

B16.1 Chromosomes and genes

- Core
- 1 State that chromosomes are made of DNA, which contains genetic information in the form of genes
  - 2 Define a gene as a length of DNA that codes for a protein
  - 3 Define an allele as an alternative form of a gene
  - 4 Describe the inheritance of sex in humans with reference to XX and XY chromosomes

Supplement

- 5 Describe a haploid nucleus as a nucleus containing a single set of chromosomes
- 6 Describe a diploid nucleus as a nucleus containing two sets of chromosomes
- 7 State that in a diploid cell, there is a pair of each type of chromosome and in a human diploid cell there are 23 pairs

CHROMOSOMES AND GENES

DNA are molecules that contain an organism's genetic codes

Groups of 3 make up a **gene: a length of DNA that codes for a protein**

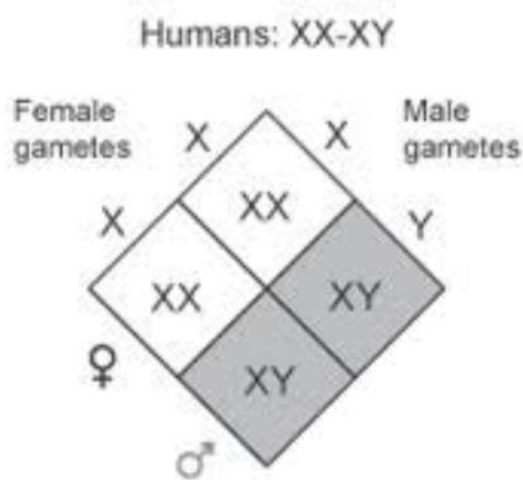
Chromosomes are made of DNA, which contains genetic information in the form of genes

Haploid nucleus contains a single set of chromosomes

Gametes

Diploid nucleus contains two sets of chromosomes

Pair of each type of chromosome - 23 pairs



XX - female

XY - male

50%

Inheritance of sex in humans

Cell division

MITOSIS

Nuclear division giving rise to **genetically identical cells**

Process

Exact replication of chromosomes occurs before mitosis

Then the **copies of chromosomes separate**, maintaining chromosome number in each daughter cell

- Role
- Growth
  - Repair of damaged cells
  - Replacement of cells
  - Asexual reproduction

MEIOSIS

Genetically different cells

from diploid to haploid

Reduction division

Chromosome number is **halved**

Involved in **production of gametes**

B16 - INHERITANCE

B16.3 Monohybrid inheritance

Core

- 1 Describe inheritance as the transmission of genetic information from generation to generation
- 2 Describe genotype as the genetic make-up of an organism and in terms of the alleles present
- 3 Describe phenotype as the observable features of an organism
- 4 Describe homozygous as having two identical alleles of a particular gene
- 5 State that two identical homozygous individuals that breed together will be pure-breeding
- 6 Describe heterozygous as having two different alleles of a particular gene
- 7 State that a heterozygous individual will not be pure-breeding
- 8 Describe a dominant allele as an allele that is expressed if it is present in the genotype
- 9 Describe a recessive allele as an allele that is only expressed when there is no dominant allele of the gene present in the genotype
- 10 Interpret pedigree diagrams for the inheritance of a given characteristic
- 11 Use genetic diagrams to predict the results of monohybrid crosses and calculate phenotypic ratios, limited to 1 : 1 and 3 : 1 ratios
- 12 Use Punnett squares in crosses which result in more than one genotype to work out and show the possible different genotypes

MONOHYBRID INHERITANCE

Definitions

Inheritance is the transmission of genetic information from generation to generation

in terms of **alleles present** (using letters)

**Genotype** is the genetic make-up of an organism

**Phenotype** is the observable features of an organism

Alleles

Homozygous

dominant  
recessive

Has two identical alleles of a particular gene

Two homozygous individuals that breed together will be **pure breeding**

Heterozygous

Has two different alleles of a particular gene

A heterozygous individual cannot pure breed

Dominant allele

An allele that is expressed if it is present in the genotype

Recessive allele

An allele that is only expressed if there is no dominant allele of the gene present in the genotype

DIAGRAMS

Pedigree diagrams

Interpret for inheritance of a given characteristic

Genetic diagrams

To predict the results of monohybrid crosses  
Calculate phenotypic ratios

1:1 3:1

Punnett squares

In crosses which result in more than one genotype to work out and show possible different genotypes

|                           |                                                                                                                                         |    |       |   |   |  |   |   |   |    |    |   |    |    |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----|-------|---|---|--|---|---|---|----|----|---|----|----|
| phenotypes of parents     | tall                                                                                                                                    |    | dwarf |   |   |  |   |   |   |    |    |   |    |    |
| genotypes of parents      | Tt                                                                                                                                      | ×  | Tt    |   |   |  |   |   |   |    |    |   |    |    |
| gametes                   | T                                                                                                                                       | t  | ×     | T | t |  |   |   |   |    |    |   |    |    |
| punnett square            | <table><tr><td></td><td>T</td><td>t</td></tr><tr><td>T</td><td>TT</td><td>Tt</td></tr><tr><td>t</td><td>Tt</td><td>tt</td></tr></table> |    |       |   |   |  | T | t | T | TT | Tt | t | Tt | tt |
|                           | T                                                                                                                                       | t  |       |   |   |  |   |   |   |    |    |   |    |    |
| T                         | TT                                                                                                                                      | Tt |       |   |   |  |   |   |   |    |    |   |    |    |
| t                         | Tt                                                                                                                                      | tt |       |   |   |  |   |   |   |    |    |   |    |    |
| F <sub>1</sub> genotypes  | 1 TT, 2 Tt, 1 tt                                                                                                                        |    |       |   |   |  |   |   |   |    |    |   |    |    |
| F <sub>1</sub> phenotypes | tall tall dwarf                                                                                                                         |    |       |   |   |  |   |   |   |    |    |   |    |    |
| ratio                     | 3 tall : 1 dwarf                                                                                                                        |    |       |   |   |  |   |   |   |    |    |   |    |    |

