

# Year 11 – Paper 2 - Biology Knowledge Organiser - Inheritance, variation and Evolution

## Types of reproduction

Organisms can reproduce sexually or asexually.

- **Sexual reproduction** involves two parents and produces genetically unique offspring
- **Asexual reproduction** involves only one parent and there is **no** fusion of gametes.

## Meiosis

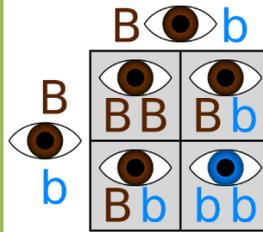
You already know how mitosis is used to replace cells in the body. Meiosis is the other form of cell division, but quite different. Meiosis produces **gametes**, so it happens in **reproductive organs**.

In meiosis, the DNA is replicated to start with (just like mitosis). But then the cell divides **twice** – i.e. divides into *four* cells – so each cell ends up with **half** the genetic information: a single set of chromosomes.

## Inheritance

We all have 2 genes for each characteristic (such as eye colour) one from mum and one from dad. These characteristics can be either recessive or dominate. You can only express a trait if you have the gene for it.

You can work out the probability of you expressing a trait but using a “punnett” square like the one to the right.



## DNA and the genome.

DNA (Deoxyribonucleic acid) can be thought of as the instruction manual for how to make an organism. Its structure is a double helix made of 4 base pairs called **Adenosine, Thymine, Cytosine, Guanine** or **A, T, C and G** for short.

T, will always pair up with A and C will always pair up with G.

## Evolution

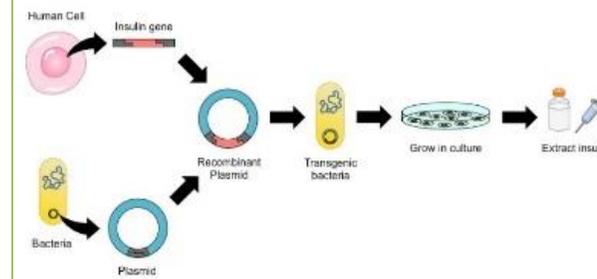
The theory of evolution by natural selection was first suggested by Charles Darwin and Edwin Russel Wallace separately in the 1800s. It states that following environmental pressures and genetic mutations/variation that certain characteristics will be favourable and therefore more likely to survive and passed on to the next generation.

## Selective breeding

Selective breeding is much like evolution however the selective pressures do not come from the natural world, instead they come from humans. In selective breeding animals are chosen based on the characteristics that we have decided are preferable and breed together to emphasize those characteristics.

## Genetic engineering and cloning

Genetic engineering is a relatively new practice of effecting the genes of organisms to create useful features that can not be created using selective breeding such as adding fish genes to tomatoes or the human insulin gene to bacteria. Similar techniques can be used in cloning.



Key Terms	Definitions
Reproduction	Making offspring. All organisms reproduce.
Offspring	Offspring is a generic term for children – it applies to any type of organism.
Gametes	Sex cells, such as pollen, egg cells, sperm cells. Gametes are produced by meiosis.
Meiosis	Type of cell division that produces gametes. Gametes are genetically unique (compare to <i>mitosis</i> , where genetically identical daughter cells are produced).
Fusion	The joining/fusing of sex cells in sexual reproduction.
Trait / characteristic	A feature of an organism such as eye colour, skin colour or hair colour.
Allele	A slightly different version of a gene caused by a mutation . It still codes for the same characteristic but will produce a slightly different version of the characteristic .
Genotype	The combination of genes inherited from parents
Phenotype	Physical expression of these genes
Classification	Sorting into groups. Traditional classification of organisms depends on their structure, but more modern methods involve analysing the biochemical similarities between organisms to classify them.
Kingdom	The largest group in the Linnaean system. In this model, there are five kingdoms (animals, plants, fungi, bacteria and protists).
Three-domain system	A modern model of classification, based on the genetic differences between organisms.