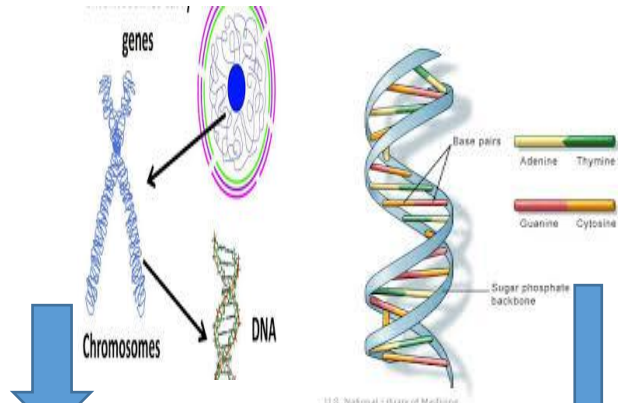


# Inheritance and Evolution



## What I know from Key Stage 3 Biology

Know information is passed on to next generation as genes.

Genes are found on chromosomes made of DNA and are passed on during reproduction.

Variation is the difference within and between species and can be continuous or discontinuous.

Species can become extinct.



Know that reproduction can be sexual or asexual.

Cell Division can be mitosis to produce identical cells or meiosis to produce sex cells.

Know that alleles are different versions of the same gene and describe how they can be inherited to produce different offspring with variation.

Some diseases can be inherited.

Genetic engineering involves modifying the genome of an organism to introduce a desired characteristic.

Know the steps in selective breeding by which humans breed plants and animals for useful characteristics.

Describe how Natural Selection leads to the evolution of new species and extinction of others. Give examples of how extinction occurs and evidence from fossils.

Describe how organisms can be classified into different groups based on a variety of criteria and know that this classification has changed over time as more evidence is found.

## Future learning

DNA replication

Mono and dihybrid crosses and more complex inheritance.

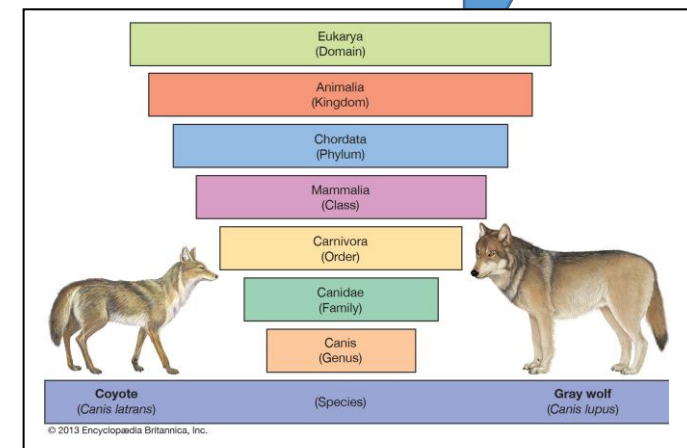
Gene technologies.

Vocabulary: asexual meiosis mitosis

gene chromosome DNA genome

variation natural selection extinction

species classification



## Core Questions Evolution

1. What is a fossil?
2. How do fossils provide evidence of evolution?
3. What is a mutation?
4. Describe how selective breeding is carried out
5. Who proposed the Theory of Natural Selection?
6. What does an evolutionary tree illustrate?
7. What is meant by the phrase "Survival of the fittest"?
8. Define a species
9. What is variation?
10. How do new species arise?

## Core questions and Answers

### Core Questions Evolution

1. What is a fossil? The stone remains of an organism that lived millions of years ago
2. How do fossils provide evidence of evolution? Show what organisms looked like millions of years ago and how they differ from those that are alive today
3. What is a mutation? A change to the DNA of an organism
4. Describe how selective breeding is carried out. Select two parents that have the characteristics you want and breed them together over many generations until you achieve the characteristic you want.
5. Who proposed the Theory of Natural Selection? Charles Darwin
6. What does an evolutionary tree illustrate? How organisms are related based on their evolutionary origins determined by their Physical characteristics and upon their DNA
7. What is meant by the phrase "Survival of the fittest? The best adapted/suited animals to their habitats survive
8. Define a species. A group of organism that can interbreed and produce fertile offspring
9. Define a population. A group of organisms of the same species, living in the same area.
10. What is variation? Differences between members of the same species
11. How do new species arise? A single population becomes isolated geographically, they adapt to their new environments over many years and become so genetically different that when they come together again they can no longer interbreed.

