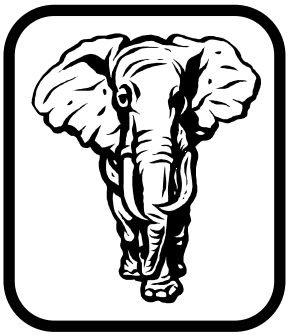
Science Revision Notes

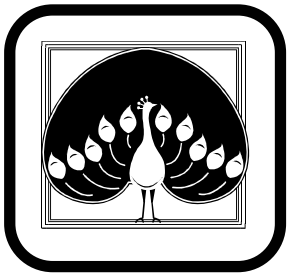
Adaptation and survival

Some animals are well **adapted** to survive in the Arctic. Polar bears have thick coats, walruses and seals are **insulated** by a large amount of body fat. Large animals can keep warmer than small ones because they have a smaller **surface area to volume** ratio. Reptiles cannot live in the arctic because they are **cold blooded**. The arctic hare has a white coat which acts as good **camouflage** in the snow.



At the equator the opposite adaptation means African elephants can **cool down** easily because their large ears increase their surface area to volume ratio. A camel's hair is coarse to stop it getting sunburned and woolly to keep in warm at night time. Camels can close their nostrils to protect their lungs in sand storms. Snakes are covered in scales to stop moisture from **evaporating**. Other animals have adaptations to avoid being eaten by **carnivores.** Bright colours warn **predators** that they are poisonous.

Transpiration is loss of water from leaves. Hot and dry weather makes plants lose water quickly. Willow trees grow near rivers but **succulents** that live in dry areas keep a store of water in their stems and leaves. Some plants reduce transpiration by only having a few **stomata;** others have leaves with a thick waxy cuticle. Seaside marram grass has tightly **curled** leaves to reduce the surface area available for water loss and the resurrection plant can survive even after losing 95% of its water. The **spines** on a cactus are very small leaves which reduce transpiration, but are also good for avoiding being eaten by herbivores; however, camels have mouths which are specially adapted to eat cacti.



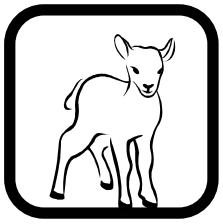
A **territory** is an area marked out by an animal to exclude others and protect the food supply for their own family. Birds like peacocks **display** to win the best females and deer **fight** for the right to pass their genes on to the next generation.

Early flowering bulbs grow well under trees because they grow **before** the leaves come out. Weeds often grow quickly **competing** with other plants for light and nutrients. Plants that grow attractive fruits are more likely to have their seeds well **dispersed** by animals that carry them away to eat.

Variation

Inheritance is passing information from parents to offspring in **gametes** by sexual reproduction. The thread like structures that carry information for many characteristics are called **chromosomes**. Small sections of chromosomes called **genes** control characteristics like eye colour. **Cloned** animals look identical because they have the same genes. Identical **twins** are natural clones.

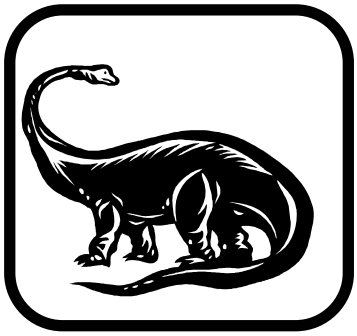
Asexual reproduction is producing offspring without sex cells making offspring identical to their parent because they carry the same genetic information. New plants have be grown from old ones by taking **cuttings** for a long time, but now tissue **cultures** can be used. These involve small groups of cells taken from a plant or animal and grown.



Cloning is another name for asexual reproduction. Scientists have been experimenting with **animal cloning,** for example Dolly, the sheep. In this process the original nucleus was **removed** from the egg cell and **replaced** by the nucleus from another animal. Another technique called **embryo transplantation** involves splitting apart cells before they **specialise** and implanting them into several host mothers. Animal cloning has to be evaluated to see if is safe before making human clones.

Genetic engineering involves **transferring** genes from one organism to another. Seed companies make genetically modified plants that will not reproduce naturally. Clients then need to buy new seed every year. People who object to cloning often do so, on **moral** and **ethical** grounds.

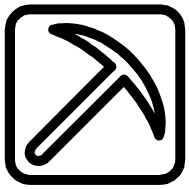
Evolution



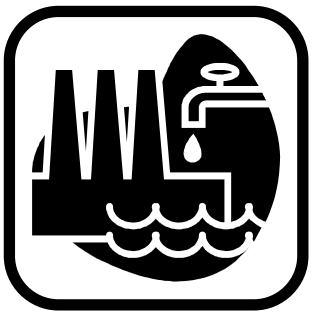
Scientists are not certain how **life** began on earth because no evidence has survived. **Fossil** records in the rocks tell scientists that animals first appeared on earth about 3000 million years ago but many became **extinct** about 200 million years ago. They show the **order,** bony fish came before amphibians. The most likely reason for the **extinction** of dinosaurs is that conditions on earth changed, but other possible **causes** are disease, meteorites or volcanic eruptions.

Lamarck thought that experiences learned by one animal could be **inherited** by its offspring and in that way the species would improve. Darwin proposed that modern species developed from simpler life forms. The Bible describes creation of individual species by God. Scientists know that new forms of genes can arise by **mutation** and 'Survival of the fittest' results in a **stronger** population. Unsuccessful **competition**, especially since humans arrived, is another reason why some animals may now be extinct.

How people affect the planet



The earth's **population** has risen significantly in the last 1000 years but the earth's resources are not shared fairly. Reducing **poverty** could mean there would be more pollution if everyone made as much rubbish as we do. Communities are populations of organisms, but more quarrying could destroy more **habitats** and converting marshes into crop growing areas is likely to reduce the number of **species** that live there.



We need to be concerned about **pollution** because it could affect our health. **Mercury** discharged by a factory is dangerous even when it gets to the sea because it can get into the fish which we catch for eating. Untreated **sewage** would reduce the amount of oxygen in a river and kill the fish. **Toxic** chemicals used to kill insects (pesticides), fertilisers to make crops grow and herbicides to kill weeds, can all pollute land and water. The best indicators of pollution in rivers are the **invertebrate** animals.

Sulfur dioxide and nitrogen oxides in the air are the main substances that create **acid rain** making rivers and lakes acidic. **Lichens** are simple plants that can be used to indicate how old a forest is, but they are easily damaged by air pollution, particularly sulfur dioxide. The number of species in an environment indicates how polluted it is.

Over the last 160 thousand years the concentration of **carbon dioxide** in the air has fluctuated, but shown an overall increase. Carbon dioxide and **methane** are thought to be the main **greenhouse** gases absorbing energy radiated by the earth making it warm up. Methane is produced by rice fields and cattle. **Landfill** sites also increase the release of methane into the air. They make bad places on which to build. Nuclear power stations do not produce any carbon dioxide, but car exhausts do. Catalytic converters help by removing nitrogen oxides from car **exhaust** gases.

Forests absorb carbon dioxide, so deforestation decreases the rate at which carbon dioxide can be removed from the air. Replanting trees is an example of **sustainable** development. Recycling and reusing things is a good idea because the earth only has limited **resources**. Sustainable development means conserving resources and leaving some for **future** generations.