GCSE Biology (Separate Science)

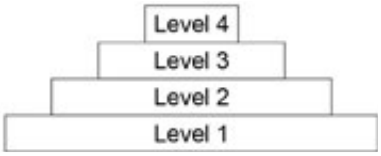
Success Criteria: Ecosystems

Adaptations, interdependence and competition

I can…	
Define an ecosystem as the interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment.	
Understand that to survive and reproduce, organisms require a supply of materials from their surroundings and from the other living organisms there.	
Describe how organisms compete with other organisms. Plants compete with each other for light and space, and for water and mineral ions from the soil. Animals often compete with each other for food, mates and territory.	
Suggest abiotic (non-living) factors which can affect a population, such as: *light intensity, temperature, moisture levels, soil pH and mineral content, wind intensity and direction, carbon dioxide levels for plants and oxygen levels for aquatic animals.*	
Suggest biotic (living) factors which can affect a population, such as: *availability of food, new predators arriving, new pathogens and one species outcompeting another so the numbers are no longer sufficient to breed.*	
Explain how a change in an abiotic factor would affect a given community when provided with appropriate data or context.	
Appreciate that within a community each species depends on other species for food, shelter, pollination, seed dispersal etc. If one species is removed it can affect the whole community. This is called interdependence.	
Define a ‘stable community’ as one where all the species and environmental factors are in balance so that population sizes remain fairly constant.	
Explain how organisms have features (adaptations) that enable them to survive in the conditions in which they normally live.	
Identify adaptations as structural, behavioural or functional.	
Define an ‘extremophile’ as an organism adapted to life in a very extreme environment such as at high temperature, pressure, or salt concentration. E.g. Bacteria living in deep sea vents	

I can…	
Describe how to determine the abundance (number of) and distribution ('spreadoutness') of species in an ecosystem using sampling methods – quantitative data.	
Understand the terms mean, mode and median in relation to abundance of organisms	
State that a quadrat is a frame (wood/metal/plastic) that is used to make out a set area for sampling. A common size of quadrat used is a square with 0.5m sizes, therefore creating a $0.25m^2$ sample area.	
Describe how to estimate the abundance of an organism in a large area using random sampling. • use measuring tapes to create a 'grid' of the entire area • use a random number generator to determine positions to place the quadrat (without bias) • Count the number of the organism within the quadrat (or the percentage cover) • Repeat with several different quadrat positions • Calculate the mean number from all the quadrats • Scale up from the size of one quadrat to the size of the whole area.	
Describe how to investigate the change in distribution of an organism in a along a distance by sampling along a transect line. • Create the transect by laying a measuring tape along the distance. • place the quadrat at the start position (e.g 0m) • Count the number of the organism within the quadrat (or the percentage cover) • Move the quadrat further along the transect (e.g 2m) • Repeat at multiple positions along the transect (e.g 4m, 6m, 8m, 10m)	
Required practical activity 9: measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.	
Evaluate the impact of environmental changes on the distribution of species in an ecosystem given appropriate information. These environmental changes could include temperature, availability of water, or composition of atmospheric gases, and could be seasonal, geographic or caused by human interaction.	

Organisation of an ecosystem

I can…	
Recognise photosynthetic organisms (e.g. plants) as the producers of biomass for life on Earth.	
Use food chains to represent feeding relationships within a community. All food chains begin with a producer (usually a green plant or alga) which synthesises biomolecules (e.g. glucose by photosynthesis).	
Describe the differences between the trophic levels of organisms within an ecosystem. Producers (1st trophic level) are eaten by primary consumers/herbivores (2nd trophic level), which in turn may be eaten by secondary consumers/carnivores (3rd tropic level) and then tertiary consumers/carnivores (4th trophic level).	
Explain how the arrows of a food chain represent the energy/biomass flow.	
Define biomass as the mass of biological molecules that make up an organism (eg. the carbs/fats/proteins). Biomass contains chemical energy.	
Construct a pyramid of biomass to represent the relative amount of biomass in each level of a food chain 	
Explain why the amount of biomass decreases along a food chain. At each trophic level biomass is: • <u>used</u> (in respiration to release energy for movement and lost as heat energy to environment) • <u>wasted</u> (egested in faeces, excreted in CO_2 and urea, not all parts of the organism are eaten) so less is available to pass on to the next trophic level.	
Calculate the efficiency of biomass transfers between trophic levels by percentages or fractions of mass.	
Identify consumers that kill and eat other animals are predators, and those eaten are prey.	
Describe how, in a stable community, the numbers of predators and prey rise and fall in cycles.	