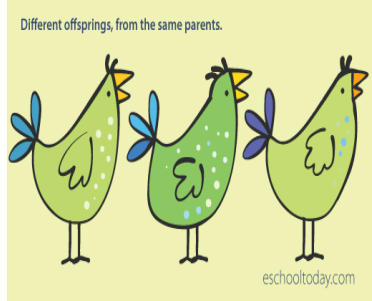
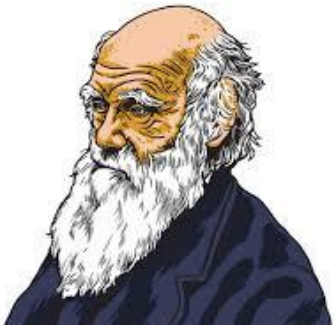
# Year 11 Natural Selection and Evolution

## Natural Selection

Some individuals are better adapted to their environment and are therefore better able to compete for survival, passing on their successful genes.

This is HOW evolution occurs.

Theory first put forward by Charles Darwin.



## Variation

Differences in the appearance of organisms is due to their **genes**, their **environment** or a combination of both.

Humans and chimps are descended from a **common ancestor**

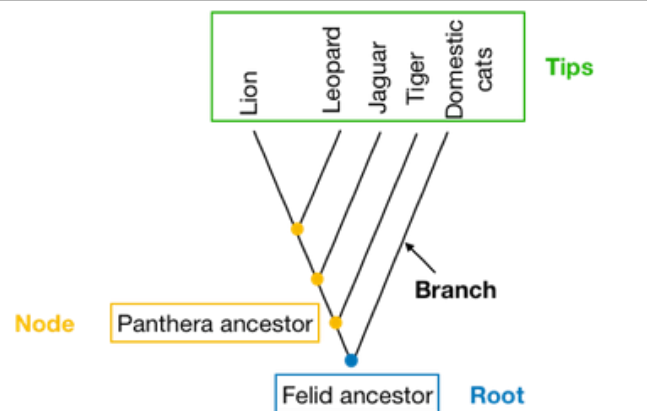
Key words	Definition
Classification	Grouping of living organisms based on common features.
Continuous Variation	Variation which has a range of values e.g. height
Discontinuous Variation	Variation which has distinct categories e.g. blood group
Evolution	Changes that occur to a species over thousands of years.
Evolutionary Tree	Diagram to show the relationship between different species and their common ancestors.
Extinction	The permanent disappearance of a species across the planet
Fossil	The 'remains' of organisms from many years ago, which are found in rocks.
Gene banks	Storage vaults for DNA – kept under specific conditions to prevent extinction
Mutation	A change in the DNA so the allele codes for something different.
Natural Selection	Best adapted individuals survive and pass on their genes to the next generation.
Selective Breeding (Artificial Selection)	Humans choose animals or plants with particular features (eg muscle size) to breed from to 'improve' the breed; takes many generations.
Species	Organisms with v similar features that can reproduce together to produce fertile offspring.
Speciation	The formation of a new species from an isolated population; takes many generations.

## Selective Breeding → centuries!

**Selective Breeding** is when humans artificially select the animals or plants they want to breed together so that the genes for a desired characteristic can remain in a population



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Evolutionary Trees show the relationships between similar species and their common ancestors. This tree shows that a lion is more closely related to a leopard than a tiger.

Fossils can be used to show the changes that have occurred over millions of years by evolution. However specific conditions are needed for fossils to form so it is not a complete record.



