

INTRODUCTION TO GENETICS

- **Genetics** is the study of heredity, that is, how _____ such as eye colour are inherited from _____ to offspring.
- **Genes** are the chemicals in the nuclei of cells that determine the characteristics that are inherited. Each human _____ has thousands of genes in the nucleus. Genes are made of _____ (deoxyribonucleic acid).
- **Chromosomes** are fine thread-like structures in the _____ of all body cells. Genes are situated on chromosomes.
- **Numbers of Human Chromosomes** – Human body cells (somatic cells) have 23 pairs or _____ chromosomes. Human _____ (sperm and egg) have only 23 chromosomes.
- **Homologous Chromosomes** – Homologous chromosomes is the name given to the _____ of chromosomes in body cells.
- **Human Sex Chromosomes** – Of the 46 chromosomes in human body cells, 1 pair or 2 sex chromosomes only determine whether a person is male or _____. Human females have 2 X-shaped sex chromosomes (_____). Human males have 1 X-shaped and 1 Y-shaped chromosome (XY).
- **Autosomes** are the _____ 22 pairs or 44 chromosomes in human body cells.

ALLELES

- **Genes** are made of DNA. Genes help us to make _____ (e.g. muscle protein, hormones, enzymes, antibodies, skin collagen, hair keratin) that will determine certain characteristics we inherit.
- For a specific characteristic (e.g. eye colour), there may be one or more types (e.g. blue, brown) that may be determined by slightly different variations of the DNA in the _____. These are called **alleles**. For example, in eye colour, there may be brown eye colour determined by a gene or **allele B**, or for blue eye colour, it is determined by a slightly different gene or **allele b**.

MULTIPLE ALLELES

- For a particular characteristic, there may be more than 2 alleles. For example, in Blood Type, there are 3 alleles – A, B and O.)

GENOTYPES AND PHENOTYPES

- Each characteristic (e.g. eye colour) is determined by a _____ of genes/alleles. One of those genes came from the _____ via sperm, and the other came from the mother via _____.
- **Genotype** is the pair of genes/alleles written in letter form (e.g. BB).
- **Phenotype** is the characteristic that appears as a result of that genotype (e.g. brown eyes).

- **Example 1 – Eye Colour in Humans**

GENOTYPE	PHENOTYPE
BB	Brown-eyed person
Bb	Brown-eyed person
bb	Blue-eyed person

- **Example 2 – Height in Pea Plants**

GENOTYPE	PHENOTYPE
TT	Tall pea plant
Tt	Tall pea plant
tt	Short pea plant

- **Homozygous (or Purebred)** – The genotype for the characteristic has the same genes/alleles (e.g. BB, bb).
- **Heterozygous (or Hybrid)** – The genotype for the characteristic has different genes/alleles (e.g. Bb).
- **Wild-type** - The most common phenotypes in a population are called the wild-type. These may be dominant (e.g. brown eye colour) or _____ (e.g. green pea colour).

MENDEL'S LAWS

- **Gregor Mendel** (1822-1884) was an Austrian monk whose work with pea plants laid the foundation for genetics.
- **Principle of Segregation** states that the alleles of a gene separate when gametes (sperm or _____) are formed. Each _____ receives one or the other allele.
- **Principle of Independent Assortment** states that the segregation of alleles of one gene is independent of the segregation of alleles of another gene during gamete formation.

SEX DETERMINATION

- Because the sperm or egg will contain only _____ of the genes and chromosomes of a person, then each sperm could contain either an X or a Y chromosome. Each egg contains either an X or the other _____ chromosome.
- To have a _____, the sperm from the father and the egg from the mother must both contain X chromosomes.
- To have a _____, the father's sperm must have a Y chromosome to join with the mother's egg that has an X chromosome.
- It is the _____ who determines the sex of a child.