AQA GCSE ECOLOGY PART 1

Ecosystem

Environment	The conditions surrounding an organism; abiotic and biotic.
Habitat	Place where organisms live e.g. woodland, lake.
Population	Individuals of a species living in a habitat.
Community	Populations of different species living in a habitat.

Organisms require a supply of materials from their surroundings and from the other living organisms.

Bacteria respire when breaking down dead organisms releasing CO_2.

Farmers optimise conditions for making compost for use as a natural fertiliser.

Anaerobic decay in biogas generators produces methane gas, used as a fuel.

Surviving and reproducing

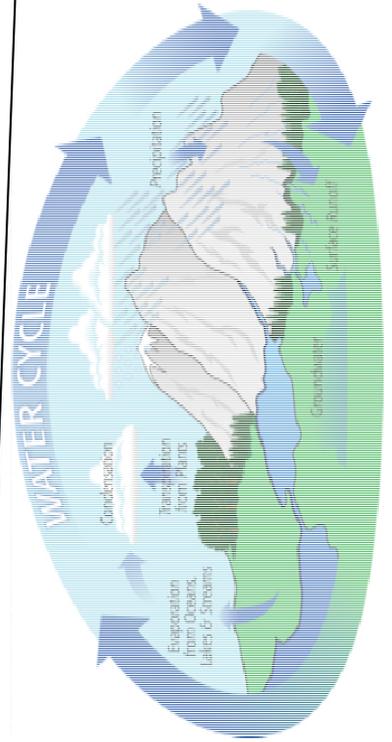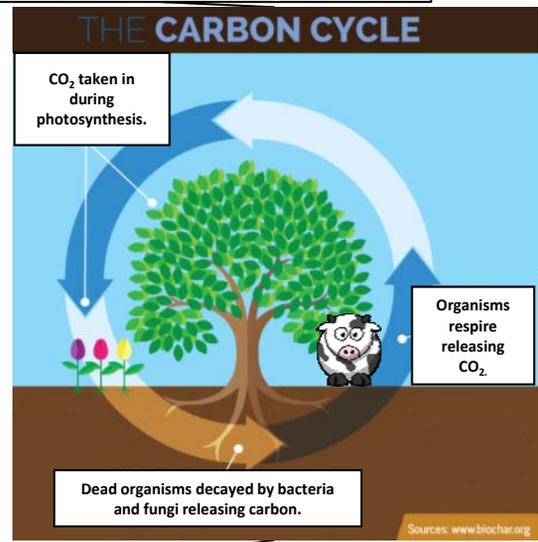|	
Competition	Plants in a community or habitat compete with each other for light, space, water and mineral ions.
	Animals compete with each other for food, mates and territory.
Interdependence	Species depend on each other for food, shelter, pollination, seed dispersal etc. Removing a species can affect the whole community

EXAMPLE: Introduction of grey squirrels to UK increased competition for food for red squirrels. The greys also carry a pathogen that kills reds.

EXAMPLE: climate change is leading to more dissolved CO_2 in oceans lowering the pH of the water affecting organisms living there.

Decomposition and material cycling

THE CARBON CYCLE

CO_2 taken in during photosynthesis.

Organisms respire releasing CO_2.

Dead organisms decayed by bacteria and fungi releasing carbon.

Sources: www.biochar.org

Materials are recycled to provide the building blocks for future organisms

Interdependence and competition

Abiotic and biotic factors.

Abiotic	Biotic
Non-living factors that affect a community	Living factors that affect a community
Living intensity.	Availability of food.
Temperature.	
Moisture levels.	New predators arriving.
Soil pH, mineral content.	
Wind intensity and direction.	New pathogens.
Carbon dioxide levels for a plant.	
Oxygen levels for aquatic organisms.	One species outcompeting so numbers are no longer sufficient to breed

Adaptations

Organisms adaptations enable them to survive in conditions where they normally live.

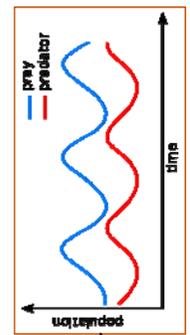Adaptations may be structural, behavioural or functional.

Adaptations		
Plants	Animals	Extremophiles
Cactus in dry, hot desert	Polar bear in extreme cold artic	Deep sea vent bacteria
No leaves to reduce water loss, wide deep roots for absorbing water.	Hollow hairs to trap layer of heat. Thick layer of fat for insulation.	Populations form in thick layers to protect outer layers from extreme heat of vent.

Levels of organisation

Photosynthetic organisms are the producers of biomass for life on Earth

Food chains

Feeding relationships in a community			
Producer	Primary consumer	Secondary consumer	Tertiary consumer

Grass → Grasshopper → Mouse → Owl

All food chains begin with a producer e.g. grass that is usually a green plant or photosynthetic algae.

Consumers that kill and eat other animals are predators and those eaten are prey.

In a stable community the numbers of predators and prey rise and fall in cycles.

prey / predator — population / time

WATER CYCLE

Precipitation / Condensation / Groundwater / Surface Runoff / Transpiration from Plants / Evaporation from Oceans, Lakes & Streams

Factors affecting rate of decay

Temperature, water, oxygen

Increase the rate of decay. In enzyme controlled reactions raising the temperature too high will denature the enzymes.

Breakdown of dead organisms releases mineral ions can into the soil.

