**9.** (a) Plants rely on the cycling of nitrogen to supply them with nitrogen in a form that they can absorb.

Select, from the list, the most suitable word or term that matches the statements (i) to (iv) below.

**active transport** **nitrogen fixation denitrification** ***Nitrobacter***

**denitrifying bacterium** ***Nitrosomonas* diffusion**  **osmosis**

**endocytosis** ***Rhizobium* nitrification**

(i) The conversion of nitrate ions into nitrogen gas.

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

(ii) A bacterium that fixes nitrogen.

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

(iii) A method by which nitrate ions pass into root hair cells.

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

(iv) The conversion of ammonium ions into nitrite ions.

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

(b) Before the widespread use of artificial fertilisers, farmers used a variety of methods to improve the fertility of the soil and so improve the yield of their crops. Two of the methods in common use were:

• **Ploughing-in**In which legumes, such as beans, alfalfa or clover, were grown in a field and then harvested. The roots were then ploughed back into the soil rather than being dug up or burnt.

• **Crop rotation**In which different crops were grown in a field in each year for three years. In the fourth year, the ‘fallow’ year, the field was not used for crops. In the following year the crop cycle was started again.

Explain how ploughing-in and crop rotation are able to improve the fertility of the soil.

Ploughing-in ....................................................................................................

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Crop rotation ...................................................................................................

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......................................................................................................................... [4]

[Total 8 marks]

**15.** The diagram below shows part of the nitrogen cycle.



(a) Using **only** the information in the diagram, state **one** example of each of the following:

(i) secondary consumer;

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

(ii) producer.

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

(b) (i) Name the process **W**.

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

(ii) State a way in which nitrogen in air can be converted directly into nitrate ions, as indicated by arrow **X**.

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

(iii) State the type of bacteria that carry out process **Y**.

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

(iv) The bacterium *Rhizobium* also has a role in the cycle shown in the diagram.

Explain the importance of *Rhizobium* in the nitrogen cycle.

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................................................................................................................[2] [Total 7 marks]

**20.** Statements about the nitrogen cycle are written below.



Select from the following terms the appropriate letter to match each statement. Write the letter in the box.

The first one has been done for you.



[Total 4 marks]

**5.** Explain how the fungal decomposition of deadwood is of benefit to the living trees within a woodland.

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[Total 4 marks]

**ANSWERS**

**9.** (a) (i) denitrification; 1

(ii) Rhizobium; 1

(iii) active transport / diffusion; 1

(iv) nitrification; 1

(b) *max 3 for each method*

***ploughing-in***

**1** legumes / named e.g., possess, (root) nodules /  
nitrogen fixing bacteria;

**2** *Rhizobium,*performs nitrogen fixation / described;

**3** nitrogenous compounds are present in, roots / nodules /  
legumes / plants;

**4** made available to soil if, ploughed in / not removed;

**5** roots / AW,decomposed / acted on by decomposers / rot / decay;

**6** nitrogenous compounds released (by decomposers);

**7** formation of nitrate; *3 max*

***crop rotation***

**8** different, crops / plants, have different (nutrient / nitrate)  
requirements;

**9** each year,different demands made on the soil / nutrients not  
being removed at the same rate;

**10** in, 4th / fallow, year, no (little) nutrients removed / used  
for grazing animals;

**11** nutrient levels allowed to build up;

**12** use legume in rotation;

**13** tuber / root, crop to improve soil structure; *3 max* 4 max

[8]

**15.** (a) *do not credit if any incorrect answer included*

(i) fox; 1

(ii) grass / clover / legume; 1

(b) (i) nitrogen fixation / Haber (process); **A** reduction 1

(ii) lightning; **A**oxidation / combines with oxygen  
 **A *‘***lightening’  
 **R**thunderstorm / lighting 1

(iii) denitrifying; **A** correct e.g.(Pseudomonas)  
 **R** Nitrobacter / Nitrosomonas / Rhizobium 1

(iv) fixes nitrogen / provides fixed nitrogen *or* NH4(+); **R**ammonia  
ref to**,** clover / legume / named legume, making,amino acids /  
polypeptides / protein;  
(plant has) no need to rely on (fixed) nitrogen compounds in soil;  
**R***ref to fertilisers*free-living species provide,ammonium (ions) / fixed nitrogen,for nitrifying bacteria / nitrification; 2 max

[7]

**20.** U;V;Z;S; 4

[4]

**5.** release of carbon dioxide;  
from fungal respiration;  
available for photosynthesis/carbon fixation;  
extracellular digestion;  
named enzyme(s);  
release of, inorganic substance/minerals/named mineral; **R** *nutrients, nitrogen* **A** *nitrogenous compound*uptake through, roots/root hairs;  
named use of mineral in plants;  
ref. to humus;  
ref. to beneficial role of humus in soil; e.g. increase water retention, improve soil  
 structure, stabilize soil max 4

[4]