Unit 2 Key Area 5 Variation and Inheritance

(a) Variation

Combining genes from 2 parents contributes to variation (differences) within a species.

Variation can be described as **Discrete** or **Continuous** (Polygenic).

Discrete variation separates members of a population into **distinct groups.**

Discrete variation is a type of variation controlled by a **single gene**.

Examples:

Eye colour, hair colour, tongue-rolling ability

Continuous variation is also known as **polygenic inheritance** and is controlled by **several genes**. Most characteristics of an individual show polygenic inheritance.

Continuous variation shows a **range of values between a minimum and a maximum.**

Examples:

Height, weight, diameter of shell

b) Genetic Terms

Gene : A unit of inheritance (DNA) carrying the genetic code to produce a protein. Several genes may be found on a chromosome.

Allele: **Different forms of a gene** are known as alleles.

Example the different alleles for eye colour gene are: brown, blue & green.

Phenotype: This is the **appearance** of an individual with respect to a characterisitic.

Example – the phenotype for eye colour may be 'green eyes'

Genotype: The genotype refers to the **combination of alleles** (genes) an individual has for a characteristic.

Example : BB or Bb or bb (where B = brown eye colour allele and b = green eye colour allele).

Dominant: This allele is always shown in the phenotype (appearance) of an individual. The dominant allele is expressed in heterozygous individuals.

Example: if an individual has the genotype Bb (where B =Brown eye allele and b=green eye allele), they will have Brown eyes since the dominant B allele is expressed and masks the presence of the b allele.

Recessive: This allele is only shown in the phenotype of a homozygous recessive individual (e.g. bb) where they possess 2 recessive alleles. In heterozygous individuals, the recessive allele is masked by the presence of the dominant allele.

Homozygous: Both alleles possessed for a characteristic are the **SAME**. (e.g. BB or bb)

Heterozygous: Both alleles possessed for a characteristic are **DIFFERENT** forms. (e.g. Bb)

P: Symbol for parents/parental generation in a genetic cross.

F1: Symbol for the first generation of offspring in a genetic cross.

F2: Symbol for the 2nd generation of offspring in a genetic cross.

c) Monohybrid Crosses

A **monohybrid cross** is used to **predict** the **phenotypic ratios** of individuals in a genetic cross.

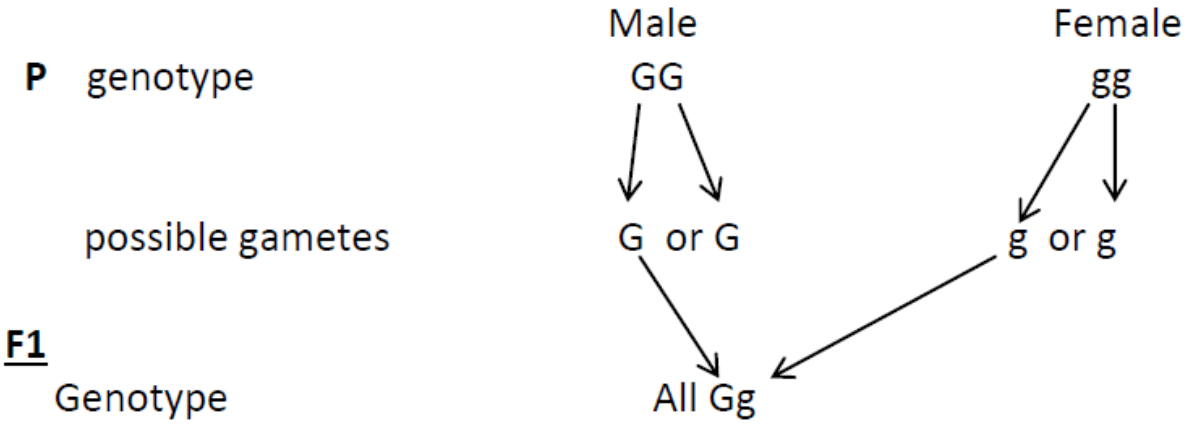
The genotype of the organism is indicated by **letters** only.

The **same** letter is used for each **alleles** of the same gene.

Dominant alleles are indicated by a **capital letter, recessive** alleles are indicated by a **small** letter.

The **possible gametes** of the parents are crossed to indicate the **predicted genotypes** of the F1 offspring.

Remember **gametes are haploid cells so will only contain one copy of each gene .**



Phenotype all offspring are **heterozygou**s therefore will all show the **dominant characteristic**

A cross involving two members of the F1 generation

F2 genoptypes

Possible gametes from the F1 generation G or g for both

Gametes inserted into punnet square to predict genotypes of offspring

/	G	g
G	GG	Gg
g	Gg	gg

F2 genotypes & phenotypes

GG = homozygous dominant – dominant characteristic

Gg = heterozygous - dominant characteristic

Gg = homozygous recessive - recessive characteristic

Ratios

Heterozygous crossed with **homozygous recessive, phenotypic ratio = 1:1**

2 Heterozygous parents produce a phenotypic ratio of **3:1**

d) The **actua**l phenotypic ratios are **not always achieved** because reproduction is a **random process** involving an element of **chance**