

This is the **Higher Combined Science** version. Higher Tier questions (★) are included. Some Separate-only content has been omitted.

Ecosystems (B4a)

Specification reference: B4a

Q1. Explain the difference between a population, community and ecosystem.

[3 marks]

Q2. A food web is removed of all foxes. Predict and explain TWO effects on the ecosystem.

[4 marks]

Nutrient Cycles (B4c)

Specification reference: B4c

Q3. Describe the carbon cycle. Name ALL the processes that move carbon between living organisms and the atmosphere.

[4 marks]

Q4. Explain the process of eutrophication following heavy fertiliser application to farmland adjacent to a lake.

[4 marks]

★ HIGHER TIER

Q5. ★ Describe the nitrogen cycle, naming the types of bacteria involved and the role of each.

[4 marks]

Total: 19 marks

Ecosystems (B4a)

Q1 (3 marks)

Explain the difference between a population, community and ecosystem.

- Population: all individuals of one species in an area [1]
- Community: all populations of different species living in the same area [1]
- Ecosystem: the community plus the non-living physical environment [1]

Q2 (4 marks)

A food web is removed of all foxes. Predict and explain TWO effects on the ecosy...

- Rabbit population will likely increase (removed from predation pressure) [1]
- More rabbits → increased competition for grass → grass population may decrease [1]
- Other prey of foxes (e.g. mice) may also increase [1]
- Overall: loss of one predator can cascade through the food web — population imbalances [1]

Nutrient Cycles (B4c)

Q3 (4 marks)

Describe the carbon cycle. Name ALL the processes that move carbon between livin...

- Photosynthesis removes CO₂ from atmosphere — converts to organic molecules [1]
- Feeding transfers carbon between organisms [1]
- Respiration (all organisms) returns CO₂ to atmosphere [1]
- Decomposition: decomposers break down dead matter releasing CO₂ / combustion also releases CO₂ [1]

Q4 (4 marks)

Explain the process of eutrophication following heavy fertiliser application to ...

- Fertilisers (nitrates/phosphates) run off into the lake [1]
- Algae grow rapidly on surface (algal bloom) [1]
- Algae block sunlight → aquatic plants below die [1]
- Bacteria decompose dead plants, consuming dissolved O₂ → fish and other aquatic organisms suffocate [1]

Q5 (4 marks) [★ HT]

★ Describe the nitrogen cycle, naming the types of bacteria involved and the rol...

- Nitrogen-fixing bacteria (in soil/root nodules): convert N₂ → ammonia/nitrates [1]
- Nitrifying bacteria: ammonia → nitrites → nitrates (available to plants) [1]
- Decomposers: break down dead organic matter → release ammonia [1]
- Denitrifying bacteria: nitrates → N₂ gas returned to atmosphere [1]