B7: Ecology

AQA · GCSE Biology · Revision Notes

Specification reference: 4.7

Note: Sections marked ★ HIGHER TIER ONLY are for Higher tier students only. Foundation tier students should focus on the unmarked sections.

4.7.1 Adaptations, Interdependence and Competition

4.7.1.1 Communities

A community is all the organisms of different species living in an ecosystem. Within a community, all organisms are interdependent — they affect each other's population sizes.

Key Terms

Population: All organisms of one species living in an area

Community: All the populations of different species in an area

Ecosystem: A community of organisms and the non-living environment they interact with

Habitat: The place where an organism lives

4.7.1.2 Abiotic and Biotic Factors

- **Abiotic factors** (non-living): temperature, light intensity, moisture level, soil pH, CO_2 and O_2 levels, wind, salinity.
- **Biotic factors** (living): food availability, predators, competitors, disease, pathogens.

Stable communities: in a stable community, the population of each species remains roughly constant because of the balance of abiotic and biotic factors.

4.7.1.3 Adaptations

Organisms are adapted to their environment — they have features that help them survive and reproduce.

- **Structural**: body shape or features (e.g. thick fur of a polar bear, long roots of a cactus).
- **Behavioural**: actions that help survival (e.g. migration, hibernation).
- **Physiological**: internal processes (e.g. camel stores fat in hump, not water; produces very little urine).

Exam Tip: Extremophiles are organisms adapted to extreme conditions (very hot, salty, or acidic environments) — e.g. bacteria near deep-sea hydrothermal vents.

4.7.2 Organisation of an Ecosystem

4.7.2.1 Levels of Organisation and Food Chains

Food chains and food webs show the feeding relationships in an ecosystem.

- **Producer** — makes its own food by photosynthesis (e.g. plants, algae).
- **Primary consumer** — eats the producer (e.g. rabbit).

- **Secondary consumer** — eats the primary consumer (e.g. fox).
- **Apex predator** — top of the food chain, not eaten by anything.
- Changes in one population affect all others in the food web.

4.7.2.2 How Materials are Cycled

The Water Cycle: water evaporates from the sea/land, rises, condenses into clouds, falls as precipitation, flows back to the sea via rivers or groundwater.

The Carbon Cycle:

- CO_2 removed from air by photosynthesis → stored as carbon compounds in plants.
- Eaten by animals → passed along the food chain.
- Returned to air by respiration (all organisms) and decomposition.
- Combustion of fossil fuels rapidly releases CO_2 back into atmosphere.

Exam Tip: In the carbon cycle, only photosynthesis removes CO_2 from the atmosphere. All the others (respiration, decomposition, combustion) release it.

★ HIGHER TIER ONLY — Decomposition and Nitrogen Cycle

- Decomposers (bacteria and fungi) break down dead organisms and waste, returning minerals to the soil.
- Rate of decomposition increases with: higher temperature, more oxygen, higher moisture.
- The Nitrogen Cycle: nitrogen gas in air → fixed by nitrogen-fixing bacteria into ammonia/nitrates → absorbed by plants → eaten by animals → returned as waste → decomposed by decomposers → denitrifying bacteria return N_2 to air.

4.7.3 Biodiversity and Human Impact

4.7.3.1–4 Human Threats to Biodiversity

- **Waste production** — pollution of water and land (landfill, sewage, toxic chemicals).
- **Deforestation** — destroys habitats, releases CO_2, reduces biodiversity.
- **Land use** — building, farming and quarrying destroy natural habitats.
- **Global warming** — caused by greenhouse gases (CO_2, methane). Effects: rising sea levels, loss of habitat, species extinction, changed weather patterns.

4.7.3.5 Maintaining Biodiversity

- Breeding programmes for endangered species (e.g. giant panda).
- Protecting and restoring habitats (e.g. nature reserves, planting hedgerows).
- Seed banks to preserve plant species.
- International agreements to reduce deforestation and pollution.
- Sustainable fishing — fishing quotas to prevent overfishing.

Key Terms

Biodiversity: The variety of living organisms in an ecosystem or on Earth

Deforestation: The permanent removal of large areas of forest

Global warming: Rise in average global temperatures due to increased greenhouse gases

★ HIGHER TIER ONLY — Trophic Levels and Biomass

• Trophic level 1 = producers; level 2 = primary consumers; level 3 = secondary consumers; level 4 = tertiary consumers.

• At each trophic level, energy is lost through respiration, excretion and movement. Only about 10% is transferred to the next level.

• Pyramids of biomass show the dry mass of living material at each trophic level — always widest at the base.

• Food chains are rarely more than 5 trophic levels because so much energy is lost at each stage.