

AQA B7a – Ecology: Adaptations TRIPLE BIOLOGY (page 1 of 2)

Key word	Definition
Environment	The non-living factors surrounding any living organism in a habitat
Habitat	The place where organisms live
Population	Individuals of one species that live in a particular habitat
Community	Populations of different species that live in a particular habitat
Ecology	The study of living things in their environment
Ecosystem	The interaction of a community of organisms (biotic) with the non-living (abiotic) parts of their environment
Organism	An individual living thing
Adaptations	Features that allow organisms to survive in the conditions in which they normally live

Examples of biotic and abiotic factors

Abiotic – non-living factors that affect a community	Biotic – living factors that affect a community
<ul style="list-style-type: none"> • Temperature • Light intensity • Moisture levels • Soil pH • Wind intensity and direction 	<ul style="list-style-type: none"> • Carbon dioxide levels for a plant • Oxygen levels for aquatic animals • Availability of food • Predation • New pathogens • Competition – one species outcompetes another

RP9 – 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

Biology only RP10 – Investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.

A range of experimental measures using **transects** and **quadrats** are used by ecologists to determine the distribution and abundance of species in an ecosystem

Factors that affect the rate of decay of biological material are water, temperature and availability of oxygen

Quadrats – Organisms are counted within a randomly placed square

Transect – Organisms are counted along a line

Biology only

- Farmers optimise conditions for rapid decay of waste biological material for making compost as a natural fertiliser
- Anaerobic decay produces methane gas.
- Biogas generators can be used to produce methane gas as a fuel

All materials in the living world are recycled to provide building blocks for future organisms

Microorganisms cycle materials by returning carbon to the atmosphere as CO₂ and mineral ions to the soil.

Types of adaptations

	Structural	Behavioural	Functional
Definition	Features of an organism's body e.g. shape, colour	The way an organism behaves e.g. migration, hibernation	Things happening inside an organism e.g. reproduction, metabolic rate
Examples	Polar bears live in the arctic so have white fur to camouflage against the snow	Many bears hibernate over the winter. This lowers their metabolism, reducing need for hunting for energy when there is least food.	Desert animals such as camels produce very little urine to conserve water in a very dry habitat

Extremophiles are organisms which live in very extreme environments such as high temperature, pressure or salt concentration. Examples are bacteria which live in deep sea vents.

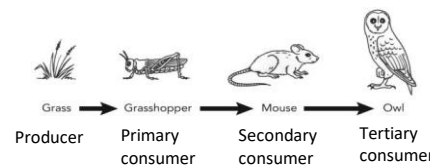
Interdependence and competition

	Interdependence	Competition
Description	Species depend on each other in many ways: for food, pollination, seed dispersal. Removing a species can affect the whole community	Plants in a community or habitat compete with each other for many things: light, air, water, space and minerals Animals also compete; for food, mates and territory
Examples	Climate change leads to more carbon dioxide dissolved in the oceans, lowering the pH of the ocean, negatively affecting the organisms that live there.	Grey squirrels were introduced to the UK in the 1800s. This increased competition for food with the native red squirrels.

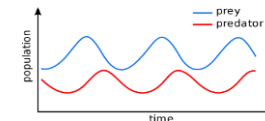
Photosynthetic organisms are the producers of biomass for life on earth.

Feeding relationships can be represented by food chains that all start with a producer

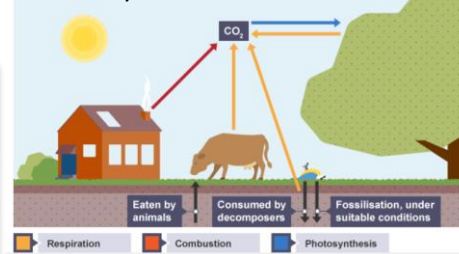
Consumers that kill and eat other animals are **predators**.
Consumers that are killed and eaten by other animals are **prey**.



