YEAR 10 - GENETICS

A **pedigree** is a symbolic family tree showing males and females who show a particular characteristic or disease. Geneticists use the information from a pedigree to determine the mode/pattern of inheritance and therefore can calculate probability. This is particularly useful when it comes to genetic counselling – where couples (who have a known family history of diseases) wish to have a children get the chance to see the probability of having an affected child and can therefore make a decision whether to go ahead.

Symbols used in Pedigree Charts:

Male	
Female	
Affected Male	
Affected Female	
Mate between Male and Female	
Offspring produced	
Identical Twins	
Non-identical Twins	
Deceased	
Generations	

Determining the mode of inheritance: You will need to be able to look at a pedigree and determine if Inheritance is **AUTOSOMAL** or **SEX-LINKED** and then if it is **DOMINANT** or **RECESSIVE**.

AUTOSOMAL VS. SEX-LINKED

- **Autosomal** – traits that occur on the first 22 pairs of chromosomes (not the sex chromosomes). Responsible for many traits such as eye colour, skin pigment and hair colour.
- **Sex-Linked (X-Linked)** – traits that are located/expressed on the Sex Chromosomes (pair 23). They are called the sex chromosomes because they determine the genetic sex of the individual. Remember the Y chromosome is small compared to the X and therefore carries fewer genes. It is the X chromosome that carries the trait. Remember females are XX and males are XY. The ova produced by the woman always carries the X, and the sperm carry either a X or Y chromosome – which therefore determines the sex of the offspring.

COMPARISON TABLE (to help recognise inheritance patterns in pedigrees):

Autosomal Recessive Inheritance	Autosomal Dominant Inheritance
• Often skips a generation • Affected individuals can have unaffected parents • Almost equal number of males and female affected • If both parents affected – all offspring produced are affected • In most cases – when an unaffected individual mates with an affected individual, all children produced are unaffected. When at least one child is affected (indicated a unaffected parent is heterozygous for the condition), approx half the children are affected • Often found where incestuous mating occurs • Examples: Albinism, Curly Hair, Cystic Fibrosis, Thalassaemia, Tay-Sach's disease, haemochromatosis	• Trait does not usually skip a generation • An affected person mating with an unaffected person produces approx 50% affected offspring (indicates the affect person is also heterozygous for the condition) • Almost equal number of males and females affected • Examples: Tongue rolling ability, the type of ear wax and Huntington's disease
Sex-Linked Recessive Inheritance	**Sex-Linked Dominant Inheritance**

• Most affected individuals are Males
• Affects males result from mothers who are also affected or are carriers (heterozygotes), and have affected brothers, fathers or maternal uncles.
  o The sons of affected mothers should be affected
  o Approx half the sons of carrier females should be affected
• Affected females come from affected fathers and affected or carrier mothers
• Examples: Haemophilia, Duchenne Muscular Dystrophy, Colour blindness
	• Traits do not skip generations
	• Affected sons must come from affected mothers
	• Approx half of the children of an affected heterozygous female are affected
	• Affected females come from affected mothers or fathers
	• All the daughters, but none of the sons, of an affected father are affected.
	• Examples: Very few, but Rett Syndrome is one example