

Adaptations, interdependence and competition

Revision notes • Levels of organisation, competition, interdependence, abiotic and biotic factors, and how organisms are adapted to their environment.

For AQA GCSE Biology 8461 and Combined Science: Trilogy 8464. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

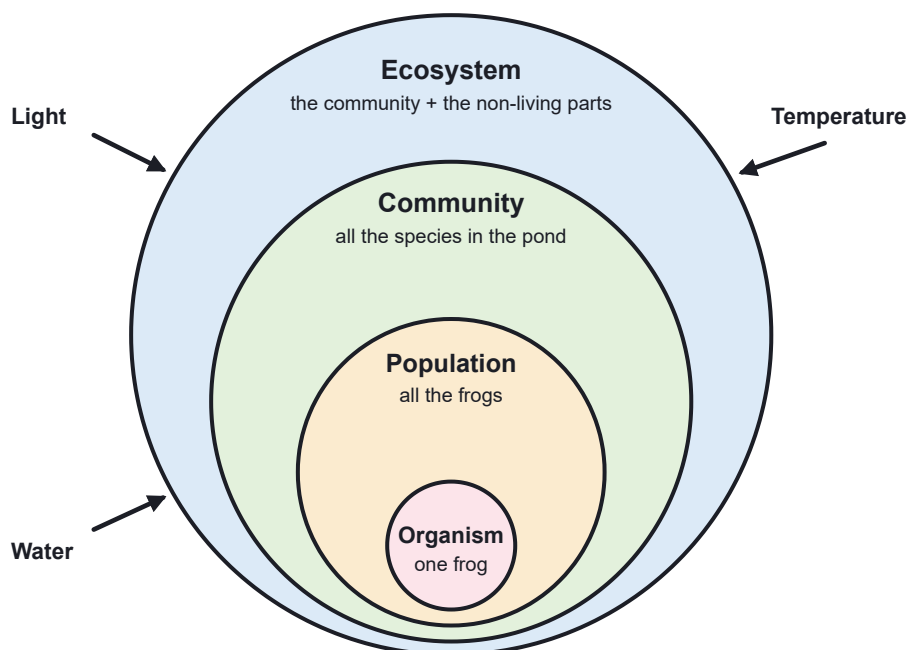
Adaptations, interdependence and competition Spec 4.7.1

Communities Spec 4.7.1.1

An **ecosystem** is the interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment.

Levels of organisation

From a single organism to the whole ecosystem, using a pond as the example		
Level	What it means	Pond example
Individual organism	One living thing	One frog
Population	All the organisms of one species living in the same area	All the frogs in the pond
Community	All the populations of the different species living in the same area	All the plants, animals and microorganisms in the pond
Ecosystem	The community together with the non-living parts of the environment	The pond community plus the water, light and temperature



Each level contains the one before it. The **ecosystem** is the community plus the abiotic factors (light, water, temperature).

To survive and reproduce, organisms need a supply of materials from their surroundings and from the other living organisms there.

Competition

Organisms in a community or habitat **compete** for the things they need when these are in short supply.

Organisms	They often compete for
Plants	Light, space, water and mineral ions from the soil
Animals	Food, mates and territory

Exam tip: You may be given a habitat and asked what organisms compete for. Match it to the table: trees in a wood compete for light, so a plant under them is short of light.

Interdependence and stable communities

Interdependence	Within a community each species depends on other species for food, shelter, pollination, seed dispersal and so on. If one species is removed it can affect the whole community.
Stable community	A community where all the species and environmental factors are in balance so that population sizes remain fairly constant.

For example, if a plant species that is pollinated by one type of insect is removed, that insect loses its food, and the animals that eat the insect lose theirs. One change spreads through the community.

Maths skill: You may need to extract and interpret information from charts, graphs and tables about how organisms in a community affect each other. Describe the pattern first, then explain it using food, competition or predation.

Abiotic factors Spec 4.71.2

Abiotic (non-living) factors can affect a community. If one of them changes, the organisms that depend on it are affected, and so are the species that feed on or depend on those organisms.

Abiotic factors and how a change might affect organisms	
Abiotic factor	How a change could affect organisms
Light intensity	Less light means plants photosynthesise more slowly and grow less, so there is less food for the animals that eat them
Temperature	Changes the rate of enzyme-controlled reactions, so growth and reproduction speed up or slow down. Too hot or too cold and organisms may die or move away
Moisture levels	Plants and animals need water to survive. In drier conditions, fewer organisms can live there
Soil pH and mineral content	Plants only grow well in a suitable pH and need mineral ions for healthy growth. Poor soil means fewer plants
Wind intensity and direction	Strong wind can damage plants and increases water loss from them. It also affects how easily animals move and feed
Carbon dioxide levels for plants	Carbon dioxide is needed for photosynthesis. Lower levels slow the growth of plants
Oxygen levels for aquatic animals	Aquatic animals need oxygen for respiration. If levels fall, fewer animals can survive in the water

To **explain** the effect of a change, link three steps: what changed, how it affects the organism, and what happens to the community.

