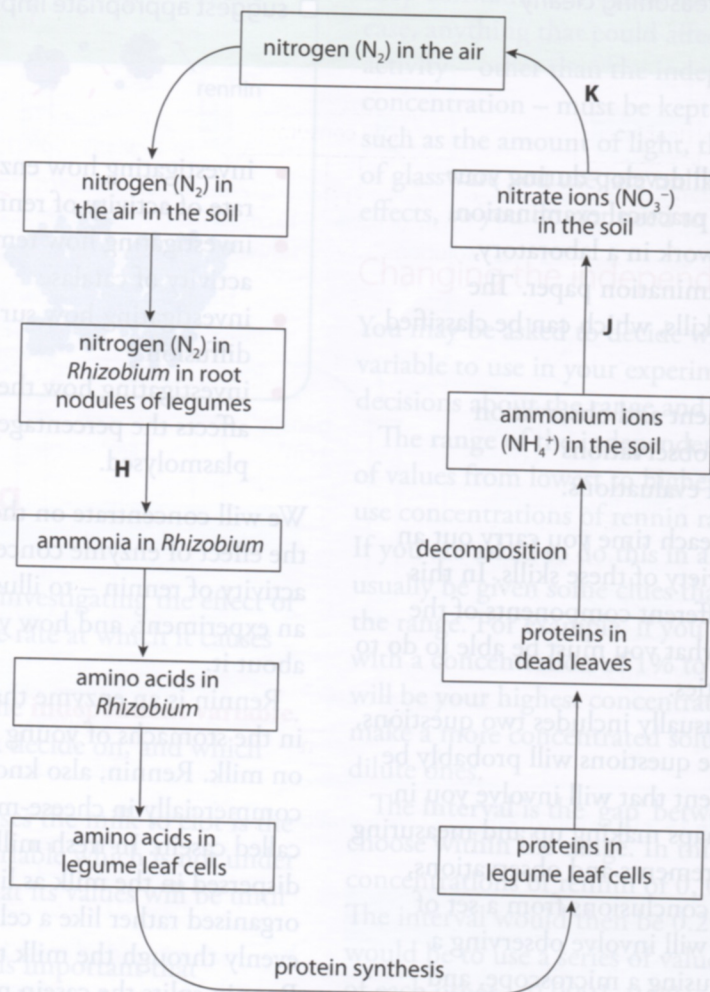
Figure 14.10 The greater sundew, *Drosera anglica*, only grows in very wet soils, where nitrates are in extremely short supply. The sticky glands on the leaves trap insects. The leaves then curl over and digest and absorb nutrients, including amino acids, from the insect's body.

5 Many species of legume grow in nitrate-deficient soils in the tropics. Some of these are large trees such as the flamboyant tree, *Delonix regia*.

Bacteria of the genus *Rhizobium* live inside swellings along the roots of legumes. These swellings are known as root nodules.

A student followed the cycling of nitrogen in an area with many flamboyant trees.

The figure summarises the flow of nitrogen in the area.



- Name the processes that occur at H, J and K. [3]
- Suggest the advantages gained by legumes of having *Rhizobium* living in their roots. [2]

[Total: 5]

[Cambridge International AS and A Level Biology 9700 Paper 21, Question 6, June 2010]