

## 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.