Higher Combined version — Higher Tier (★) included; Separate-only (◆) removed.

Q1. Explain why food chains rarely contain more than five trophic levels.

[3 marks]

Q2. Explain why eating a plant-based diet requires less land than eating a meat-based diet. Use your knowledge of energy transfer in food chains.

[4 marks]

★ HIGHER TIER

Q3. ★ A grassland ecosystem: grass = 12,000 kg, rabbits = 1,200 kg, foxes = 60 kg. (a) Calculate biomass transfer efficiency from rabbit to fox. (b) Suggest why this value is lower than expected.

[3 marks]

Total: 10 marks

Q1 (3 marks)

Explain why food chains rarely contain more than five trophic levels.

- Energy is lost at each trophic level through respiration (heat), movement and waste [1]
- Only approximately 10% of energy transfers from one level to the next [1]
- After 5 levels, so little energy remains that a further level cannot be supported [1]

Q2 (4 marks)

Explain why eating a plant-based diet requires less land than eating a meat-based diet. Us…

- Plants are producers — first trophic level [1]
- Eating plants directly provides the most efficient energy transfer to humans [1]
- Eating meat adds an extra trophic level — ~90% energy lost at each step [1]
- Far more plant material required to produce 1 kg of meat than 1 kg of plant food → more land needed [1]

Q3 (3 marks) [★ HT]

★ *A grassland ecosystem: grass = 12,000 kg, rabbits = 1,200 kg, foxes = 60 kg. (a) Calcula…*

- (a) (60 ÷ 1200) × 100 = 5% [1]
- (b) Lower than typical 10% because: foxes are active predators — use a lot of energy in hunting (respiration/movement) [1]
- Or: foxes eat a lot of bone/indigestible material — large proportion lost as waste [1]