

Q4 a. This is correct. Which information have they used from the question to work out the answer?

4 Tropical fish excrete ammonia, which is an alkali.
The pH level of water in a tropical fish tank needs to be maintained between 6.6 and 7.4 for the fish to survive.

This is the optimum pH range for the bacteria that are responsible for the conversion of ammonia into nitrites and then nitrates.

Nitrosomonas bacteria convert ammonia into nitrites.

Nitrobacter bacteria convert nitrites into nitrates.

(a) (i) *Nitrosomonas* bacteria are an example of

- A nitrogen fixing bacteria
- B nitrifying bacteria
- C denitrifying bacteria
- D *Helicobacter* bacteria

(ii) Explain why *Nitrosomonas* and *Nitrobacter* bacteria are needed in tropical fish tanks.

To ~~keep~~ keep the pH levels between 6.6 and 7.4. X

An aquatic plant in the fish tank had a concentration of nitrates higher than the water in the fish tank.

(iii) Explain how this aquatic plant can uptake nitrates from the water in the fish tank. X

Q4 a ii. Why is this wrong?
Hint – read the question through again!

-What do fish produce as a waste product?
-Why are the two types of bacteria needed?
-can you explain what would happen to the pH and therefore the fish if these bacteria were not present?

Q4 a iii. Why is this wrong? Can you describe the concentration of nitrates in the plant in comparison to the concentration of nitrates water? What do we call it when substances plants take up substances against the concentration gradient?

Q4 b. Why did this question only score 1 mark?

Work through these steps...

-Think about how you can find a representative sample size of the clover in the field using a quadrat.

-Calculate the area that you would have sampled using the quadrat.

-Think about how many times that sample area would fit into the field.

Leguminous plants have nodules on their roots that have colonies of nitrogen-fixing bacteria.

Clover is a leguminous plant.

(b) Describe how a quadrat could be used to sample the population of clover in a 500m² field.

If you take a quadrat with an area of 25m² and count the amount of clovers within it, then ~~next~~ multiply that number by 20, it will give you a rough number of clovers in the field.

The nitrogen-fixing bacteria provide nitrates for the plants and release any excess into the soil.

(c) Explain how leguminous plants such as clover could be used to reduce the amount of artificial fertilisers.

Because nitrates are a natural fertiliser, so if ~~the plants~~ leguminous plants produce that, we can use that instead of artificial fertilisers X

Q4 c. Why is this wrong?

Think about what leguminous plants add to plants and soil. How can this be used over a period of time to increase nitrates in the soil? How could this reduce the need for fertilisers?

Q4 a. This is correct. Which information have they used from the question to work out the answer? Make sure you know what all of the bacteria in the nitrogen cycle do.

Q4 a ii. Why is this wrong? Hint – read the question through again!

-Fish produce ammonia. This would increase pH of tank and kill the fish.
-Nitrosomonas breaks ammonia down to nitrites. Nitrobacter convert nitrites to nitrates.

4 Tropical fish excrete ammonia, which is an alkali.
The pH level of water in a tropical fish tank needs to be maintained between 6.6 and 7.4 for the fish to survive.

This is the optimum pH range for the bacteria that are responsible for the conversion of ammonia into nitrites and then nitrates.

Nitrosomonas bacteria convert ammonia into nitrites.

Nitrobacter bacteria convert nitrites into nitrates.

(a) (i) Nitrosomonas bacteria are an example of

- A nitrogen fixing bacteria
- B nitrifying bacteria
- C denitrifying bacteria
- D Helicobacter bacteria

(ii) Explain why Nitrosomonas and Nitrobacter bacteria are needed in tropical fish tanks.

To ~~keep~~ keep the pH levels between 6.6 and 7.4. X

An aquatic plant in the fish tank had a concentration of nitrates higher than the water in the fish tank.

(iii) Explain how this aquatic plant can uptake nitrates from the water in the fish tank.

Q4 a iii. Why is this wrong? Concentration of nitrates in the plant is higher than in the water. Nitrate is taken up by the plant against the concentration gradient by active transport.

this question only score 1 mark?

Work through these steps...

-Use random sampling or a belt transect to find a representative sample size of the clover in the field using a quadrat.

-Calculate the area that you would have sampled using the quadrat.

E.g 20 quadrats

-Think about how many times that sample area would fit into the 500m² field. Multiple the number of

Leguminous plants have nodules on their roots that have colonies of nitrogen-fixing bacteria.

Clover is a leguminous plant.

(b) Describe how a quadrat could be used to sample the population of clover in a 500m² field.

If you take a quadrat with an area of 25m² and count the amount of clovers within it, then ~~next~~ multiply that number by 20, it will give you a rough number of clovers in the field.

The nitrogen-fixing bacteria provide nitrates for the plants and release any excess into the soil.

(c) Explain how leguminous plants such as clover could be used to reduce the amount of artificial fertilisers.

Because nitrates are a natural fertiliser, so if ~~the plants~~ leguminous plants produce that, we can use that instead of artificial fertilisers X

Q4 c. Why is this wrong?