AQA GCSE ECOLOGY PART 2

Factors affecting food security
Enough food is needed to feed a changing population

- Increasing birth rate.
- Changing diets in developing countries.
- New pests and pathogens affecting farming.
- Environmental changes e.g. famine when rains fail.
- Cost of agriculture input.
- Conflicts (war) affecting water of food availability

Farming techniques
Increasing efficiency of food production

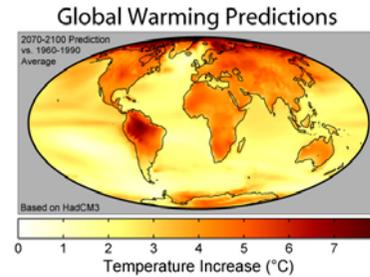Reduce energy waste, limiting movement, control temperature, high protein diet to increase growth.

Sustainable fisheries
Fish stocks in oceans are declining

Maintain/grow fish stocks to a sustainable level where breeding continues or certain species may disappear. By controlling net size, fishing quotas.

Biotechnology
Meeting the demands of a growing population

- Fungus *Fusarium* to produce mycoprotein. Requires glucose syrup, aerobic conditions. Biomass is harvested and purified.
- GM bacterium produces insulin to treat diabetes.
- GM crops to provide more/nutritional food (golden rice).

Global warming
Levels of CO_2 and methane in the atmosphere are increasing.

Decreased land availability from sea level rise, temperature rise damages delicate habitats, extreme weather events harm populations of plants and animals.

There is a global consensus about global warming and climate change based on systematic reviews of thousands of peer reviewed publications.

Global warming

Global Warming Predictions
2070-2100 Prediction vs. 1960-1990 Average
Based on HadCM3
Temperature Increase (°C)

Food production (biology only)

Trophic levels and biomass (biology only)

Some people have concerns about the treatment of animals.

Aquatic Ecosystem — Sea Lion / Herring / Zooplankton / Phytoplankton
Terrestrial Ecosystem — Mice / Grasshoppers / Grasses

Level 4
Level 3
Level 2
Level 1

Decomposers break down dead plants and animal matter by secreting enzymes. Small soluble food molecules than diffuse into the microorganism.

Transfer of biomass
Biomass is lost between the different trophic levels

Producers transfer about 1% of the incident energy from light for photosynthesis.

Approximately 10% of the biomass from each trophic level is transferred to the level above.

Large amounts of glucose is used in respiration, some material egested as faeces or lost as waste e.g. CO_2, water and urea in urine.

Human activity can have a positive impact on biodiversity
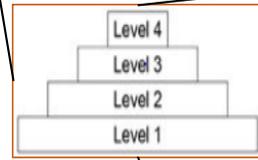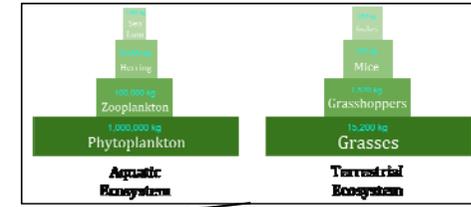
Maintaining biodiversity

Scientists and concerned citizens
Put in place programmes to reduce the negative impacts of humans on ecosystems and biodiversity

- Breeding programmes for endangered species.
- Protection and regeneration of rare habitats.
- Reintroduction of field margins and hedgerows in agricultural areas where farmers grow only one type of crop.
- Reduction of deforestation and CO_2 emissions by some governments.
- Recycling resources rather than dumping waste in landfill.

Some of the programmes potentially conflict with human needs for land use, food production and high living standards.

Trophic levels can be represented by numbers and biomass in pyramids.
Trophic levels are numbered sequentially according to how far the organisms is along the food chain.

Level 1	Producers	Plants and algae.
Level 2	Herbivores	Primary consumers.
Level 3	Carnivores	Secondary consumers.
Level 4	Carnivores	Tertiary consumers.

Apex predators are carnivores with no predators.

Maintain a great biodiversity

Maintain a great biodiversity	*Ensures the stability of ecosystems*	By reducing the dependence on one species on another for food, shelter, maintenance of the physical environment.
	Future of human species	Many human activities are reduction biodiversity and only recently measures have been taken to stop it.

Biodiversity is the variety of all different species of organisms on Earth, or within an ecosystem

Biodiversity

Experimental methods are used to determine the distribution and abundance of a species.

Sampling techniques	*Quadrats*	Organisms are counted within a randomly placed square
	Transects	Organisms are counted along a belt (transect) of the ecosystem.

Processing data

Median	Middle value in a sample.
Mode	Most occurring value in a sample.
Mean	The sum of all the value in a sample divided by the sample number.

Environmental changes affect the distribution of species	*Temperature*	These changes might be seasonal, geographic or caused by human interaction.
	Availability of water	
	Composition of atmospheric gases	

Example: Several species of bird migrate from cold winter conditions to warmer conditions closer to the equator.

Human activity can have a negative impact on biodiversity

Biodiversity and the effect of human interaction on the ecosystem

Pollution kills plants and animals which can reduce biodiversity.

Waste management	*Rapid growth in human population and higher standard of living*	More resources used and more waste produced.
		Pollution in water; sewage, fertiliser or toxic chemicals.
		Pollution in air; smoke or acidic gases.
		Pollution on land; landfill and toxic chemicals.

AQA GCSE ECOLOGY PART 3

Waste, land use and deforestation

Land use

Humans reduce the amount of land and habitats available for other plants, animals and microorganisms.

Building and quarrying.
Farming for animals and food crops.
Dumping waste.
Destruction of peat bogs to produce cheap compost for gardeners/farmers to increase food production.

Impact of environmental change (Biology HT only)

Large scale deforestation

In tropical areas (e.g. rain forest) has occurred to:

Provide land for cattle and rice fields, grow crops for biofuels.

Deforestation reduces biodiversity and removes a sink for increasing the amount CO_2 in the atmosphere.

The decay or burning of peat release CO_2 into the atmosphere.

This conflicts with conserving peat bogs and peatlands as habitats for biodiversity and reduce CO_2 emissions.