7.1 Adaptations, interdependence and competition

Name: _____ Class: _____ Date: _____ **Total: 19 marks**

KEY WORDS ecosystem • interdependence • extremophile

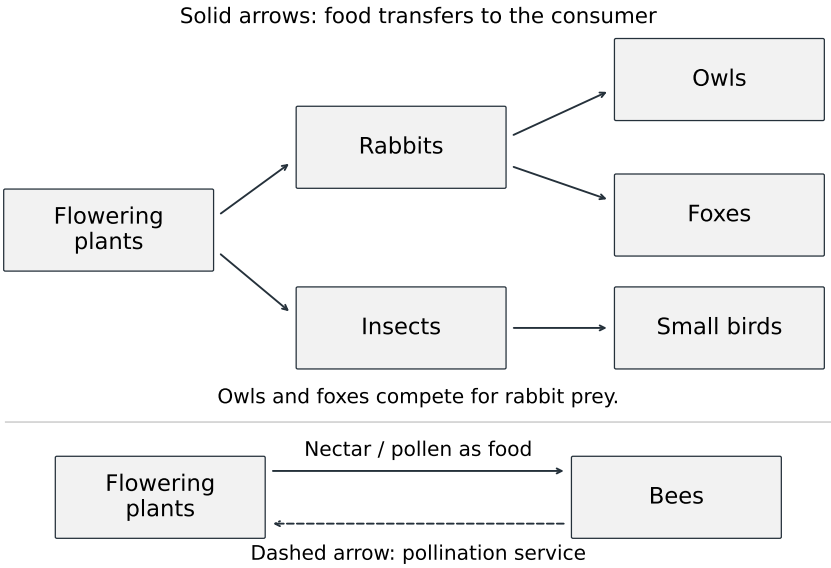
Objective

Describe communities, competition, interdependence, abiotic and biotic factors, and adaptations. Original questions for spec statement 4.7.1.

1 Key knowledge and worked examples

Levels. Individual: one organism. Population: one species in an area. Community: populations of different species. Ecosystem: the community interacting with non-living surroundings. AQA 2023 Q01.1 [1] asks for a community; sheet Q1.1 [2] requires both the community and its abiotic interactions.

Competition uses limited shared resources: plants need light, space, water and mineral ions; animals need food, mates and territory. **Interdependence** includes food, shelter, pollination and seed dispersal.

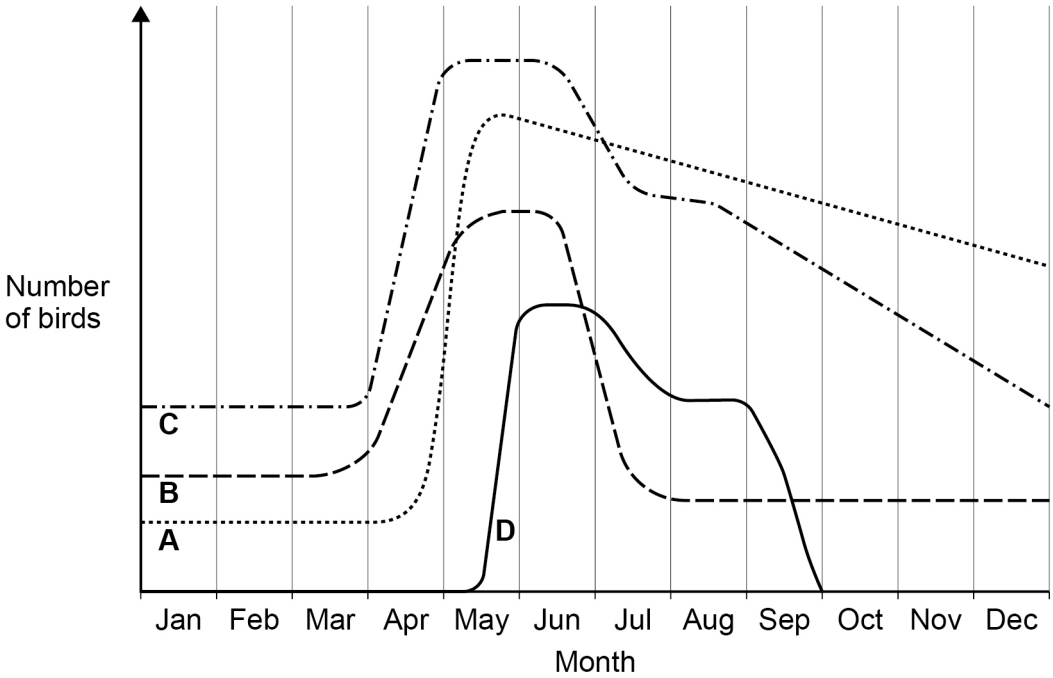


Worked Q3.1 [4]. Bees obtain food from flowers and pollinate them. Fewer bees may mean less pollination of bee-dependent plants, fewer seeds/fruits and less successful

plant reproduction; consumers may then have less food. Name the organisms and explain the links.

