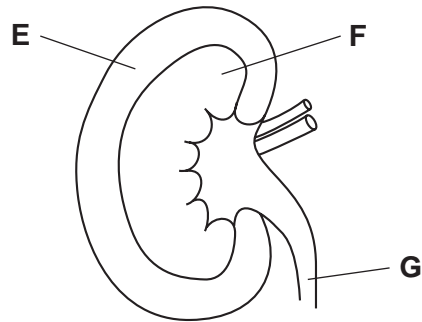


- 1 Fig. 3.1 shows a vertical section of a kidney.



**Fig. 3.1**

- (a) Name the parts **E**, **F** and **G**.

**E** .....

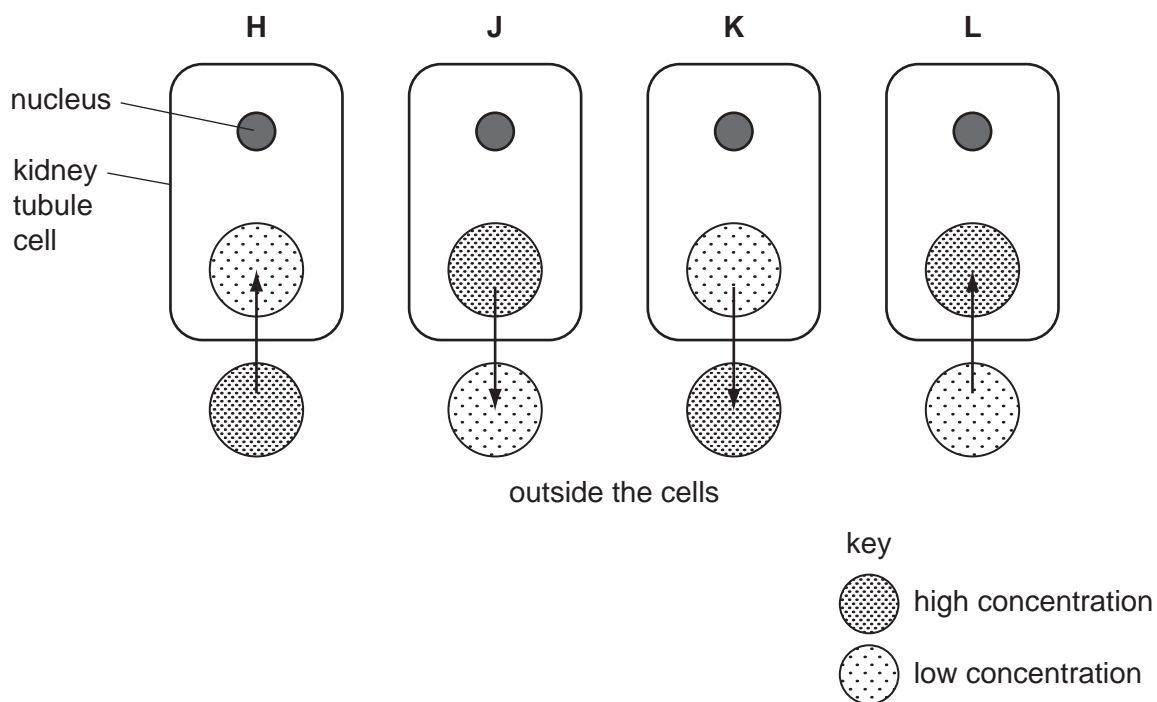
**F** .....

**G** ..... [3]

(b) Substances move into and out of cells in kidney tubules.

Fig. 3.2 shows four processes, **H**, **J**, **K** and **L**, that occur in cells lining the kidney tubule.

The net movement of substance is shown by an arrow, in each case.



**Fig. 3.2**

(i) Complete Table 3.1 by stating the letter, **H**, **J**, **K** or **L**, which identifies each of the processes. Give a reason for each answer.

**Table 3.1**

process		reason
diffusion of oxygen		
active uptake of sodium ions		

[4]

- (ii) Glucose is filtered from the blood. Usually all of it is reabsorbed by the kidney tubules so that there is none present in the urine.