## Inheritance and Selection

### Core questions

1. Name the gametes in animals and plants     Sperm and eggs in animals     pollen and eggs in plants
2. Where is genetic information stored in a cell?     Nucleus
3. What is a gene?     Small piece of DNA that makes a protein
4. Which type of cell division makes the gametes?     Meiosis
5. How many chromosomes are there in a human body cell?     46
6. How many chromosomes are there in a human gamete?     23
7. What is an allele?     An alternative form of a gene
8. Write down the genotype of a female     XX
9. What is meant by a recessive allele?     Only shows up in the phenotype if there are 2 present
10. What is a punnett square?     Table used to determine the probability of offspring
11. Name a genetic disease caused by a recessive allele     Cystic fibrosis
12. Name a genetic disease caused by a dominant allele     Polydactyly
13. What is an organism's genome?     All of its DNA
14. What is genetic engineering?     When a gene is taken from one organism and inserted into another
15. Describe the structure of DNA     Polymer made of repeating nucleotides/double helix

## Inheritance and Selection Core Questions

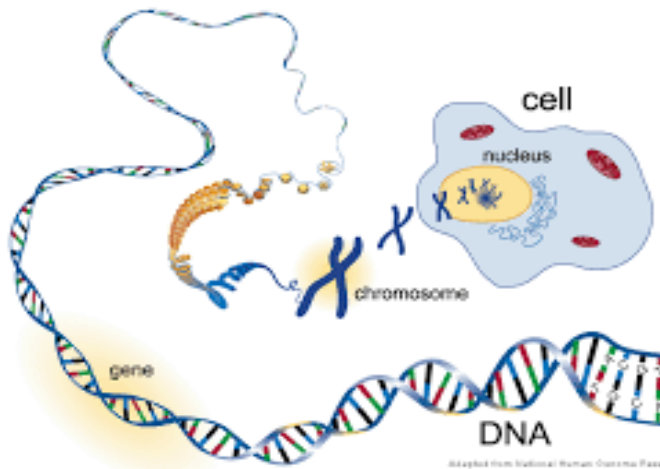
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# Year 11 - Inheritance



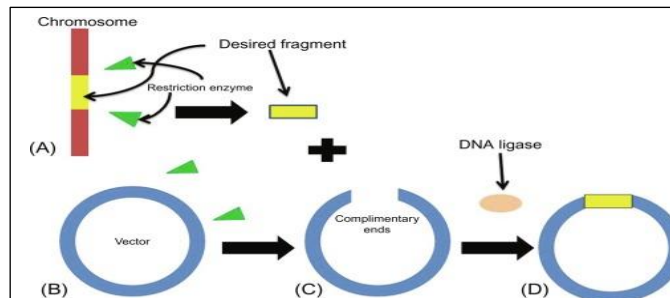
We inherit characteristics from our parents which are passed on through sperm and egg cells.



Genes are the unit of heredity which pass on our features to the next generation. Genes are short lengths of DNA which coil up to form chromosomes. They are found in the nucleus of living cells.

The DNA structure was modelled by four scientists:  
Watson, Crick, Franklin and Wilkins.

Key word	Definition
Allele	Different versions of the same gene, eg blue or brown for eye can be dominant or recessive
Chromosome	Long strands of DNA which carries the genes
Dominant allele	Only need 1 copy for it to show up (in the phenotype)
DNA	The molecule from which chromosomes and genes are made of
Gamete	Sex cells eg. sperm and egg
Gene	a section of DNA that codes for a characteristic eg eye colour
Genome	All the DNA (and associated proteins) of an organism.
Genetic Engineering	The <b>process</b> of cutting a gene from one organisms DNA and inserting into another.
Genetic Modification	<b>Changes</b> made to the genome of an organism. (GM)
Gene Therapy	Inserting a 'healthy' gene into cells of someone suffering from a genetic disorder.
Genotype	The combination of alleles (genes) an individual has
Heterozygous genotype	When the two alleles inherited are DIFFERENT (hybrid)
Homozygous genotype	When the 2 alleles inherited are the SAME
Inheritance	The combination of DNA that you inherit from your parents.
Meiosis	Cell division to make gametes for sexual reproduction – new cells are different
Mitosis	Cell division to make identical copies for growth, repair an asexual reproduction.
Phenotype	The 'appearance' or expression of an individual's features eg they have brown eyes.
Recessive	An allele that only shows up if BOTH copies inherited are the same and there is no dominant allele.
Variation	Different features in the same and different species can be continuous or discontinuous. Caused by genes and/or environment
Vector	A method of getting recombinant DNA into the new cell, eg a plasmid or virus.



Genetic Engineering uses ENZYMES to cut DNA and insert genes from one organism into another, using a vector. The organism with the new DNA is said be Genetically Modified. Common process for 'improving' crops and livestock for food.