Worked Q3.2 [4]. A new rabbit predator eats more rabbits, so fewer survive (2: effect + cause). Existing rabbit predators face greater competition for prey, so less food may reduce their survival/reproduction (2). Alternatively, explain reduced grazing and increased plant numbers. Give two developed effects.

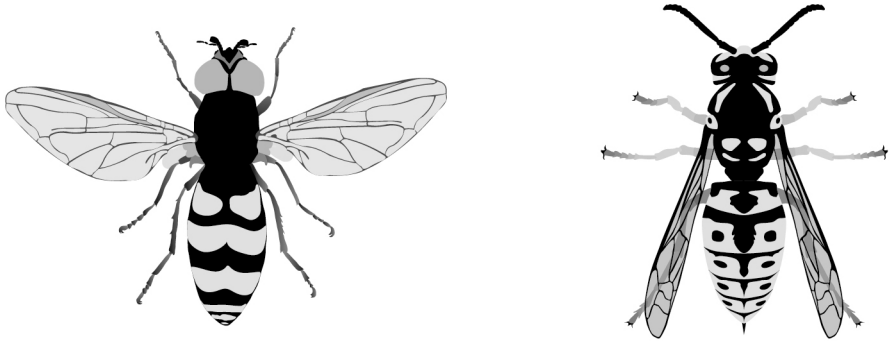
Abiotic / biotic. Light, temperature, moisture, soil pH/minerals, wind, plant CO_2 and aquatic oxygen are abiotic. Food, predators, pathogens and competitors are biotic. AQA 2025 Q02.5 [3] asks for factors other than water near a tree: light intensity, soil pH and mineral-ion content fit. The scheme ignores CO_2/space here. Context matters. Nitrate supports amino acids/proteins; do not assign that role to every mineral ion.



Worked data, AQA 2023 Q01.4–.6. A is constant January–March/early April, rises April–May, then falls May/June–December (3). With the supplied June/July disease context, B has lowest resistance (1). D migrates: present only around May–September/October (1). No numerical vertical scale means no exact counts or percentage decreases can be calculated.

Adaptations / worked Q1.3. Structural: insulating blubber, reducing heat transfer. Behavioural: migration, changing the conditions experienced. Functional: venom production, helping capture prey. Explain the feature's benefit; organisms do not choose inherited features because they need them.

Figure 1



Hoverfly **Wasp**

Worked adaptation, AQA 2024 Q01.4 [3]. Both insects have yellow/black markings and share a habitat; the wasp has a sting, the hoverfly does not. The hoverfly resembles the wasp (1); predators avoid wasps to avoid being stung (1); so predators are less likely to attack/eat the hoverfly (1). Similar appearance is the structural feature; the survival benefit needs the predator-response explanation. Do not just say a predator "thinks it is a wasp".

Extremophiles / Q3.3. These organisms survive conditions extreme for most life, e.g. vent bacteria at high temperature/pressure. **Enrichment for the authored energy question:** some use energy released in chemical reactions to make organic food (chemosynthesis), so sunlight is unnecessary for that process. Chemosynthesis detail is beyond the named syllabus requirement.

2 Practice

2.1 Define an ecosystem. [2]

2.2 Give three things animals compete for. [3]

2.3 Name the three types of adaptation with one example each. [3]

3 Exam-style questions

3.1 Explain how interdependence makes a community unstable when one species is removed. Use a named example chain. [4]

3.2 A new predator arrives in a woodland food web. Explain two effects on the community. [4]

3.3 Deep-sea vent bacteria live at high temperature and pressure with no light. Explain why they are called extremophiles, and suggest how they still obtain energy. [3]

Solutions

2.1 The interaction of a community of living organisms (biotic); with the non-living (abiotic) parts of their environment.

2.2 Food, mates, territory.

2.3 Structural – e.g. thick fur/blubber for cold; behavioural – e.g. migration to warmer climates; functional – e.g. venom production, an internal process.

3.1 Each species depends on others for food, shelter, pollination or seed dispersal; e.g. remove bees → fewer plants are pollinated → plant numbers fall; the animals feeding on those plants lose their food source and also fall; so effects cascade through the community – interdependence.

3.2 Any two developed effects, 2 marks each. More prey are eaten, so fewer survive and the prey population may fall. Existing predators face greater competition for the same prey, so less food may reduce their survival/reproduction. Alternatively, fewer herbivores graze, so their food plants may increase. Maximum 4 marks; two effects with causal explanations.

3.3 The conditions are extreme for most organisms, e.g. the supplied high temperature and pressure. A plausible energy-source suggestion is chemosynthesis: some vent bacteria use energy released by chemical reactions to make organic food. This final point is enrichment for the authored question, not an extra recall requirement in AQA 4.7.1.4.