Part A Ecosystems

Parts of an Ecosystem

Habitat – place where an organism lives
Population – a group of organisms all of the same species
Community – all the living things in an ecosystem together
Ecosystem – all the interactions between the community and habitat

Factors which affect the organisms living in an ecosystem can be biotic (living) or abiotic (non-living). Together these factors create a set of specific environmental conditions. The set of environmental conditions is called the ecological niche. Each organism will be adapted to best cope with a particular ecological niche.

Energy Flow

A food chain shows the feeding relationships that exist between members of an ecosystem. It shows the direction of energy flow from one organism to the next. All the energy present in an ecosystem comes from the sun. Green plants use sunlight to carryout photosynthesis – producing their own food.

Organisms that are able to produce their own food are called producers. An organism that is unable to produce their own food, and instead must consume other organisms are called consumers.

Consumers may be subdivided into smaller groupings, depending on what they eat.

Herbivores – only eat plants
Carnivores – only eat other animals
Omnivores – eat both plants and other animals
Decomposers – break-down waste materials, and recycle nutrients back into the ecosystem.

An organism that eats other animals is called a predator. The organism that is eaten is called a prey.

For a food chain, the organisms are given specific titles depending on where in the food chain they are located.

(a) Ecosystems

e.g.	lettuce	→	slug	→ song thrush
	producer		primary consumer	secondary consumer

In an ecosystem, feeding relationships are never as simple as one plant eats or is eaten by just one other organism. Instead, many organisms may consume or be consumed by many different organisms. For this reason we show the multiple feeding relationships as a food web. As with a food chain, a food web always begins with a producer.

At each stage or energy transfer in a food chain, only 10% of the energy consumed by an organism is stored and passed onto its predator. The rest of the energy is lost.

Faeces	undigested waste passes through an organism
Movement	to move an organism requires energy – this comes from its food
Heat	to maintain its body temperature, an animal requires energy – this energy comes from their food.

To improve the efficiency of energy transfer, and decrease the amount lost, there must be fewer organisms in a food chain. Therefore, more of the energy absorbed from the sun by the producer will be transferred to the secondary consumer.

Pyramids

A pyramid of numbers shows the number of each type of organism present in a food chain. It may look distorted if only one large organism is present as the producer, e.g. an oak tree. We can use a pyramid of biomass to give a more accurate picture of food chain within an ecosystem.

A pyramid of biomass shows the total living mass of each population. Again, this may give a misleading representation of the energy contained within the organisms at each level of a food chain. This is due to different chemical compositions. We can use a pyramid of energy to give the most accurate picture of the energy present within each population in a food chain.

(a) Ecosystems

A pyramid of energy shows the potential productivity at each stage in a food chain – measured in $kJ/m^2/year$.

Biodiversity

Biodiversity is the range of different species present in an ecosystem. The greater the number of species present in an ecosystem, the higher the biodiversity.

A species is a group of organisms that may breed together to produce a fertile offspring.

To ensure the continued stability of an ecosystem, the biodiversity of an ecosystem should be maintained. Removal of one or more species from an ecosystem can have a serious impact on the survival of the species left behind.

To allow an organism to survive well in a given set of environmental conditions (ecological niche) it will have to show certain characteristics or adaptations. An adaptation is an inherited characteristic that makes an organism more suited to its environment. These may give an organism a competitive advantage over other species.

Adaptations can be structural – the organism's body is better suited to cope with its environment.

e.g. Darwins Finches – each species of finch has a specific beak shape. The beak shape is directly related to the manner in which that species of finch obtains food.

Desert plants – narrow fibrous roots to absorb as much water as they can when it is available. Leaves are covered in a thick waxy cuticle to prevent water loss. Reduced leaf area to reduce potential water loss.

Adaptations can be behavioural – if a particular response enables an organism to survive better in its environment, then the response is said to have adaptive significance. e.g. woodlice move towards damp and dark conditions to allow them to survive predators and dehumidification. Behaviour adaptations are inherited characteristics that allow an organism to respond to its environment.

(a) Ecosystems

Grazing can affect the diversity of species in an ecosystem. Selective grazers, such as sheep, only eat specific types of plant. If the specific types of plant are more vigorous than others, then the selective grazers keep the more vigorous plants in check to prevent them from taking over. Unselective grazers, such as rabbits, eat any type of plant. This can cause a decrease in biodiversity by reducing the chances of a less vigorous species surviving.

Pollution can greatly affect the biodiversity of an ecosystem.

A. Acid rain can decrease the pH of aquatic or soil ecosystems. Many organisms are unable to cope and so die. This decreases the biodiversity within an ecosystem. A decrease in the pH of rain water causes more metal ions to be washed from rocks and soil into rivers and streams. Many organisms cannot survive increased ion concentration and so die. This further decreases the biodiversity of an ecosystem.
B. Sewage can decrease the oxygen levels within an aquatic ecosystem. The rapid influx of organic waste and microbes leads to a sharp decrease in dissolved oxygen. A decreased oxygen concentration will not allow many organisms to survive. This will decrease the biodiversity of an ecosystem.

If an organism's habitat is destroyed, they will not survive. When habitats are destroyed on a large enough scale, the Biodiversity within an ecosystem will decrease.

Deforestation destroys the woodland habitats of many different animals. It may also have far reaching consequences for surrounding land. Trees will no longer be able to soak up rain water – instead it will flow down eroding hillsides and flooding valleys.

Desertification occurs in dry pasts of the world. Over grazing, removal of barrier forests and the inappropriate use of local water can all lead from marginal land being turned into desert.

Pollution and destruction of an organism's habitat are both examples of environmental mismanagement by humans. Both lead to decreased species diversity.

(a) Ecosystems

Plants compete for water, light and soil nutrients. Animals compete for food, water and shelter.

Competition between members of the same species (intra-species competition) is more intense the competition between members of two different species (inter-species competition). This is due to members of the same species occupying exactly the same ecological niche, Members of two different species occupy similar but slightly different ecological niches.