This paper covers the **full Higher Separate** specification. Higher Tier questions are marked ★. Separate-only questions are marked ◆.

Ecosystems and Food Webs (9.1–9.3)

Specification reference: 9.1

Q1. Explain why removing a keystone predator from an ecosystem can have wide-ranging effects.

[3 marks]

Q2. Explain why only about 10% of energy is transferred from one trophic level to the next. Give TWO specific reasons.

[4 marks]

★ HIGHER TIER

Q3. ★ A grassland has: grass 50,000 kg, rabbits 5,000 kg, foxes 250 kg. (a) Calculate the efficiency of transfer from grass to rabbits. (b) Explain why the fox population is much smaller than the rabbit population.

[3 marks]

Material Cycles (9.4–9.6)

Specification reference: 9.4

Q4. Describe the carbon cycle. State the ONE process that removes CO■ from the atmosphere and name THREE processes that return it.

[4 marks]

★ HIGHER TIER

Q5. ★ Describe the nitrogen cycle. Name and describe the role of each type of bacteria involved.

[4 marks]

Biodiversity and Human Impact (9.7–9.8)

Specification reference: 9.7

Q6. Describe the full chain of events that leads to eutrophication in a lake. Start with fertiliser application.

[4 marks]

Q7. Evaluate TWO conservation strategies to maintain biodiversity.

[4 marks]

★ HIGHER TIER

Q8. ★ Evaluate international agreements as a strategy for reducing threats to biodiversity.

[3 marks]

Total: 29 marks

Ecosystems and Food Webs (9.1–9.3)

Q1 (3 marks)

Explain why removing a keystone predator from an ecosystem can have wide-ranging…

- Prey species numbers increase without predation pressure [1]
- Increased prey leads to overgrazing/overconsumption of producers [1]
- This can cause collapse of other dependent species — cascade effect through food web [1]

Q2 (4 marks)

Explain why only about 10% of energy is transferred from one trophic level to th…

- Energy lost through respiration — organisms use energy for movement, maintaining body temperature, etc. → released as heat [1]
- Energy lost in waste products (faeces, urine) — not consumed by the predator [1]
- Energy used for biological processes (growth, reproduction) at each level [1]
- Only energy stored in new biomass is available to the next trophic level [1] — any two with clear explanation

Q3 (3 marks) [★ HT]

★ A grassland has: grass 50,000 kg, rabbits 5,000 kg, foxes 250 kg. (a) Calculat…

- (a) (5000 ÷ 50000) × 100 = 10% [1]
- (b) Foxes are at the third trophic level — most energy has been lost at previous steps [1]
- Only ~10% transfers from grass to rabbit and ~10% from rabbit to fox → far less energy available for fox biomass [1]

Material Cycles (9.4–9.6)

Q4 (4 marks)

Describe the carbon cycle. State the ONE process that removes CO■ from the atmos…

- Only photosynthesis removes CO■ from atmosphere [1]
- Returns CO■: respiration (all organisms) [1]
- Decomposition by bacteria and fungi [1]
- Combustion (burning fossil fuels or wood) [1]

Q5 (4 marks) [★ HT]

★ Describe the nitrogen cycle. Name and describe the role of each type of bacter…

- Nitrogen-fixing bacteria: convert atmospheric N■ → ammonia/nitrates in soil and root nodules of legumes [1]
- Nitrifying bacteria: convert ammonia → nitrites → nitrates (available to plants) [1]
- Decomposers: break down dead organisms → release ammonia [1]
- Denitrifying bacteria: convert nitrates → N■ gas, returning nitrogen to atmosphere [1]

Biodiversity and Human Impact (9.7–9.8)

Q6 (4 marks)

Describe the full chain of events that leads to eutrophication in a lake. Start …

- Fertilisers (nitrates/phosphates) applied to farmland [1]
- Rainwater carries them into the lake (run-off) [1]
- Algae grow rapidly on surface (algal bloom) — blocking light to plants below [1]
- Plants die; bacteria decompose them and use O■; O■ depleted → fish and other aquatic organisms suffocate [1]

Q7 (4 marks)

Evaluate TWO conservation strategies to maintain biodiversity.

- Nature reserves: protects habitat from development [1]; may be too small for viable populations/cannot prevent climate change [1]

• Captive breeding: prevents extinction, allows reintroduction [1]; animals may lose survival behaviours/genetic diversity reduced in small captive populations [1] — accept any two methods with benefit + limitation

Q8 (3 marks) [★ HT]

★ Evaluate international agreements as a strategy for reducing threats to biodiv…

• Benefit: coordinated global action — e.g. Paris Agreement to limit emissions, CITES to regulate trade in endangered species [1]

• Benefit: can protect species that cross national borders (migratory animals, ocean fish) [1]

• Limitation: agreements are not always legally binding; economic interests may override conservation goals; not all countries participate [1]