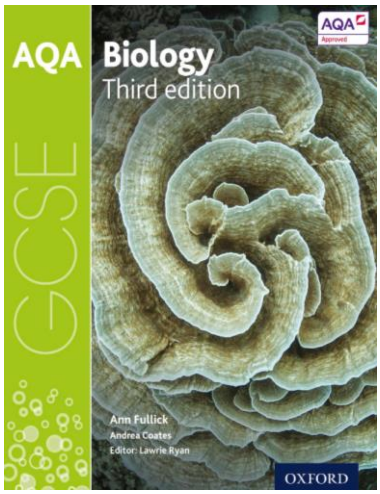
I can…	
State that atoms on Earth are finite and that all materials in the living world are recycled through the abiotic and biotic components of an ecosystem to provide the building blocks for future organisms.	
Describe how water is cycled through the ecosystem by continuously evaporation/transpiration into vapour and condensation/precipitated.	
Explain the importance of the water cycle providing fresh water for plants and animals on land before draining into the seas.	
State that carbon atoms form the base of all biological molecules (carbs, fats, proteins) that make up cells.	
Describe how carbon atoms are cycled through an ecosystem between the atmosphere (carbon in CO_2 in air) and living things • producers (plants) take in CO_2 during photosynthesis and produce glucose and other biomolecules • Consumers take in carbon in biomolecules from food, and use for growth (=becomes part of consumer biomass) or uses for energy (=carbon released back into atmosphere as CO_2 following respiration) • Humans burn (= combustion) biomass (eg. trees) or fossil fuels to release energy (also releases carbon as CO_2 into atmosphere).	
Identify some types of microorganisms (bacteria and fungi) as decomposers that secrete extracellular enzymes to breakdown dead/waste material and absorb the small soluble products by diffusion (= decay/decomposition)	
Explain the role of microorganisms in cycling materials through an ecosystem such as by returning carbon to the atmosphere as CO_2 (when they respire) and mineral ions to the soil.	
Explain how temperature, water and availability of oxygen affect the rate of decay of biological material. (Warmer = faster but too hot denatures enzymes, so decomposition stopped Oxygen needed for microorganisms to aerobically respire.)	
Required practical activity 10: investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.	
Appreciate that gardeners and farmers try to provide optimum conditions for rapid decay of waste biological material to produce compost for use as a natural fertiliser (providing minerals to aid the growth of plants/crops).	
Understand that anaerobic decay produces methane gas. Biogas generators can be used to produce methane gas as a fuel.	

AQA exam specification:

- 4.7.1 Adaptations, interdependence and competition
- 4.7.2 Organisation of an ecosystem
- 4.7.4 Trophic levels in an ecosystem

Additional support:

Access the appropriate textbook on kerboodle.com, create your own revision notes of the key points of the topic and attempt the summary questions.



Separate Biology GCSE textbook

Adaptations, interdependence and competition
pages 258-273
Organising an ecosystem
pages 277-283
Trophic levels and biomass
pages 300-303

Utilise online revision resources to support your class notes, such as…

Attempt past paper questions using www.physicsandmathstutor.com and self-mark your answers using the official exam mark schemes.

Extension work/extra challenge:

Ask your teacher for extension tasks:

- Keystone Species