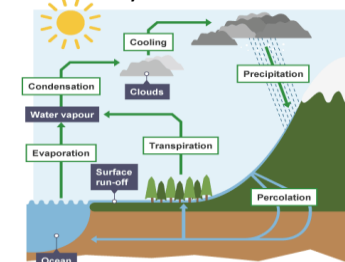
In a stable community, the number of predators and prey rise and fall in cycles



The carbon cycle



The water cycle



AQA B7b Ecology: Biodiversity TRIPLE BIOLOGY (page 2 of 2)

Key word	Definition
Biodiversity	The variety of all different species of organisms on Earth, or within an ecosystem
Apex predator	A predator with no predators. The top of a food chain

Maintaining a great biodiversity

- **Ensures the stability of ecosystems** by reducing the dependence of one species on another for food, shelter and maintenance of the physical environment
- **Ensures the future of the human species.** Many human activities are reducing biodiversity.

Scientists and concerned citizens have put programs in place to reduce the negative impacts of humans on biodiversity including:

- Breeding programs for endangered species
- Protection and regeneration of rare habitats
- Field margins and hedgerows in agricultural areas where farmers grow one crop
- Reduction of carbon dioxide emissions and deforestation by governments
- Recycling resources rather than dumping waste

Land use

- Humans reduce the amount of land available for plants and animals by for example: building, farming, quarrying and dumping waste
- Decay or burning of peat from peat bogs releases a large amount of carbon dioxide to the atmosphere as peat bogs are a major **carbon sink**
- Destruction of peat bogs and other areas to produce garden compost reduces biodiversity

Large scale deforestation has occurred across the world, particularly in tropical areas to:

- Provide land for cattle
- Provide land for rice fields
- Provide land for growth of biofuels

This deforestation leads to a reduction in biodiversity

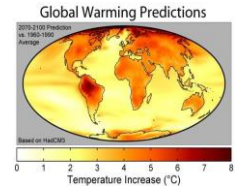


Global warming

- Levels of carbon dioxide and methane are increasing in the atmosphere due to human activity
- There is a global consensus about the human impact on global warming and climate change, based on thousands of **peer reviewed** publications.

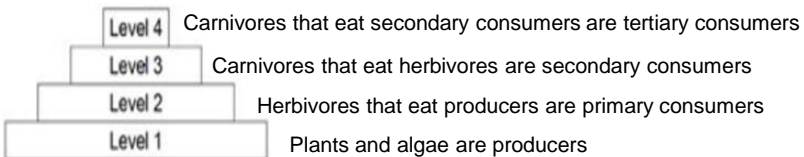
Some effects of global warming on biodiversity are:

- Sea level rise
- Decreased land availability caused by sea level rise
- Damaged and destroyed habitats due to temperature rise
- Extreme weather events harm populations of plants and animals



Trophic levels and biomass – Biology only

- Trophic levels can be represented by numbers, starting with plants and algae and continuing depending on how far the organism is up the food chain.
- Pyramids of biomass can represent the relative biomass of each level in the food chain, starting with trophic level 1 at the bottom of the pyramid
- Decomposers break down dead plant and animal matter by secreting enzymes. Small food molecules diffuse into the microorganism.



- Biomass is lost between the trophic levels – some egested as faeces; some lost as carbon dioxide, water and urea; some as large amounts of glucose used in respiration
- Producers transfer approximately 1% of the energy of light for photosynthesis
- Approximately 10% of the biomass from each trophic level is transferred to the level above

Waste management

Rapid human population growth and increase in standard of living means that more waste is being produced.

This pollution can kill animals and plants, reducing biodiversity

Pollution can occur:

- In water from sewage and toxic chemicals
- In air from smoke and acidic gases
- On land from landfill and toxic chemicals

Food production – Biology only

Factors affecting **food security** – having enough food to feed the population

- Increasing birth rate
- Changing diets in developing countries
- New pests and pathogens
- The cost of agricultural inputs
- Environmental change e.g. a widespread famine if less rain
- Conflicts (war) affecting availability of water or food

Biotechnology can meet the demands of a growing population

- Genetically modified (GM) bacterium produces human insulin. This is harvested and purified to treat people with diabetes
- GM crops can provide food with an improved nutritional value such as golden rice (increased vitamin A) or more food
- The fungus *Fusarium* is used to produce mycoprotein. A vegetarian protein-rich food. It is grown on glucose syrup, in aerobic conditions.

Farming techniques – increasing efficiency of food production by:

- Restricting movement of animals to limit energy loss
- Feeding animals high protein foods
- Controlling temperature of their surroundings

Sustainable fisheries are needed as fish stocks are declining

- Must maintain or grow fish stocks to a sustainable level otherwise species will become extinct
- Techniques include controlling net size and introducing fishing quotas