Leguminous plants add nitrate to plants and soil.

Crop rotation over a period of time increases nitrates in the soil.

This reduces the need for fertilisers.

Answers!

Question number	Answer	Mark
6(a)(i)	B	(1)

Question number	Answer	Mark
6(a)(ii)	<p>An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):</p> <ul style="list-style-type: none"> fish produce ammonia as a waste product which the bacteria convert (into nitrites then nitrates) (1) this prevents the pH from getting too high and prevents the fish from dying (1) 	<p>accept pH above 7.4</p> <p>(2)</p>

Question number	Answer	Mark
6(a)(iii)	<p>An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark):</p> <ul style="list-style-type: none"> the aquatic plant will take up nitrates by active transport (1) against the concentration gradient/from where there is a low concentration to where there is a high concentration of nitrates (1) 	(2)

Question number	Answer	Additional guidance	Marks
6(b)	<p>An answer that combines the following points of application of knowledge and understanding to provide a logical description:</p> <ul style="list-style-type: none"> a description of the use of a quadrat either by random sampling or using a belt transect (1) a sample size 10–100 and count the number of clover plants in each quadrat (1) multiplication factor dependent on the number of quadrats sampled (1) 	to gain maximum marks steps must be in a logical sequence	(3)

Question number	Answer	Mark
6(c)	<p>An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (3 marks):</p> <ul style="list-style-type: none"> clover/leguminous plants could be used in crop rotation (1) where at intervals (2–3 years) a field is planted with clover/leguminous plants and left fallow (1) the clover/leguminous plants will have colonies of nitrogen fixing bacteria which will produce nitrates (1) the nitrates will increase the fertility of the soil and negate the need for artificial fertilisers (1) 	(4)

Now try this!

1. (a) Describe how active transport moves mineral ions from the soil into plants.

(3)

.....
.....
.....
.....
.....
.....

1 (b).
Explain how different types of bacteria act to increase nitrate concentration in the soil.

(4)

.....
.....
.....
.....
.....
.....
.....
.....

Q2 a (i) Explain how plants use the nitrates from the soil.

(2)

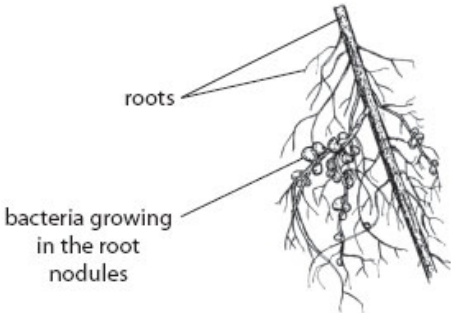
.....
.....
.....

(ii) Describe how the over-use of nitrate fertilisers can cause eutrophication.

(4)

.....
.....
.....
.....
.....
.....

(b) Leguminous plants such as beans and peas have bacteria growing inside nodules on their roots.
The diagram shows some nodules on a root.



Explain the relationship between this bean plant and the bacteria growing in the root nodules.

(3)

.....
.....
.....
.....
.....

Answers!

Question Number	Answer	Acceptable answers	Mark
(ii)	A description including three of the following: <ul style="list-style-type: none"> (mineral ions) pumped (1) using energy (1) move up/against their concentration gradient (1) across a (partially permeable) membrane (1) 	low concentration to a high concentration	(3)

Question Number	Answer	Acceptable answers	Mark
	an explanation linking the following points <ul style="list-style-type: none"> nitrogen fixing bacteria (1) fix nitrogen gas for the plant (1) decomposing bacteria / decomposers (1) decompose / break down animal / plant matter / protein / urea (1) into ammonia (1) (then) nitrifying bacteria (1) convert ammonia / nitrites into nitrates (1) 	nitrogen fixing bacteria convert nitrogen into nitrates / nitrogen compounds (2)	(4)

	Answer	Acceptable answers	Mark
a(ii)	an explanation to include the following points <ul style="list-style-type: none"> used to make protein (1) for growth (1) 	Ignore references to use as food (plants do not feed) accept amino acids / chlorophyll / DNA ignore references to photosynthesis / respiration	(2)
a(iii)	A description linking four of the following points (nitrates) leach/flow into water (1) algae and small plants grow rapidly /algal bloom (1) underwater plants cannot photosynthesise (1) (lack of photosynthesis / sunlight) causes plants to die (1) decomposers / (decomposing) bacteria break down the dead material / plants (1) these bacteria use up oxygen during respiration(1)	accept fertilisers for nitrates	(4)
b	An explanation to include three of the following points bacteria use nitrogen / nitrogen fixing bacteria (1) make ammonia / ammonium / nitrogen compounds /nitrates for use by plants (1) bacteria protected (within the root nodule) (1) bacteria obtain chemical substances / glucose / sugar from the plant (1) this is called a mutualism / symbiosis(1)	Ignore food/nutrients reject parasitism	(3)

Total for question = 10 marks