Name the part of the kidney where filtration occurs.

..... [1]

- (iii) Use Fig. 3.2 to describe how kidney tubules reabsorb glucose from the filtrate.

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

- (c) When plants are grown in a solution that includes a poison that prevents respiration, the roots continue to absorb water, but do **not** absorb many ions.

Explain this result.

.....  
.....  
.....  
.....  
.....  
.....  
..... [3]

**[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.

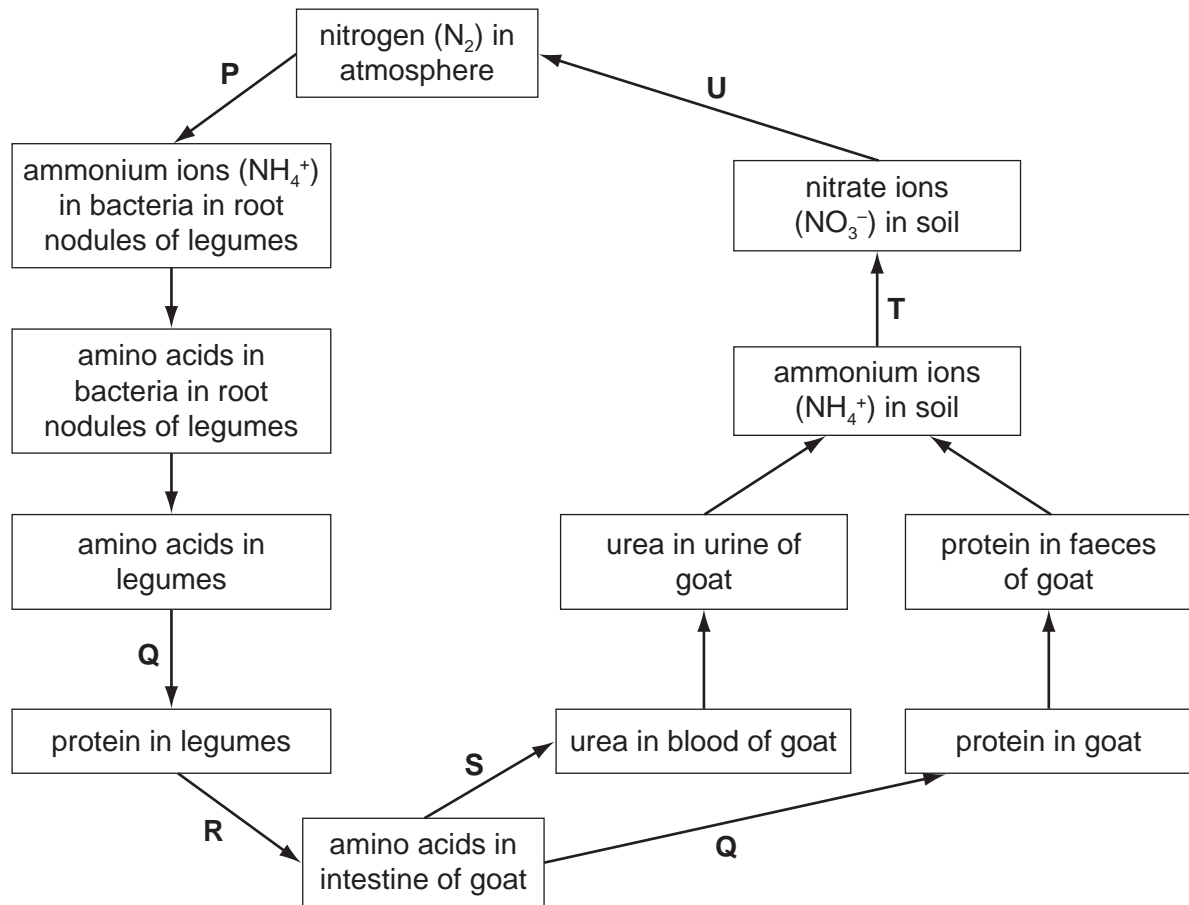


Fig. 6.1

- (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	pr
<b>P</b>	
<b>Q</b>	
<b>R</b>	
<b>S</b>	deamination
<b>T</b>	
<b>U</b>	

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-irra	irradiated	non-irradiated	irradiated
mean number of nodules per plant at 45 days	12		7	21
mean dry mass of nodules per plant at 45 days / g	0.09			

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

.....