Exam tip: Always finish the chain. Saying 'less light' is not enough. Say that there is less photosynthesis, so plants grow less and fewer herbivores can be supported.

Maths skill: Questions often give a table or graph of an abiotic factor against the number of organisms. State where the number is highest or lowest, and quote values from the data.

Biotic factors Spec 4.7.1.3

Biotic (living) factors can also change a community. The four you need to know are:

Biotic factor	How a change could affect a community
Availability of food	Less food means more competition, so animal numbers fall. More food means numbers can rise
New predators arriving	Prey are eaten, so the prey population falls. Anything the prey ate may then increase
New pathogens	Disease can kill or weaken many organisms of a species, so the population falls
One species outcompeting another	The weaker competitor gets less of the food, light or space it needs. Its numbers may become no longer sufficient to breed, so the species can die out in that area

A change in one population affects others. If a new predator reduces the number of prey, the predator's other food sources and the prey's food source are all affected.

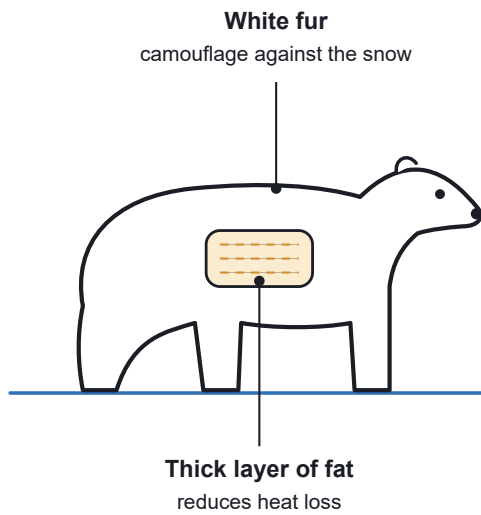
Common mistake: Do not say that a population 'adapts' to a new predator or pathogen in the short term. Describe what happens to numbers: they rise or fall, and why.

Maths skill: You may be asked to interpret a graph of two populations over time. Describe how each changes, then link the changes, for example prey falling when predators rise.

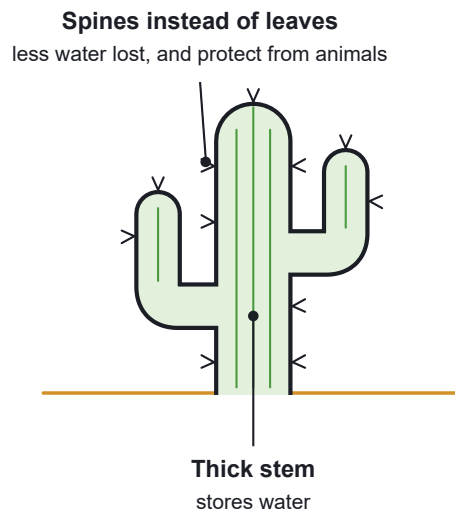
Adaptations Spec 4.7.1.4

Organisms have features called **adaptations** that enable them to survive in the conditions in which they normally live. Adaptations may be structural, behavioural or functional.

Type	What it is	Examples
Structural	A feature of the body's structure	A thick layer of fat and a white coat on a polar bear. Spines and a thick, water-storing stem on a cactus
Behavioural	The way an organism acts	Migrating to a warmer place for winter. Hunting at night to avoid the heat of the day
Functional	How a body process works	A camel producing very little, concentrated urine to save water



Polar bear: cold Arctic



Cactus: hot, dry desert

Structural adaptations match the conditions: the polar bear is adapted to the **cold**, the cactus to the **hot, dry** desert.

Extremophiles

Extremophile

An organism that lives in an environment that is very extreme, such as at high temperature, pressure or salt concentration. Bacteria living in deep sea vents are extremophiles.

When you explain an adaptation, you are given information about the environment. Name the feature, then say how it helps survival.

Exam tip: Use the pattern 'feature, then how it helps, then in that environment'. For example: thick fat (feature) reduces heat loss (how it helps) in the cold Arctic (environment).

Quick check

1. Put in order, smallest to largest: community, organism, ecosystem, population.
2. What do plants often compete for?
3. What do animals often compete for?
4. What is a stable community?
5. What is an extremophile?

Quick check answers

Adaptations, interdependence and competition

1. Organism, population, community, ecosystem.
2. Light, space, water and mineral ions from the soil.
3. Food, mates and territory.
4. One where all the species and environmental factors are in balance so population sizes remain fairly constant.
5. An organism that lives in very extreme conditions, such as high temperature, pressure or salt concentration.