.....

.....

.....

.....

..... [3]

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

.....

.....

.....

..... [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.

.....

.....

.....

.....

.....

.....

.....

..... [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.

.....

.....

.....

..... [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.

.....

.....

.....

..... [2]

[Total: 18]

- 3 The sweet potato plant, *Ipomoea batatas*, has fibrous roots and storage roots. Fibrous roots absorb water and ions from the soil. Storage roots store insoluble carbohydrates.

Fig. 3.1 shows the growth of these roots on a sweet potato plant.



Fig. 3.1

- (a) Explain, using the term **water potential**, how fibrous roots absorb water.

.....

.....

.....

.....

.....

..... [3]



The membranes of root hair cells contain proteins for the absorption of ions.

**(b)** Describe how root hair cells are adapted for the absorption of ions.

.....

.....

.....

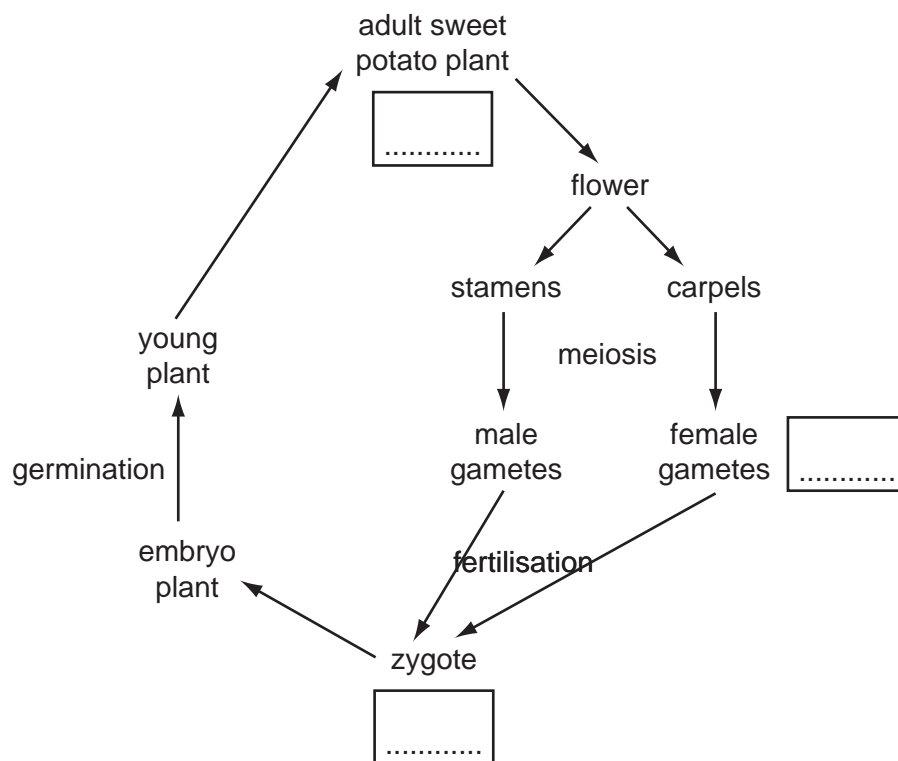
.....

.....

..... [3]

Sweet potato plants produce flowers to reproduce sexually. Sweet potato plants also reproduce asexually when shoots grow from the storage roots to form new plants.

Fig. 3.2 shows the life cycle of sweet potato. The diploid number of this species is 90.



**Fig. 3.2**

**(c)** Complete Fig. 3.2 by writing the number of chromosomes in the three boxes. [2]

- (d) State **two** advantages and **one** disadvantage of **asexual** reproduction for plants, such as sweet potato.

*advantage 1* .....

.....

*advantage 2* .....

.....

*disadvantage* .....

..... [3]

[Total: 11]